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**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**

METROPOLITAN TRANSPORTATION AUTHORITY

**REVISED DRAFT REPORT
October 18, 1993**

BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

Presented to:

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October 18, 1993

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I. INTRODUCTION

The Los Angeles County Metropolitan Transportation Authority (MTA) has identified the need to connect the existing Long Beach Blue Line with the proposed Pasadena Blue Line. The Downtown Blue Line Connection will improve overall mobility in the metropolitan Downtown Los Angeles area and may also supplement service offered by the Metro Red Line Subway in downtown which would otherwise serve as the sole downtown circulator between Union Station and the 7th Street Metro Center Station, thereby relieving a potential capacity problem on the Metro Red Line Subway.

Previous planning and environmental studies completed for the Long Beach and Pasadena Blue Lines have also identified the need for a connection of the two light rail systems through downtown Los Angeles. In addition, these studies have proposed a number of potential alignments that are identified as possible connectors. However, implementation of a light rail structure through downtown Los Angeles would potentially result in a large number of significant impacts due to the intensity of existing land use configurations found throughout the area. Therefore, this Preliminary Planning Study is needed to further study the range of alternatives for a downtown connector, identifying potential alignments through downtown Los Angeles.

This Blue Line Connection Preliminary Planning Study is a crucial step in creating the critical link between the Long Beach Blue Line and the Pasadena Blue Line. This study presents the need for a connector through downtown Los Angeles, identifies several feasible alternative routes, and begins to identify anticipated impacts and address the challenges associated with implementing such a system. A next phase of Route Refinement/EIR will be required to determine the exact configuration of the alignment, identify the full environmental impacts and the resulting mitigation measures associated with implementation. The goal of this Preliminary Planning Study is to identify a refined set of alternatives that can be carried forward for this further analysis and to provide a solid baseline of information regarding those refined alternatives to be used in the Route Refinement/Environmental Impact Report.

II. THE MTA REGIONAL RAIL PLAN

At the time of preparation of this report, the MTA is reviewing the existing 30-Year Plan and making recommendations to update it. Currently, the plan consists of a 400-mile regional rail network. It is within this context that the Downtown Blue Line Connector is planned. However, future policy decisions by the MTA Board could potentially affect the extent and timing of the rail network. The following is a description of the MTA Regional Rail Plan.

MTA has embarked on an aggressive plan to implement a 400-mile rail program in Los Angeles County that will be part of a regional rail program to complement the existing bus transit system. The rail program includes both urban rail lines in the most dense and congested corridors and commuter rail lines for long-distance regional travel, as well as other high-capacity transportation improvements. The urban rail lines include stations approximately every mile (closer in high-density areas like Downtown) and may operate with either heavy rail (i.e., Metro Red Line subway) or light rail (i.e., Metro Blue Line) technology. Commuter rail or Metro Link service is geared toward more suburban markets, with train stations located approximately five miles apart. The Metro Link trains run on conventional rail tracks.

A. *The Rail Program*

Figure II-1 illustrates the rail projects included in MTA's rail program. The figure includes several types of projects:

Existing rail projects, currently in operation. These include the Blue Line from Long Beach to LA Metro Center (7th/Flower), the Red Line from Union Station to Westlake/McArthur Park, Metro Link lines from Union Station to Moorpark, Santa Clarita, San Bernardino and Riverside, plus Orange County Transportation Authority Commuter Rail Service into Union Station.

Rail projects currently under construction or committed for construction. These include the Green Line from El Segundo to Norwalk (I-605 Freeway) along the I-105 Freeway, Red Line extension to the San Fernando Valley, Mid-City Area (Pico/San Vicente) and East Los Angeles and the Blue Line from Union Station to Pasadena.

Rail projects under study. These include additional extensions of the Red Line west from Pico/San Vicente to Westwood and east-west across the San Fernando Valley, and Candidate Corridors extending light rail service from Downtown Los Angeles to Burbank, the 10/60 Corridor and Santa Monica, and an extension of the Blue Line from Pasadena to Azusa. Extensions to the Green Line are also planned north to LAX, south to Torrance and east to the Norwalk Transportation Center. The Crenshaw Corridor (not shown on figure) extending from the Pico/San Vicente Red Line station south to the Green Line is also under study.

B. *The Downtown Connector*

The Blue Line Downtown Connector is under study because of the line's regional significance. The connector is essential to provide light rail system connectivity. Given the forthcoming start of construction on the Blue Line to Pasadena, the need for the Connector as a means to provide through-running trains between the existing Blue Line, the Pasadena Blue Line and any future light rail candidates becomes a critical issue for operation of the regional rail system. The Downtown Connector will serve four primary purposes initially: (1) it will eliminate the need for Blue Line patrons to transfer to the Red Line to travel through downtown, (2) it will provide an alternate distribution system for Metro Link riders coming into Downtown at Union Station, (3) it will allow trains on the Pasadena Blue Line to access the Maintenance Yard and Shops on the existing Blue Line, and (4) it will act as an effective circulation system within Downtown. Potential alignments for the Downtown Connector also provide opportunities for several joint development projects with major developments now in the planning stage. As an alignment is determined, detailed planning/design for these projects can proceed, incorporating a train station into development plans.

C. *Other Related Light Rail Lines*

In the longer term, the Downtown Connector will serve additional light rail lines running through or connecting to downtown. These will include the light rail lines north to Burbank, west to USC/Exposition Park (and potentially along the Exposition ROW to Santa Monica), and east to I-605 Freeway (10-60 Corridor). The Downtown Connector will then provide the opportunity for several combinations of through-running trains (e.g., Long Beach to Pasadena/Azusa, Long Beach to Burbank, Santa Monica to Pasadena, Santa Monica to Burbank, etc.)

D. *Implementation of the Downtown Connector*

How the rail projects shown in Figure II-1 will be implemented is currently under review by the MTA Board. The Pasadena Blue Line is currently estimated to be under construction through 1997. Based on that implementation schedule, the Red Line would then serve as the primary Downtown connector between Union Station and Metro Center requiring passengers to transfer at both locations (assuming a through north-south trip). Prior to that time, additional Metro Link lines, which are under construction with the use of State Rail Bonds, will be initiated (by 1996) as well as the Red Line Extensions to North Hollywood, East Los Angeles, and Pico/San Vicente by the year 2000, all of which have committed Federal funding. *Ridership levels are projected to increase on all these lines to the point that the Red Line trunk through Downtown will be operating above capacity and the mandatory transfers to/from the Red Line at Union Station will strain the capacity of Union Station itself.* The Downtown Connector is critical once a substantial portion of the Blue Line light rail system is in place. Furthermore, it will be difficult to operate the regional rail program efficiently and without significant inconvenience to rail passengers who would otherwise be forced to transfer one or more times to complete a trip through Downtown. The implementation of a Downtown Connector would not result in the need for additional maintenance facilities, but rather, would use existing rail maintenance facilities for service.



III. PRELIMINARY PLANNING STUDY APPROACH & METHODOLOGY

The Blue Line Connection Preliminary Planning Study is not intended to be a conventional engineering analysis of possible technical configurations through Downtown's existing development and landscape. Rather it is a preliminary review of sensible and feasible alignments which incorporate downtown Los Angeles' natural and cultural resources, business needs and economic trends, as well as transit engineering constraints and advantages. This Preliminary Planning Study will result in a refined set of alternatives used to initiate the subsequent Route Refinement/Environmental Impact Report phase. It is designed to provide MTA policy makers with a technical assessment of the conditions, alternatives and issues involved with this project.

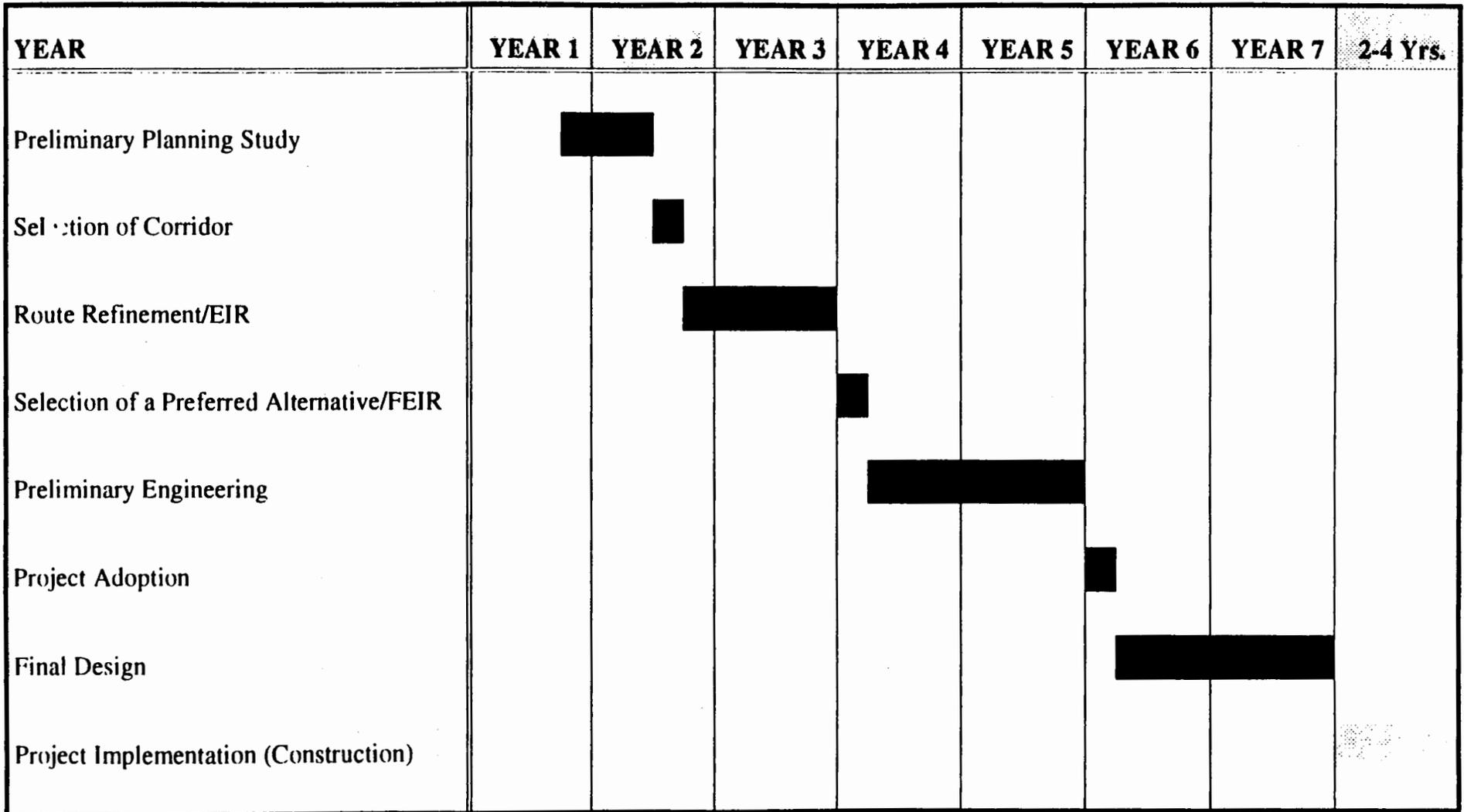
The Blue Line Connection project is a high visibility project which requires a wide range of disciplines for proper analysis. Therefore, a unique approach and methodology is necessary to ensure that any issues identified are addressed in a comprehensive manner. This approach includes a strong project team structure and an intensive public involvement program which is discussed in this section and reflected throughout this document.

A. *Study Process*

Building a light rail system to connect the existing Long Beach Blue Line with the proposed Pasadena Blue Line is a complex and engaging task that requires a thorough examination of all the issues and complexities associated with it. The first step toward implementing such a system is completion of a Preliminary Planning Study.

This Preliminary Planning Study is a comprehensive analysis dealing with a wide range of issues. As mentioned above, this study provides the framework upon which all additional studies will build. However, the goal of the study is not to reach conclusions regarding individual alternatives, but instead to provide a solid informational base on a refined set of alternatives from which comparisons can be drawn. A descriptive and illustrative profile is provided for each of the five refined alternatives to illustrate the merits of each alternative across a number of variables. However, no judgment is made regarding one alternative's superiority compared to another.

The next phase to be completed after the Preliminary Planning Study is the Route Refinement/Environmental Impact Review which is followed by Preliminary Engineering, Final Design and Construction/Implementation. Construction is estimated between two and five years depending upon alternative selection. (Figure III-1.)



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FIGURE III-1
Project Schedule

B. Project Team Structure

The project team structure is an important element to the overall success of the project due to the multifaceted nature of the Blue Line Connector which requires a number of different specializations and expertise. The Cordoba Team is comprised of six firms with a strong nucleus of professionals from various fields. The team is comprised of prime consultant Cordoba Corporation with Gruen Associates, Meyer Mohaddes Associates, Inc., Transmetrics, Sverdrup Corporation, and Manuel Padron and Associates. This team brings together a number of disciplines including: transportation planning, civil and structural engineering, design elements, and consensus building.

C. Public Involvement Program

Unique to this Preliminary Planning Study is the inclusion of an intensive public involvement program which includes three distinct groups: Technical Advisory Committee (TAC), Downtown Advisory Group (DAG), and the general public (Appendix A.). The TAC was comprised of individuals from public agencies and local elected officials. This includes MTA and RCC staff who need to remain apprised of the project. The DAG was comprised of any private citizen, entity or association in Downtown or with interest in Downtown. The general public was apprised of the project development through news articles principally in the Downtown News.

The TAC's role was to provide an advisory function throughout the study's duration. A total of six TAC meetings were held on a monthly basis to ensure the technical integrity of the project's direction as well as to solicit specific input. The goal of the TAC meetings was to build a consensus on the optimum set of alternatives for which further analysis can be provided.

The DAG was formed to encourage participation of business and community leaders. A total of four DAG meetings were held throughout the course of the study. In addition, a series of one-on-one meetings were held with members of the DAG to answer specific questions and/or concerns regarding the project.

The public involvement program contributed greatly to the overall project by raising salient issues and providing necessary information relevant to downtown Los Angeles. Both the TAC and DAG will be carried forward to the next phase of the project and will help provide on-going public participation throughout the project to the implementation phase.

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IV. DEVELOPMENT OF PRELIMINARY ALTERNATIVES

This section provides a summary of the preliminary review of feasible alignments for the Downtown Connection. A total of 14 alternatives form the original group that is evaluated in this section and refined into a subset for further analysis in the "Refinement of Alternatives Evaluation" section. The original (14) alternatives were based on previous MTA planning studies and alternatives proposed in other strategic planning studies such as the Downtown Strategic Plan.

This development of preliminary alternatives is a qualitative assessment of alternatives and is intended to be a cursory review of all 14 original alternatives across a number of variables. During this phase of the study, the objective is to eliminate any alternatives which may have "fatal flaws" within the context of Downtown Los Angeles and/or duplicate already existing or planned mass transit service. The results of this section, coupled with the input derived throughout the public involvement program and close consultation with MTA staff, resulted in a complete assessment of each alternative.

The following discussion outlines the preliminary evaluation process and highlights these initial findings.

A. *Review of Transportation System Documents*

A number of reports and studies have been reviewed to provide a clear understanding of existing studies and projects as they relate to the Blue Line Connector project. The following documents have been reviewed and are briefly summarized (Appendix B):

- CRA Fact Book - Los Angeles Downtown Strategic Plan
- Downtown Strategic Plan - CRA
- Transportation Improvement Plan for Union Station
- LACTC Proposed 30-year Integrated Transportation Plan
- Central City West Specific Plan
- Exposition Park Branch Line Rail Transit Corridor Route
- Pasadena-Los Angeles Light Rail Transit Project FEIR
- Final Report Part A - Electric Bus Study for RTD and the LACTC
- Bunker Hill Transit Study Phase II
- The Long Beach - Los Angeles Rail Transit Project FEIR
- Los Angeles Rail Rapid Transit Project - Metro Red Line FEIR

Information gleaned from these reports serves as background information and provides the starting point from which this development of preliminary alternatives begins. However, some of the studies and information reviewed is outdated and does not provide an accurate assessment of the current situation.

B. Identification of Alternatives

An original set of alternatives are identified and labeled for the development of preliminary alternatives. A number of sources contribute to the compilation of these alternatives including: the Long Beach Light Rail Line Environmental Impact Report, the Pasadena Light Rail Line Environmental Impact Report, the former Southern California Rapid Transit District, the Downtown Strategic Plan Advisory Committee and the study's Technical Advisory Committee and Downtown Advisory Group.

A total of 14 alternatives, including possible station locations, form the original group to be evaluated in this development of preliminary alternatives section (Figures IV-1,2,3,4.). These alternatives provide a wide array of options for consideration throughout the Downtown area and are listed below:

- Alternative #1 - Bunker Hill/Little Tokyo
- Alternative #2 - Financial District/Broadway/Spring
- Alternative #3 - 11th Street/San Pedro
- Alternative #4 - Pico/San Pedro
- Alternative #5 - Alameda
- Alternative #6 - Spring/Main
- Alternative #7 - Broadway (LA-2)
- Alternative #8 - Flower/Second/Los Angeles (LA-2)
- Alternative #9 - Olympic/Flower/First/Los Angeles (LA-3)
- Alternative #10 - Bunker Hill/Chinatown
- Alternative #11 - Bunker Hill/2nd Street
- Alternative #12 - North Main/Chinatown
- Alternative #13 - San Pedro
- Alternative #14 - Central

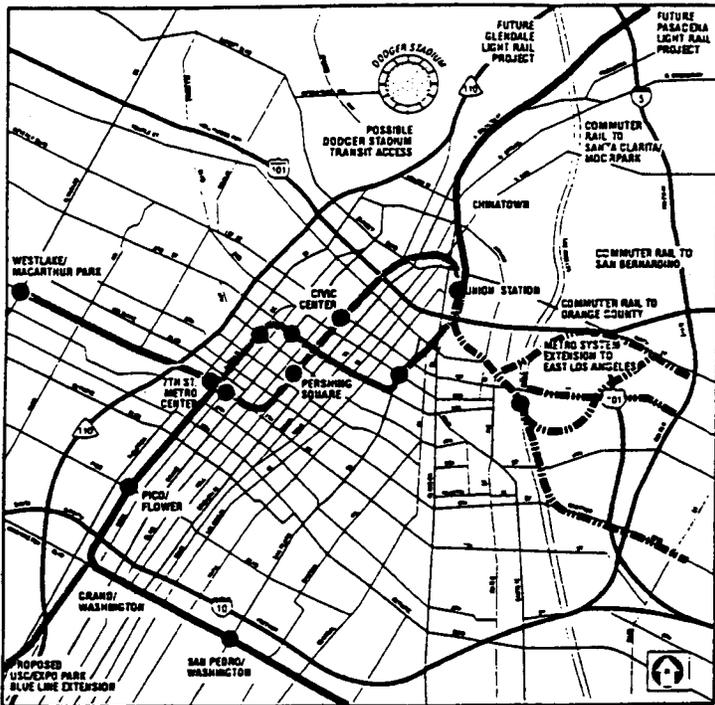
Note: Numbers for the alternatives are selected arbitrarily and do not reflect any prioritization. Station locations for each of the alternatives are carried forward from their original source when possible.

C. Matrix Approach

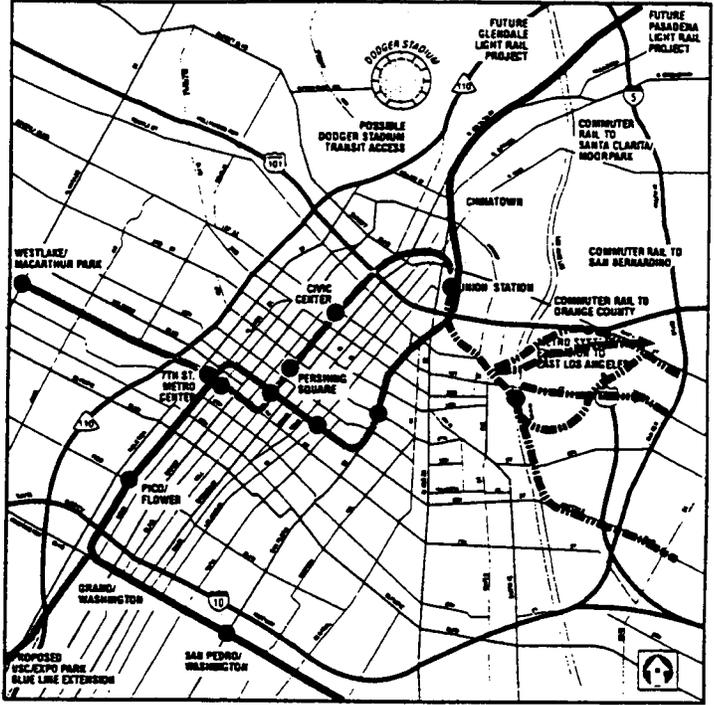
Development of a preliminary alternatives evaluation, requires an approach that allows for easy comparisons between alternatives and criteria. This evaluation process could include any number of techniques available, however, for this study, an evaluation matrix approach is selected to provide a comprehensive illustration of the conclusions derived from the analysis.

This evaluation includes a cursory analysis of each alternative by criteria. This analysis is preliminary in nature providing only a first glance at the available data. Preliminary documentation for each evaluation criteria summarizes the initial findings for each alternative.

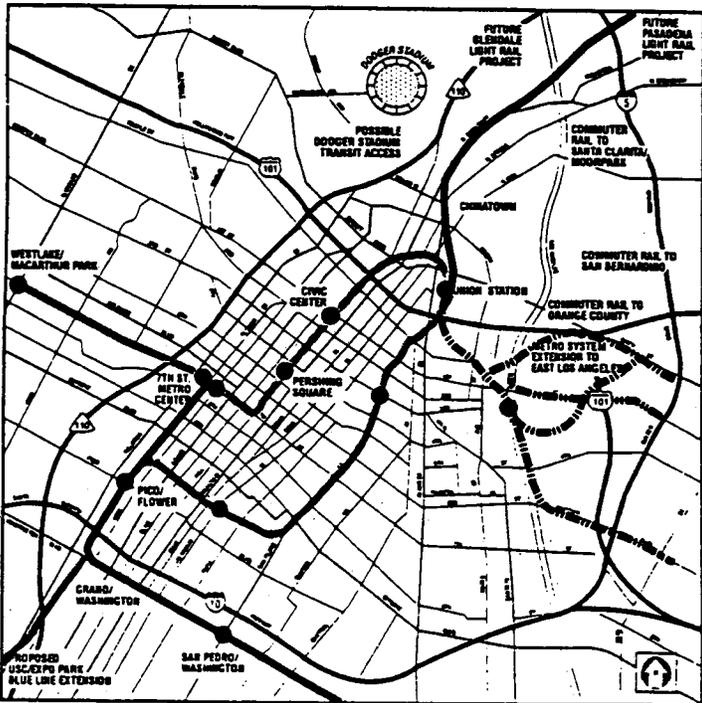
ORIGINAL ALTERNATIVES 1-4



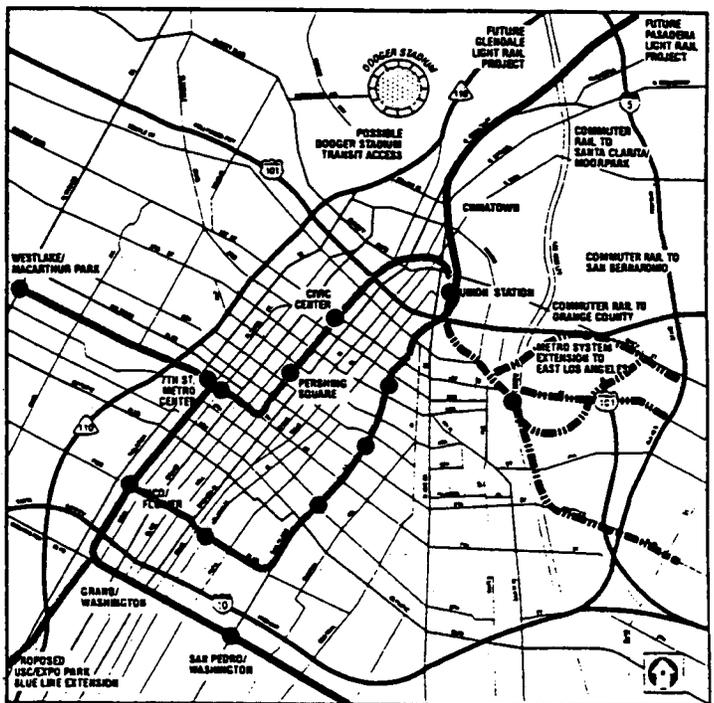
Alternative 1



Alternative 2



Alternative 3



Alternative 4



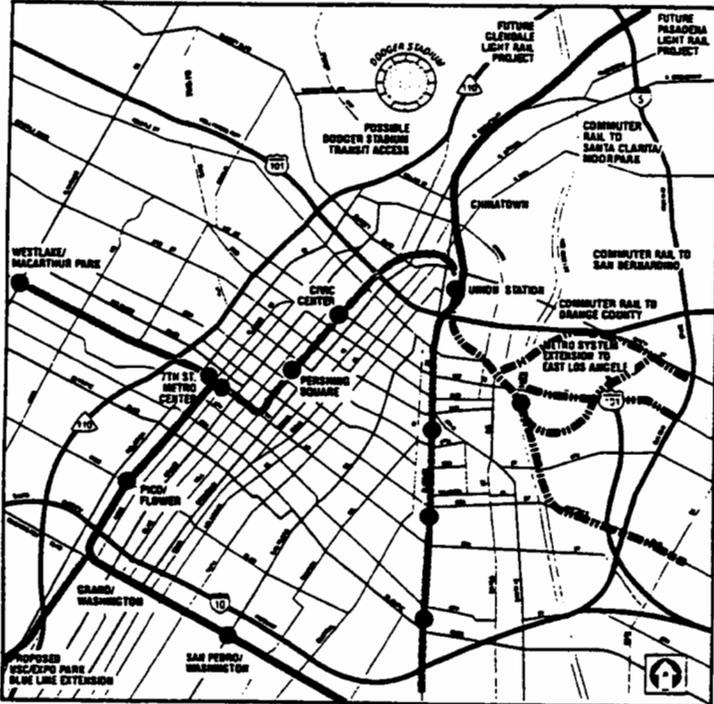
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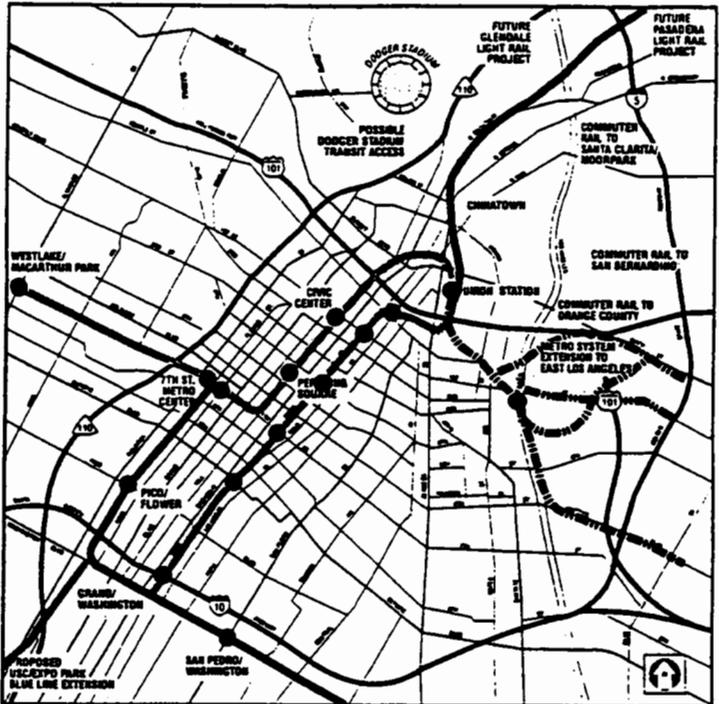
FIGURE IV-1

- Metro Red Line
- Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- Downtown Connector Alternative

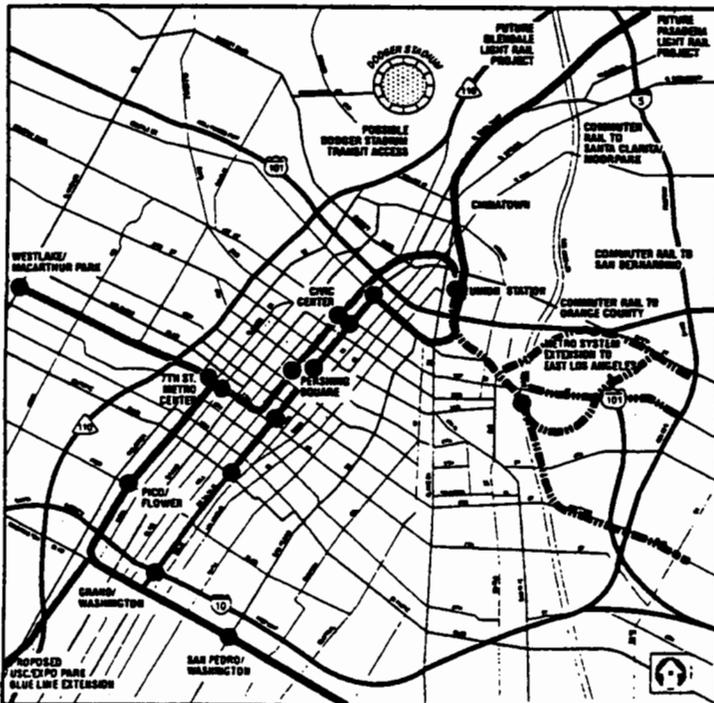
ORIGINAL ALTERNATIVES 5-8



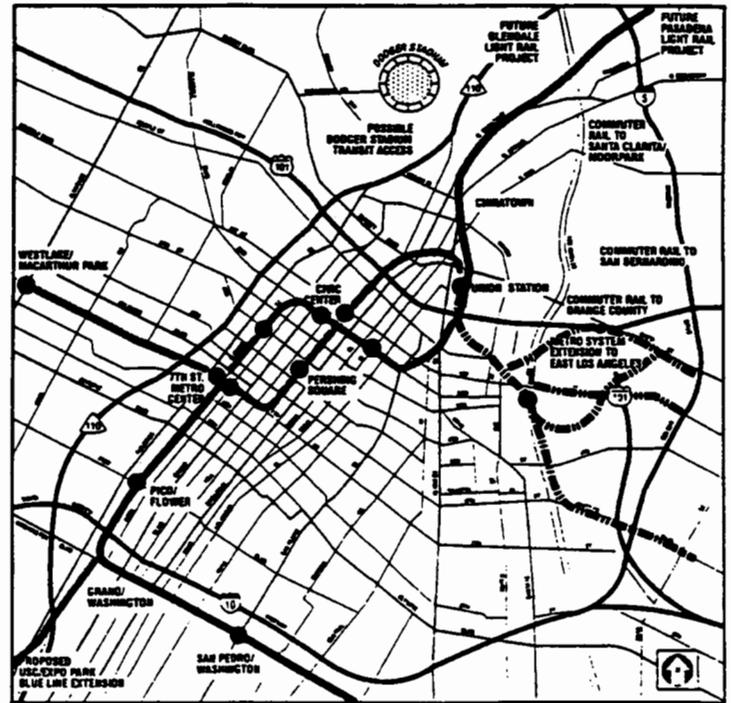
Alternative 5



Alternative 6



Alternative 7



Alternative 8



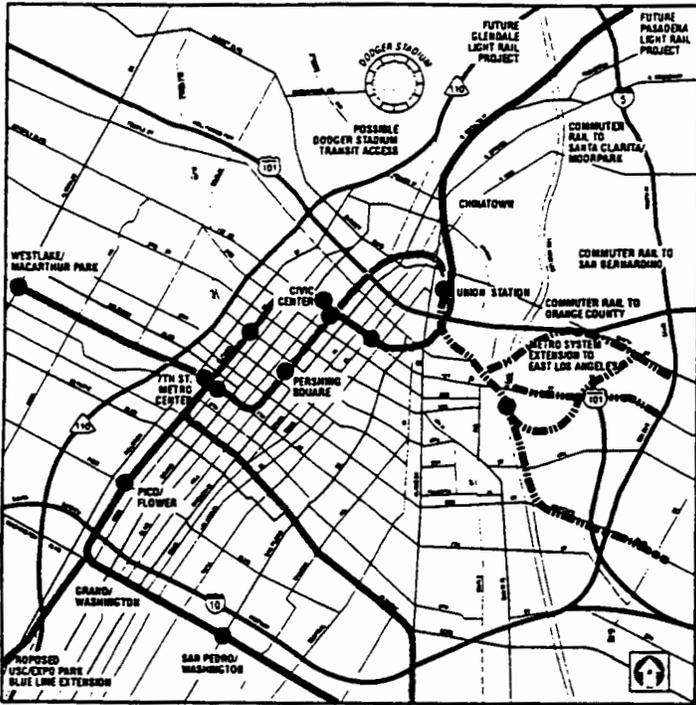
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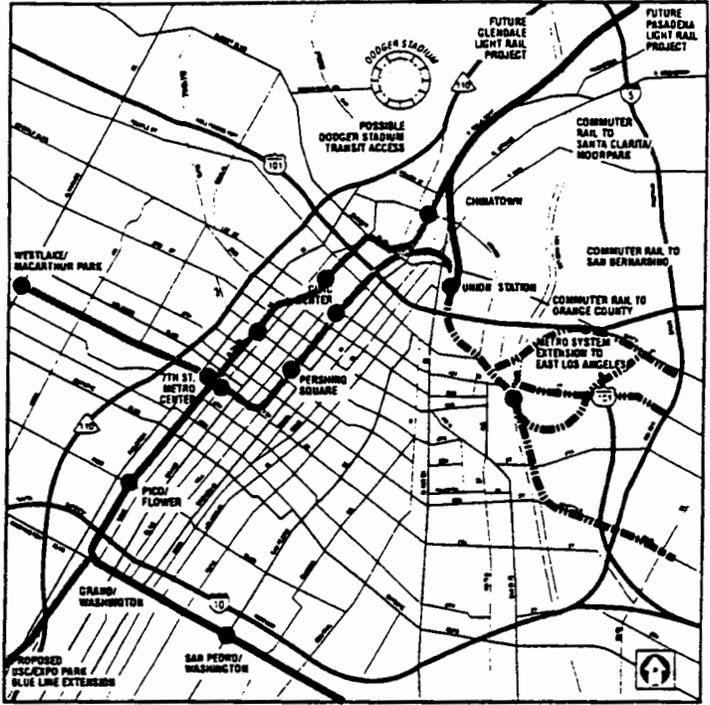
FIGURE IV-2

- Metro Red Line
- Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- Downtown Connector Alternative

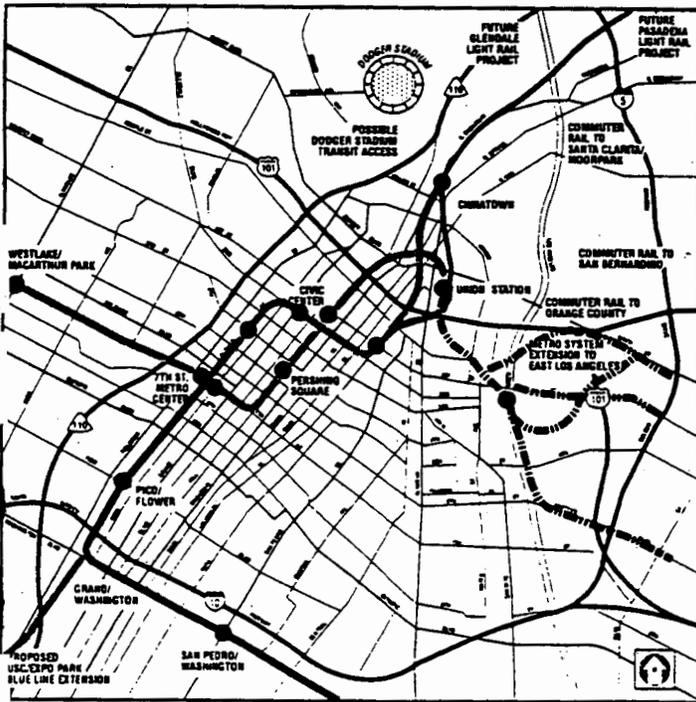
ORIGINAL ALTERNATIVES 9-12



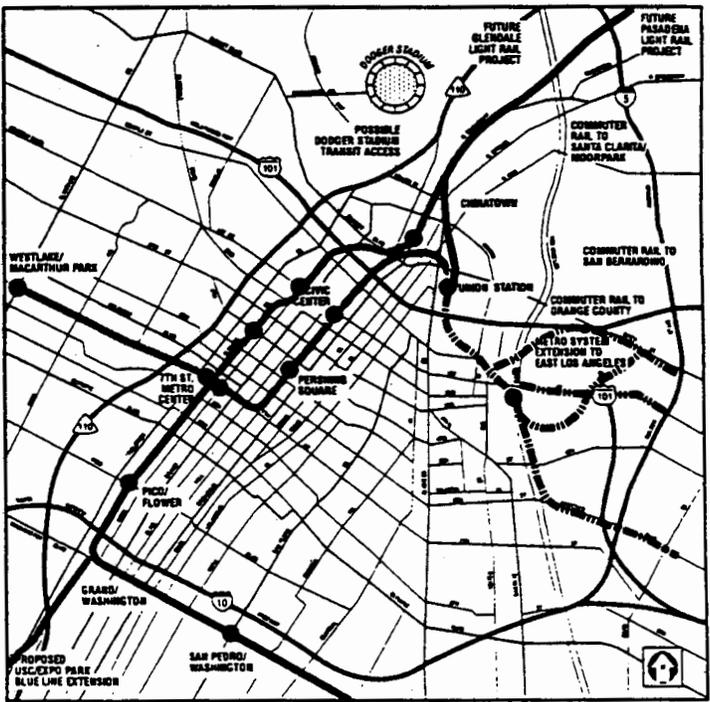
Alternative 9



Alternative 10



Alternative 11



Alternative 12



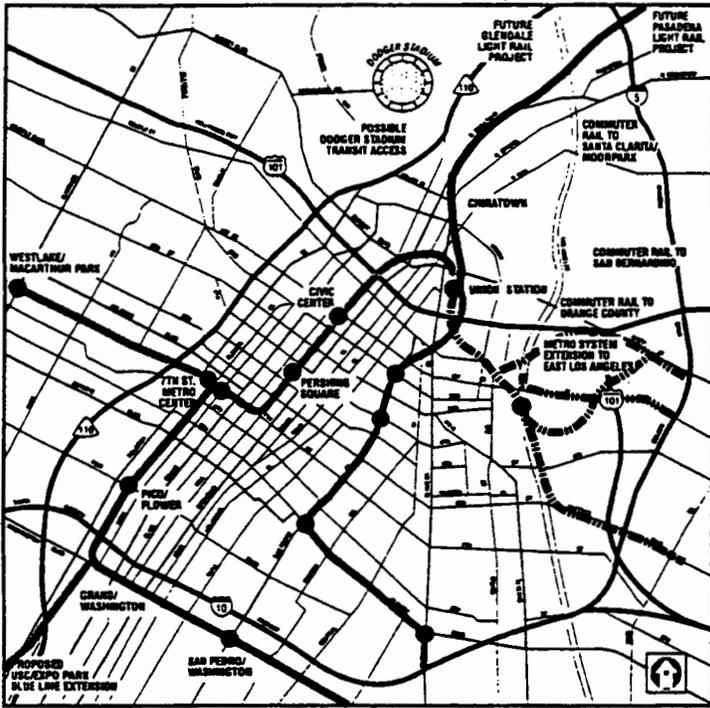
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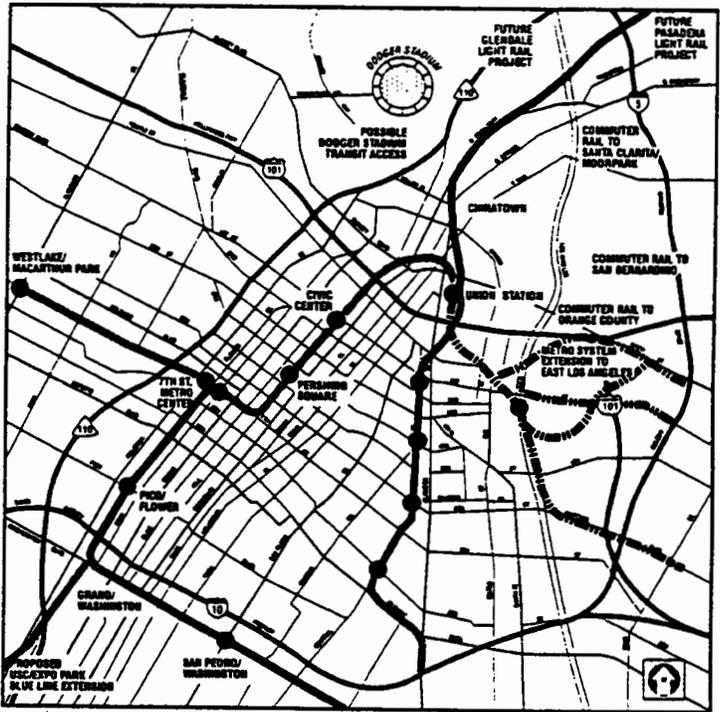
FIGURE IV-3

- Metro Red Line
- Metro Red Line Eastern Extension Alternatives
- Metro Blue Line - Long Beach and Pasadena Segments
- Downtown Connector Alternative

ORIGINAL ALTERNATIVES 13-14



Alternative 13



Alternative 14



BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

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FIGURE IV-4

- Metro Red Line
- Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- Downtown Connector Alternatives

The initial results mentioned above are used to create a single evaluation matrix which summarizes all the documentation relating to the original alternatives and criteria. Due to the qualitative nature of this evaluation, numbers are not used in this matrix to prevent any discrimination of alternatives based on results of a single individual criteria analysis. Instead, a "high", "medium" or "low" ranking is given to each alternative within each criteria. This ranking is assigned depending upon the alternative's performance against the criteria and was used to assess the relative strengths and weaknesses of the alternatives while not prejudging any one.

D. Selection of Evaluation Criteria

The criteria, to be used in the development of preliminary alternatives evaluation described above, were developed through a series of discussions with MTA staff, the TAC, the DAG and the Consultant Team. Criteria have been chosen to include a wide range of disciplines providing useful insight into the positive and negative elements of the proposed alternatives. Careful attention is paid to balance the criteria between engineering, operational, financial and social issues. The following is a list of the nine selected criteria including a brief description:

Inter-modal Transfers Between Systems - The extent to which the alignment of the Blue Line Downtown Connection requires transfers in order to access other transit modes, i.e. Metro Red Line, Metro Link, other light rail lines, bus, DASH, etc.

Cost and Funding Feasibility - An assessment of the expected costs of the Blue Line Downtown Connection given the alignment length, number of stations and configuration.

Employment Centers - The degree to which the Blue Line downtown connection serves existing and possible future employment centers in the downtown Los Angeles community, i.e. Bunker Hill, Garment district, Civic Center, etc.

Relation to Downtown Strategic Plan Goals - An assessment of the possible alignments in relation to the goals of the Downtown Strategic Plan. This evaluation will only indicate compatibility or apparent conflicts.

Geographic Distribution of Transit - The degree to which the Blue Line Downtown Connection demonstrates an equitable distribution of rail transit service within downtown Los Angeles.

Engineering Feasibility/Constructibility - Given the planned alignment, number of stations and configuration of the Blue Line Downtown Connection, the degree to which the combination of these elements are feasible from an engineering perspective in the existing downtown Los Angeles landscape.

Patronage and System Capacity - Given the alignment and potential connections to other modes, an assessment of the system's ridership capacity.

Land Use Compatibility - An assessment of the potential land use impacts and compatibility with existing general and specific plans for downtown Los Angeles.

Economic Development Potential - Identification of the economic development opportunities and constraints associated with the Blue Line Downtown Connection.

Overall system operations and regional connectivity for the proposed alternatives was also regularly reviewed during the development of alternatives phase by MTA staff. A complete discussion is presented for the final set of alternatives.

E. Preliminary Evaluation Results

As previously discussed, the nature of this preliminary evaluation is qualitative with the primary focus of the evaluation centered on ranking the alternatives by criteria using three rankings of "high", "medium" and "low". To accomplish this across 11 preliminary evaluation criteria and 14 original alternatives, a separate analysis was completed by criteria and a table summarizing the analysis was completed. Using these findings, the alternatives were ranked. In addition to this analysis, input received from the TAC and DAG meetings was utilized to ensure the proper ranking of alternatives.

From these results, the evaluation matrix is created to highlight the strengths and weaknesses of each alternative and summarize the initial findings. (Figure IV-5.) This matrix allows each alternative to be compared with another relative to any one criteria. However, the preliminary matrix is not a quantitative tool to be used across all eleven criteria simultaneously. Rather, it graphically illustrates the results of the preliminary evaluation for the purpose of selecting a subset of feasible alternatives for in-depth analysis.

Using the preliminary evaluation matrix, a set of advantages and disadvantages are identified and summarized for each of the 14 alternatives. (Figure IV-6.) Using this summary table and preliminary evaluation matrix, a recommendation was made to either combine, refine or drop alternatives from consideration. This recommendation was reviewed and approved by the TAC and DAG.

F. Refined Alternatives

From the original 14 alternatives, a subset of five alternatives are recommended for further evaluation in the "Refinement of Alternatives Evaluation" section. These five alternatives include:

- Alternative #1 - Bunker Hill/Little Tokyo
- Alternative #5 - Alameda Corridor
- Alternative #8 - Flower/Second/Los Angeles (LA-2)
- Alternative #9 - Flower/First/Los Angeles (LA-3)
- Alternative #3, #4 & #13 - San Pedro Street East (combination of alternatives)

ALTERNATIVES	INTER-MODAL TRANSFERS	COST AND FUNDING FEASIBILITY	EMPLOYMENT CENTERS	RELATION TO DSP GOALS	GEOGRAPHIC DISTRIBUTION OF TRANSIT	ENGINEERING FEASIBILITY/ CONSTRUCTIBILITY	PATRONAGE AND SYSTEM CAPACITY	LAND USE COMPATIBILITY	ECONOMIC DEVELOPMENT POTENTIAL
1 BUNKER HILL/LITTLE TOKYO	CONVENIENT	MEDIUM/MEDIUM	HIGH	ADEQUATE	HIGH/HIGH	DIFFICULT	MEDIUM	HIGH	HIGH
2 FINANCIAL DISTRICT/BROADWAY/SPRING	CONVENIENT	MEDIUM/HIGH	LOW	ADEQUATE	MEDIUM/MEDIUM	DIFFICULT	MEDIUM	MEDIUM	LOW
3 116th/SAN PEDRO	CONVENIENT	MEDIUM/MEDIUM	LOW	CONSISTENT	MEDIUM/HIGH	AVERAGE	HIGH	MEDIUM	MEDIUM
4 PICO/SAN PEDRO	CONVENIENT	MEDIUM/MEDIUM	LOW	CONSISTENT	MEDIUM/HIGH	AVERAGE	HIGH	MEDIUM	LOW
5 ALAMEDA	INCONVENIENT	VERY LOW/VERY HIGH	LOW	ADEQUATE	LOW/HIGH	AVERAGE	MEDIUM	MEDIUM	HIGH
6 SPRING/MAIN	INCONVENIENT	VERY LOW/VERY HIGH	HIGH	ADEQUATE	HIGH/MEDIUM	AVERAGE	LOW	MEDIUM	HIGH
7 BROADWAY (LA-1 2)	INCONVENIENT	VERY LOW/VERY HIGH	HIGH	ADEQUATE	LOW/LOW	AVERAGE	LOW	HIGH	HIGH
8 FLOWER/SECOND/LOS ANGELES (LA-2)	CONVENIENT	LOW/HIGH	HIGH	CONSISTENT	MEDIUM/LOW	AVERAGE	MEDIUM	HIGH	MEDIUM
9 OLYMPIC/FLOWER/FIRST/LOS ANGELES (LA-3)	CONVENIENT	A.) LOW/HIGH B.) VERY HIGH/VERY LOW	HIGH	ADEQUATE	HIGH/MEDIUM	DIFFICULT	HIGH	MEDIUM	HIGH
10 BUNKER HILL/CHINATOWN	INCONVENIENT	MEDIUM/HIGH	MEDIUM	ADEQUATE	LOW/LOW	DIFFICULT	MEDIUM	HIGH	MEDIUM
11 BUNKER HILL/2nd STREET	INCONVENIENT	MEDIUM/MEDIUM	MEDIUM	CONSISTENT	HIGH/MEDIUM	DIFFICULT	MEDIUM	HIGH	LOW
12 NORTH MAIN/CHINATOWN	INCONVENIENT	MEDIUM/MEDIUM	MEDIUM	ADEQUATE	LOW/LOW	DIFFICULT	MEDIUM	HIGH	MEDIUM
13 SAN PEDRO	INCONVENIENT	VERY LOW/VERY HIGH	MEDIUM	CONSISTENT	HIGH/HIGH	AVERAGE	MEDIUM	MEDIUM	HIGH
14 CENTRAL	INCONVENIENT	VERY LOW/VERY HIGH	MEDIUM	ADEQUATE	HIGH/HIGH	AVERAGE	MEDIUM	MEDIUM	HIGH



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**FIGURE IV-5
Preliminary Evaluation Matrix**

ALTERNATIVES	ADVANTAGES	DISADVANTAGES	RECOMMENDATION
1. BUNKER HILL/LITTLE TOKYO	Major Employment & Cultural Centers Direct Connection Serves Little Tokyo	High Cost Difficult Engineering	REFINE*
2. FINANCIAL DISTRICT/ BROADWAY/SPRING	Geographic Distribution Serves Little Tokyo	Duplicates Red Line Service High Cost Difficult Engineering No Bunker Hill Service	DROP
3. 11thST/SAN PEDRO	Consistent w/ DSP Goals Geographic Distribution	No Bunker Hill Service Potential Traffic Impacts	REFINE (COMBINE 3, 4, 13)
4. PICO/SAN PEDRO	Consistent w/ DSP Goals Geographic Distribution	No Bunker Hill Service Potential Traffic Impacts	REFINE (COMBINE 3, 4, 13)
5. ALAMEDA	Geographic Distribution Low Cost Economic Development Potential	No Bunker Hill Service	REFINE
6. SPRING/MAIN	Major Employment & Cultural Centers Economic Development Potential	No Bunker Hill Service Duplicates Transit Service Potential Traffic/Operational Constraints	DROP
7. BROADWAY (LA-1-2)	Major Employment & Cultural Centers Economic Development Potential	No Bunker Hill Service Duplicates Transit Service Potential Traffic/Operational Constraints	DROP
8. FLOWER/SECOND/LOS ANGELES (LA-2)	Serves Bunker Hill Direct Connection Serves Little Tokyo	High Cost Difficult Engineering	REFINE*
9. OLYMPIC/FLOWER/FIRST/ LOS ANGELES (LA-3)	Serves Bunker Hill Direct Connection Serves Little Tokyo	High Cost Difficult Engineering	REFINE*
10. BUNKER HILL/CHINATOWN	Serves Bunker Hill	No Union Station Connection High Cost Difficult Engineering Potential Traffic/Operational Constraints	DROP
11. BUNKER HILL/2nd STREET	Serves Bunker Hill	No Union Station Connection High Cost Difficult Engineering Potential Traffic/Operational Constraints	DROP
12. NORTH MAIN/CHINATOWN	Serves Bunker Hill	No Union Station Connection High Cost Difficult Engineering Potential Traffic/Operational Constraints	DROP
13. SAN PEDRO	Consistent w/ DSP Goals Geographic Distribution Serves Little Tokyo	No Bunker Hill Service Potential Traffic/Operational Constraints	REFINE (COMBINE 3, 4, 13)
14. CENTRAL	Consistent w/ DSP Goals Geographic Distribution Serves Little Tokyo	Physical Feasibility Land Use Impacts No Bunker Hill Service	DROP

* SIMILAR ALTERNATIVE

NOTE: This table summarizes the Preliminary Evaluation Matrix and highlights the predominant advantages and disadvantages of each alternative for decision making purposes.



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**FIGURE IV-6
Preliminary Recommendations**

These alternatives provide geographic dispersement throughout downtown Los Angeles with three variations of one primary alternative serving the Bunker Hill community and two alternatives serving the eastern industrial community in downtown.

The alignment for each of these alternatives has also been refined to optimize the positive characteristics of each line and improve the cost effectiveness of each alternative. The following modifications were made prior to beginning the in-depth analysis:

- Alternative #9 originally had an east-west segment connecting the Long Beach Blue Line south of Metro Center at 9th Street to Alameda Street and proceeding south via Long Beach Avenue to Washington Boulevard (This was originally considered as an alternative to Washington Boulevard for the existing Blue Line.). This segment of Alternative #9 has been removed from consideration, which reduces costs.
- The fifth selected alternative is a derivative of Alternatives #3, #4 and #13. All three of the original alternatives traverse primarily along San Pedro connecting with the Long Beach Blue Line via either 11th Street (Alt. #3), Pico Boulevard (Alt. #4) or Olympic Boulevard/Long Beach Avenue (Alt. #13). The new refined alignment extends north from the existing Long Beach Blue Line along San Pedro to First Street proceeding east along First behind the Mangrove site (private development at northeast corner of First and Alameda Streets) and then continuing along Gooier Street to Union Station.

The five refined alternatives are relabeled to simplify the refined subset and eliminate any confusion with the old numbering system. The new names are listed below in **bold** with the old original alternative number attached for clarification:

Alternative A - Bunker Hill First Street
Alternative #9 - Flower/First/Los Angeles (LA-3)

Alternative B - Bunker Hill Second Street
Alternative #8 - Flower/Second/Los Angeles (LA-2)

Alternative C - Bunker Hill Third Street
Alternative #1 - Bunker Hill/Little Tokyo

Alternative D - San Pedro Street
Alternatives #3, #4, & #13 - San Pedro Street East

Alternative E - Alameda Street
Alternative #5 - Alameda Corridor



V. REFINEMENT OF ALTERNATIVES EVALUATION

A. *Overview*

In the previous section, the preliminary evaluation resulted in the original 14 alternatives being narrowed to a subset of five refined alternatives. In this section, the five refined alternatives are reviewed in greater detail. Unlike the preliminary evaluation, the refinement of alternatives evaluation is a detailed analysis of each alternative irrespective of one another. The objective is to provide a body of information specific to each alternative which will reveal its feasibility, efficiency, and estimated impacts and benefits to the community. It is not intended to rank the alternatives from "best" to "worst". This approach will allow MTA to make an informed decision for appropriate next steps in the Route Refinement/Environmental Impact Report phase. The following discussion highlights the process and results of the refinement of alternatives evaluation.

To complete the refinement of alternatives evaluation, a set of in-depth evaluation criteria were chosen by MTA staff together with the TAC and DAG to provide a highly descriptive and quantitative analysis of alternatives. The resulting set of criteria represent those factors which are essential for review in the development of a light rail system. The criteria listed below are discussed and presented in equal detail for each of the five refined alternatives in the subsequent subsections:

- Technical Description of Alternative
- Engineering Feasibility and Constructibility
- Station Location and Design Analysis
- Economic/Market Analysis
- Capital Costs
- Environmental Assessment
- Transportation Impact Analysis

The result of the refinement of alternatives evaluation is a compilation of information relative to each of the five refined alternatives. Findings are therefore, presented by alternative in a concise format to provide an summation of the alternative.

Following the alternative subsections is the Analysis of Ridership and Operations for all five of the refined alternatives. This section is a comprehensive analysis of all five alternatives plus a dual connector within the framework of the entire regional operating system. A combined discussion of the operating plans and patronage analysis for the alternatives is most useful presented jointly. Similarities and differences are readily highlighted and concluding remarks are provided for maximum interpretation.

In addition, the "Systems Facilities" discussion is presented as a separate technical report. The light rail vehicle (LRV) systems and trackwork must be compatible with those that have been selected for the existing Long Beach segment and the planned future Pasadena segment. As a

result. this is not a new system type proposed for the Downtown Connector. Additional information on the definition of this system, however, is provided in the accompanying report.

Essentially, all construction plans and specifications shall comply with current requirements of the American Railway Engineering Association (AREA) Manual for Railway Engineering and Portfolio of Trackwork Plans, and the American Public Transit Association (APTA) Guidelines for Design of Rapid Transit Facilities, modified as necessary to reflect the physical requirements and the operating characteristics of the Blue Line Light Rail Transit (LRT) system.

Where the LRV operates in a public street or shares its right-of-way with motor vehicles, the design guidelines of the American Association of State Highway and Transportation Officials (AASHTO), Caltrans or the Los Angeles Public Utilities Commission (PUC) shall also be adopted per LACMTA guidelines.

Following the presentation of findings by alternative subsections and the discussion of Operations Plans & Patronage Analysis is a Comparative Analysis of Alternatives. This review presents the alternatives collectively and allows distinct and subtle differences between alignments to be discussed. Finally, this report concludes with a discussion of significant issues relevant to the Downtown Light Rail Connection and potential next steps.

UNION STATION



BUNKER HILL

RED LINE



7th CENTER METRO

SAN PEDRO

ALAMEDA

BLUE LINE

ALTERNATIVE A

BUNKER HILL FIRST STREET

ALTERNATIVE A Bunker Hill First Street

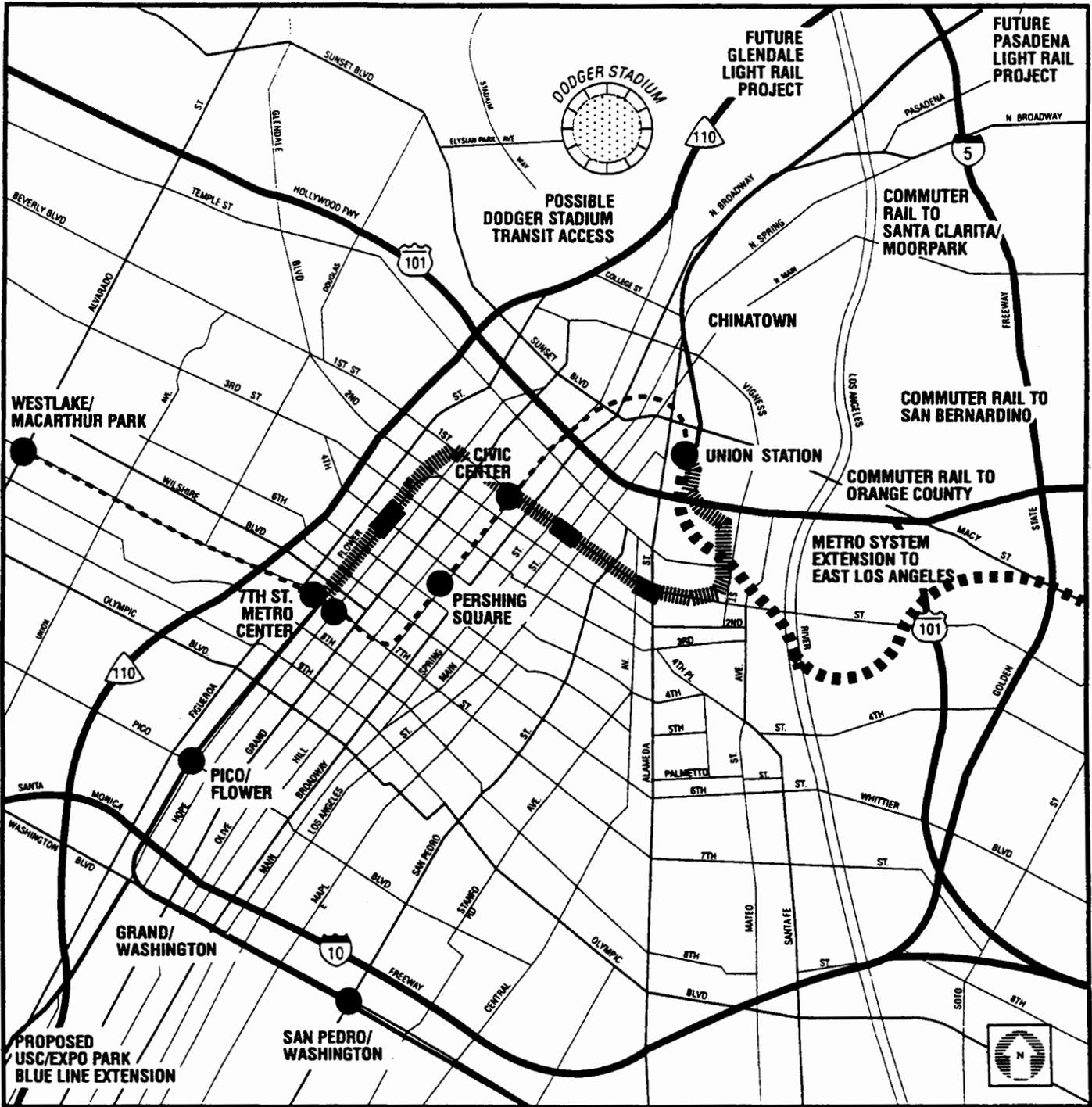
Technical Description of Alignment

Alternative	Subalternative	At-Grade	Tunnel	Cut & Cover	Aerial	Total
A	---	720'	7,460'	1,870'	900'	11,040'

Source: Transmetrics

Alternative A - Bunker Hill First Street is the first of three alternatives studied which begin at the existing terminus of the Long Beach - Los Angeles Blue Line at Metro Center (Seventh and Flower Streets). (Appendix E Plan and Profile Alt. A.) The existing station at that location is underground, and the line extension from that point to the north would be similarly underground. As this alternative proceeds north along Flower Street, a curve-tangent-curve arrangement is introduced which turns the line to the east directly under First Street. The line continues in tunnel under First Street, through Little Tokyo and beyond Alameda Street before once again turning to the north. At this point the alignment undergoes a transition from an underground to an aerial structure, with the resulting portal structure being located just north of Turner Street. The alignment itself avoids the Nishi Hongwanji Buddhist Temple located at the intersection of First and Vignes Streets, and also endeavors to maintain traffic along Garey Street between Turner and Ducommun Streets. To accomplish this, the alignment emerges somewhat east of Garey Street, thereby affecting the properties along Garey Street between Turner and Commercial Streets. However, there is a possibility that Garey Street between Ducommun and Commercial Streets, as well as Ducommun and Jackson Streets between Garey and Vignes Streets, would be closed to traffic if there is not enough right-of-way available. Reverse curves are then introduced to transition the alignment from along Garey Street, across the Hollywood Freeway, and eventually to tie into trackage along Platform No. 1 of Union Station. At that location, the alignment connects with the Pasadena - Los Angeles Blue Line.

Three stations are proposed for **Alternative A**, including: 4th & Flower, 1st & Main and 1st & Alameda. On the following page is a study area map illustrating the proposed alignment through Downtown Los Angeles. (Figure V-A1.) In addition, a complete set of Plan and Profile drawings are presented in Appendix E. These drawings are to be viewed only as conceptual drawings completed to assess engineering feasibility.



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**ALTERNATIVE A
 BUNKER HILL-FIRST STREET
 Figure V-A1**

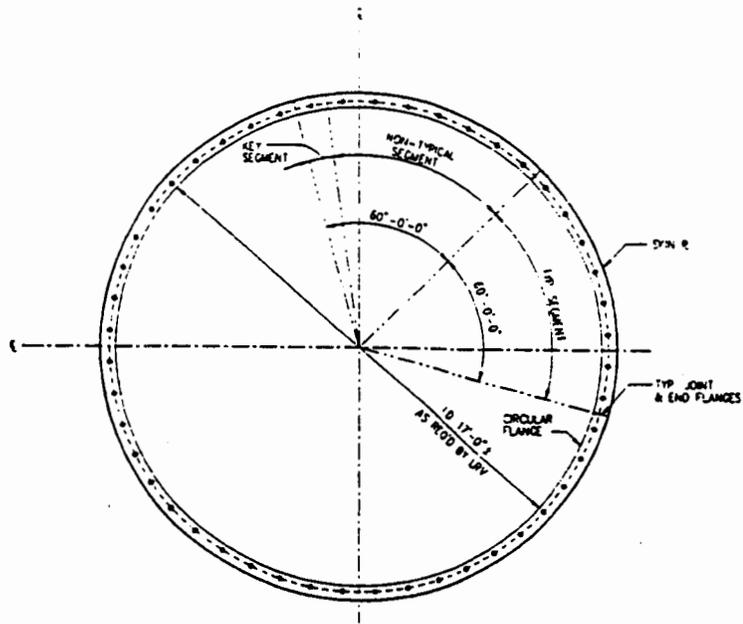
Engineering Feasibility and Constructibility

Two basic approaches are available for the construction methodology of Bunker Hill alternatives underground segments: 1) deep bored tunnels (Figure to the right), and 2) cut-and-cover construction (opposite page). *This is the same for Alt. A, B & C.*

Deep Bored Tunnels

Tunneling requires two separately-bored tubes, one needed for each direction of track. If deep enough, these tunnels would not negatively affect buildings or other types of structures above. However other potentially serious issues related to tunneling include:

- High capital costs
- Time of construction
- Necessary ventilation
- Geological and/or groundwater consideration
- Effect of sharp horizontal curves
- Tunnel construction permit and safety issues



BORED TUNNEL - TYPICAL SECTION

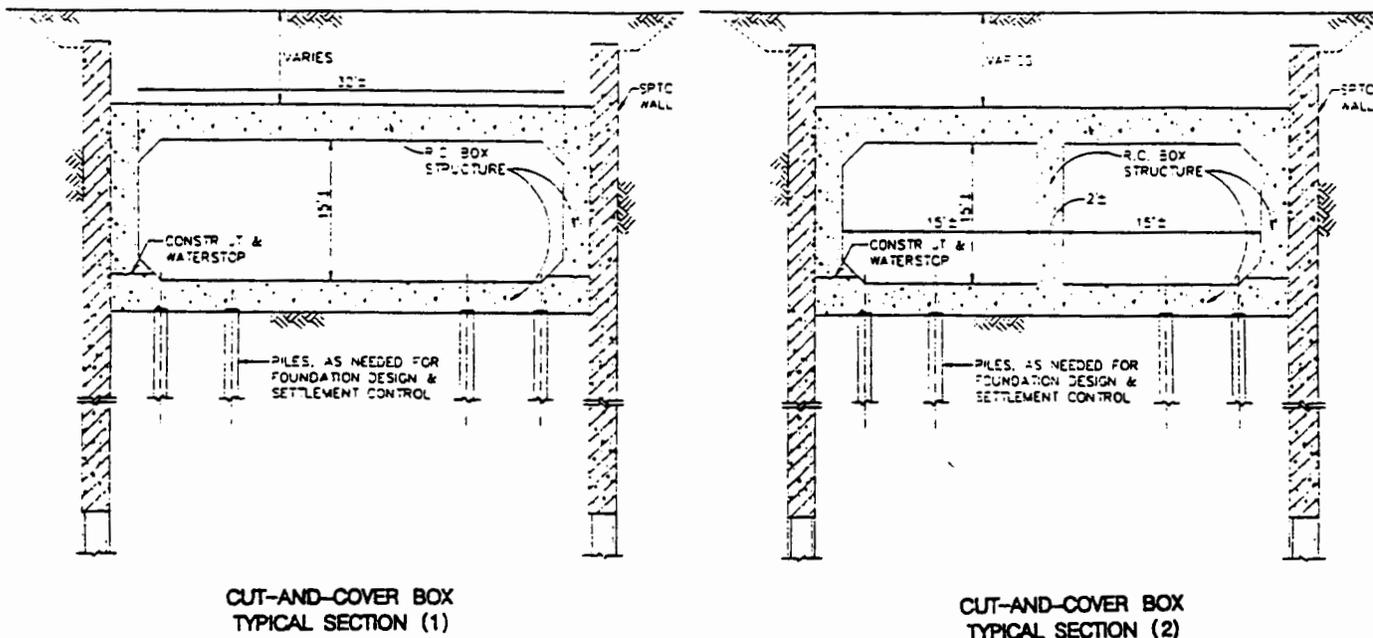
Cut-and-Cover Construction

Cut-and-cover construction would involve a single large trench and the construction of a box structure which would eventually be buried, thereby allowing the reconstruction of the involved street above. The required trench would be wide enough to accommodate a two-track light rail line. With double platforms located along the exterior sides of tracks in the underground stations, such as the case of the existing Metro Center Station, the width of the cut-and-cover concrete box may be kept minimum between stations. Such minimum box width is approximately 45' considering the dual-track train operation envelope, a pair of structural walls, and their adjacent outer SPTC walls. However, for less disturbance to the existing buildings, it is desirable to have a minimum clear space on each side of 10' added to the construction limit. Thus, a rough estimate of the required street width for normal cut-and-cover construction is approximately 65'. In addition, other issues related to cut-and-cover include:

- Temporary disruption of vehicular/pedestrian traffic and parking (mitigated by temporary covering of trench)
- Potential impacts on businesses along the route (mitigated by RCC mitigation plans)
- Potential noise and air pollution during construction
- Generally greater impacts upon existing utilities and what is required to maintain services
- Soil support requirements

Requirements for Alternative A - Bunker Hill First Street

The above trade-offs between tunnel and cut-and-cover construction approaches must be considered for all Bunker Hill alternatives. In certain circumstances, however, a choice is not available. The construction of underground stations will require cut-and-cover construction, regardless of the depth of the station. Furthermore, and as a rule of thumb, the top of any tunnel structure should be approximately one tunnel diameter below the surface elevation in order to allow the tunnel to be bored. A lesser depth could also mandate cut-and-cover construction.



Specific to the three Bunker Hill alternatives is the immediate transition from Metro Center to a tunnel section which requires cut-and-cover construction. In addition, all the **Bunker Hill Alternatives A, B and C** transition from tunnel to aerial viaducts along Garey Street which can be assumed to also involve cut-and-cover construction. This could be extended to the 1st/Alameda Station to save costs. Other engineering issues include:

Under Red Line Tunnels - The vertical location of the existing Red Line along Hill Street as it crosses First Street is near the surface. Therefore, at this location the Blue Line Connection **Alternative A** must be a tunnel section *under* the Red Line due to insufficient cover over the Red Line for **Alternative A** to be constructed.

Less-than-desired Horizontal Radii - The minimum desired horizontal radius to allow trains to operate at 25 mph is 200'. Slightly less-than-desired minimum horizontal radii must be utilized in back-to-back turns at Garey and Ducommun Streets and crossing the Hollywood Freeway connecting with Union Station. This is true for all three Bunker Hill Alternatives due to existing land use configurations and alignment restraints.

Freeway Viaduct - The viaduct crossing of the Hollywood Freeway will require careful monitoring. Special design considerations may be necessary to achieve the necessary vertical clearance over freeway lanes. It has already been concluded that the vertical curve just south of Platform No. 1 may have to already begin within Union Station right-of-way. (Appendix C.) Furthermore, Caltrans has ongoing plans to introduce modifications to the freeway corridor at this location. The placement of piers for the transit structure and, in turn, the resulting span lengths and structural depths are all issues which could affect geometric definition. (This is true for all three Bunker Hill alternatives.)

Planned Development Impacts - The line location would also have to be coordinated with planned development within the Mangrove Site (an area bounded by Alameda Street to the west, First Street to the south, Temple and Turner Streets to the north, and private right-of-way to the east), as well as the "Central Plant" development planned at Third and Flower Streets. (This is true for all three Bunker Hill alternatives.)



Station Location and Design Analysis

Given the alignment of **Alternative A** as determined by engineering feasibility and constructibility, more specific information is developed for each station location and configuration. The following narrative and graphic information presents a descriptive overview of the design implications surrounding each proposed station as well as a perspective on the stations' integration with adjacent land uses.

System Configuration

Alternative A - Bunker Hill First Street is predominantly an underground system with a transition to an aerial structure before connecting to Union Station. Station location choices were based upon existing and anticipated future ridership demands to and from local centers. A total of three underground station locations are proposed:

- 4th & Flower Station (between Third and Fourth Streets)
- 1st & Main Station (between Main and Spring Streets)
- 1st & Alameda Station (corner of Alameda and First Streets)

Station Platforms

All locations are assumed to involve cut-and-cover tunnel sections. The separation of individually bored tubes is such that center platforms are indicated. In order to exit from these stations to peripheral sidewalks, it is traditionally necessary to introduce mezzanines. An alternative is available in the event the involved street is sufficiently wide to have a median divider in which stairs/escalators/elevators can exit. Such, however, is not the case for **Bunker Hill First Street**. A further alternative could involve the use of side platforms which are not interconnected. In any event, the exact physical definition of station configurations is a matter of later design phases.

Station Portal Locations

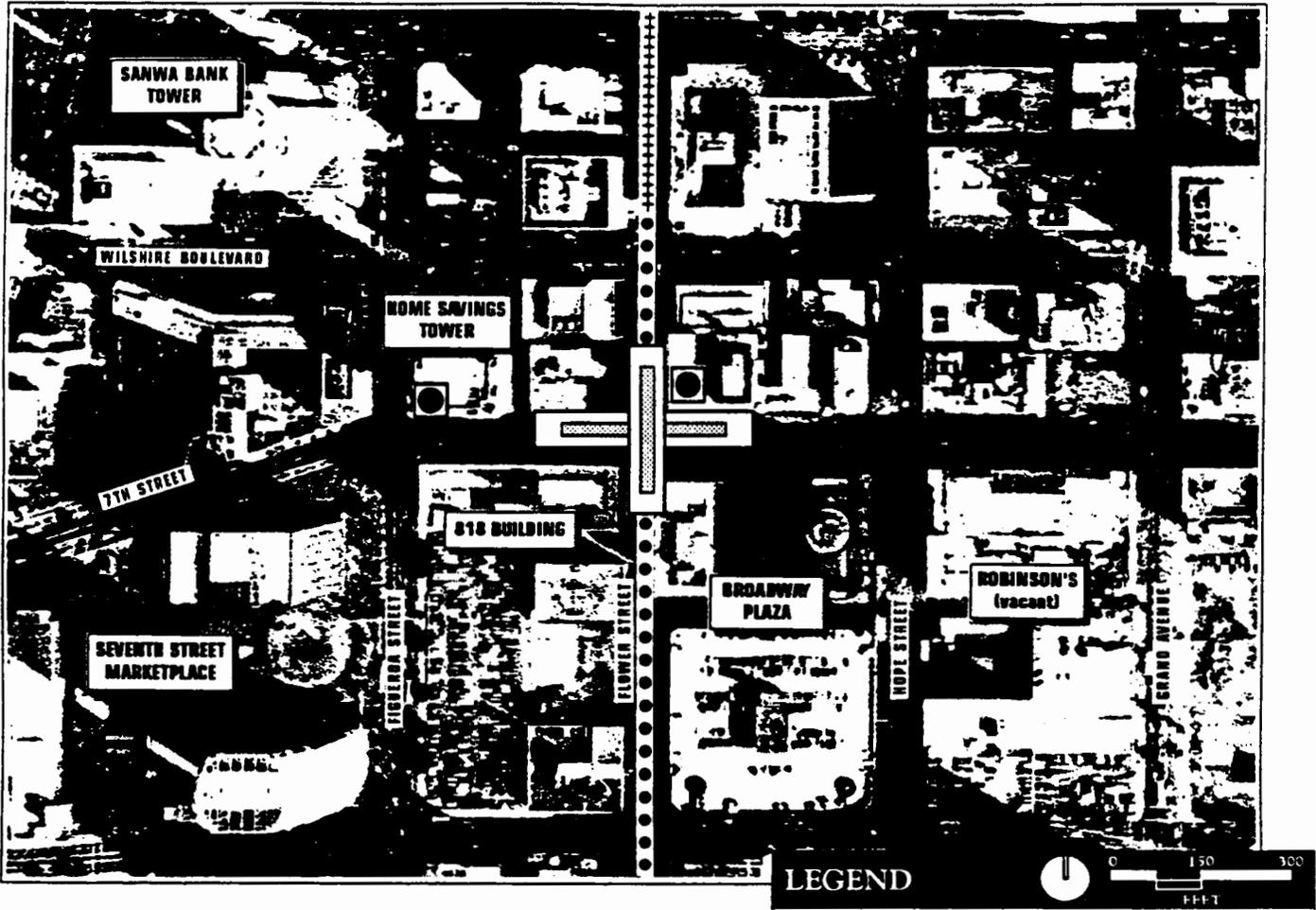
As part of this Preliminary Planning Study, portal locations are preliminary identified for each underground station location. For the three proposed stations of **Alternative A**, two portals are identified for the 4th & Flower Station and one portal is identified for the 1st & Main and 1st & Alameda Stations, respectively. For these latter two stations, a secondary portal location is suggested which may be incorporated into the system as patronage demands warrant in the future.

Engineering-Related Issues

Other related engineering issues include:

- Station locations are flexible and are only limited by the need to be located within horizontal tangents, as well as vertical tangents with a 1% maximum to 0.3% minimum vertical grade.
- Station locations can be shifted in order to incorporate specific station entrances. Alternatively, mezzanines can be extended to accomplish similar goals. One such specific station entrance presently identified is at the northeast corner of the 4th & Flower Station.

The following pages illustrate the proposed station locations for **Alternative A - Bunker Hill First Street**. Local land uses are highlighted by building name and/or any prominent entity located near the station location to illustrate potential ridership demands associated with these sites. (Includes drawings for 7th Street Metro Center & Union Station.)



7TH STREET METRO CENTER

Located below the intersection of 7th and Flower Streets, the 7th Street Metro Center connects the Metro Rail System's existing Blue and Red Lines. Among the significant projects surrounding the site include commercial centers such as the Seventh Street Marketplace and Broadway Plaza, and office buildings such as the Home Savings Tower, Sanwa Bank Tower, 777 Tower, and 818 Building. The Bunker Hill alignment alternatives would connect the Downtown Blue Line Connection with the Long Beach-Los Angeles Blue Line at Metro Center. Existing portals are located below the Home Savings Tower on Figueroa Street and the Roosevelt Building on Flower Street.

ALIGNMENTS

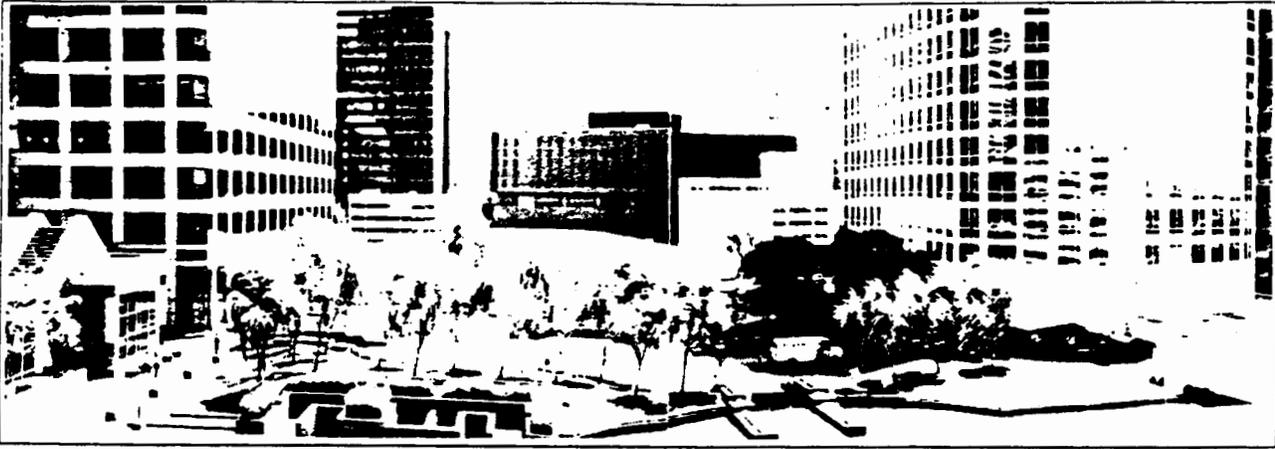
- Metro Red Line
- Metro Blue Line
- Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

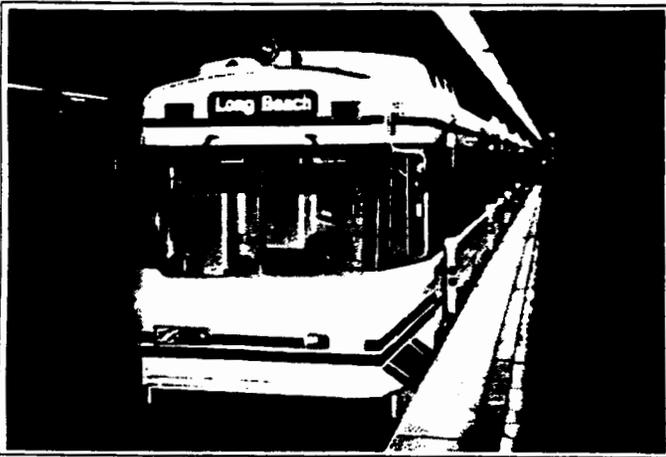
- At-Grade
- Aerial
- Subway
- Proposed or Existing Portal
- Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





View of Seventh Street Marketplace from upper level pedestrian plaza. The Marketplace represents one of the major land uses in the vicinity of the 7th Street Metro Center.



View from Metro Blue Line platform.



View from Metro Red Line platform.



View of 7th Street Metro Center from Home Savings Tower portal.



View looking north toward tunnel connection linking the Bunker Hill Alignment Alternatives to the 7th Street Metro Center.

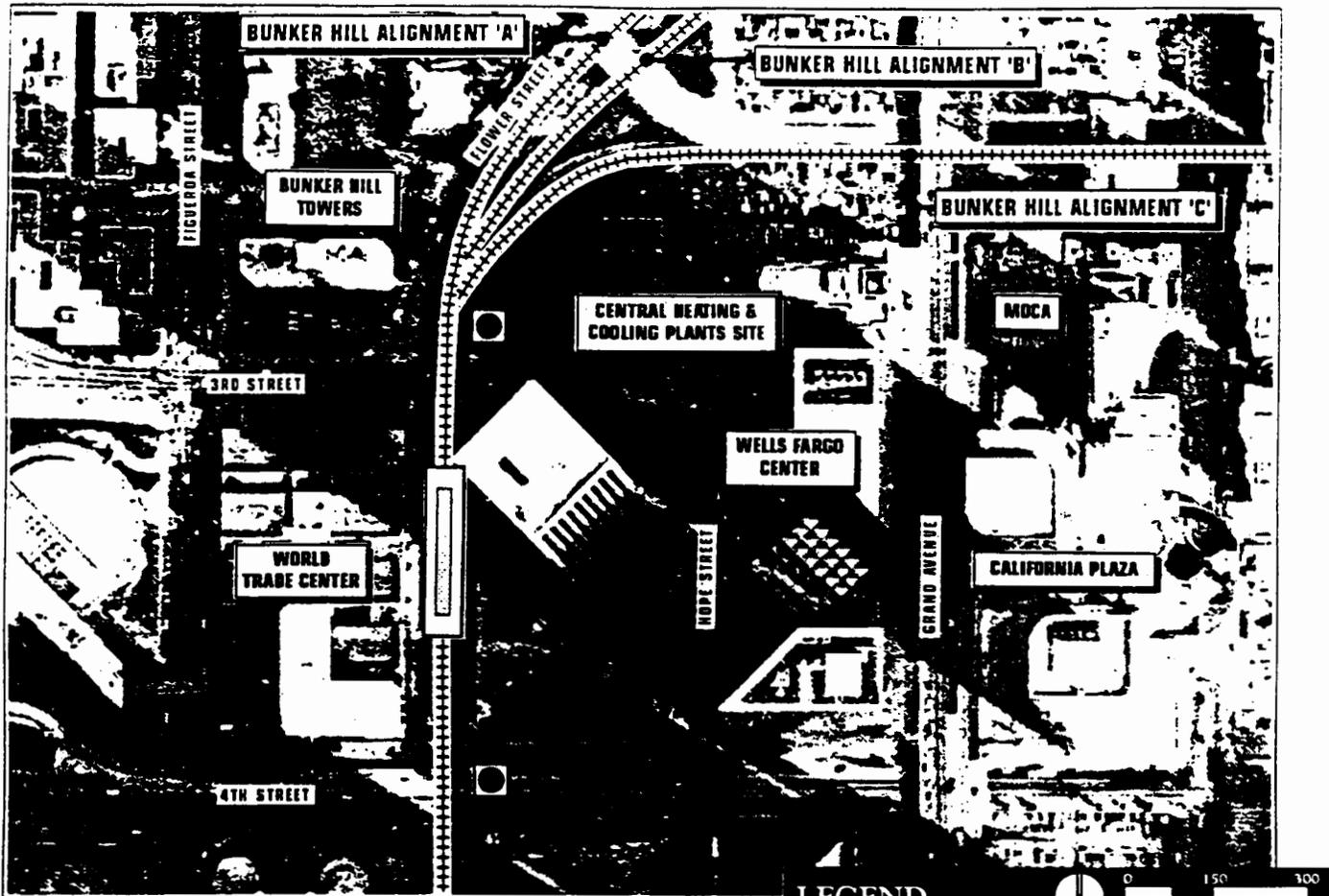
GRAPHICS BY GRUEN ASSOCIATES



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FIGURE V-A3
Station Site Visual Survey
7th Street Metro Center



4TH & FLOWER

The 4th and Flower Station would provide service to Bunker Hill's residential community and commercial office towers. Among the significant uses in this district include high density residential complexes such as the Bunker Hill Towers, Grande Promenade Apartments, and Museum Tower, as well as major commercial and entertainment developments that include the Wells Fargo Center, World Trade Center, California Plaza, 444 Tower, Bonaventure Hotel, Intercontinental Hotel, and MOCA.

The Bunker Hill alignment alternative has three east-west subway options for approaching the 4th and Flower Station: from below 1st, 2nd or 3rd Streets. Located below Flower Street between 3rd and 4th Streets, the station would be accessed via two portal locations: (1) at a pedestrian plaza located below the 4th Street overpass, and (2) at the Central Heating and Cooling Plants site, with a pedestrian connection to the top of Bunker Hill integrated as part of a potential development project (refer to station, concourse, and building elevation for 4th and Flower Station).

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





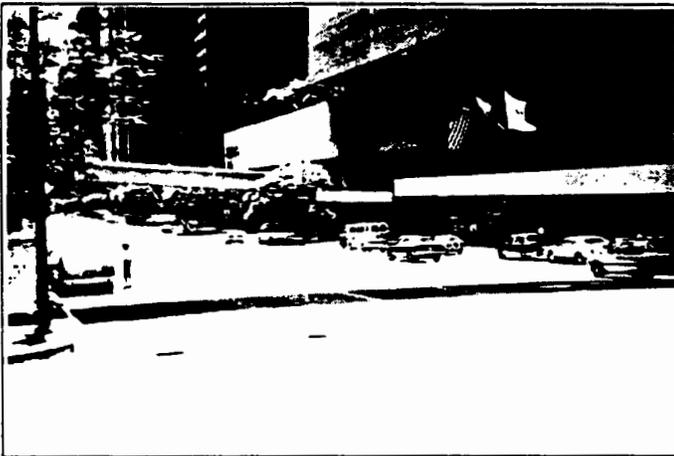
View north on Grand Avenue atop Bunker Hill. MOCA appears in right background and the Music Center in left background.



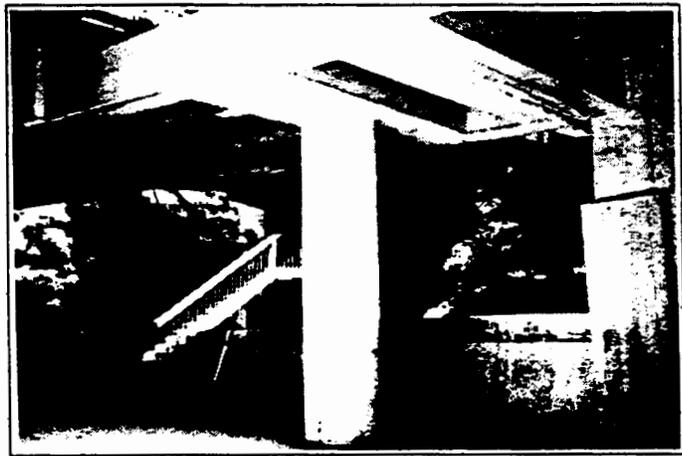
Commercial office towers on Bunker Hill represent some of the primary land uses which which would be served by the 4th and Flower Station.



View from Wells Fargo Center looking west toward the Bonaventure Hotel.



View south along Flower Street at its intersection with 4th Street.



This pedestrian plaza on the east side of Flower Street, north of 4th Street, could potentially serve as a portal location.

GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

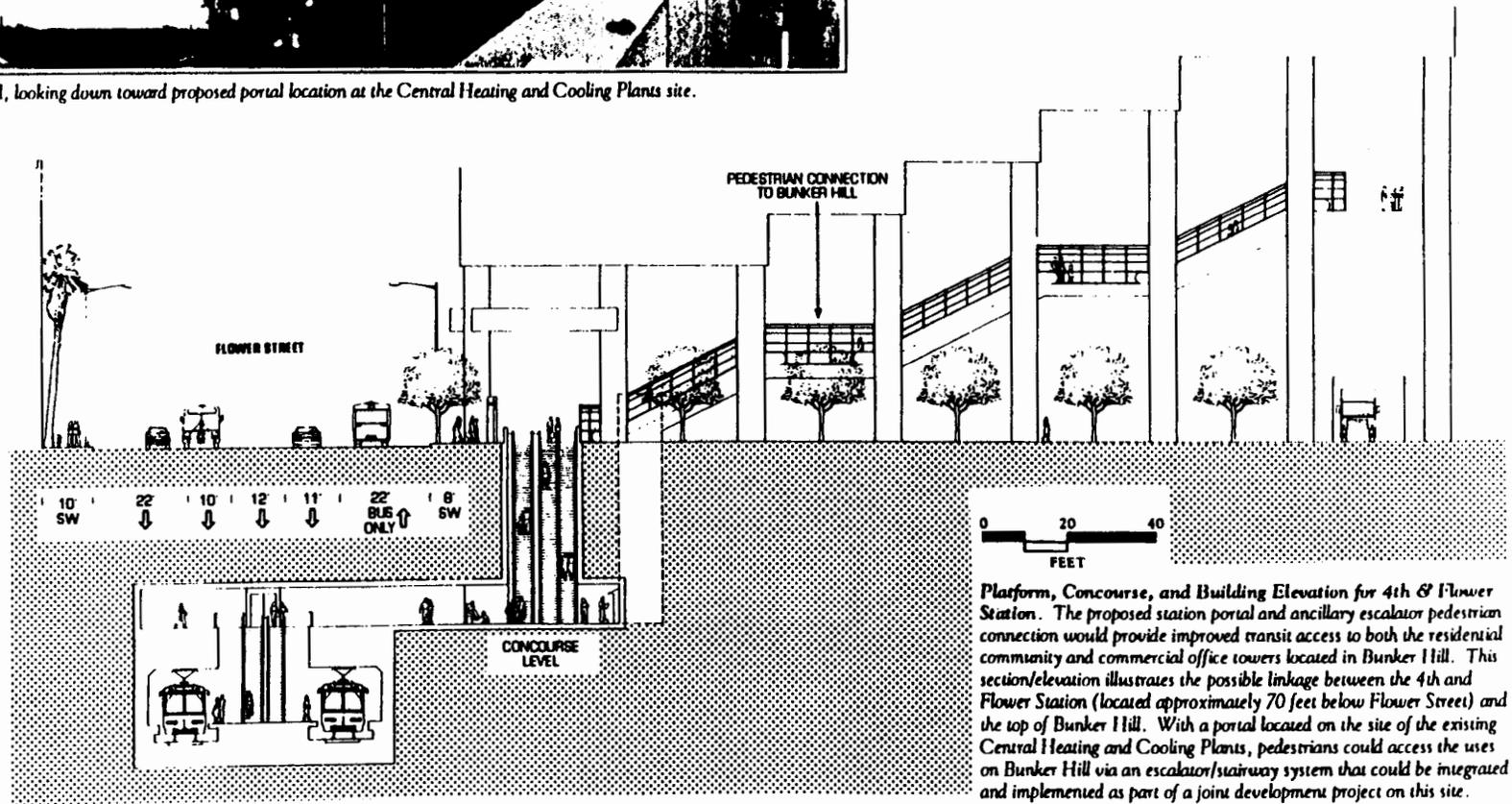
METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-A5
Station Site Visual Survey
4th & Flower





View from above 3rd Street tunnel, looking down toward proposed portal location at the Central Heating and Cooling Plants site.



Platform, Concourse, and Building Elevation for 4th & Flower Station. The proposed station portal and ancillary escalator pedestrian connection would provide improved transit access to both the residential community and commercial office towers located in Bunker Hill. This section/elevation illustrates the possible linkage between the 4th and Flower Station (located approximately 70 feet below Flower Street) and the top of Bunker Hill. With a portal located on the site of the existing Central Heating and Cooling Plants, pedestrians could access the uses on Bunker Hill via an escalator/stairway system that could be integrated and implemented as part of a joint development project on this site.

GRAPHICS BY GRUEN ASSOCIATES

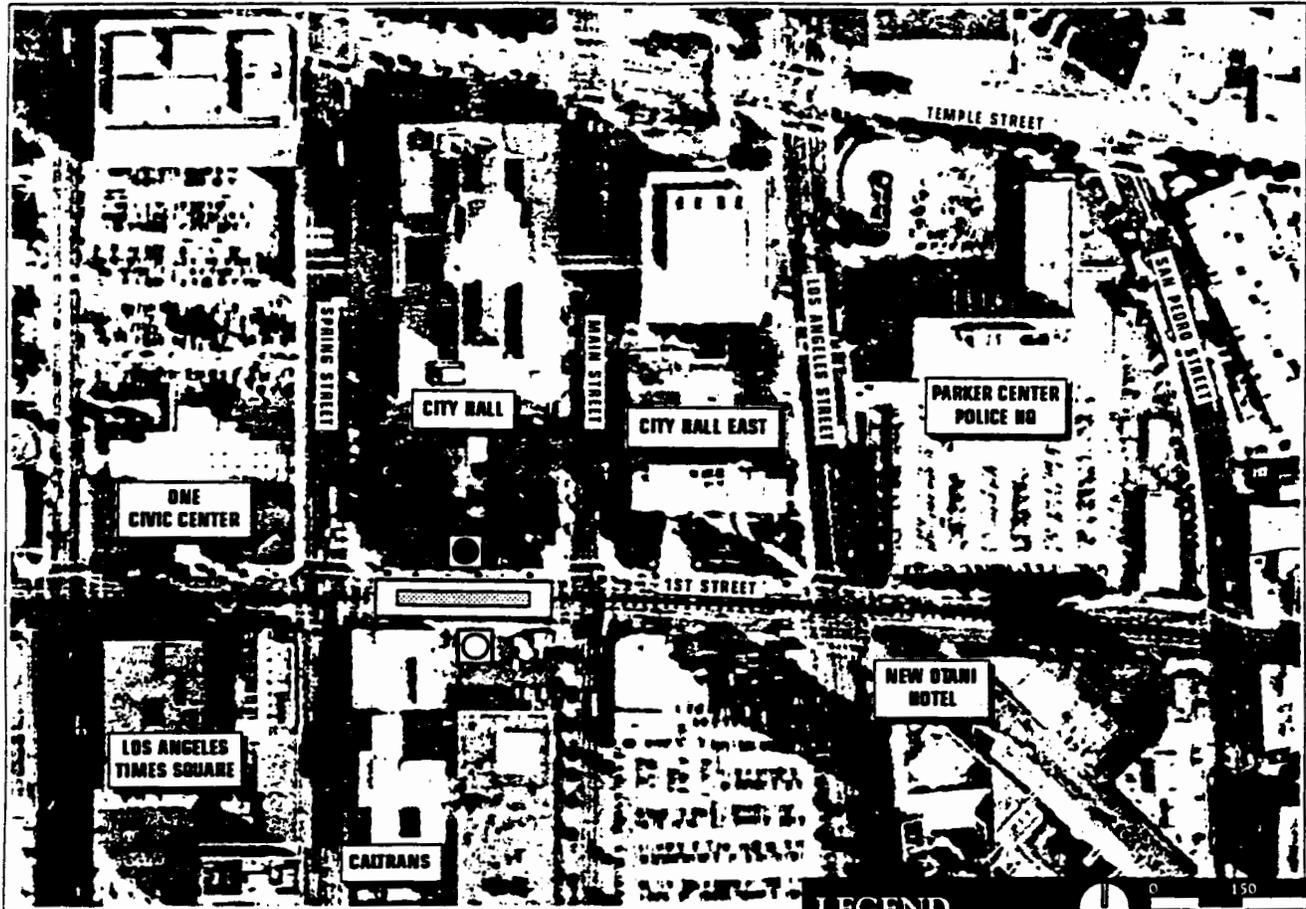


BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-A6

Portal to Bunker Hill Pedestrian Connection
4th & Flower Station



1ST & MAIN

Located on 1st Street between Spring and Main Streets, the 1st and Main Station would provide service to the Civic Center, as well as to other commercial uses such as the Los Angeles Times Square and the New Otani Hotel.

The station would be constructed with the implementation of Bunker Hill Alignment Alternative 'A'. Access to the subway station would initially be via a single portal on the north side of 1st Street (refer to typical subway station elevation), with a possible future portal surfacing on the south side of the street.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

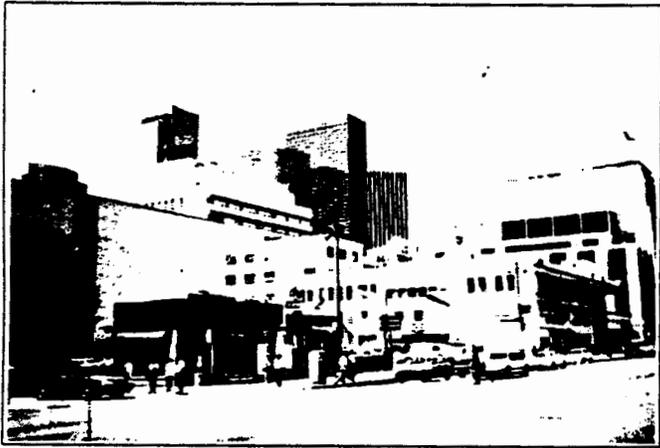




View of City Hall looking north from Spring Street.



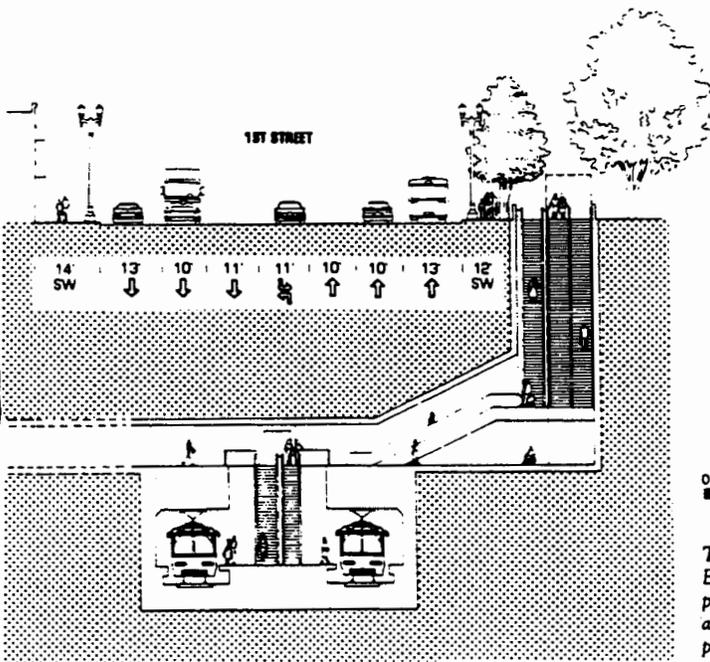
Los Angeles Times Square.



Intersection of 1st and Main Streets looking toward southwest corner.



Intersection of 1st and Main Streets looking toward southeast corner.



Typical Subway Station Elevation: 1st & Main Station example. Each of the Bunker Hill Alignment Alternatives would have subway stations, with access initially provided through a single portal. The elevation on the left illustrates how the portal and station may be designed utilizing banks of escalators to connect the surface to the platform some 80 feet below.

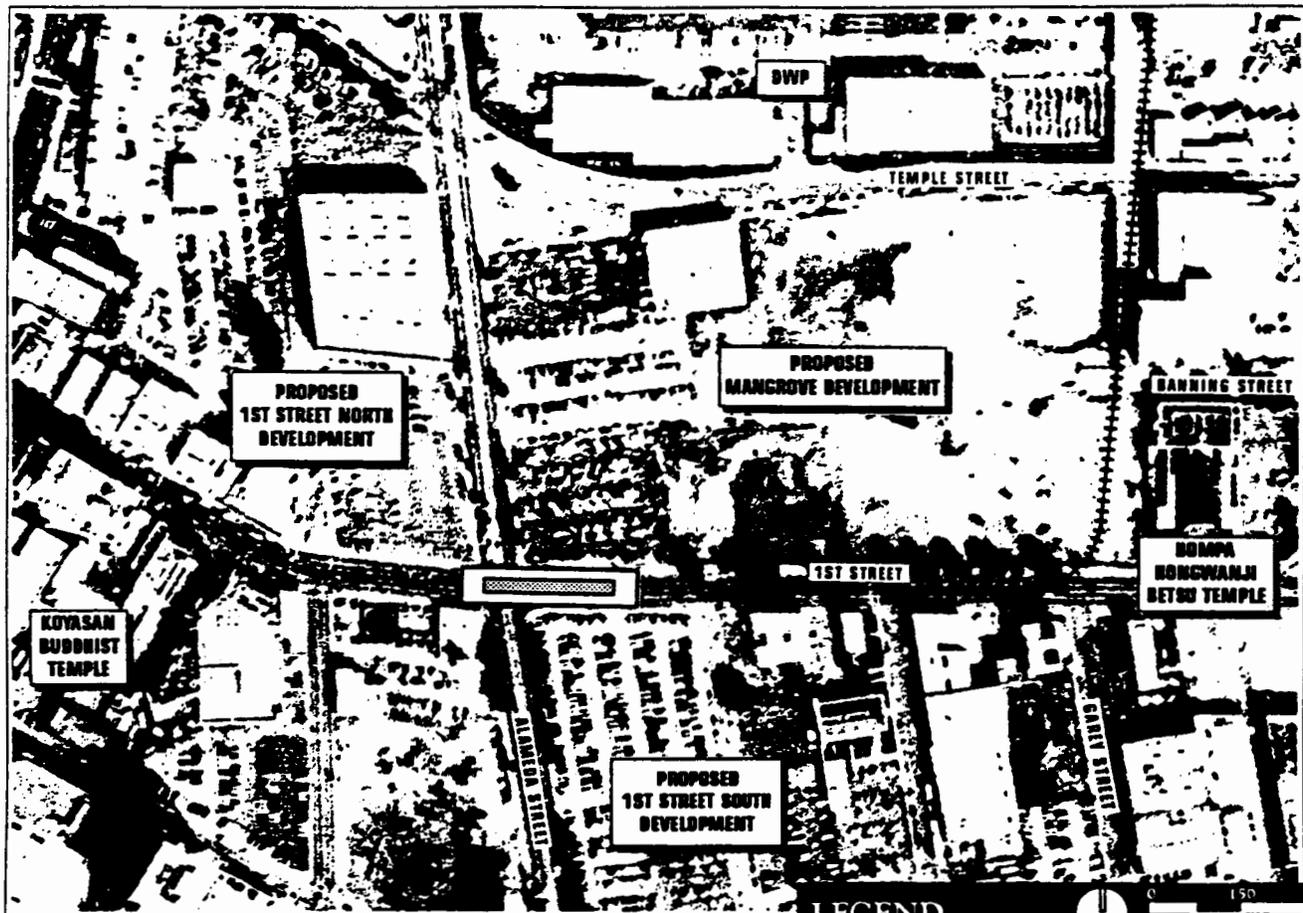
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-A8
Station Site Visual Survey
and Typical Subway Station Elevation
1st & Main



1ST & ALAMEDA BUNKER HILL ALIGNMENT

Located on the eastern end of Little Tokyo, the 1st and Alameda Station occupies an area comprised of a mix of cultural and institutional uses, as well as vacant parcels targeted for proposed developments. Some of the significant uses in the area include the Homba Hongwanji Betsu Temple, Koyasan Buddhist Temple, Little Tokyo historical retail core on 1st Street, Temporary Contemporary Museum, Japanese-American National Museum, and Department of Water and Power maintenance and operations yard. Among the proposed developments include three projects located at the intersection of 1st and Alameda Streets: 1st Street North (NW corner), 1st Street South (SE corner), and the Mangrove Development (NE corner).

The proposed 1st and Alameda Station for the Bunker Hill alignment alternative would be subsurface, straddling the intersection of 1st and Alameda. The station would initially have a single portal on the southwest corner, with a possible future portal surfacing on the northeast corner.

LEGEND

ALIGNMENTS

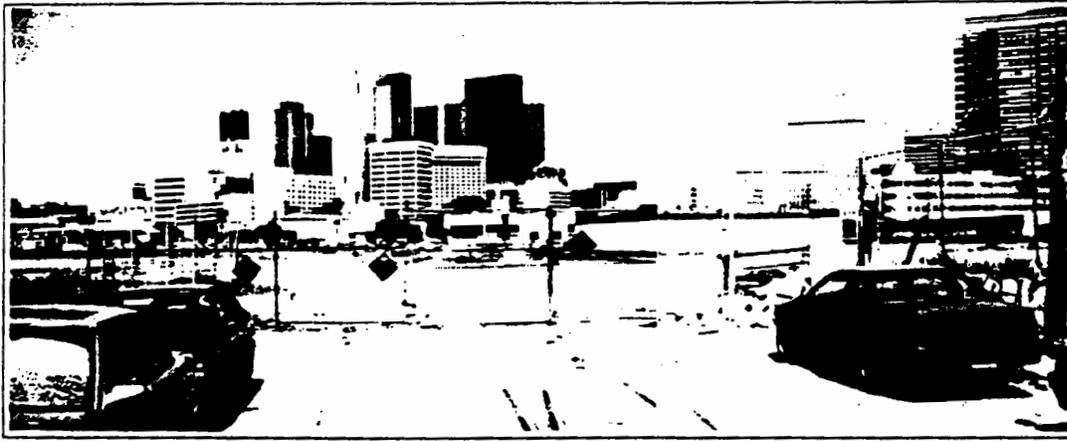
-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





View west from Banning Street, overlooking the Mangrove Development site.



View from southeast corner of intersection of 1st and Alameda Streets.



View west along First Street.



View from northwest corner of intersection of 1st and Alameda Streets, overlooking 1st Street South Development site.

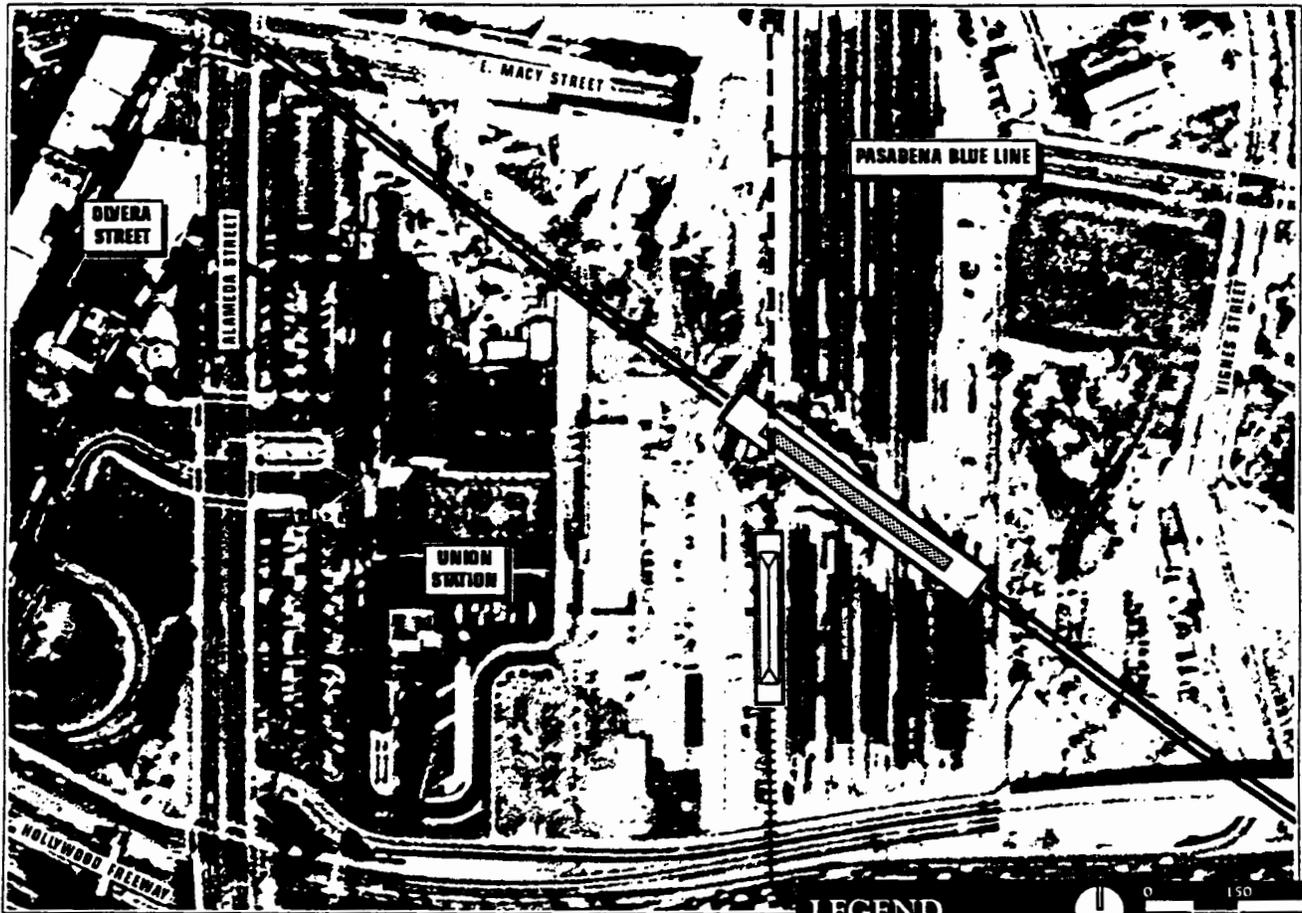
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-A10
Station Site Visual Survey
1st & Alameda



UNION STATION

The Los Angeles Union Passenger Terminal (LAUPT) at Union Station represents the primary transportation center in the 400-mile Metro Rail system. Among the significant land uses surrounding the site include historic Pueblo de Los Angeles, Olvera Street, and Chinatown. Currently, the station provides Commuter Rail Metrolink, Metro Red Line, and Amtrak passenger service. In the future, the LAUPT will include a LRT platform serving the Pasadena-Los Angeles Blue Line. The Downtown Blue Line Connection would connect, at-grade, to this platform via an aerial structure spanning the Hollywood Freeway.

LEGEND

ALIGNMENTS

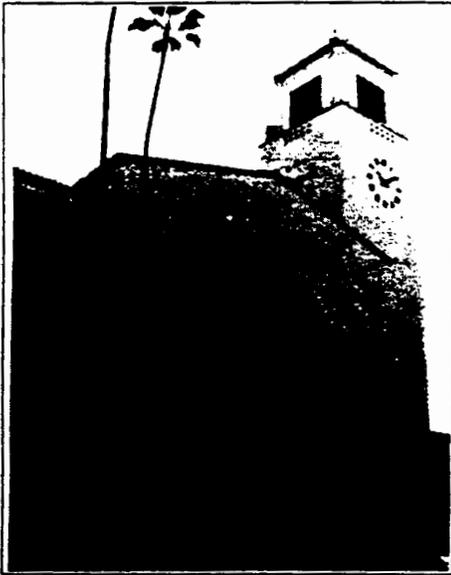
-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

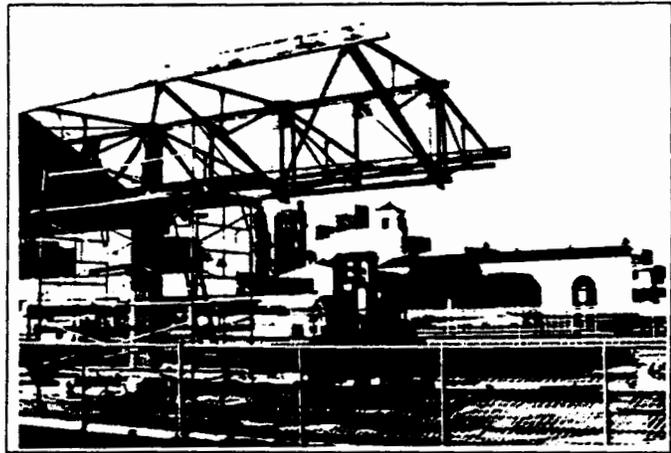
-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





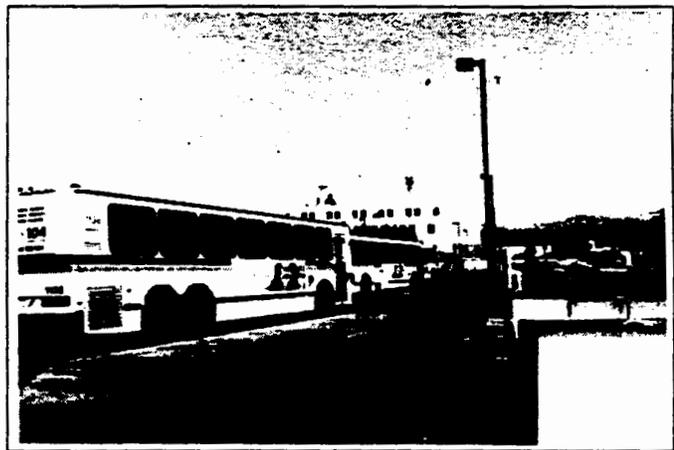
Union Station facade.



View west from Union Station passenger platforms.



View west toward Olvera Street.



Union Station Bus Loading area.



View south toward Civic Center.



Commuter Rail Metrolink passenger platform.

GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-A12
Station Site Visual Survey
Union Station

CAPITAL COST ESTIMATE

ALTERNATIVE A - BUNKER HILL FIRST STREET

LOW PROFILE

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$123,907,760
2. STATIONS	\$105,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$60,975,360
5. VEHICLES	\$28,800,000
SUBTOTAL (A)	\$318,683,120 *
6. PRE-REVENUE OPERATION	\$7,967,078
7. OWNERS INSURANCE	\$25,494,650
8. MASTER AGREEMENTS	\$7,967,078
SUBTOTAL (B)	\$41,428,806
9. ART FOR TRANSIT	\$1,593,416
SUBTOTAL (C)	\$1,593,416
10. RIGHT-OF-WAY	\$14,871,982
SUBTOTAL (D)	\$14,871,982
11. PROFESSIONAL SERVICES	\$128,036,290
SUBTOTAL (E)	\$128,036,290
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$39,612,312
b. OF SUBTOTAL ITEM (D)	\$4,089,795
c. OF SUBTOTAL ITEM (E)	\$12,803,629
SUBTOTAL (F)	\$56,505,736
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$743,599
GRAND TOTAL (1993 DOLLARS)	\$561,862,949

* See worksheet for detail

WORKSHEET

DESCRIPTION	QUANTITY	PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 93+40 to 99+50	610	\$2,575	RF	\$1,570,750
Cut & Cover (Guideway)	1,870	\$18,400	RF	\$34,408,000
Cut & Cover (Station)	900	\$29,800	RF	\$26,820,000
Guideway At-grade	0	\$0	RF	\$0
Aerial Guideway	990	\$5,400	RF	\$5,346,000
Tunnel Construction	6,670	\$7,733	RF	\$51,578,010
Underpinning (Allowance)	2,290	\$1,500	RF	\$3,435,000
Soil Stabilization Under Existing Tunnels	1	\$500,000	LS	\$500,000
Tie-in at Station 4+52	1	\$250,000	LS	\$250,000
SUBTOTAL (GUIDEWAY COSTS)				\$123,907,760
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)			EA	\$0
Subway Station (3-car)	3	\$35,000,000	EA	\$105,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$105,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	12	\$2,400,000	EA	\$28,800,000
SUBTOTAL (VEHICLE COSTS)				\$28,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	11,040	\$421	RF	\$4,647,840
Train Control Station (LRT)	3	\$900,000	EA	\$2,700,000
Train Control Guideway (LRT)	11,040	\$2,013	RF	\$22,223,520
Traction Power Station (LRT)	3	\$1,580,000	EA	\$4,740,000
Traction Power Guideway (LRT)	11,040	\$270	RF	\$2,980,800
Communications	11,040	\$1,330	RF	\$14,683,200
Fare Collection (LRT)	3	\$670,000	EA	\$2,010,000
Fans/Air Handling/UPS	3	\$1,750,000	EA	\$5,250,000
Signage & Graphics	3	\$580,000	EA	\$1,740,000
SUBTOTAL (SYSTEM COSTS)				\$60,975,360
TOTAL ESTIMATED COST				\$318,683,120

ECONOMIC/MARKET ANALYSIS

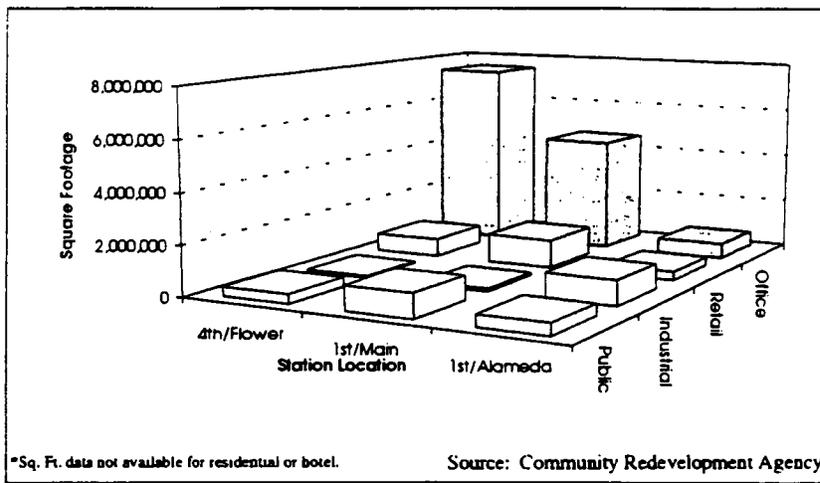
ALTERNATIVE A - BUNKER HILL FIRST STREET

(Within 0.25 miles of proposed station)

Current Land Use

SIGNIFICANT NOTES:

- o Vacancy rates in Bunker Hill are approximately 20%. Potentially, the proposed Downtown Connector could help decrease vacancy rates around the stations.
- o According to land use plans for the City of Los Angeles, Bunker Hill is 77% built-out with some undeveloped parcels available. By comparison, the Historic Core, Little Tokyo and Civic Center have 42%, 80% and 43%, respectively, in available density.
- o CBI lease rates range from \$13.00 to \$25.00.
- o Alternative A proposes station locations that serve three distinct land use groups: 4th/Flower station has the highest level of office use, 1st/Main station is primarily office uses but with a high concentration of public and retail uses, 1st/Alameda station has a high concentration of industrial uses.
- o Approximately 3,483 residential units and 3,345 hotel rooms are located in the vicinity of Alternative A.



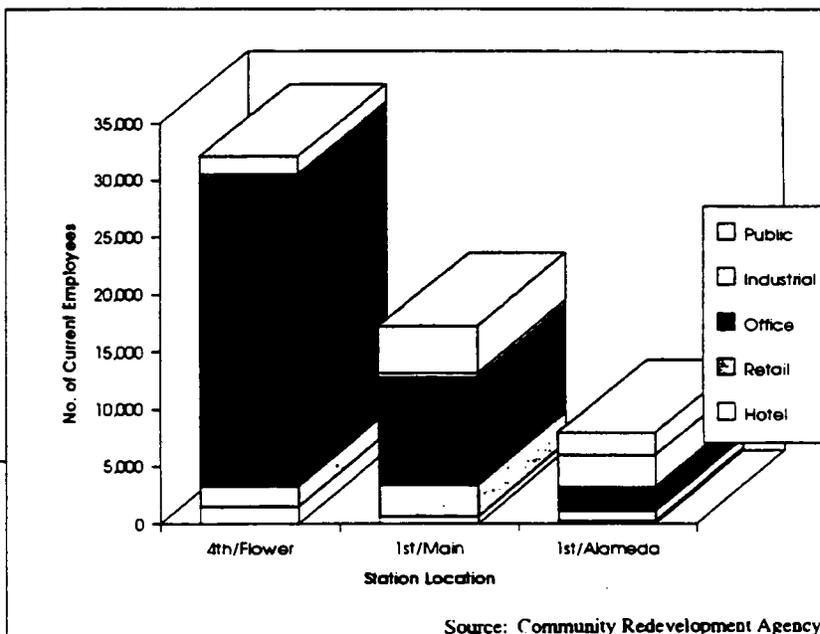
*Sq. Ft. data not available for residential or hotel. Source: Community Redevelopment Agency

Station Location	Square Footage			
	Office	Retail	Industrial	Public
4th/Flower	7,509,529	738,243	79,013	373,519
1st/Main	4,608,245	1,140,578	120,996	960,260
1st/Alameda	609,032	348,203	997,204	465,451

Current Employment

SIGNIFICANT NOTES:

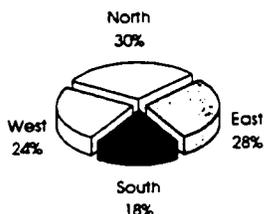
- o Bunker Hill has the highest concentration of employment with the greatest density found at the 4th/Flower station due primarily to the large office-related work segment.
- o Employment is concentrated in the clerical occupational category, which accounts for 44% of workers.
- o Professionals and managers account for 23% of the workforce which is the second highest occupational concentration.
- o Based on proposed development, estimated employment includes an additional 35,016 jobs.



Source: Community Redevelopment Agency

Station Loc	No. of Employees					
	Office	Retail	Industrial	Public	Hotel	Total
4th/Flower	27,034	1,773	213	1,578	1,500	32,098
1st/Main	9,476	2,739	326	4,054	624	17,219
1st/Alameda	2,166	837	2,695	1,980	253	7,931
Total	38,676	5,349	3,234	7,612	2,377	57,248

Origin of Office Employees



Source: LA City Strategic Transportation Action

ECONOMIC/MARKET ANALYSIS
ALTERNATIVE A - BUNKER HILL FIRST STREET
 (Within 0.25 miles of proposed station)

Major Planned Projects

<u>First Street North</u> (Alameda, 1st, Central, Temple)	<u>Mangrove Estates</u> (NE Corner - Alameda & 1st)	<u>Flower/3rd Office Project</u>
- Office 785,000 s.f.	- Office 495,000 s.f.	- Office 1,400,000 s.f.
- Retail 95,000 s.f.	- Retail 234,000 s.f.	- Retail 50,000 s.f.
- Cultural 65,000 s.f.	- Recreational 15,000 s.f.	
- Housing 273 units	- Housing 1,200 units	
- Hotels 426 rooms	- Hotel 433 rooms	

<u>Sunshine Pacific</u> (Sunset & Alameda)	<u>First Street South</u> (SE Corner - Alameda & 1st)
- Retail 185,000 s.f.	- Office 389,000 s.f.
- Housing 296 units	- Retail 215,000 s.f.
	- Housing 640 units
	- Hotels 400 rooms

Status:

First Street North	- Waiting for City approval and financing. Construction expected to begin in 1994.
Sunshine Pacific	- Estimate of construction date not given.
Mangrove Estates	- Completing EIR, with construction expected to begin in 1997
First Street South	- Completing EIR, with construction expected to begin in 1997
Flower/3rd Proj.	- Construction, if Connector is built here, is expected to begin in 1997.

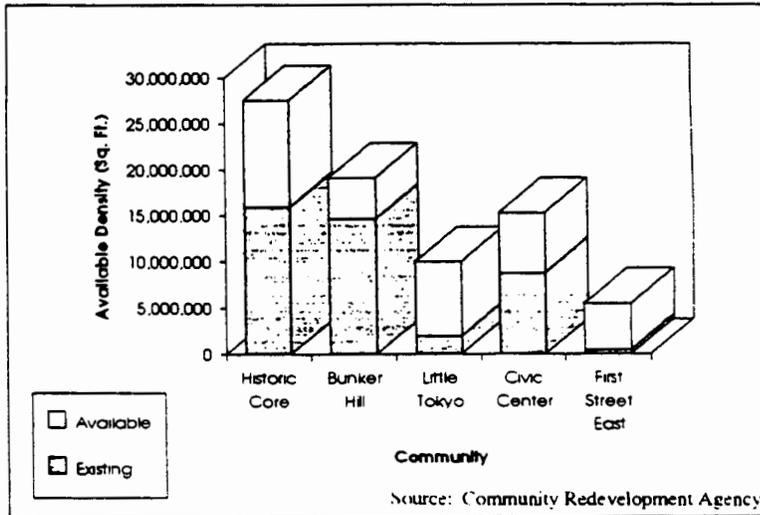
SIGNIFICANT NOTES:

Many of the business/real estate professionals interviewed stated that implementation of a Downtown Connector could contribute to a greater viability of future developments if a station were located nearby. In addition, a proposed project has incorporated a station into its existing plans creating a unique joint development opportunity.

Development Opportunities

SIGNIFICANT NOTES:

- o According to current land use plans for the City of Los Angeles, 23% of available density is remaining in Bunker Hill. However, if any significant transportation project is built in Bunker Hill, such as the proposed Downtown Connector, the Floor Area Ratio would be allowed to increase from 5:1 to 6:1 creating an additional 4.0 million square feet of available density.
- o Development opportunities exist around all three of the proposed stations. Mixed-use developments including residential, office, retail and hotel provide the best opportunity for joint development in the Bunker Hill area.
- o Little Tokyo has a high percentage of available density due in large part to underdeveloped parcels rather than vacant space.
- o Los Angeles County can cause long term construction of over 6.0 million net rentable square feet on its vacant and underutilized Civic Center properties within current zoning and CBI Redevelopment Plan Restrictions.
- o Additional development maybe facilitated at the 7th/Flower station by presence of a through route.



Community	Existing Devlpmnt.	%	Available Density	%
Historic Core	16,000,000	58%	11,600,000	42%
Bunker Hill	14,672,000	77%	4,467,755	23%
Little Tokyo	2,000,000	20%	8,000,000	80%
Civic Center	8,800,000	57%	6,500,000	43%
First Street East	500,000	9%	5,000,000	90%

* Includes larger area than .25 miles around station sites

Environmental Assessment

The following is a preliminary assessment of environmental impacts associated with the **Alternative A - Bunker Hill First Street**. Both short and long-term impacts are presented in key impact areas, such as land use, traffic and parking, noise and vibration, air, aesthetics, cultural resources, and business impacts. A subsequent Environmental Impact Report following this study will provide detailed analysis of anticipated impacts and proposed mitigation measures.

Short-Term Construction Impacts

The **Bunker Hill First Street** alternative will utilize, a combination of cut-and-cover and bored tunnel construction techniques. However, at the northern end along Garey Street, the line transitions to an aerial configuration to connect with Union Station. As discussed in the Engineering Feasibility section, the cut-and-cover technique poses considerable surface impacts. Five segments of **Alternative A**, as identified in the following matrix, will experience significant environmental impacts during construction. These segments will be most heavily affected, during the process of ground breaking, digging and placement of wood boards. The surface street will be significantly altered. At a minimum, one traffic lane in both directions will remain open for local traffic circulation. While the at-grade wood boards or precast concrete planks will permit normal traffic flow during construction, the altered street will cause various impacts outlined below in the matrix.

A significant issue for all of the three Bunker Hill alternatives is the starting point for construction. Will construction start at the Metro Center or Union Station? The starting point is significant in relation to the environmental impacts. It will be the ingress and egress point for truck entry and dirt hauling throughout the entire construction process. Pedestrians along this segment would be affected from potentially altered sidewalks and/or change in accessibility to local business fronts. Street traffic would also be altered with a likely lane closure during the construction period. As a result of construction activity, significant noise, dust and vibration impacts are also anticipated to the immediate area. Although temporary, on-going construction activity will result in visual impacts from the presence of construction equipment, materials and alteration of the street. This intense activity may be more appropriate at the northern end of the alignment from Union Station, where the existing local land use is light industrial and less dense. An ingress and egress point for truck activity may be conveniently located near Garey Street where abandoned buildings and/or vacant property may be utilized. The alternative is starting at Metro Center which would significantly exacerbate already identified short-term impacts associated with the cut-and-cover construction here. In addition, the effect of tunneling and cut-and cover construction on ground movement, water table change, and deformation of the adjacent structures shall be continuously observed and any potential impacts mitigated.

Another construction impact associated with all the alternatives, is construction of the aerial structure across the 101 Freeway for the connection to Union Station. A Traffic Management Plan will have to be prepared and approved by Caltrans identifying the construction procedures that will be employed to minimize impacts on the freeway. (Refer to "Need for System Facilities" Technical Report, Instrumentation System section for potential impacts.

Long-Term Impacts

Due to the nature of construction being proposed, cut-and-cover and tunneling, the long-term impacts are mostly limited to property acquisition and traffic, both pedestrian and vehicle. Furthermore, some permanent street closures at Jackson, Ducommon and/or Garey (northern section only) Streets may be required, which could potentially result in a significant traffic impact. Re-routing of local traffic might be required as a potential mitigation measure. These transportation impacts are discussed in greater detail in the following subsection. Some of the other long-term impacts include issues such as business development and aesthetics.

ENVIRONMENTAL ASSESSMENT
ALTERNATIVE A - BUNKER HILL FIRST STREET
LOW PROFILE

Segment/Station	Plan & Profile	Length	Type of Construction	Potential Impacts	Sensitive Receptors
7th Street Metro Center: Metro Center to mid-block on Flower Street. between Fifth and Sixth Street	0+00 to 4+00	400 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Increased pedestrian traffic	Downtown Library
4th & Flower Station: Between Third and Fourth Streets	16+00 to 19+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	None
1st & Main Station: Between Spring and Main Streets	53+00 to 56+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	None
1st & Alameda Station: Corner of First and Alameda Streets	76+00 to 79+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual - Cultural resources <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	Koyasan Buddhist Temple
Garey Street: Garey Street, between 1st & Alameda Station to Commercial Street	79+00 to 105+00	2,600 ft.	Portal & Aerial	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered vehicle traffic - Altered business accessibility - Street closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition and displacement - Right-of-way acquisition - Visual - Street closures	Los Angeles Hampa Hoogwanji Betsu (Temple)

Transportation Impact Analysis

Traffic Impacts

Since the **Bunker Hill First Street** alternative is primarily subway, there will be minimal ongoing impact to vehicular traffic, except in the vicinity of Gary Street. Gary Street is a local street with low traffic volumes. During the Route Refinement/EIR stage of this project, the precise location and alignment of the portal and transition structure to aerial configuration will be identified. In general, this transition will occur north of Temple Street and south of Commercial Street. Depending upon its design, it could affect traffic on Jackson Street and/or Ducommon Street. This will determine whether Gary Street or the intersecting side streets might have to be closed to vehicular traffic. At the present time, Gary Street has one travel lane in each direction plus parking on each side of the street and runs between East Temple Street and Commercial Street. There are no major cross-streets along Gary Street. It is utilized by some traffic as a route to the freeway, but it is parallel by Vignes Street, one block to the east, which leads directly to the freeway on ramp and which can accommodate any traffic diverted from Gary Street.

Bunker Hill First Street will facilitate the addition of several new rail lines through downtown. The preliminary operations plan developed for this study included six lines through the connector with the potential for as many as 60 trains per hour, total of both directions. Some of the rail lines would utilize the existing Blue Line corridor along Washington Boulevard. Other lines would potentially utilize the extension south and west to USC/Exposition Park and potentially west to Santa Monica. North of Union Station they would extend to Pasadena or the Glendale-Burbank area. There is the potential for traffic impacts along the southern section of Flower Street, where the trains run at-grade, and at the Flower/Washington intersection. These potential impacts are not new locations where traffic may be affected, but the connector will facilitate enhanced rail service which will result in additional train service, thereby increasing the level of at-grade train movements through intersections on lower Flower Street. South of Washington Boulevard, the rail lines will split, some proceeding along the existing Blue Line to Long Beach and some extending west to Santa Monica, therefore the impacts of the connector should not be significant beyond the Flower/Washington intersection. In the next phase, the potential need for mitigation measures along Flower Street, south of the existing Blue Line portal to Washington Street, will be assessed.

Station Areas

The average daily traffic volumes on the roadways where the three **Bunker Hill First Street** stations would be located are as follows:

Station Location	Traffic Volume (ADT)
1st and Alameda Streets	24,000 (plus 27,000 on Alameda)
1st and Main Streets	30,000
4th and Flower Streets	20,000

The primary circulation issues with the subway configuration are associated with station areas, pedestrian access and integration with bus service. The parking demand at these stations will be negligible because these stations primarily serve as destinations for employees coming into downtown and for internal downtown trips. There is no parking proposed at these stations, therefore vehicular impacts associated with the stations are minimal. Pedestrian access will be provided via escalators/elevators to the street level. The proposed stations would be expected to generate a high volume of pedestrians, so appropriate sidewalk and station access capacity will have to be provided to handle peak pedestrian loads at commute periods. For example, the station at 4th/Flower would serve a number of high-rise office buildings and hotels (on Flower Street and on Bunker Hill via escalators) with a large employee base. The station at 1st/Main would serve a variety of establishments including the Civic Center area with a large number of transit-oriented employees. The station at 1st/Alameda would potentially serve a large number of developments proposed in the vicinity as well as the Little Tokyo area.

Transfer Opportunities

Even though all three Bunker Hill alternatives provide transfer opportunities with the Metro Red Line at the Metro Center Station and at Union Station, a potential additional transfer opportunity is provided with **Bunker Hill First Street**. The station at 1st/Main Streets is in close proximity to the Metro Red Line Civic Center Station. This transfer would however, require a one-block walk between the station portals. The bus service on 1st Street is relatively limited compared to the north-south streets, primarily because of the north-south orientation of many routes through the downtown area, but First Street is utilized by several MTA (former RTD) routes, the DASH, and Torrance and Gardena Municipal Lines. The accessibility to bus transit service for the passengers of rail service would provide convenient connections and vice versa. When the locations of stations and portals are finalized in the EIR, pedestrian access routes should be analyzed and mitigation may be required.

Parking

Parking is not proposed to be provided at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking in available parking provided by others. The only area where on-street parking is potentially displaced is along Garey Street. Long-term metered parking (\$1.00 for 10 hours) is provided on both sides of Garey Street; 33 spaces between Temple and Ducommon Streets, the blocks most likely to be affected, and 10 spaces and one loading zone north of Ducommon, which may potentially be affected. The number of parking spaces which could potentially be displaced is therefore approximately 40, which is relatively insignificant. The availability of other long-term metered on-street parking within a one block walk, plus off-street parking facilities nearby, would offset the loss of parking along Garey Street.

Driveway Access Issues

The proposed alignment does not impact any driveway access, except along Garey Street. Garey Street provides access to only a limited number of industrial/warehouse facilities, plus an exit from the DWP site. Access may be limited to right-in/right-out only, for these driveways along Garey Street or potentially closed if the property along the east side of Garey Street is purchased to accommodate the portal and transition to aerial structure. Driveway impacts will have to be evaluated in greater detail when the portal and transition structures are located.



UNION STATION



BUNKER HILL

RED LINE



7th CENTER METRO

SAN PEDRO

ALAMEDA

BLUE LINE

ALTERNATIVE B

BUNKER HILL SECOND STREET

ALTERNATIVE B Bunker Hill Second Street

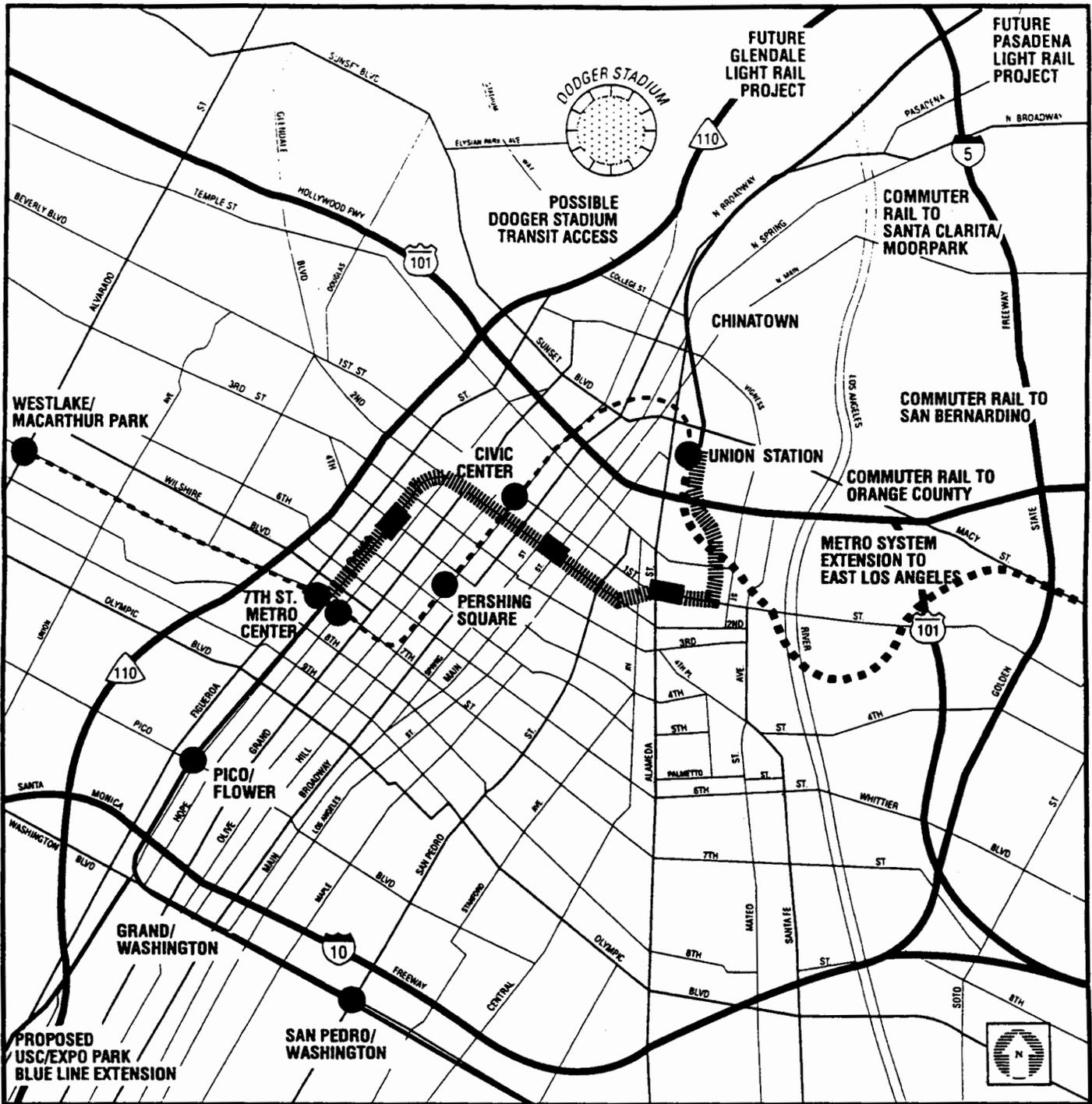
Technical Description of Alignment

Alternative	Subalternative	At-Grade	Tunnel	Cut & Cover	Aerial	Total
B	Low Profile	720'	7,390'	1,870'	990'	10,970'
B	High Profile	720'	2,020'	7,240'	990'	10,970'

Source: Transometrics

Alternative B - Bunker Hill Second Street is the second of three alternatives studied which begin at the existing terminus of the Long Beach-Los Angeles Blue Line at Metro Center (Seventh and Flower Streets). (Appendix E Plan and Profile Alt. B.) **Bunker Hill Second Street** begins as does **Bunker Hill First Street**. However, as this alternative proceeds north along Flower Street, a curve is introduced which turns the line to the east directly under Second Street. The line continues under Second Street until just east of San Pedro Street where reverse curves to the left are introduced to transition the alignment to tie into that of **Alternative A Bunker Hill First Street** just west of Alameda Street. Beyond that point, the alternative is identical with that of **Bunker Hill First Street**. That is, the line continues in tunnel under First Street, through Little Tokyo and beyond Alameda Street before once again turning to the north. At this point the alignment undergoes a transition from an underground to an aerial structure, with the resulting portal structure being located just north of Turner Street. The alignment itself avoids the Nishi Hongwanji Buddhist Temple located at the intersection of First and Vignes Streets, and also endeavors to maintain traffic along Garey Street between Turner and Ducommun Streets. To accomplish this, the alignment emerges somewhat east of Garey Street, thereby affecting the properties along Garey Street between Turner and Commercial Streets. However, there is a possibility that Garey Street between Ducommun and Commercial Streets, as well as Ducommun and Jackson Streets between Garey and Vignes Streets, would be closed to traffic if there is not enough right-of-way available. Reverse curves are then introduced to transition the alignment from along Garey Street, across the Hollywood Freeway, and eventually to tie into trackage along Platform No. 1 of Union Station. At that location, the alignment connects with the Pasadena - Los Angeles Blue Line.

Three station locations are proposed for **Alternative B**, including: 4th & Flower, 2nd & Main and 1st & Alameda. On the following page is a study area map illustrating the proposed alignment through Downtown Los Angeles. (Figure V-B1.) In addition, a complete set of Plan and Profile drawings are presented in Appendix E. These drawings are to be viewed only as conceptual drawings completed to assess engineering feasibility.



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**
METROPOLITAN TRANSPORTATION AUTHORITY

**ALTERNATIVE B
BUNKER HILL-SECOND STREET**
Figure V-B1

- Metro Red Line
- ■ ■ Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ||||| Downtown Connector Alternative

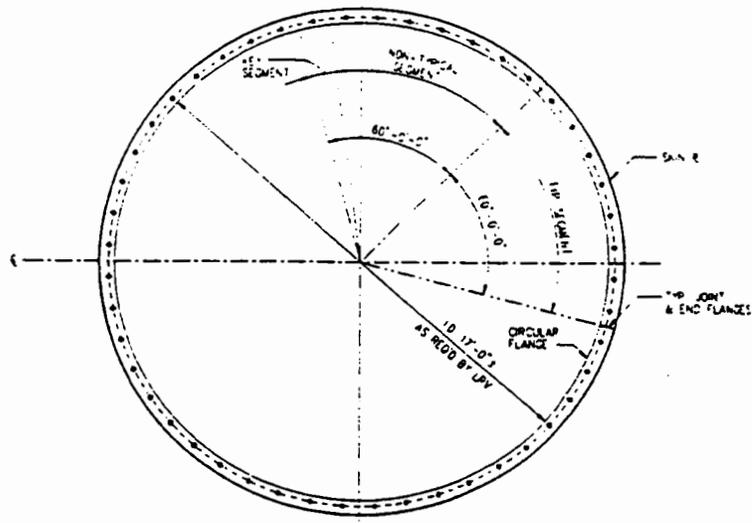
Engineering Feasibility and Constructibility

Two basic approaches are available for the construction methodology of Bunker Hill alternatives underground segments: 1) deep bored tunnels (Figure to the right), and 2) cut-and-cover construction (opposite page). *This is the same for Alt. A, B & C.*

Deep Bored Tunnels

Tunneling requires two separately-bored tubes, one needed for each direction of track. If deep enough, these tunnels would not negatively affect buildings or other types of structures above. However other potentially serious issues related to tunneling include:

- High capital costs
- Time of construction
- Necessary ventilation
- Geological and/or groundwater consideration
- Effect of sharp horizontal curves
- Tunnel construction permit and safety issues



BORED TUNNEL - TYPICAL SECTION

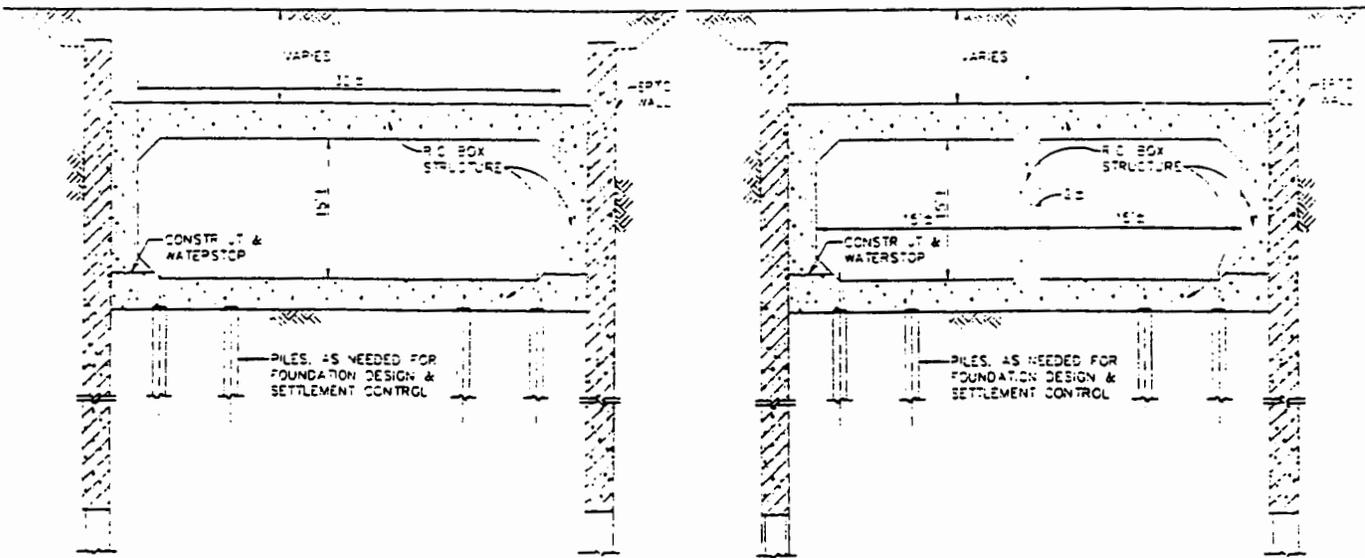
Cut-and-Cover Construction

Cut-and-cover construction would involve a single large trench and the construction of a box structure which would eventually be buried, thereby allowing the reconstruction of the street above. The required trench would be wide enough to accommodate a two-track light rail line. With double platforms located along the exterior sides of tracks in the underground stations, such as the case of the existing Metro Center Station, the width of the cut-and-cover concrete box may be kept minimum between stations. Such minimum box width is approximately 45' considering the dual-track train operation envelope, a pair of structural walls, and their adjacent outer SPTC walls. However, for less disturbance to the existing buildings, it is desirable to have a minimum clear space on each side of 10' added to the construction limit. Thus, a rough estimate of the required street width for normal cut-and-cover construction is approximately 65'. In addition, other issues related to cut-and-cover include:

- Temporary disruption of vehicular/pedestrian traffic and parking (mitigated by temporary covering of trench)
- Potential impacts on businesses along the route (mitigated by RCC mitigation plans)
- Potential noise and air pollution during construction
- Generally greater impacts upon existing utilities and what is required to maintain services
- Soil support requirements

Requirements for Alternative B - Bunker Hill Second Street

The above trade-offs between tunnel and cut-and-cover construction approaches must be considered for all Bunker Hill alternatives. In certain circumstances, however, a choice is not available. The construction of underground stations will require cut-and-cover construction, regardless of the depth of the station. Furthermore, and as a rule of thumb, the top of any tunnel structure should be approximately one tunnel diameter below the surface elevation in order to allow the tunnel to be bored. A lesser depth could also mandate cut-and-cover construction.



CUT-AND-COVER BOX
TYPICAL SECTION (1)

CUT-AND-COVER BOX
TYPICAL SECTION (2)

Specific to the three Bunker Hill alternatives is the immediate transition from Metro Center to a tunnel section which requires cut-and-cover construction. In addition, all the Bunker Hill Alternatives A, B and C transition from tunnel to aerial viaducts along Garey Street which can be assumed to also involve cut-and-cover construction. This could be extended to the 1st/Alameda Station to save costs.

Other engineering issues specific to **Bunker Hill Second Street** include:

Under/Over Red Line Tunnels - As the Blue Line Connection crosses the Red Line Tunnel along Hill and Second Streets, more separation is available between the Tunnel and street surface than at First Street. Therefore, both "over" and "under" schemes are presented, however, the "over" option appears to have inadequate separation between the Red and Blue Line tunnels. Nevertheless, the presentation of both profile options is intended to provide insight as to some of the comparative issues involved such as the ability to reduce depth of stations

Second Street Vehicular Tunnel - Inadequate vertical separation may be confronted between the proposed Blue Line tunnels and the existing Second Street vehicular tunnel, as well as the Red Line tunnels, thereby mandating the "low" profile option.

Transition to First Street Station - Land use in the area of transition between San Pedro Street and Alameda Street must be carefully monitored. Here too, any further type of development could mandate the use of a "low" tunnel profile.



Station Location and Design Analysis

Given the alignment of **Alternative B** as determined by engineering feasibility and constructibility, more specific information is developed for each station location and configuration. The following narrative and graphic information presents a descriptive overview of the design implications surrounding each proposed station as well as a perspective on the stations' integration with adjacent land uses.

System Configuration

Alternative B - Bunker Hill Second Street is predominantly an underground system with a transition to an aerial structure before connecting to Union Station. Station location choices were based upon existing and anticipated future ridership demands to and from local centers. A total of three underground station locations are proposed:

- 4th & Flower Station (between Third and Fourth Streets)
- 2nd & Main Station (between Main and Spring Streets)
- 1st & Alameda Station (corner of Alameda and First Streets)

Station Platforms

All locations are assumed to involve cut-and-cover tunnel sections. The separation of individually bored tubes is such that center platforms are indicated. In order to exit from these stations to peripheral sidewalks, it is traditionally necessary to introduce mezzanines. An alternative is available in the event the involved street is sufficiently wide to have a median divider in which stairs/escalators/elevators can exit. Such, however, is not the case for **Bunker Hill Second Street**. A further alternative could involve the use of side platforms which are not interconnected. In any event, the exact physical definition of station configurations is a matter of later design phases.

Station Portal Locations

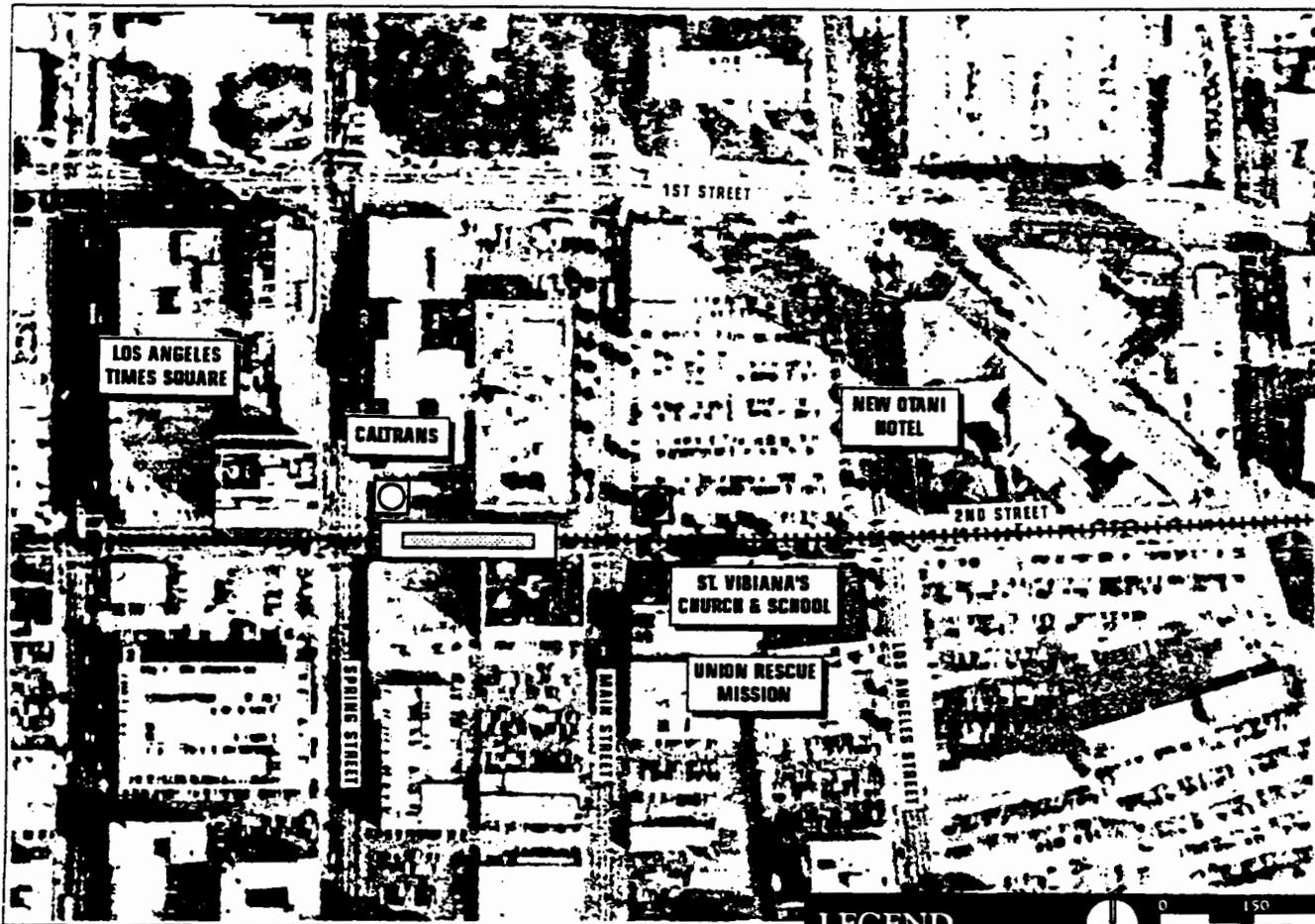
As part of this Preliminary Planning Study, portal locations are identified for each underground station location. For the three proposed stations of **Alternative B**, two portals are identified for the 4th & Flower Station and one portal is identified for the 2nd & Main and 1st & Alameda Stations, respectively. For these latter two stations, a secondary portal location is suggested which may be incorporated into the system as patronage demands warrant in the future.

Engineering-Related Issues

Other related engineering issues include:

- Station locations are flexible and are only limited by the need to be located within horizontal tangents, as well as vertical tangents with a 1% maximum to 0.3% minimum vertical grade.
- Station locations can be shifted in order to incorporate specific station entrances. In essence, mezzanines can be extended to accomplish similar goals. One such specific station entrance presently identified is at the northeast corner of the 4th & Flower Station.

The following pages illustrate the proposed station locations for **Alternative B - Bunker Hill Second Street**. Local land uses are highlighted by building name and/or any prominent entity located near the station location to illustrate potential ridership demands associated with these sites. (Only graphics are presented for the 2nd and Main Street Station. All other station location graphics are identical to Alternative A.)



2ND & MAIN

The 2nd and Main Station would provide convenient service to nearby activity centers such as Little Tokyo, the Spring Street commercial office core, and the Civic Center. In addition to these areas, other significant uses include Caltrans Headquarters, the County Engineering Building, St. Vibiana's Church and School.

Located below 2nd Street between Spring and Main Streets, the proposed station would be constructed with the implementation of Bunker Hill Alignment Alternative 'B'. The station would initially have a single portal located on the northeast corner of 2nd and Main Streets, with a possible future portal surfacing in the existing Caltrans parking lot on the northeast corner of 2nd and Spring Streets.

LEGEND



ALIGNMENTS

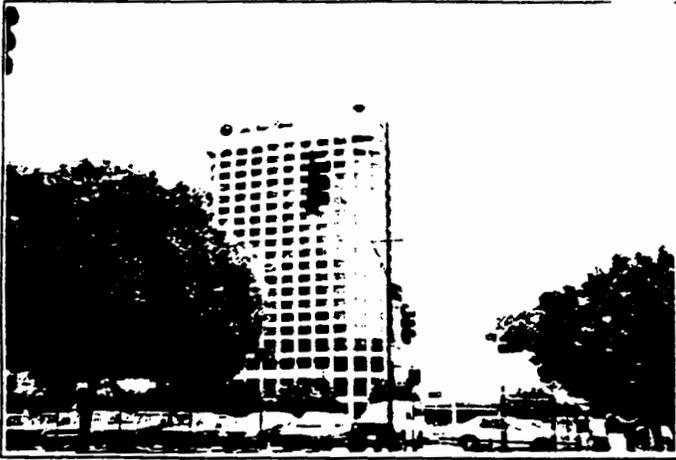
-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





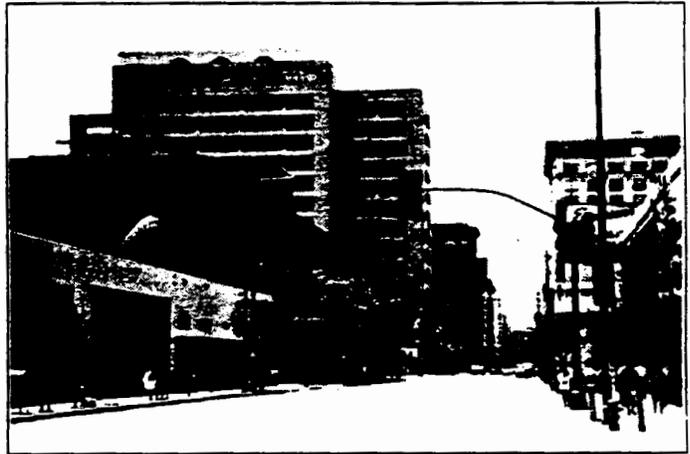
View looking east from intersection of 2nd and Main Streets. The New Otani Hotel appears in background.



St. Vibiana's Church and School.



View of Caltrans Headquarters (foreground) and City Hall, looking north on Spring Street.



View south along Spring Street. The Ronald Reagan State Office Building appears in background.

GRAPHICS BY GRUEN ASSOCIATES



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-B3
Station Site Visual Survey
2nd & Main

CAPITAL COST ESTIMATE

ALTERNATIVE B - BUNKER HILL SECOND STREET

LOW PROFILE

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$123,389,550
2. STATIONS	\$105,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$60,692,980
5. VEHICLES	\$28,800,000
SUBTOTAL (A)	\$317,882,530 *
6. PRE-REVENUE OPERATION	\$7,947,063
7. OWNERS INSURANCE	\$25,430,602
8. MASTER AGREEMENTS	\$7,947,063
SUBTOTAL (B)	\$41,324,728
9. ART FOR TRANSIT	\$1,589,413
SUBTOTAL (C)	\$1,589,413
10. RIGHT-OF-WAY	\$15,285,982
SUBTOTAL (D)	\$15,285,982
11. PROFESSIONAL SERVICES	\$127,868,102
SUBTOTAL (E)	\$127,868,102
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$39,512,798
b. OF SUBTOTAL ITEM (D)	\$4,203,645
c. OF SUBTOTAL ITEM (E)	\$12,786,810
SUBTOTAL (F)	\$56,503,254
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$764,299
GRAND TOTAL - 1993 DOLLARS	\$561,218,307

* See worksheet for detail.

WORKSHEET

DESCRIPTION	QUANTITY	PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 93+40 to 99+50	610	\$2,575	RF	\$1,570,750
Cut & Cover (Guideway)	1,870	\$18,400	RF	\$34,408,000
Cut & Cover (Station)	900	\$29,800	RF	\$26,820,000
Guideway At-grade	0	\$0	RF	\$0
Aerial Guideway	990	\$5,400	RF	\$5,346,000
Tunnel Construction	6,600	\$7,736	RF	\$51,059,800
Underpinning (Allowance)	2,290	\$1,500	RF	\$3,435,000
Soil Stabilization Under Existing Tunnels	1	\$500,000	LS	\$500,000
Tie-in at Station 4+52	1	\$250,000	LS	\$250,000
SUBTOTAL (GUIDEWAY COSTS)				\$123,389,550
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)			EA	\$0
Subway Station (3-car)	3	\$35,000,000	EA	\$105,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$105,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	12	\$2,400,000	EA	\$28,800,000
SUBTOTAL (VEHICLE COSTS)				\$28,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	10,970	\$421	RF	\$4,618,370
Train Control Station (LRT)	3	\$900,000	EA	\$2,700,000
Train Control Guideway (LRT)	10,970	\$2,013	RF	\$22,082,610
Traction Power Station (LRT)	3	\$1,580,000	EA	\$4,740,000
Traction Power Guideway (LRT)	10,970	\$270	RF	\$2,961,900
Communications	10,970	\$1,330	RF	\$14,590,100
Fare Collection (LRT)	3	\$670,000	EA	\$2,010,000
Fans/Air Handling/UPS	3	\$1,750,000	EA	\$5,250,000
Signage & Graphics	3	\$580,000	EA	\$1,740,000
SUBTOTAL (SYSTEM COSTS)				\$60,692,980
TOTAL ESTIMATED COST				\$317,882,530

ECONOMIC/MARKET ANALYSIS

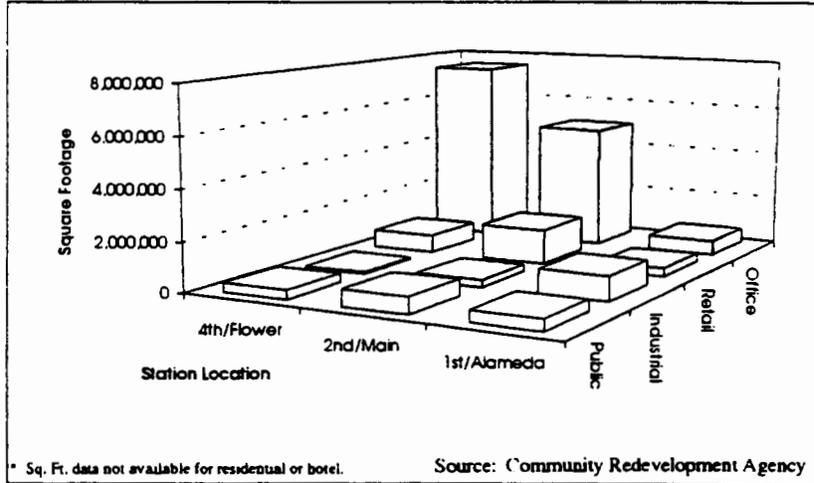
ALTERNATIVE B - BUNKER HILL SECOND STREET

(Within 0.25 miles of proposed station)

Current Land Use

SIGNIFICANT NOTES:

- o Vacancy rates in Bunker Hill are approximately 20%. Potentially, the proposed Downtown Connector could help decrease vacancy rates around the stations.
- o According to land use plans for the City of Los Angeles, Bunker Hill is 77% built-out with some undeveloped parcels available. By comparison, the Historic Core, Little Tokyo and Civic Center have 42%, 80% and 43%, respectively, in available density.
- o CBD lease rates range from \$13.00 to \$25.00.
- o Alternative B proposes station locations that serve three distinct land use groups: 4th/Flower station has a high concentration of office use, 2nd/Main station is primarily office uses but with a high concentration of retail use. 1st/Alameda station has the highest level of industrial uses.
- o Approximately 3,780 residential units and 3,685 hotel rooms are located in the vicinity of Alternative B.

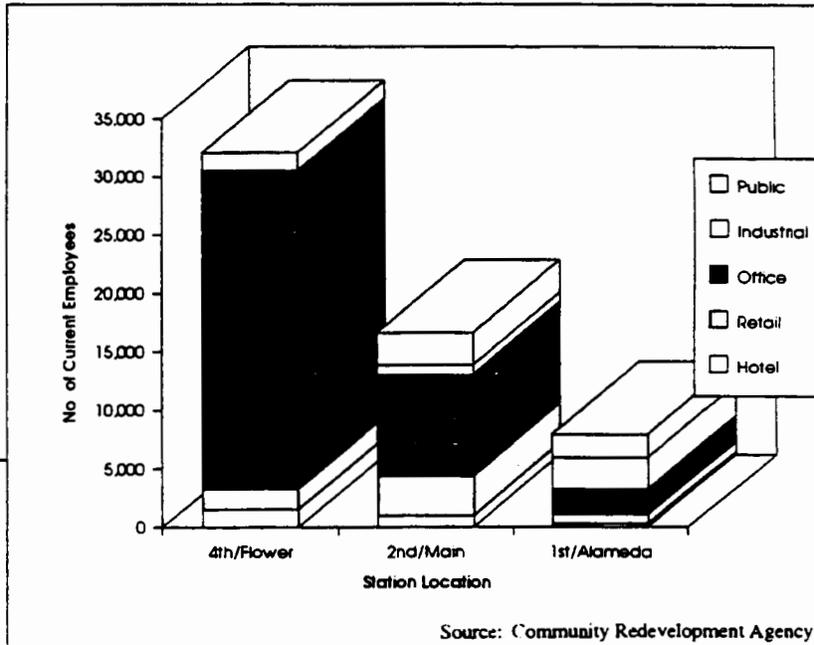


Station Location	Square Footage			
	Office	Retail	Industrial	Public
4th/Flower	7,509,529	738,243	79,013	373,519
2nd/Main	5,005,735	1,415,212	295,169	660,054
1st/Alameda	609,032	348,203	997,204	465,451

Current Employment

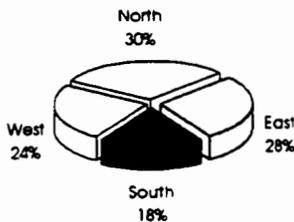
SIGNIFICANT NOTES:

- o Bunker Hill has the highest concentration of employment with the greatest density found at the 4th/Flower station due primarily to the large office-related work segment.
- o Employment is concentrated in the clerical occupational category, which accounts for 44% of workers.
- o Professionals and managers account for 23% of the workforce which is the second highest occupational concentration.
- o Based on proposed development, estimated employment includes an additional 35,132 jobs.



Station Loc	Office	Retail	Industrial	Public	Hotel	Total
4th/Flower	27,034	1,773	213	1,578	1,500	32,098
2nd/Main	8,685	3,400	798	2,787	964	16,634
1st/Almda	2,166	837	2,695	1,980	253	7,931
Total	37,885	6,010	3,706	6,345	2,717	56,663

Origin of Office Employees



Source: LA Strategic Transportation Action

ECONOMIC/MARKET ANALYSIS

ALTERNATIVE B - BUNKER HILL SECOND STREET

(Within 0.25 miles of proposed station)

Major Planned Projects

First Street North <i>(Alameda, 1st, Central, Temple)</i>	Mangrove Estates <i>(NE Corner - Alameda & 1st)</i>	Flower/3rd Office Project
- Office 785,000 s.f.	- Office 495,000 s.f.	- Office 1,400,000 s.f.
- Retail 95,000 s.f.	- Retail 234,000 s.f.	- Retail 50,000 s.f.
- Cultural 65,000 s.f.	- Recreational 15,000 s.f.	
- Housing 273 units	- Housing 1,200 units	
- Hotel 426 units	- Hotel 433 rooms	
Sunshine Pacific <i>(Sunset & Alameda)</i>	First Street South <i>(SE Corner - Alameda & 1st)</i>	
- Retail 185,000 s.f.	- Office 389,000 s.f.	
- Housing 296 units	- Retail 215,000 s.f.	
	- Housing 640 units	
	- Hotels 400 rooms	

Status:

First Street North	- Waiting for City approval and financing. Construction expected to begin in 1994.
Sunshine Pacific	- Estimate of construction date not given.
Mangrove Estates	- Completing EIR, with construction expected to begin in 1997.
First Street South	- Completing EIR, with construction expected to begin in 1997.
Flower/3rd Proj.	- Construction, if Connector is built here, is expected to begin in 1997.

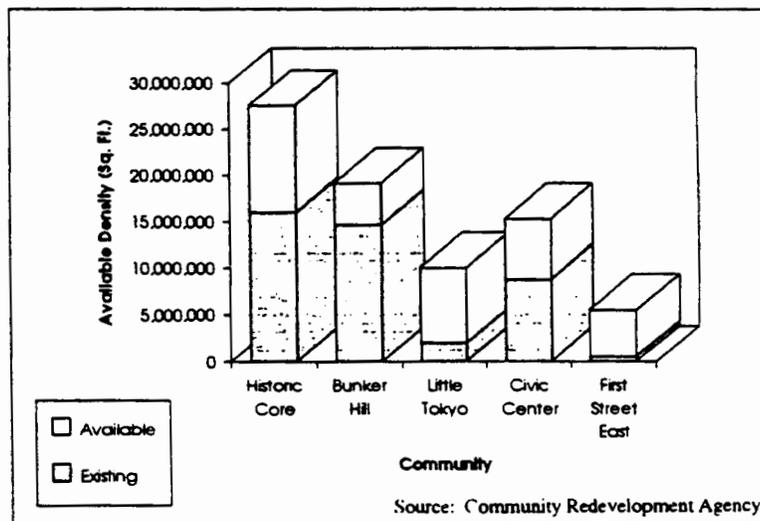
SIGNIFICANT NOTES:

Many of the business/real estate professionals interviewed stated that implementation of a Downtown Connector could contribute to a greater viability of future developments if a station were located nearby. In addition, a proposed project has incorporated a station into its existing plans creating a unique joint development opportunity.

Development Opportunities

SIGNIFICANT NOTES:

- o According to current land use plans for the City of Los Angeles, 23% of available density is remaining in Bunker Hill. However, if any significant transportation project is built in Bunker Hill, such as the proposed Downtown Connector, the Floor Area Ratio would be allowed to increase from 5:1 to 6:1 creating an additional 4.0 million square feet of available density.
- o Development opportunities exist around all three of the proposed stations. Mixed-use developments including residential, office, retail and hotel provide the best opportunity for joint development in the Bunker Hill area.
- o Little Tokyo has a high percentage of available density due in large part to underdeveloped parcels rather than vacant space.
- o Los Angeles County can cause long term construction of over 6.0 million net rentable square feet on its vacant and underutilized Civic Center properties within current zoning and CBD Redevelopment Plan Restrictions.
- o Additional development maybe facilitated at the 7th/Flower station by presence of a through route.



Community	Existing		Available	
	Devlpmnt.	%	Density	%
Historic Core	16,000,000	58%	11,600,000	42%
Bunker Hill	14,672,000	77%	4,467,755	23%
Little Tokyo	2,000,000	20%	8,000,000	80%
Civic Center	8,800,000	57%	6,500,000	43%
First Street East	500,000	9%	5,000,000	90%

* Includes larger area than .25 miles around station sites.

Environmental Assessment

The following is a preliminary assessment of environmental impacts associated with the **Alternative B - Bunker Hill Second Street**. Both short and long-term impacts are presented in key impact areas, such as land use, traffic and parking, noise and vibration, air, aesthetics, cultural resources, and business impacts. A subsequent Environmental Impact Report following this study will provide detailed analysis of anticipated impacts and proposed mitigation measures.

Short-Term Construction Impacts

The **Bunker Hill Second Street** alternative will utilize a combination of cut-and-cover and bored tunnel construction techniques. However, at the northern end of the alignment along Garey Street, the line transitions to an aerial configuration to connect with Union Station. As discussed in the Engineering Feasibility section, the cut-and-cover technique poses considerable surface impacts. Five segments of **Alternative B**, as identified in the following matrix, will experience significant environmental impacts during construction. For a minimum time period of approximately three weeks, these segments will be most heavily affected. During the process of ground breaking, digging and placement of wood boards, the surface street will be significantly altered. At a minimum, one traffic lane in both directions will remain open for local traffic circulation. While the at-grade wood boards or precast concrete planks will permit normal surface traffic flow during construction, the altered street will cause various impacts as outlined in the following matrix.

A significant issue for all of the three Bunker Hill alternatives is the starting point for construction. Will construction start at the Metro Center or Union Station? The starting point is significant in relation to the environmental impacts. It will be the ingress and egress point for truck entry and dirt hauling throughout the entire construction process. Pedestrians along this segment would be affected from potentially altered sidewalks and/or change in accessibility to local business fronts. Street traffic would also be altered with a likely lane closure during the construction period. As a result of construction activity, significant noise, dust and vibration impacts are also anticipated to the immediate area. Although temporary, on-going construction activity will result in visual impacts from the presence of construction equipment, materials and alteration of the street. This intense activity throughout construction may be more appropriate at the northern end of the alignment from Union Station, where the existing local land use is light industrial and less dense. An ingress and egress point for truck activity may be conveniently located near Garey Street where abandoned buildings and/or vacant property may be utilized. This alternative starts at Metro Center which would significantly exacerbate already identified short-term impacts associated with cut-and-cover construction. In addition, the effect of tunneling and cut-and cover construction on ground movement, water table change, and deformation of the adjacent structures shall be continuously observed and any potential impacts mitigated.

Another construction impact associated with all the alternatives, is construction of the aerial structure across the 101 Freeway for the connection to Union Station. A Traffic Management Plan will have to be prepared and approved by Caltrans identifying the construction procedures that will be employed to minimize impacts on the freeway.

Long-Term Impacts

Due to the nature of construction being proposed, cut-and-cover and tunneling, the long-term impacts are mostly limited to property acquisition and traffic, both pedestrian and vehicle. Furthermore, some permanent street closures at Jackson, Ducommon and/or Garey (northern section only) Streets may be required, which could potentially result in a significant traffic impact. Re-routing of local traffic might be required as a potential mitigation measure. These transportation impacts are discussed in greater detail in the following subsection. Some of the other long-term impacts include issues such as business development and aesthetics.

ENVIRONMENTAL ASSESSMENT
ALTERNATIVE B - BUNKER HILL SECOND STREET
LOW PROFILE

Segment/Station	Plan & Profile	Length	Type of Construction	Potential Impacts	Sensitive Receptors
7th Street Metro Center: Metro Center to mid-block on Flower Street, between Fifth and Sixth Street	0+00 to 4+00	400 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> <ul style="list-style-type: none"> - Increased pedestrian traffic 	Downtown Library
4th & Flower Station: Between Third and Fourth Streets	16+00 to 19+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> <ul style="list-style-type: none"> - Property acquisition - Business development - Increased pedestrian traffic 	None
2nd & Main Station: Between Spring and Main Streets	50+00 to 53+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> <ul style="list-style-type: none"> - Property acquisition - Business development - Increased pedestrian traffic 	St. Vibiana Church/School
1st & Alameda Station: Corner of First and Alameda Streets	76+00 to 79+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual - Cultural resources <u>Long-Term:</u> <ul style="list-style-type: none"> - Property acquisition - Business development - Increased pedestrian traffic 	Koyasan Buddhist Temple
Garey Street: Garey Street, between 1st & Alameda Station to Commercial Street	79+00 to 105+00	2,600 ft.	Portal & Aerial	<u>Short-Term/Construction Related:</u> <ul style="list-style-type: none"> - Increased truck traffic - Altered vehicle traffic - Altered business accessibility - Street closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> <ul style="list-style-type: none"> - Property acquisition and displacement - Right-of-way acquisition - Visual - Street closures 	Los Angeles Hompa Hongwanji Betsu (Temple)

Transportation Impacts

Traffic Impacts

Since the **Bunker Hill Second Street** is primarily subway, there will be minimal ongoing impact to vehicular traffic, except in the vicinity of Gary Street. Gary Street is a local street with low traffic volumes. During the Route Refinement/EIR stage of this project, the precise location and alignment of the portal and transition structure to aerial configuration will be identified. This transition will occur north of Temple Street and south of Commercial Street. Depending upon its design, it could affect traffic on Jackson Street and/or Ducommon Street. This will determine whether Gary Street or the intersecting side streets might have to be closed to vehicular traffic. At the present time, Gary Street has one travel lane in each direction plus parking on each side of the street and runs between East Temple Street and Commercial Street. There are no major cross-streets along Gary Street. It is utilized by some traffic as a route to the freeway, but it is parallel by Vignes Street, one block to the east, which leads directly to the freeway on ramp and which can accommodate any traffic diverted from Gary Street.

Bunker Hill Second Street will facilitate the addition of several new rail lines through downtown. The preliminary operations plan developed for this study included six lines through the connector with the potential for as many as 60 trains per hour, total of both directions. Some of the rail lines would utilize the existing Blue Line corridor along Washington Boulevard. Other lines would potentially utilize the extension south and west to USC/Exposition Park and potentially west to Santa Monica. North of Union Station they would extend to Pasadena or the Glendale-Burbank area. There is the potential for traffic impacts along the southern section of Flower Street, where the trains run at-grade, and at the Flower/Washington intersection. These potential impacts are not new locations where traffic may be affected, but the connector will facilitate enhanced rail service which will result in additional train service, thereby increasing the level of at-grade train movements through intersections on lower Flower Street. South of Washington Boulevard, the rail lines will split, some proceeding along the existing Blue Line to Long Beach and some extending west to Santa Monica, therefore the impacts of the connector should not be significant beyond the Flower/Washington intersection. In the project EIR, the potential need for mitigation measures along Flower Street, south of the existing Blue Line portal to Washington Street, will be assessed.

Station Areas

The average daily traffic volumes on the roadways where the stations would be located are as follows:

Station Location	Traffic Volume (ADT)
1st and Alameda Streets	24,000 (plus 27,000 on Alameda)
2nd and Main Streets	14,000
4th and Flower Streets	20,000

The primary circulation issues with the subway configuration are associated with station areas, pedestrian access and integration with bus service. The parking demand at these stations will be negligible because these stations primarily serve as destinations for employees coming into downtown and for internal downtown trips. There is no parking proposed at these stations, therefore vehicular impacts associated with the stations are minimal. Pedestrian access will be provided via escalators/elevators to the street level. The proposed stations would be expected to generate a high volume of pedestrians, so appropriate sidewalk and station access capacity will have to be provided to handle peak pedestrian loads at commute periods. For example, the station at Fourth/Flower would serve a number of high-rise office buildings and hotels (on Flower Street and on Bunker Hill via escalators) with a large employee base. The station at Second/Main would serve a variety of establishments including the Civic Center area, one block to the north, with a large number of transit-oriented employees. The station at First/Alameda would potentially serve a large number of developments proposed in the vicinity as well as the Little Tokyo area.

Transfer Opportunities

There is no bus service provided on Second Street itself, so patrons on the Blue Line would have to walk to the north-south streets adjacent to the station portals or to First Street to transfer between the bus and rail transit systems. Bus routes could however, be realigned to directly serve rail transit portals on Second Street, if the demand for transfers warranted such a realignment. When the locations of stations and portals are finalized in the EIR, pedestrian access routes would be analyzed and mitigation may be required.

Parking

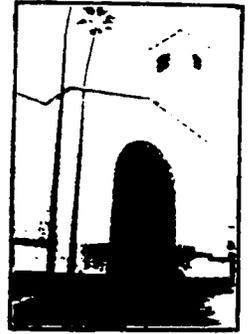
Parking is not proposed to be provided at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking in available parking provided by others. The only area where on-street parking is potentially displaced is along Garey Street. Long-term metered parking (\$1.00 for 10 hours) is provide on both sides of Garey Street; 33 spaces between Temple and Ducommon Streets, the blocks most likely to be affected, and 10 spaces and one loading zone north of Ducommon, which may potentially be affected. The number of parking spaces which could potentially be displaced is therefore approximately 40, which is relatively insignificant. The availability of other long-term metered on-street parking within a one block walk, plus off-street parking facilities nearby, would offset the loss of parking along Garey Street.

Driveway Access Issues

The proposed alignment does not affect any driveway access, except along Garey Street. Garey Street provides access to only a limited number of industrial/warehouse facilities, plus an exit from the DWP site. Access may be limited to right-in/right-out only, for these driveways along Garey Street or potentially closed if the property along the east side of Garey Street is purchased to accommodate the portal and transition to aerial structure. Driveway impacts will have to be evaluated in greater detail when the portal and transition structures are located.



UNION STATION



BUNKER HILL

RED LINE



7th CENTER METRO

SAN PEDRO

ALAMEDA

BLUE LINE

ALTERNATIVE C

BUNKER HILL THIRD STREET

ALTERNATIVE C

Bunker Hill Third Street

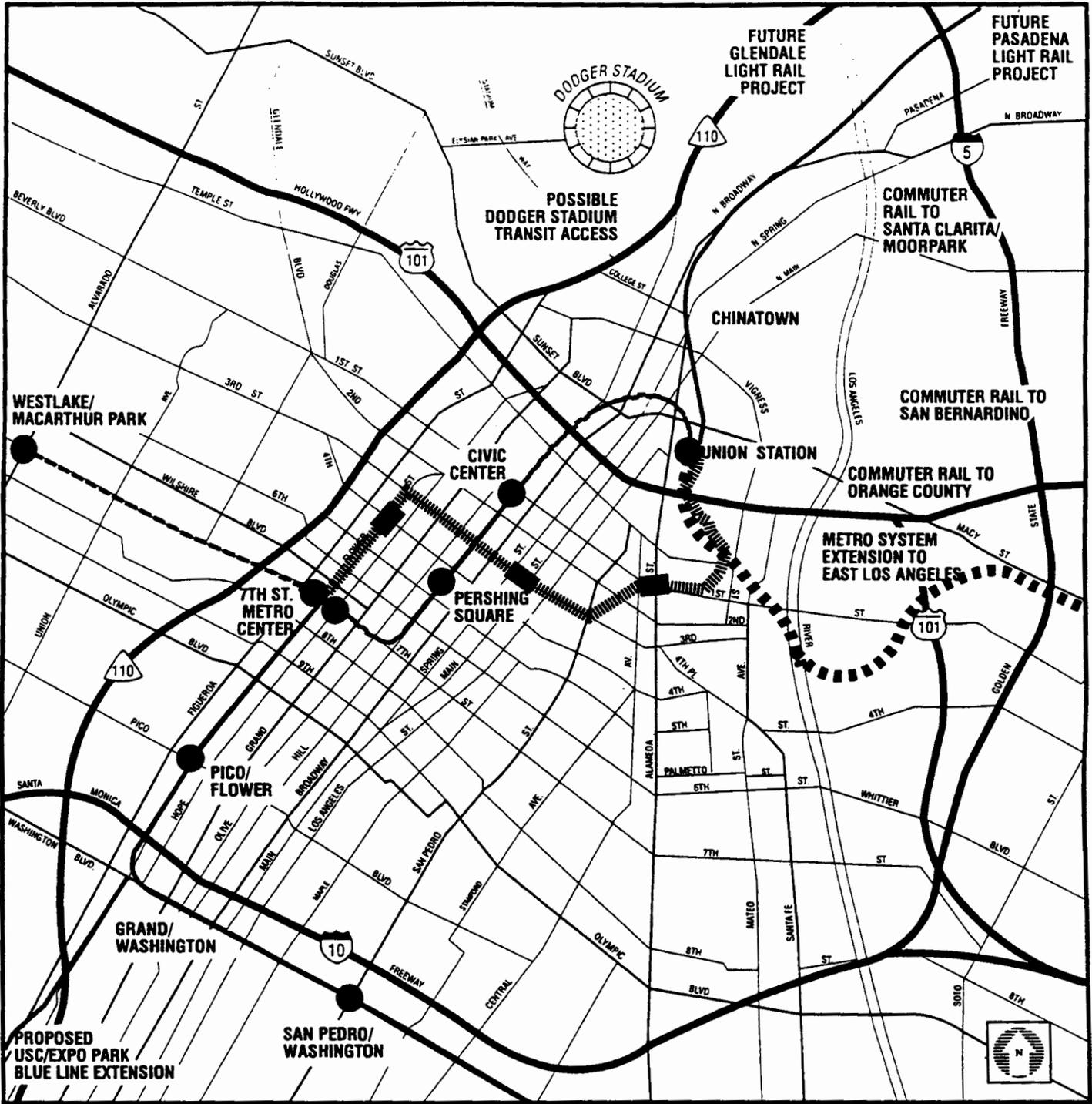
Technical Description of Alignment

Alternative	Subalternative	At-Grade	Tunnel	Cut & Cover	Aerial	Total
C	Low Profile	720'	7,940'	1,870'	990'	11,520'
C	High Profile	720'	5,580'	4,230'	990'	11,520'

Source: Transmetrics

Alternative C - Bunker Hill Third Street is the last of the three alternatives studied which begin at the existing terminus of the Long Beach-Los Angeles Blue Line at Metro Center (Seventh and Flower Streets). (Appendix E Plan and Profile Alt. C.) **Alternative C** begins the same as **Alternatives A and B**. This alternative, however, is intended to proceed east under Third Street. Due to the location of the 4th & Flower Station, the alignment cannot immediately turn into the Third Street corridor, but must first proceed more north to Second Place, before utilizing reverse curves to finally enter the Third Street corridor location. The line then continues under Third Street until San Pedro Street where reverse curves to the left are introduced to transition the alignment to tie into that of **Bunker Hill Second Street** at about Central Avenue. Beyond that point, the alternative is identical with that of **Bunker Hill Second Street** for a short distance, and is then identical with **Bunker Hill First Street**. The line continues in tunnel under First Street, through Little Tokyo and beyond Alameda Street before once again turning to the north. At this point the alignment undergoes a transition from an underground to an aerial structure, with the resulting portal structure being located just north of Turner Street. The alignment itself avoids the Nishi Hongwanji Buddhist Temple located at the intersection of First and Vignes Streets, and also endeavors to maintain traffic along Garey Street between Turner and Ducommun Streets. To accomplish this, the alignment emerges somewhat east of Garey Street, thereby affecting the properties along Garey Street between Turner and Commercial Streets. However, there is a possibility that Garey Street between Ducommun and Commercial Streets, as well as Ducommun and Jackson Streets between Garey and Vignes Streets, would be closed to traffic if there is not enough right-of-way available. Reverse curves are then introduced to transition the alignment from along Garey Street, across the Hollywood Freeway, and eventually to tie into trackage along Platform No. 1 of Union Station. At that location, the alignment connects with the Pasadena - Los Angeles Blue Line.

Three station locations are proposed for **Alternative C**, including: 4th & Flower, 3rd & Main and 1st & Alameda. On the following page is a study area map illustrating the proposed alignment through Downtown Los Angeles. (Figure V-C1.) In addition, a complete set of Plan and Profile drawings are presented in Appendix E. These drawings are to be viewed only as conceptual drawings completed to assess engineering feasibility.



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**
METROPOLITAN TRANSPORTATION AUTHORITY

**ALTERNATIVE C
BUNKER HILL-THIRD STREET**
Figure V-C1

- - - Metro Red Line
- • • Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ▨▨▨▨▨ Downtown Connector Alternative

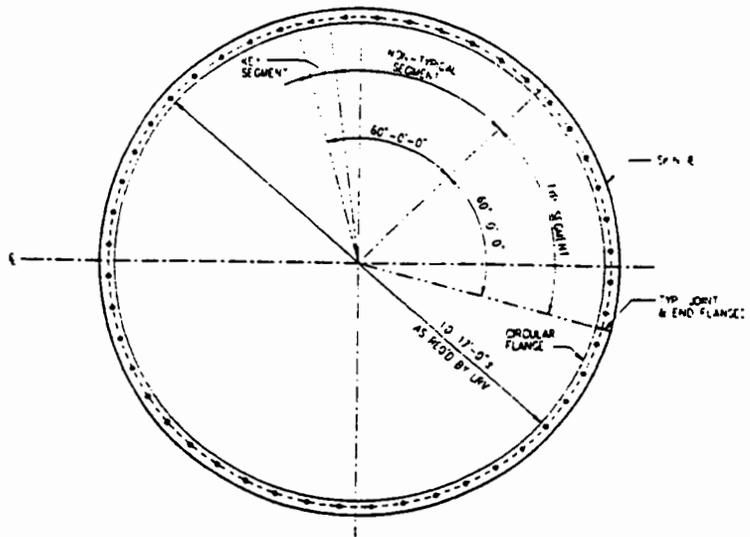
Engineering Feasibility and Constructibility

Two basic approaches are available for the construction methodology of Bunker Hill alternatives underground segments: 1) deep bored tunnels (Figure to the right), and 2) cut-and-cover construction (opposite page). *This is the same for Alt. A, B & C.*

Deep Bored Tunnels

Tunneling requires two separately-bored tubes, one needed for each direction of track. If deep enough, these tunnels would not negatively affect buildings or other types of structures above. However other potentially serious issues related to tunneling include:

- High capital costs
- Time of construction
- Necessary ventilation
- Geological and/or groundwater consideration
- Effect of sharp horizontal curves
- Tunnel construction permit and safety issues



BORED TUNNEL - TYPICAL SECTION

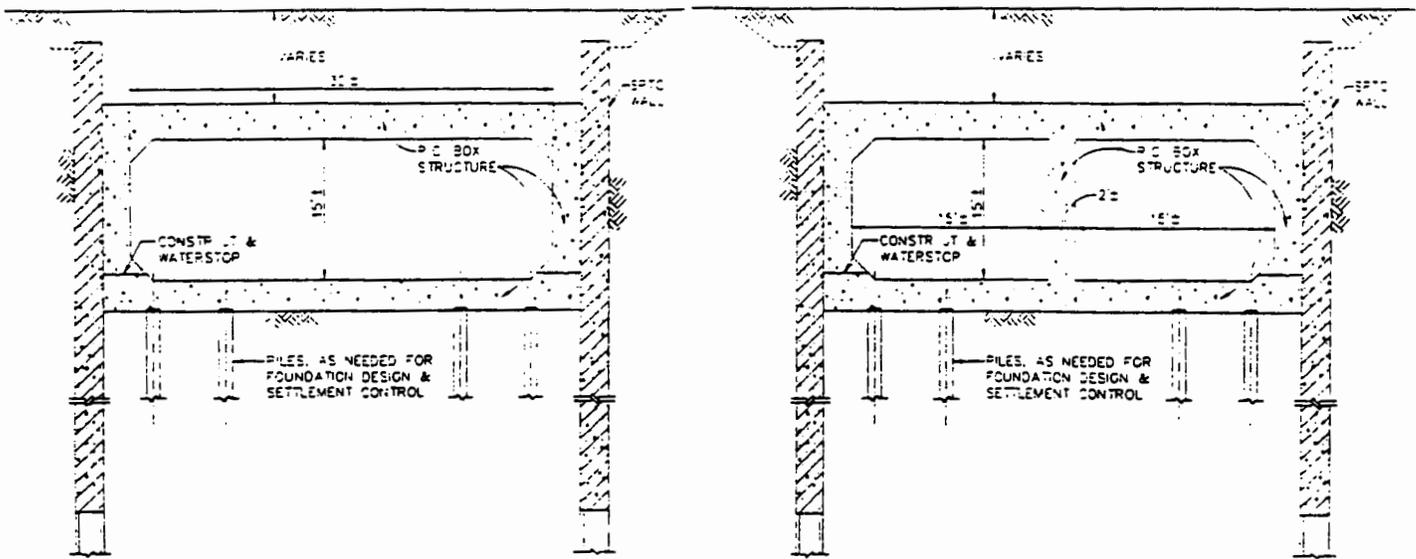
Cut-and-Cover Construction

Cut-and-cover construction would involve a single large trench and the construction of a box structure which would eventually be buried, thereby allowing the reconstruction of the street above. The required trench would be wide enough to accommodate a two-track light rail line. With double platforms located along the exterior sides of tracks in the underground stations, such as the case of the existing Metro Center Station, the width of the cut-and-cover concrete box may be kept minimum between stations. Such minimum box width is approximately 45' considering the dual-track train operation envelope, a pair of structural walls, and their adjacent outer SPTC walls. However, for less disturbance to the existing buildings, it is desirable to have a minimum clear space on each side of 10' added to the construction limit. Thus, a rough estimate of the required street width for normal cut-and-cover construction is approximately 65'. In addition, other issues related to cut-and-cover include:

- Temporary disruption of vehicular/pedestrian traffic and parking (mitigated by temporary covering of trench)
- Potential impacts on businesses along the route (mitigated by RCC mitigation plans)
- Potential noise and air pollution during construction
- Generally greater impacts upon existing utilities and what is required to maintain services

Requirements for Alternative C- Bunker Hill Third Street

The above trade-offs between tunnel and cut-and-cover construction approaches must be considered for all Bunker Hill alternatives. In certain circumstances, however, a choice is not available. The construction of underground stations will require cut-and-cover construction, regardless of the depth of the station. Furthermore, and as a rule of thumb, the top of any tunnel structure should be approximately one tunnel diameter below the surface elevation in order to allow the tunnel to be bored. A lesser depth could also mandate cut-and-cover construction.



CUT-AND-COVER BOX
TYPICAL SECTION (1)

CUT-AND-COVER BOX
TYPICAL SECTION (2)

Specific to the three Bunker Hill alternatives is the immediate transition from Metro Center to a tunnel section which requires cut-and-cover construction. In addition, all the **Bunker Hill Alternatives A, B and C** transition from tunnel to aerial viaducts along Garey Street which can be assumed to also involve cut-and-cover construction. This could be extended to the 1st/Alameda Station to save costs.

Other engineering issues specific to **Bunker Hill Third Street** include:

Under/Over Red Line Tunnels - As the Blue Line Connection crosses the Red Line Tunnel along Hill and Third Streets, adequate vertical distance appears to exist between the existing tunnels and the street surface. Therefore, both an "high" and "low" profile sub-alternative has been presented. For this alternative, greater consideration can also be given to a cut-and-cover approach.

Third Street Vehicular Tunnel - The horizontal and vertical relationship between the proposed Blue Line tunnels and the existing Third Street vehicular tunnel need further study. Considerations for this tunnel may affect the desired point where the alignment enters the Third Street corridor.

Transition to First Street Station - Land use in the area of transition between San Pedro Street and Central Avenue must be carefully monitored. Although tunnel construction is indicated at this location, any new development could affect geometric definition.

Planned Development Impacts - Development of the northeast corner at Third/Flower Streets must be monitored as possibly affecting the alignment.



Station Location and Design Analysis

Given the alignment of **Alternative C** as determined by engineering feasibility and constructibility, more specific information is developed for each station location and configuration. The following narrative and graphic information presents a descriptive overview of the design implications surrounding each proposed station as well as a perspective on the stations' integration with adjacent land uses.

System Configuration

Alternative C - Bunker Hill Third Street is predominantly an underground system with a transition to an aerial structure before connecting to Union Station. Station location choices were based upon existing and anticipated future ridership demands to and from local centers. A total of three underground station locations are proposed:

- 4th & Flower Station (between Third and Fourth Streets)
- 3rd & Main Station (between Main and Spring Streets)
- 1st & Alameda Station (corner of Alameda and First Streets)

Station Platforms

All locations are assumed to involve cut-and-cover tunnel sections. The separation of individually bored tubes is such that center platforms are indicated. In order to exit from these stations to peripheral sidewalks, it is traditionally necessary to introduce mezzanines. An alternative is available in the event the involved street is sufficiently wide to have a median divider in which stairs/escalators/elevators can exit. Such, however, is not the case for **Bunker Hill Third Street**. A further alternative could involve the use of side platforms which are not interconnected. In any event, the exact physical definition of station configurations is a matter of later design phases.

Station Portal Locations

As part of this Preliminary Planning Study, portal locations are identified for each underground station location. For the three proposed stations of **Alternative C**, two portals are identified for the 4th & Flower Station and one portal is identified for the 3rd & Main and 1st & Alameda Stations, respectively. For these latter two stations, a secondary portal location is suggested which may be incorporated into the system as patronage demands warrant in the future.

Engineering-Related Issues

Other related engineering issues include:

- Station locations are flexible and are only limited by the need to be located within horizontal tangents, as well as vertical tangents with a 1% maximum to 0.3% minimum vertical grade.
- Station locations can be shifted in order to incorporate specific station entrances. In essence, mezzanines can be extended to accomplish similar goals. One such specific station entrance presently identified is at the northeast corner of the 4th & Flower Station.

The following pages illustrate the proposed station locations for **Alternative C - Bunker Hill Third Street**. Local land uses are highlighted by building name and/or any prominent entity located near the station location to illustrate potential ridership demands associated with these sites. (Only graphics are presented for the Third and Main Street Station. All other station location graphics are identical to Alternative A.)



LEGEND

ALIGNMENTS

- ==== Metro Red Line
- Metro Blue Line
- ||||| Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

- ▬ At-Grade
- ▬ Aerial
- ▬ Subway
- Proposed or Existing Portal
- Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

3RD & MAIN

The primary uses served by the 3rd and Main Station include the Ronald Reagan State Office Building, commercial office buildings along Spring Street, and historic uses along Broadway such as the Bradbury Building, Grand Central Market, and Million Dollar Theater.

Located below 3rd Street between Spring and Main Streets, the proposed station would be constructed with the implementation of Bunker Hill Alignment Alternative 'C'. The 3rd and Main Station would initially be accessed via a single portal located on the northeast corner of 3rd and Spring Streets, with optional future portal sites located below the State Office Building and the southeast corner of 3rd and Main Streets. This location has the ability to best serve the historic core as recommended in the Downtown Strategic Plan.





View north along Main Street.



View south along Main Street.



Ronald Reagan State Office Building. A possible portal could be located within the building's plaza on Main Street.



Intersection of 3rd and Main Streets looking toward the southeast corner.

GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY
METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-C3
Station Site Visual Survey
3rd & Main

CAPITAL COST ESTIMATE

ALTERNATIVE C - BUNKER HILL THIRD STREET

HIGH PROFILE

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$142,654,120
2. STATIONS	\$105,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$62,911,680
5. VEHICLES	\$28,800,000
SUBTOTAL (A)	\$339,365,800 *
6. PRE-REVENUE OPERATION	\$8,484,145
7. OWNERS INSURANCE	\$27,149,264
8. MASTER AGREEMENTS	\$8,484,145
SUBTOTAL (B)	\$44,117,554
9. ART FOR TRANSIT	\$1,696,829
SUBTOTAL (C)	\$1,696,829
10. RIGHT-OF-WAY	\$16,159,982
SUBTOTAL (D)	\$16,159,982
11. PROFESSIONAL SERVICES	\$136,455,656
SUBTOTAL (E)	\$136,455,656
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$42,183,169
b. OF SUBTOTAL ITEM (D)	\$4,443,995
c. OF SUBTOTAL ITEM (E)	\$13,645,566
SUBTOTAL (F)	\$60,272,730
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$807,999
GRAND TOTAL - 1993 DOLLARS	\$598,876,550

* See worksheet for detail.

WORKSHEET

DESCRIPTION	QUANTITY	PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 93+40 to 99+50	610	\$2,575	RF	\$1,570,750
Cut & Cover (Guideway)	4,230	\$18,400	RF	\$77,832,000
Cut & Cover (Station)	900	\$18,400	RF	\$16,560,000
Guideway At-grade	0	\$0	RF	\$0
Aerial Guideway	990	\$5,400	RF	\$5,346,000
Tunnel Construction	4,790	\$7,862	RF	\$37,660,370
Underpinning (Allowance)	2,290	\$1,500	RF	\$3,435,000
Tie-in at Station 4+52	1	\$250,000	LS	\$250,000
SUBTOTAL (GUIDEWAY COSTS)				\$142,654,120
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)			EA	\$0
Subway Station (3-car)	3	\$35,000,000	EA	\$105,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$105,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	12	\$2,400,000	EA	\$28,800,000
SUBTOTAL (VEHICLE COSTS)				\$28,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	11,520	\$421	RF	\$4,849,920
Train Control Station (LRT)	3	\$900,000	EA	\$2,700,000
Train Control Guideway (LRT)	11,520	\$2,013	RF	\$23,189,760
Traction Power Station (LRT)	3	\$1,580,000	EA	\$4,740,000
Traction Power Guideway (LRT)	11,520	\$270	RF	\$3,110,400
Communications	11,520	\$1,330	RF	\$15,321,600
Fare Collection (LRT)	3	\$670,000	EA	\$2,010,000
Fans/Air Handling/UPS	3	\$1,750,000	EA	\$5,250,000
Signage & Graphics	3	\$580,000	EA	\$1,740,000
SUBTOTAL (SYSTEM COSTS)				\$62,911,680
TOTAL ESTIMATED COST				\$339,365,800

CAPITAL COST ESTIMATE

ALTERNATIVE C - BUNKER HILL THIRD STREET

LOW PROFILE

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$127,461,200
2. STATIONS	\$105,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$62,911,680
5. VEHICLES	\$28,800,000
SUBTOTAL (A)	\$324,172,880 *
6. PRE-REVENUE OPERATION	\$8,104,322
7. OWNERS INSURANCE	\$25,933,830
8. MASTER AGREEMENTS	\$8,104,322
SUBTOTAL (B)	\$42,142,474
9. ART FOR TRANSIT	\$1,620,864
SUBTOTAL (C)	\$1,620,864
10. RIGHT-OF-WAY	\$16,159,982
SUBTOTAL (D)	\$16,159,982
11. PROFESSIONAL SERVICES	\$130,592,708
SUBTOTAL (E)	\$130,592,708
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$40,294,689
b. OF SUBTOTAL ITEM (D)	\$4,443,995
c. OF SUBTOTAL ITEM (E)	\$13,059,271
SUBTOTAL (F)	\$57,797,955
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$807,999
GRAND TOTAL - 1993 DOLLARS	\$573,294,862

* See worksheet for detail.

WORKSHEET

DESCRIPTION	QUANTITY	UNIT PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 93+40 to 99+50	610	\$2,575	RF	\$1,570,750
Cut & Cover (Guideway)	1,870	\$18,400	RF	\$34,408,000
Cut & Cover (Station)	900	\$29,800	RF	\$26,820,000
Guideway At-grade	0	\$0	RF	\$0
Aerial Guideway	990	\$5,400	RF	\$5,346,000
Tunnel Construction	7,150	\$7,711	RF	\$55,131,450
Underpinning (Allowance)	2,290	\$1,500	RF	\$3,435,000
Soil Stabilization Under Existing Tunnels	1	\$500,000	LS	\$500,000
Tie-in at Station 4+52	1	\$250,000	LS	\$250,000
SUBTOTAL (GUIDEWAY COSTS)				\$127,461,200
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)			EA	\$0
Subway Station (3-car)	3	\$35,000,000	EA	\$105,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$105,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	12	\$2,400,000	EA	\$28,800,000
SUBTOTAL (VEHICLE COSTS)				\$28,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	11,520	\$421	RF	\$4,849,920
Train Control Station (LRT)	3	\$900,000	EA	\$2,700,000
Train Control Guideway (LRT)	11,520	\$2,013	RF	\$23,189,760
Traction Power Station (LRT)	3	\$1,580,000	EA	\$4,740,000
Traction Power Guideway (LRT)	11,520	\$270	RF	\$3,110,400
Communications	11,520	\$1,330	RF	\$15,321,600
Fare Collection (LRT)	3	\$670,000	EA	\$2,010,000
Fans/Air Handling/UPS	3	\$1,750,000	EA	\$5,250,000
Signage & Graphics	3	\$580,000	EA	\$1,740,000
SUBTOTAL (SYSTEM COSTS)				\$62,911,680
TOTAL ESTIMATED COST				\$324,172,880

ECONOMIC/MARKET ANALYSIS

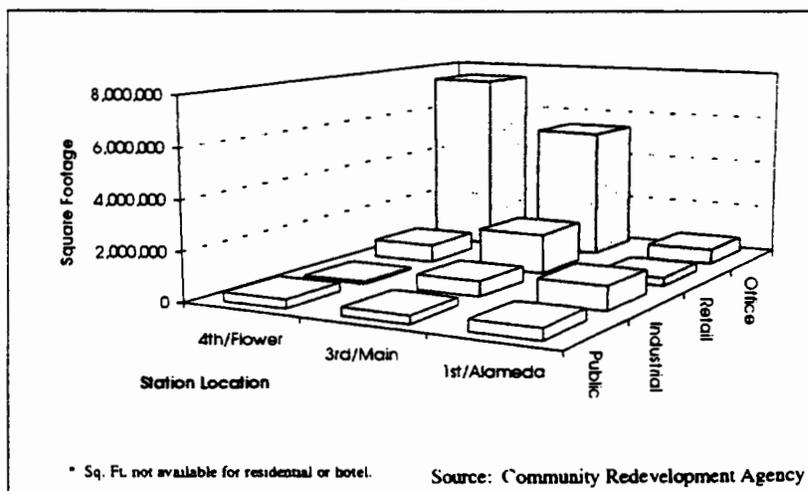
ALTERNATIVE C - BUNKER HILL THIRD STREET

(Within 0.25 miles of proposed station)

Current Land Use

SIGNIFICANT NOTES:

- o Vacancy rates in Bunker Hill are approximately 20%. Potentially, the proposed Downtown Connector could help decrease vacancy rates around the stations.
- o According to land use plans for the City of Los Angeles, Bunker Hill is 77% built-out with some undeveloped parcels available. By comparison, the Historic Core, Little Tokyo and Civic Center have 42%, 80% and 43%, respectively, in available density.
- o CBD lease rates range from \$13.00 to \$25.00.
- o Alternative C proposes station locations that serve three distinct land use groups: 4th/Flower station has a high concentration of office use, 3rd/Main station is primarily office uses but with a high concentration of public and retail uses, 1st/Alameda station has the highest level of industrial uses.
- o Approximately 4,014 residential units and 4,118 hotel rooms are located in the vicinity of Alternative C.

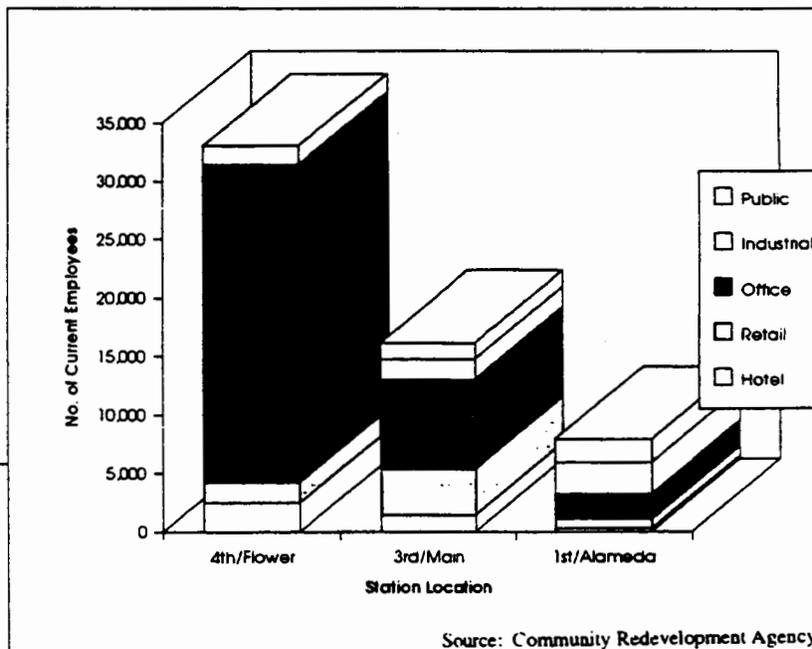


Station Location	Square Footage			
	Office	Retail	Industrial	Public
4th/Flower	7,509,529	738,243	79,013	373,519
3rd/Main	5,393,171	1,644,317	624,375	327,740
1st/Alameda	609,032	348,203	997,204	465,451

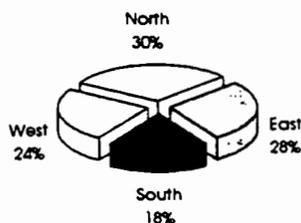
Current Employment

SIGNIFICANT NOTES:

- o Bunker Hill has the highest concentration of employment with the greatest density found at the 4th/Flower station due primarily to the large office-related work segment.
- o Employment is concentrated in the clerical occupational category, which accounts for 44% of workers.
- o Professionals and managers account for 23% of the workforce which is the second highest occupational concentration.
- o Based on proposed development, estimated employment includes an additional 35,984 jobs.



Origin of Office Employees



Source: LA Strategic Transportation Action

Station Loc	Office	Retail	Industrial	Public	Hotel	Total
4th/Flower	27,034	1,773	213	1,578	2,468	33,066
3rd/Main	7,716	3,951	1,688	1,385	1,397	16,137
1st/Alameda	2,166	837	2,695	1,980	253	7,931
Total	36,916	6,561	4,596	4,943	4,118	57,134

ECONOMIC/MARKET ANALYSIS

ALTERNATIVE C - BUNKER HILL THIRD STREET

(Within 0.25 miles of proposed station)

Major Planned Projects

First Street North <i>(Alameda, 1st, Central, Temple)</i>	Mangrove Estates <i>(NE Corner - Alameda & 1st)</i>	Flower/3rd Office Project
- Office 785,000 s.f.	- Office 495,000 s.f.	- Office 1,400,000 s.f.
- Retail 95,000 s.f.	- Retail 234,000 s.f.	- Retail 50,000 s.f.
- Cultural 65,000 s.f.	- Recreational 15,000 s.f.	
- Housing 273 units	- Housing 1,200 units	
- Hotel 426 units	- Hotel 433 rooms	
Sunshine Pacific <i>(Sunset & Alameda)</i>	First Street South <i>(SE Corner - Alameda & 1st)</i>	
- Retail 185,000 s.f.	- Office 389,000 s.f.	
- Housing 296 units	- Retail 215,000 s.f.	
	- Housing 640 units	
	- Hotels 400 rooms	

Status:

First Street North	- Waiting for City approval and financing. Construction expected to begin in 1994.
Sunshine Pacific	- Estimate of construction date not given.
Mangrove Estates	- Completing EIR, with construction expected to begin in 1997.
First Street South	- Completing EIR, with construction expected to begin in 1997.
Flower/3rd Proj.	- Construction, if Connector is built here, is expected to begin in 1997.

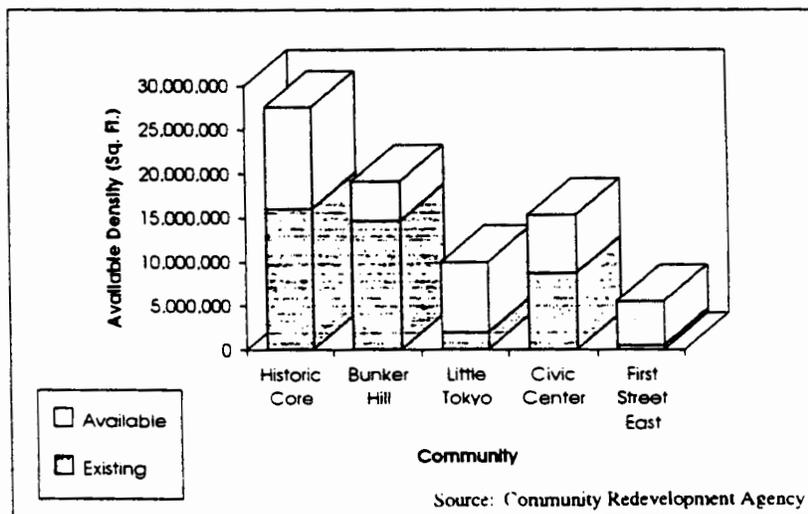
SIGNIFICANT NOTES:

Many of the business/real estate professionals interviewed stated that implementation of a Downtown Connector could contribute to a greater viability of future developments if a station were located nearby. In addition, a proposed project has incorporated a station into its existing plans creating a unique joint development opportunity.

Development Opportunities

SIGNIFICANT NOTES:

- o According to current land use plans for the City of Los Angeles, 23% of available density is remaining in Bunker Hill. However, if any significant transportation project is built in Bunker Hill, such as the proposed Downtown Connector, the Floor Area Ratio would be allowed to increase from 5:1 to 6:1 creating an additional 4.0 million square feet of available density.
- o Development opportunities exist around all three of the proposed stations. Mixed-use developments including residential, office, retail and hotel provide the best opportunity for joint development in the Bunker Hill area.
- o Little Tokyo has a high percentage of available density due in large part to underdeveloped parcels rather than vacant space.
- o Los Angeles County can cause long term construction of over 6.0 million net rentable square feet on its vacant and underutilized Civic Center properties within current zoning and CBD Redevelopment Plan Restrictions.
- o Additional development maybe facilitated at the 7th/Flower station by presence of a through route.



Community	Existing Devlpmnt.	%	Available Density	%
Historic Core	16,000,000	58%	11,600,000	42%
Bunker Hill	14,672,000	77%	4,467,755	23%
Little Tokyo	2,000,000	20%	8,000,000	80%
Civic Center	8,800,000	57%	6,500,000	43%
First Street East	500,000	9%	5,000,000	90%

* Includes larger area than .25 miles around station sites.

Environmental Assessment

The following is a preliminary assessment of environmental impacts associated with the **Alternative C - Bunker Hill Third Street**. Both short and long-term impacts are presented in key impact areas, such as land use, traffic and parking, noise and vibration, air, aesthetics, cultural resources, and business impacts. A subsequent Environmental Impact Report following this study will provide detailed analysis of anticipated impacts and proposed mitigation measures.

Short-Term Construction Impacts

The **Bunker Hill Third Street** alternative will utilize a combination of cut-and-cover and bored tunnel construction techniques. However as the northern end of the alignment along Garey Street, the line transitions to an aerial configuration to connect with Union Station. As discussed in the Engineering Feasibility section, the cut-and-cover technique poses considerable surface impacts. Five segments of **Alternative C**, as identified in the following matrix, will experience significant environmental impacts during construction. For a minimum time period of approximately three weeks, these segments will be most heavily affected. During the process of ground breaking, digging and placement of wood boards, the surface street will be significantly altered. At a minimum, one traffic lane in both directions will remain open for local traffic circulation. While the at-grade wood boards or precast concrete planks will permit normal surface traffic flow during construction, the altered street will cause various impacts as outlined in the following matrix.

A significant issue for all of the three Bunker Hill alternatives is the starting point for construction. Will construction start at the Metro Center or Union Station? The starting point is significant in relation to the environmental impacts. It will be the ingress and egress point for truck entry and dirt hauling throughout the entire construction process. Pedestrians along this segment would be affected from potentially altered sidewalks and/or change in accessibility to local business fronts. Street traffic would also be altered with a likely lane closure during the construction period. As a result of construction activity, significant noise, dust and vibration impacts are also anticipated to the immediate area. Although temporary, on-going construction activity will result in visual impacts from the presence of construction equipment, materials and alteration of the street. This intense activity throughout construction may be more appropriate at the northern end of the alignment from Union Station, where the existing local land use is light industrial and less dense. An ingress and egress point for truck activity may be conveniently located near Garey Street where abandoned buildings and/or vacant property may be utilized. This alternative starts at Metro Center which would significantly exacerbate already identified short-term impacts associated with cut-and-cover construction. In addition, the effect of tunneling and cut-and cover construction on ground movement, water table change, and deformation of the adjacent structures shall be continuously observed and any potential impacts mitigated.

Another construction impact associated with all the alternatives, is construction of the aerial structure across the 101 Freeway for the connection to Union Station. A Traffic Management Plan will have to be prepared and approved by Caltrans identifying the construction procedures that will be employed to minimize impacts on the freeway.

Long-Term Impacts

Due to the nature of construction being proposed, cut-and-cover and tunneling, the long-term impacts are mostly limited to property acquisition and traffic, both pedestrian and vehicle. Furthermore, some permanent street closures at Jackson, Ducommon and/or Garey (northern section only) Streets may be required, which could potentially result in a significant traffic impact. Re-routing of local traffic might be required as a potential mitigation measure. These transportation impacts are discussed in greater detail in the following subsection. Some of the other long-term impacts include issues such as business development and aesthetics.

ENVIRONMENTAL ASSESSMENT
ALTERNATIVE C - BUNKER HILL THIRD STREET
LOW & HIGH PROFILE

Segment/Station	Plan & Profile	Length	Type of Construction	Potential Impacts	Sensitive Receptors
7th Street Metro Center: Metro Center to mid-block on Flower Street, between Fifth and Sixth Street	4+00 to 4+00	400 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Increased pedestrian traffic	Downtown Library
4th & Flower Station: Between Third and Fourth Streets	16+00 to 19+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	None
3rd & Main Station: Between Spring and Main Streets	53+00 to 56+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	Union Church of L.A.
1st & Alameda Station: Corner of First and Alameda Streets	76+00 to 79+00	275 ft.	Cut-and-Cover	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual - Cultural resources <u>Long-Term:</u> - Property acquisition - Business development - Increased pedestrian traffic	Koyasan Buddhist Temple
Garey Street: Garey Street, between 1st & Alameda Station to Commercial Street	79+00 to 105+00	2,600 ft.	Portal & Aerial	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered vehicle traffic - Altered business accessibility - Street closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition and displacement - Right-of-way acquisition - Visual - Street closures	Los Angeles Homba Hongwanji Betsu (Temple)

Transportation Impacts

Traffic Impacts

Since **Bunker Hill Third Street** is primarily subway, there will be minimal ongoing impact to vehicular traffic, except in the vicinity of **Garey Street**. **Garey Street** is a local street with low traffic volumes. During the Route Refinement/EIR stage of this project, the precise location and alignment of the portal and transition structure to aerial configuration will be identified. This transition will occur north of **Temple Street** and south of **Commercial Street**. Depending upon its design, it could affect traffic on **Jackson Street** and/or **Ducommon Street**. This will determine whether **Garey Street** or the intersecting side streets might have to be closed to vehicular traffic. At the present time, **Garey Street** has one travel lane in each direction plus parking on each side of the street and runs between **East Temple Street** and **Commercial Street**. There are no major cross-streets along **Garey Street**. It is utilized by some traffic as a route to the freeway, but it is parallel by **Vignes Street**, one block to the east, which leads directly to the freeway on ramp and which can accommodate any traffic diverted from **Garey Street**.

This downtown connection will facilitate the addition of several new rail lines through downtown. The preliminary operations plan developed for this study included six lines through the connector with the potential for as many as 60 trains per hour, total of both directions. Some of the rail lines would utilize the existing Blue Line corridor along **Washington Boulevard**. Other lines would potentially utilize the extension south and west to **USC/Exposition Park** and potentially west to **Santa Monica**. North of **Union Station** they would extend to **Pasadena** or the **Glendale-Burbank** area. There is the potential for traffic impacts along the southern section of **Flower Street**, where the trains run at-grade, and at the **Flower/Washington** intersection. These potential impacts are not new locations where traffic may be affected, but the connector will facilitate enhanced rail service which will result in additional train service, thereby increasing the level of at-grade train movements through intersections on lower **Flower Street**. South of **Washington Boulevard**, the rail lines will split, some proceeding along the existing Blue Line to **Long Beach** and some extending west to **Santa Monica**, therefore the impacts of the connector should not be significant beyond the **Flower/Washington** intersection. In the project EIR, the potential need for mitigation measures along **Flower Street**, south of the existing Blue Line portal to **Washington Street**, will be assessed.

Station Areas

The average daily traffic volumes on the roadways where the stations would be located are as follows:

Station Location	Traffic Volume (ADT)
1st and Alameda Streets	24,000 (plus 27,000 on Alameda)
Third and Main Streets	17,000
4th and Flower Streets	20,000

The primary circulation issues with the subway configuration are associated with station areas, pedestrian access and integration with bus service. The parking demand at these stations will be negligible because these stations primarily serve as destinations for employees coming into downtown and for internal downtown trips. There is no parking proposed at these stations, therefore vehicular impacts associated with the stations are minimal. Pedestrian access will be provided via escalators/elevators to the street level. The proposed stations would be expected to generate a high volume of pedestrians, so appropriate sidewalk and station access capacity will have to be provided to handle peak pedestrian loads at commute periods. For example, the station at Fourth/Flower would serve a number of high-rise office buildings and hotels (on Flower Street and on Bunker Hill via escalators) with a large employee base. The station at Third/Main would serve the Ronald Reagan State Office Building and a variety of commercial uses. The station at First/Alameda would potentially serve a large number of developments proposed in the vicinity as well as the Little Tokyo area.

Transfer Opportunities

The bus service on Third Street is limited compared to the north-south streets, primarily because of the north-south orientation of many routes through the downtown area, but Third Street is utilized by one MTA (former RTD) route, and Torrance and Montebello Municipal Lines. Although since Third Street is a one-way street westbound, it only carries buses in one direction and patrons must walk down to Fourth Street for the reverse trip. When the locations of stations and portals are finalized in the EIR, pedestrian access routes would be analyzed and mitigation may be required.

Parking

Parking is not proposed to be provided at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking in available parking provided by others. The only area where on-street parking is potentially displaced is along Garey Street. Long-term metered parking (\$1.00 for 10 hours) is provided on both sides of Garey Street; 33 spaces between Temple and Ducommon Streets, the blocks most likely to be affected, and 10 spaces and one loading zone north of Ducommon, which may potentially be affected. The number of parking spaces which could potentially be displaced is therefore approximately 40, which is relatively insignificant. The availability of other long-term metered on-street parking within a one block walk, plus off-street parking facilities nearby, would offset the loss of parking along Garey Street.

Driveway Access Issues

The proposed alignment does not affect any driveway access, except along Garey Street. Garey Street provides access to only a limited number of industrial/warehouse facilities, plus an exit from the DWP site. Access may be limited to right-in/right-out only, for these driveways along Garey Street or potentially closed if the property along the east side of Garey Street is purchased to accommodate the portal and transition to aerial structure. Driveway impacts will have to be evaluated in greater detail when the portal and transition structures are located.



UNION STATION



BUNKER HILL



7th CENTER METRO

RED LINE

SAN PEDRO

ALAMEDA

BLUE LINE

ALTERNATIVE D

SAN PEDRO STREET

ALTERNATIVE D San Pedro Street

Technical Description of Alignment

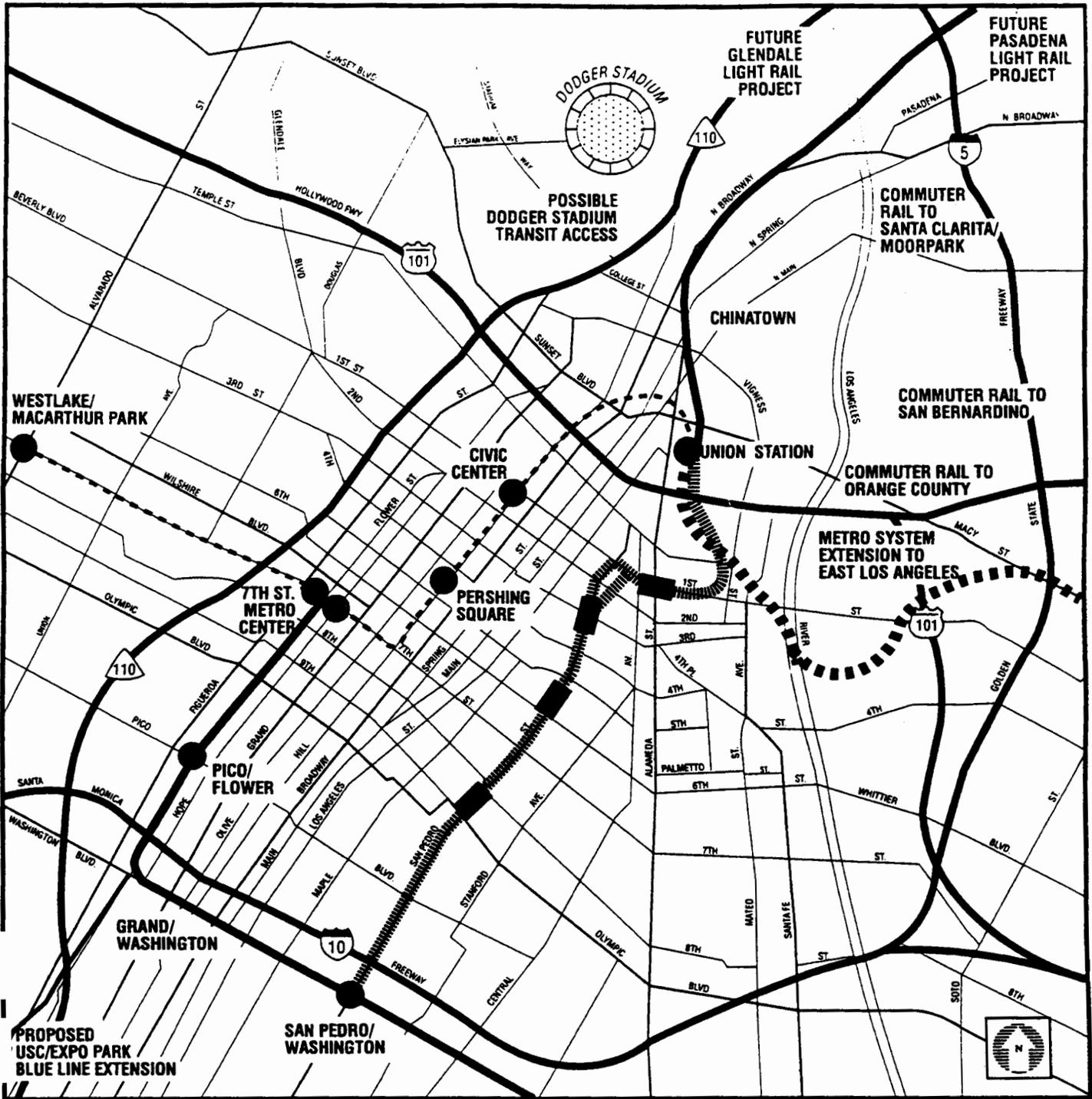
Alternative	Subalternative	At-Grade	Tunnel	Cut & Cover	Aerial	Total
D	At-Grade	12,500'	---	---	2,000'	14,500'
D	Aerial	2,150'	---	---	12,250'	14,400'

Source: Transmetrics

Alternative D - San Pedro Street is the only alternative for which both at-grade and aerial options exist for most of the alignment. (Appendix E - Plan and Profile Alt. D.) The alternative begins with an at-grade "T-track" connection with the existing Long Beach - Los Angeles Blue Line at the intersection of San Pedro Street and Washington Boulevard. The alignment proceeds north in an at-grade configuration along San Pedro Street and under the Santa Monica Freeway. Beginning north of 15th Street, a transition is introduced from an at-grade to an aerial structure. This transition is completed prior to Pico Boulevard so that no through streets are interrupted. The "T" intersections of San Pedro Street with 14th Place and 14th Street are also maintained, but only for "right in/right out" movements. Continuing to the north, the San Pedro Street alternative is shown both on viaduct, as well as at-grade. The at-grade option is identified with a spline profile. The alignment eventually departs the San Pedro Street corridor at First Street. A tighter radius of turn is indicated for the at-grade option than for the aerial option. In either case, there would be right-of-way impacts in the southeast quadrant of the First/San Pedro Street intersection. An additional alignment alternative is indicated generally along existing rail right-of-way between the intersections of San Pedro/Third Streets and Alameda/First Streets. *This is presented only as possibilities if the prime alternative proves unacceptable and may prove to be infeasible.* (Other possible alignments may utilize 3rd and 4th Streets or other east-west arterials further south, furthermore, a shared subway alignment could be utilized as recommended by the the Downtown Strategic Plan. Such alignments would avoid significant impacts in Little Tokyo anticipated with this alternative. Another alternative which would avoid significant impacts to the Little Tokyo community would be a subway alignment for at least a portion of the proposed San Pedro alternative.)

In each case, the alignment, both aerial and at-grade, proceeds east along First Street, turning north again to enter the Garey Street corridor at Turner Street in an aerial configuration. The at-grade option would transition to an aerial structure between First and Turner Streets. Because of the highly visible nature of this alternative, care would be taken to maintain some reasonable distance from the Nishi Hongwanji Buddhist Temple. After proceeding north along Garey Street, reverse curves are introduced to transition the alignment from along Garey Street, across the Hollywood Freeway, and eventually to tie into trackage along Platform No. 1 of Union Station. At that location, the alignment connects with the Pasadena - Los Angeles Blue Line.

Four station locations are proposed for **Alternative D - San Pedro Street**, including: 9th & San Pedro, 6th & San Pedro, 2nd & San Pedro, and 1st & Alameda. On the following page is a study area map illustrating the proposed alignment through Downtown Los Angeles. (Figure V-D1.) In addition, a complete set of Plan and Profile drawings are presented in Appendix E. These drawings are to be viewed only as conceptual drawings completed to assess engineering feasibility.



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**
METROPOLITAN TRANSPORTATION AUTHORITY

**ALTERNATIVE D
SAN PEDRO STREET**
Figure V-D1

- Metro Red Line
- ▣▣▣ Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ▨▨▨▨ Downtown Connector Alternative

Engineering Feasibility and Constructibility

Alternative D - San Pedro Street differs entirely from the Bunker Hill alternatives. The underground issues inherent with Bunker Hill do not apply for San Pedro Street which is configured as either an at-grade or aerial system. Therefore, the engineering issues involve those inherent with both at-grade and aerial rail operations.

At-Grade Configuration

General engineering issues related to an at-grade configuration include:

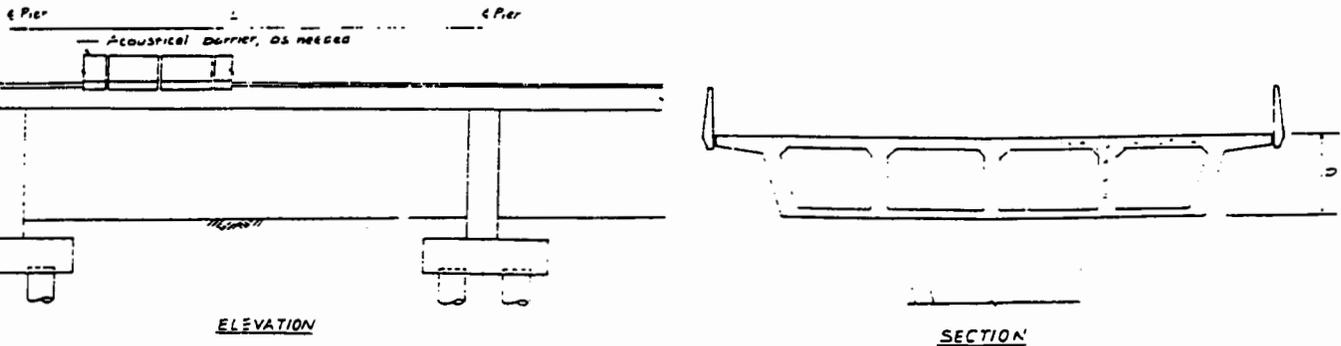
- Operational feasibility
- Traffic impacts, particularly at street intersections
- Vehicular and pedestrian safety considerations
- Signalization options, including transit preemption
- Use of available space and the possible loss of on-street parking
- Methods of providing for left turns across transit tracks
- Possible introduction of "transit mall" concepts
- Impacts during implementation
- Best configuration for providing traction power

Aerial Configuration

General engineering issues related to an aerial configuration include:

- Traffic impacts, primarily as resulting from the introduction of the viaduct structure
- Impacts during the construction of the viaduct
- Use of available space, particularly with regards to parking and the introduction of turning lanes
- Pier placement and configuration in general

The choice of at-grade versus aerial configuration involves a great number of trade-offs. Two different aerial configurations utilizing continuous or simply-supported spans (figures below, also see figures presented for Alt. E Alameda Street) involve a much greater capital cost investment, which may be wholly or partially offset by other considerations. A detailed evaluation would be required for a final selection at a later stage of development.



VIADUCT SCHEME 1
CONTINUOUS GIRDERS

Significant Issues

A number of more site-specific engineering issues can also be cited:

"T" Configuration - The at-grade "T" configuration for trackage at the southerly end of **Alternative D** could raise serious operational concerns. Ideally, some transit movements could be grade separated, but such may be quite difficult to accomplish. Grade separating a turning movement is difficult structurally, and creates more visual and spatial impacts. Constructing a "fly-over" along Washington Boulevard is structurally more aesthetic, but would still require additional width for trackage along this facility. Considering the general traffic demand along Washington Boulevard, and the type of development along this street, obtaining additional width for trackage is likely not possible. (This issue is also confronted by the **Alameda Street Alternative**, but with more mitigations available.) Affecting possible mitigations for this alternative is the close proximity of the existing San Pedro Station on Washington Boulevard.

Freeway Clearance - Clearance under the Santa Monica Freeway is assumed adequate, but must be verified.

At-grade Intersections - At-grade intersections involving both light rail and general traffic would be a concern throughout. Included among many critical locations would be the at-grade crossing of First and Alameda Street. Traffic impacts could preclude serious consideration of the at-grade option.

First Street Turning Radii - The use of First Street as part of the overall alignment appeared indicated as an alternative to the use of Temple Street or Second Street, options which would have even greater right-of-way and operational impacts. In any event, less than desired turning radii must be utilized at the San Pedro/First Street intersection, as well as the turn to the north from First Street to Garey Street and the eventual transition to Union Station.

Freeway Viaduct - The viaduct crossing of the Hollywood Freeway will require careful monitoring. Special design considerations may be necessary to achieve the necessary vertical clearance over freeway lanes. It has already been concluded that the vertical curve just south of Platform No. 1 may have to already begin within Union Station right-of-way. Furthermore, Caltrans has on-going plans to introduce modifications to the freeway corridor at this location. The placement of piers for the transit structure and, in turn, the resulting span lengths and structural depths are all issues which could affect geometric definition. (Appendix C.)

Planned Development Impacts - The line location would also have to be coordinated with planned development within the Mangrove Site, and area bounded by Alameda Street to the west, First Street to the south, Temple and Turner Streets to the north, and private right-of-way to the east.

Less-than-Desired Vertical Curves - With regards to vertical transitions, both at-grade and aerial options will require vertical curves of a length less than the desired criteria. This occurs at 15th Street for the aerial option and at 1st Street for the at-grade option.

Garey Street - It is assumed that a viaduct structure can be introduced along the centerline of Garey Street. The taking of additional right-of-way east of Garey Street would thereby be avoided, although, as with the Bunker Hill alternatives, some right-of-way would have to be acquired in the area bounded by Hewitt, Ducommun, Garey and Commercial Streets.

Pedestrian Access and Safety - Each proposed station area has its unique issues: the elementary school near the Washington-San Pedro junction; the heavy pedestrian and delivery traffic related to the Garment District at the 9th/San Pedro Station; the unique needs and problems of the Skid Row population in the 6th/San Pedro Station area; and the retail, elderly and tourist pedestrian traffic at 2nd/San Pedro.

Station Location and Design Alternatives

Given the alignment of **Alternative D** as determined by engineering feasibility and constructibility, more specific information is developed for each station location and configuration. The following narrative and graphic information presents a descriptive overview of the design implications surrounding each proposed station as well as a perspective on the stations' integration with adjacent land uses.

System Configuration

Alternative D - San Pedro Street is presented as two options: a predominantly at-grade or aerial system. A total of four station locations are proposed for either option as follows:

- 9th & San Pedro Station (between 8th and 9th Streets)
- 6th & San Pedro Station (between 5th and 6th Streets)
- 2nd & San Pedro Station (between 2nd and 3rd Streets)
- 1st & Alameda Station (corner of 1st and Alameda Streets)

Station location choices were based upon existing and anticipated future ridership demands to and from local centers. In all instances, the station locations would involve either all at-grade street stations or all aerial stations, depending upon which option is utilized. As with the other alternatives, station locations are flexible and are only limited by the need to be located within horizontal tangents, as well as vertical tangents with a 1% maximum to 0.3% minimum vertical grade.

Station Platforms

With respect to the Blue Line Connection's **Alternative D - San Pedro Street** (at-grade or aerial), station designs would utilize center platforms. The station platforms would be accessed from the center of the street for at-grade or the aerial option. This configuration would be similar to the design of existing Long Beach-Los Angeles Blue Line Stations. Center-loading platforms have been chosen for this alignment by virtue of San Pedro Street's light traffic volumes and lack of available right-of-way at station sites. It can be expected that the exact physical definition of station configurations will be refined during later design phases.

Engineering-Related Issues

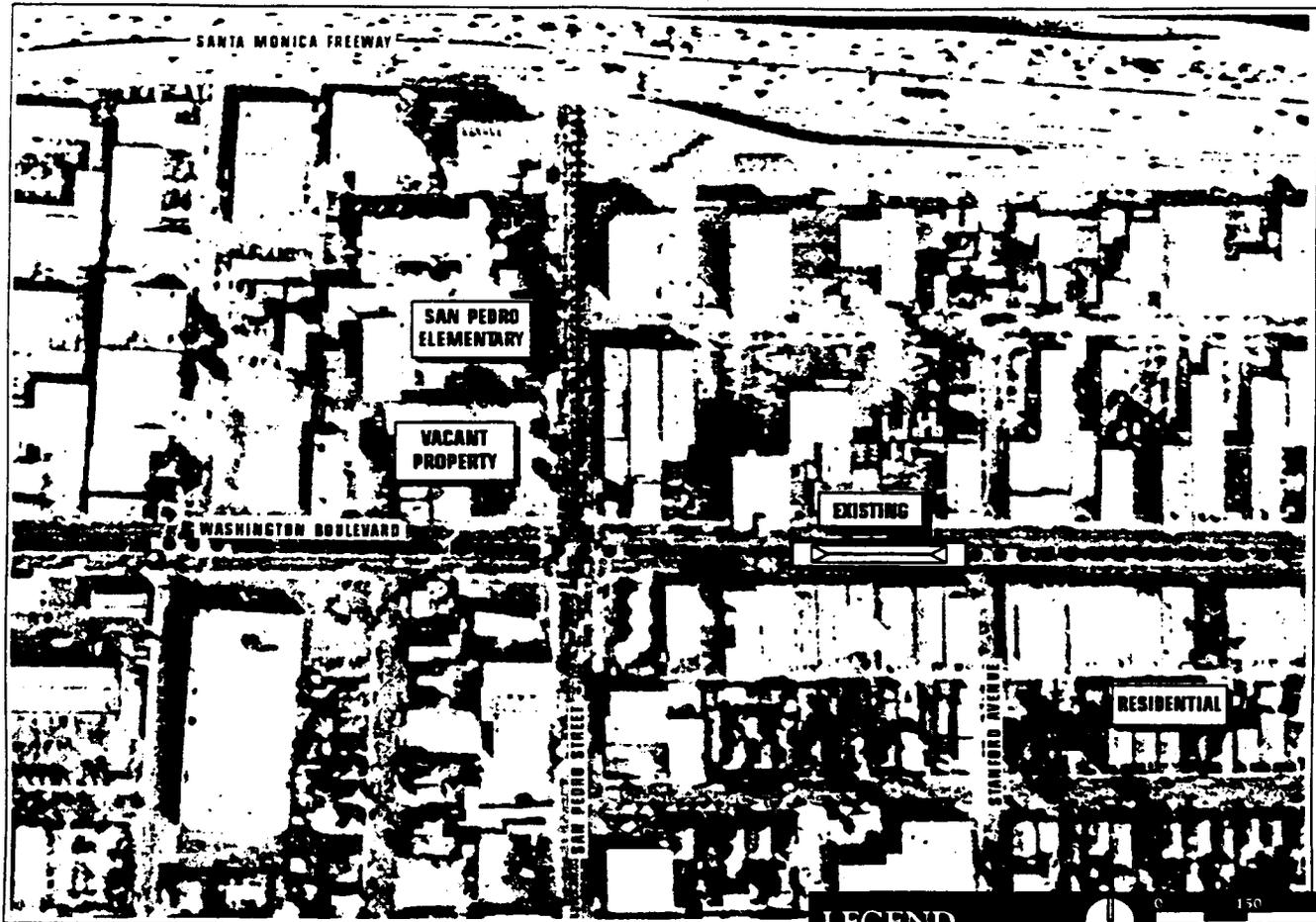
Issues involving aerial versus at-grade stations are quite varied. Naturally, the capital cost difference is significant. Engineering issues involving at-grade stations mostly involve:

- Spatial requirement and its availability on street.
- General traffic circulation. It is frequently desirable to introduce "far side" platforms which make it easier to introduce left-turn lanes along the approach roadways to a street intersection.
- Side platforms versus center platforms have similar cost considerations. In addition, center platforms require track transitions to wider overall transit sections. Added costs are incurred for track "specials" and reduced operating speeds. For purposes of this Preliminary Planning Study, center platforms are presented.

Engineering issues involving aerial stations are somewhat similar and include:

- Center platforms require track transitions to achieve a wider track separation. This complicates and adds cost to the structure itself.
- Center platforms, however, provide the opportunity to concentrate or reduce the number of stairs, escalators and/or elevators. These would then most likely provide station access from the median of the street section.
- Pier configuration becomes a critical design element.
- Side platforms, although basically simplifying structure design and track arrangement, could involve additional cost by creating two separate areas requiring stairs, escalators and elevators, as well as fare collection devices and other platform amenities. Due to the existing land uses along San Pedro Street, side platforms are not recommended.
- Whatever the configuration of an aerial station, they are not limited to "mid-block" locations as are at-grade stations. Aerial stations can be located "mid-block" or straddling a cross street, depending upon the desired locations for street-to-platform access.

The following pages graphically illustrate the proposed station locations for **Alternative D - San Pedro Street**. Local land uses are highlighted specifically by building name and/or any prominent entity located near the station location to illustrate the potential ridership demands to and from these sites.



WASHINGTON & SAN PEDRO

The San Pedro Street Alignment Alternative would approach the existing Long Beach-Los Angeles Blue Line at-grade. Although the majority of the land uses surrounding the alignment and the existing Washington and San Pedro Station focus on auto-related commercial use, some sensitive land uses are also located in the area, including San Pedro Elementary School and residential clusters located one block south of Washington Boulevard.

Because of the existing heavy congestion at the intersection of Washington Boulevard and San Pedro Street, it is anticipated that the alignment may require grade separation in order to connect the route with the existing Metro Blue Line. At present, the alignment is depicted at-grade. This issue will require closer study during the Route Refinement and EIR process.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: *Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments*

SOURCE: PACIFIC AEROGRAPHICS, January 1992.

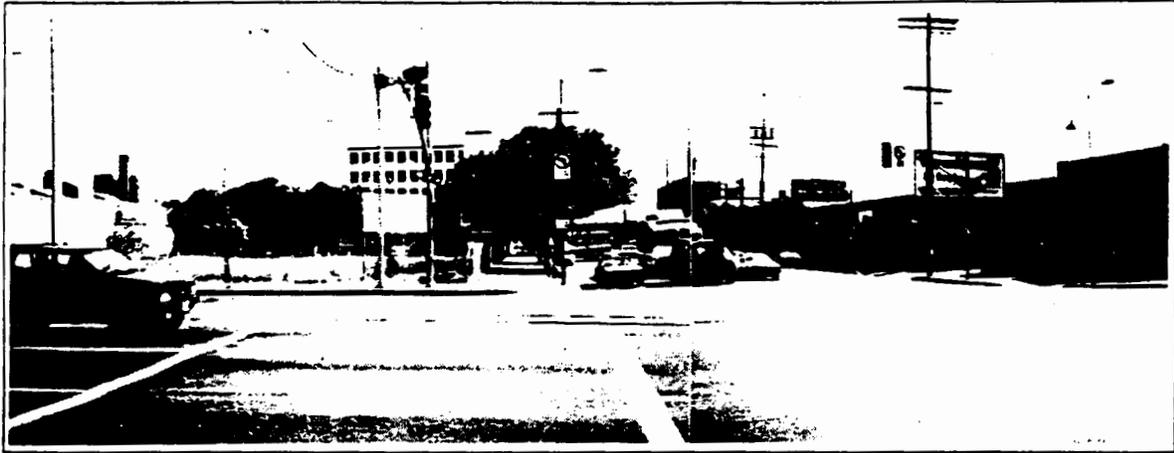
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-D2
Station Area Site Context
Washington & San Pedro



View of intersection of Washington Boulevard and San Pedro Street. A vacant parcel appears on left of photo.



View east along Washington Boulevard. The Long Beach-Los Angeles Blue Line currently operates in the median of this right-of-way.



View north along San Pedro Street.

GRAPHICS BY GRUEN ASSOCIATES



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-D3
Station Site Visual Survey
Washington & San Pedro



9TH & SAN PEDRO

The City Market, located on San Pedro Street between 9th and 11th Streets, represents the primary land use which would be served by the 9th and San Pedro Station. Other significant land uses in the area include the Garment District along 11th Street and the collection of fabric companies located near the intersection of 9th and San Pedro Streets.

The 9th and San Pedro Station, situated along San Pedro Street just north of 9th Street, would utilize either an at-grade or aerial platform, depending upon the alignment's profile. Because the alignment would be accessed via a center-loading platform, there would be some taking of right-of-way (street and sidewalk), resulting in the narrowing of sidewalks and the elimination of on-street parking near station locations.

LEGEND



ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

SOURCE: PACIFIC AEROGRAPHICS, January 1992

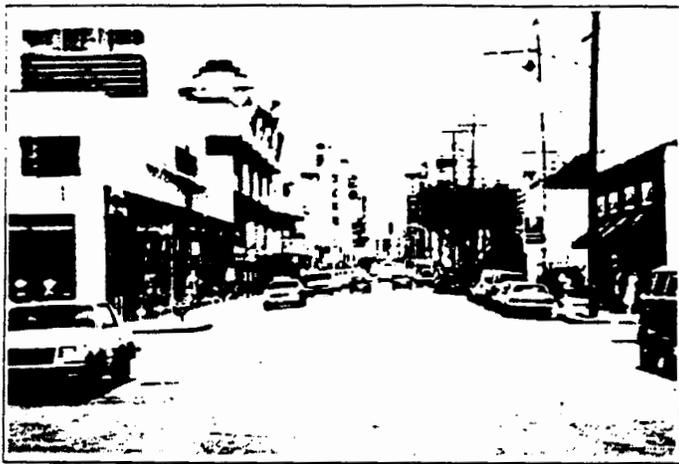
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

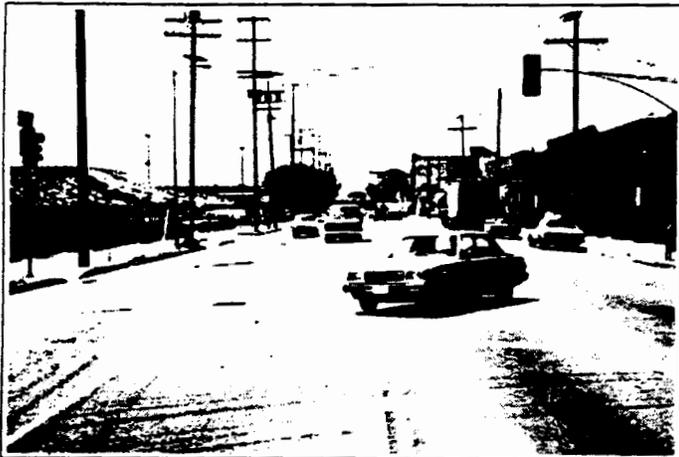
FIGURE V-D4
Station Area Site Context
9th & San Pedro



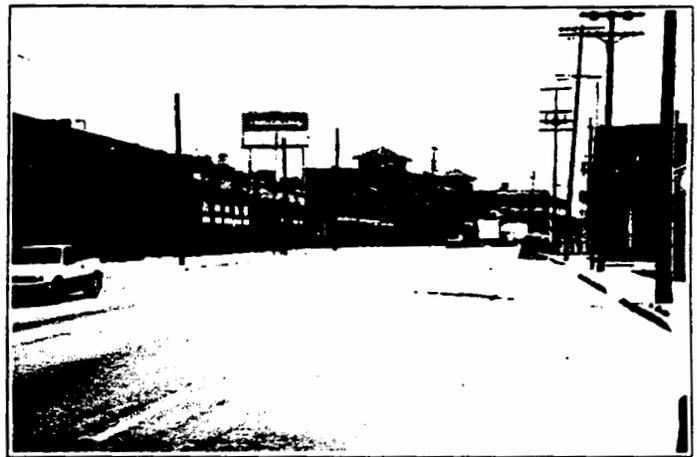
View west along 11th Street looking toward the Garment District.



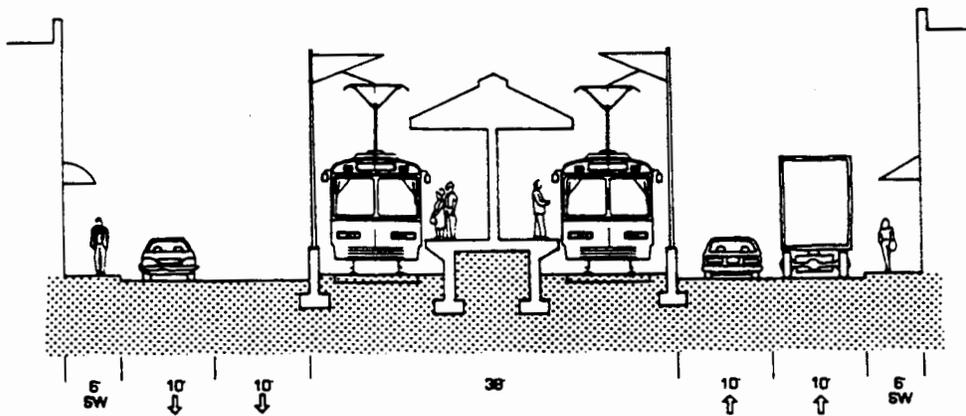
City Market.



View looking south along San Pedro Street.



View looking north on San Pedro Street.



Typical At-Grade Station Elevation for San Pedro Street. This elevation illustrates the relationship between an at-grade station platform and San Pedro Street. In contrast to the aerial station configuration, the at-grade alignment is more harmonious with the scale of the street. However, this station type would also require the taking of street right-of-way, as well as a reduction in the width of sidewalks.



GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-D5
Station Site Visual Survey
and Typical Aerial Station Elevation
9th & San Pedro



LEGEND



ALIGNMENTS

- Metro Red Line
- Metro Blue Line
- Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

- At-Grade
- Aerial
- Subway
- Proposed or Existing Portal
- Optional Portal for Future Development

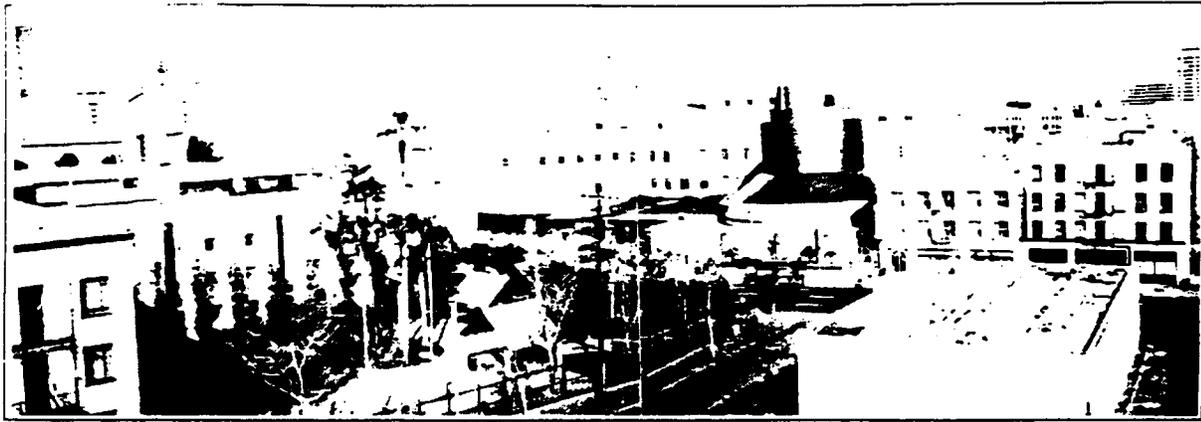
NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

6TH & SAN PEDRO

The 6th and San Pedro Station would provide improved transportation access to some of Central City East's diverse districts, including the Flower Mart, the Toy District, and the transit-dependent population residing in the SRO housing projects located along 5th, Wall, and San Julian Streets, as well as in the Weingart Center.

Located along San Pedro Street just north of 6th Street, this station would utilize either an at-grade or aerial platform, depending upon the alignment's profile. Because the alignment would be accessed via a center-loading platform, there would be some taking of right-of-way (street and sidewalk), resulting in the narrowing of sidewalks and the elimination of on-street parking near station locations.





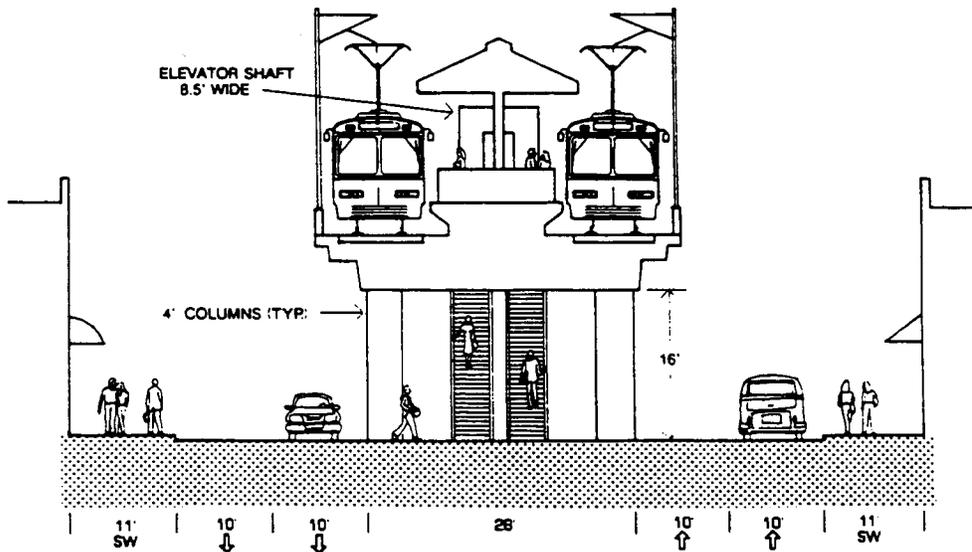
View north from Simone SRO Hotel, overlooking Central City East's SRO housing population.



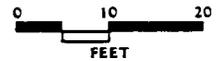
6th and San Pedro Building.



View south along San Pedro Street just south of 6th Street.



Typical Aerial Station Elevation for San Pedro Street. This elevation illustrates the relationship between an aerial guideway and San Pedro Street. Transit riders would access the platform from the center of the street. This configuration would require some taking of street and sidewalk right-of-way, resulting in the loss of on-street parking spaces.



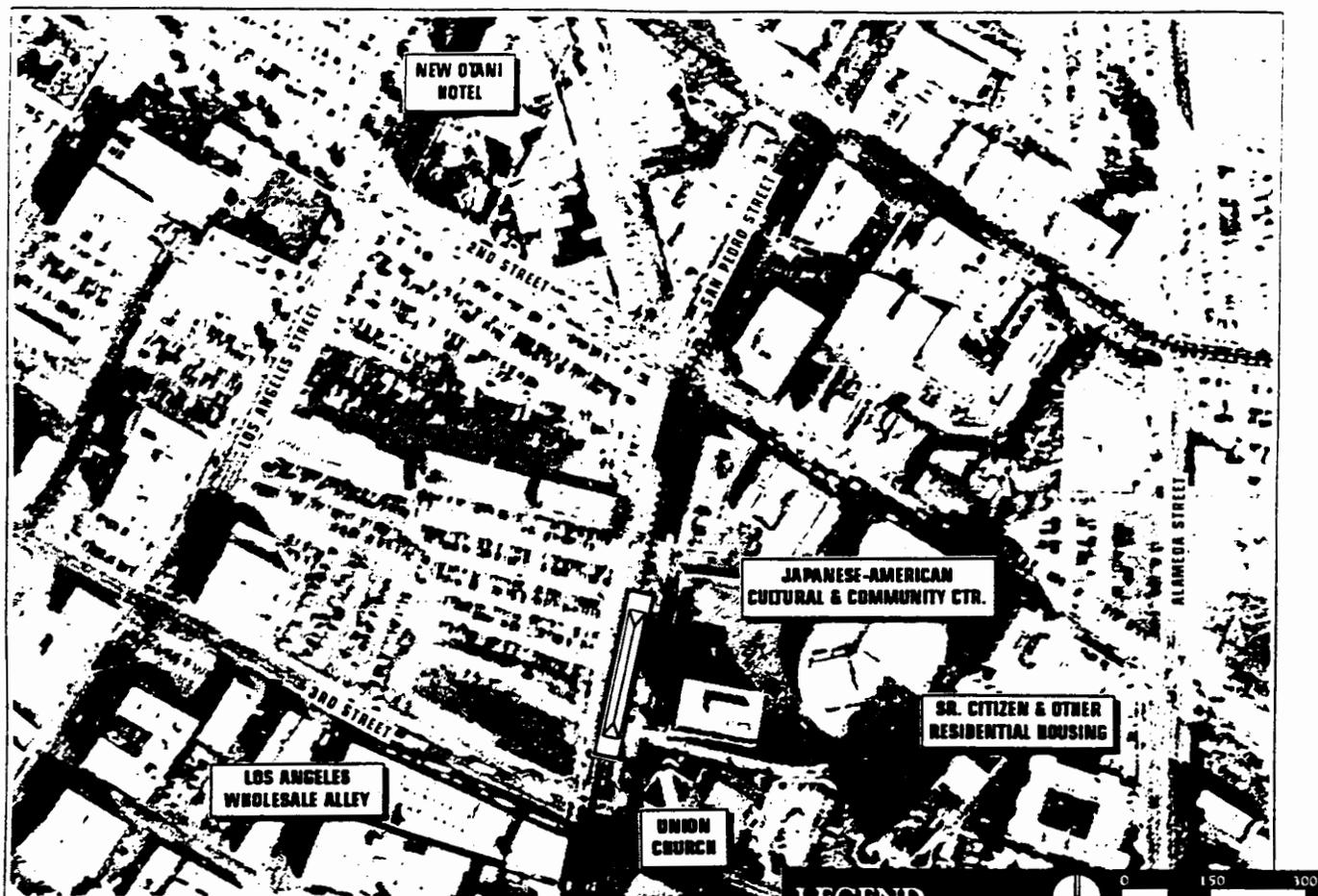
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-D7
Station Site Visual Survey
and Typical Aerial Station Elevation
6th & San Pedro



2ND & SAN PEDRO

The 2nd and San Pedro Station would provide service to the heart of Little Tokyo's commercial district, residential community, and cultural center. In addition, this station would improve access to nearby wholesale businesses. Among the significant land uses include the New Otani Hotel, Union Church, Japanese-American Theatre, Japanese-American Cultural and Community Center, Noguchi Plaza, Mitsubishi Bank, and the Los Angeles Wholesale Alley.

Following the San Pedro Street Alignment Alternative, the 2nd and San Pedro Station would either be at-grade or aerial, depending upon the alignment profile. Located on San Pedro Street between 2nd and 3rd Streets, this station would require some taking of right-of-way (street and sidewalk). Unlike the Alameda Street alignment stations, aerial stations along the San Pedro Street alignment would not require additional private property acquisition since the platforms would be center-loading, accessed from the center of the street (refer to San Pedro Street typical station elevation).

LEGEND

ALIGNMENTS

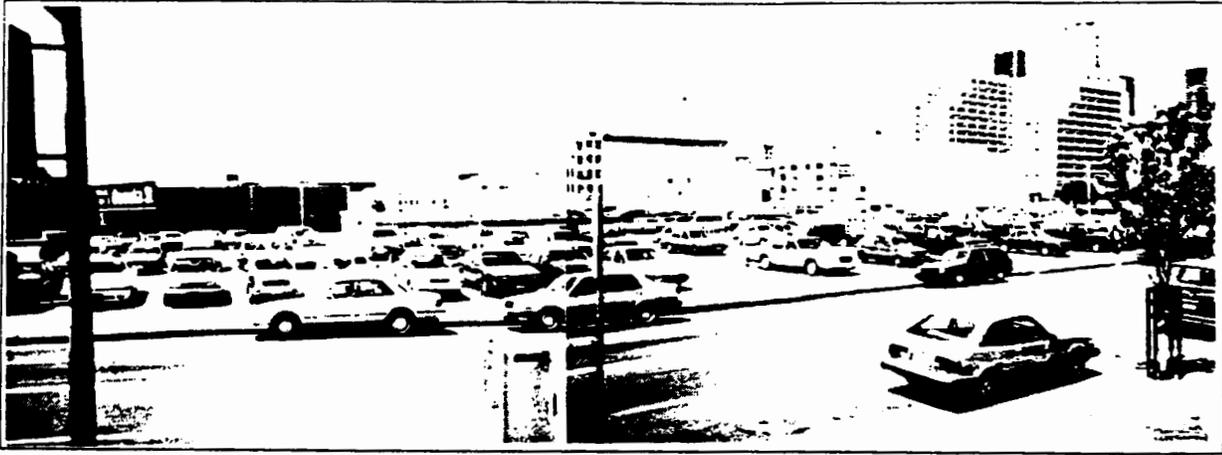
-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





View looking south from Onizuka Street pedestrian promenade.



View west from intersection of 2nd and San Pedro Streets.



View north looking toward Onizuka Street pedestrian promenade and Civic Center.



View south along San Pedro Street.



View east along 2nd Street.

GRAPHICS BY GRUEN ASSOCIATES

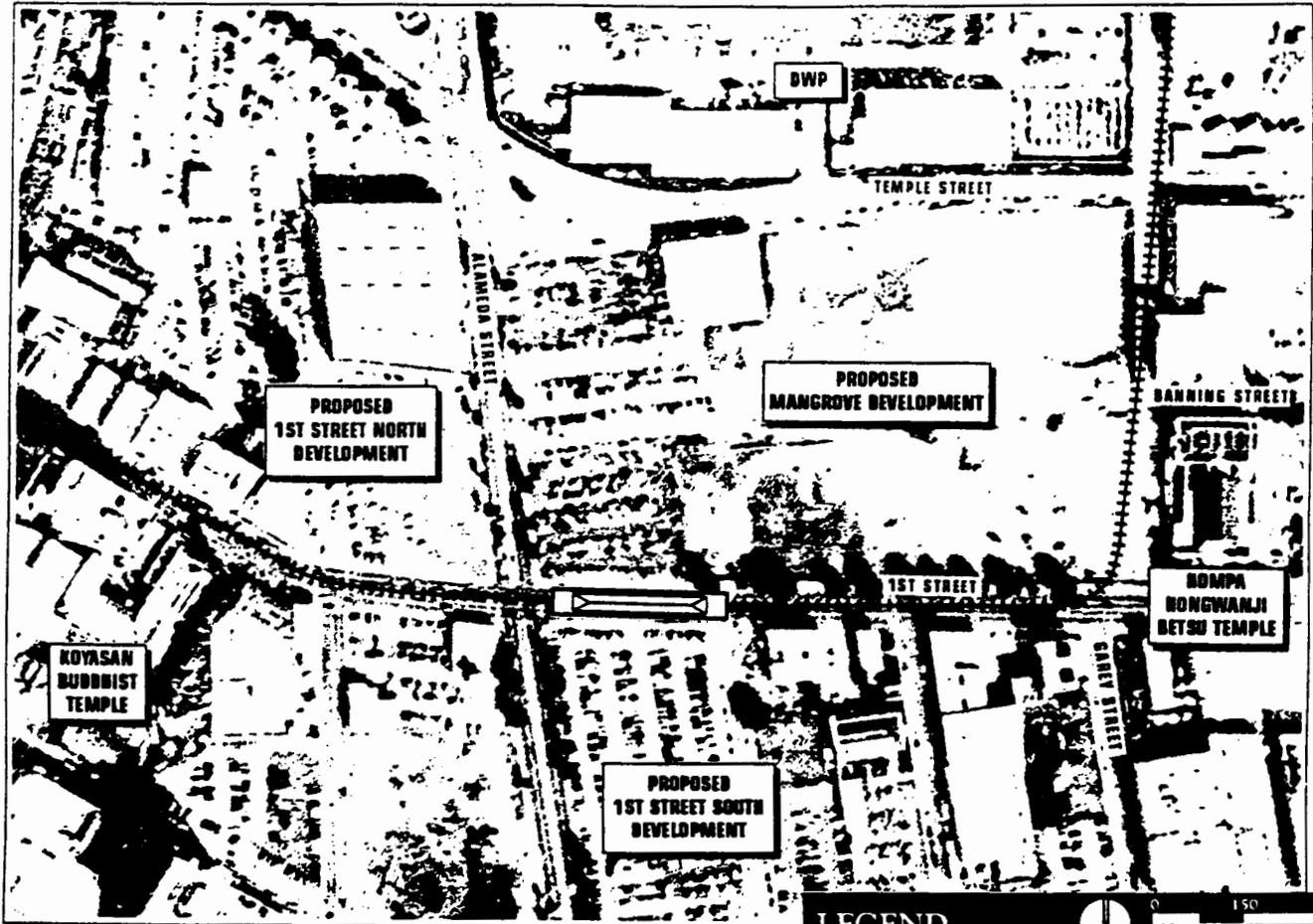


**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-D9
Station Site Visual Survey
2nd & San Pedro





1ST & ALAMEDA SAN PEDRO STREET ALIGNMENT

East of Alameda Street, the San Pedro Street alignment alternative would follow the same route as the Bunker Hill alternative, but would have either an at-grade or aerial guideway profile. The proposed station location would be along 1st Street, east of Alameda Street. Like the Alameda Street alignment, the construction of an aerial station's ancillary facilities would require some property acquisitions or coordinated integration of the facilities as part of proposed development projects.

With regard to a possible at-grade station, it can be expected that a taking of right-of-way (street and sidewalk) would be required in order to construct the station platform.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments



CAPITAL COST ESTIMATE

ALTERNATIVE D - SAN PEDRO STREET

AERIAL

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$59,420,000
2. STATIONS	\$29,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$26,970,400
5. VEHICLES	\$40,800,000
SUBTOTAL (A)	\$156,190,400 *
6. PRE-REVENUE OPERATION	\$3,904,760
7. OWNERS INSURANCE	\$12,495,232
8. MASTER AGREEMENTS	\$3,904,760
SUBTOTAL (B)	\$20,304,752
9. ART FOR TRANSIT	\$780,952
SUBTOTAL (C)	\$780,952
10. RIGHT-OF-WAY	\$33,398,543
SUBTOTAL (D)	\$33,398,543
11. PROFESSIONAL SERVICES	\$71,629,380
SUBTOTAL (E)	\$71,629,380
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$19,414,467
b. OF SUBTOTAL ITEM (D)	\$9,184,599
c. OF SUBTOTAL ITEM (E)	\$7,162,938
SUBTOTAL (F)	\$35,762,004
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$1,669,927
GRAND TOTAL - 1993 DOLLARS	\$319,735,958

* See worksheet for detail

Note: Capital cost estimates do not reflect any potential need for acquisition of additional Red Line cars which have been estimated up to \$115 million in capital outlay. However, estimates do reflect the difference in operating costs between alternatives.

WORKSHEET

DESCRIPTION	QUANTITY	PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 14+00 to 16+00	200	\$2,575	RF	\$515,000
Guideway At-grade	1,850	\$1,800	RF	\$3,330,000
Aerial Guideway	12,350	\$4,500	RF	\$55,575,000
SUBTOTAL (GUIDEWAY COSTS)				\$59,420,000
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)	4	\$6,500,000	EA	\$26,000,000
Subway Station (3-car)			EA	\$0
Traffic Control Improvement (Allow)	1	\$3,000,000	EA	\$3,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$29,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	17	\$2,400,000	EA	\$40,800,000
SUBTOTAL (VEHICLE COSTS)				\$40,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	14,400	\$421	RF	\$6,062,400
Special Tie-in at Washington	1	\$500,000	LS	\$500,000
Train Control Station (LRT)	4	\$160,000	EA	\$640,000
Train Control Guideway (LRT)	14,400	\$500	RF	\$7,200,000
Traction Power Station (LRT)	4	\$1,100,000	EA	\$4,400,000
Traction Power Guideway (LRT)	14,400	\$270	RF	\$3,888,000
Communications	14,400	\$200	RF	\$2,880,000
Fare Collection (LRT)	4	\$250,000	EA	\$1,000,000
Signage & Graphics	4	\$100,000	EA	\$400,000
SUBTOTAL (SYSTEM COSTS)				\$26,970,400
TOTAL ESTIMATED COST				\$156,190,400

CAPITAL COST ESTIMATE

ALTERNATIVE D - SAN PEDRO STREET

AT-GRADE

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$33,532,500
2. STATIONS	\$15,000,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$27,109,500
5. VEHICLES	\$40,800,000
SUBTOTAL (A)	\$116,442,000 *
6. PRE-REVENUE OPERATION	\$2,911,050
7. OWNERS INSURANCE	\$9,315,360
8. MASTER AGREEMENTS	\$2,911,050
SUBTOTAL (B)	\$15,137,460
9. ART FOR TRANSIT	\$582,210
SUBTOTAL (C)	\$582,210
10. RIGHT-OF-WAY	\$33,398,543
SUBTOTAL (D)	\$33,398,543
11. PROFESSIONAL SERVICES	\$56,290,472
SUBTOTAL (E)	\$56,290,472
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$14,473,741
b. OF SUBTOTAL ITEM (D)	\$9,184,599
c. OF SUBTOTAL ITEM (E)	\$5,629,047
SUBTOTAL (F)	\$29,287,387
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$1,669,927
GRAND TOTAL - 1993 DOLLARS	\$252,807,999

* See worksheet for detail

Note: Capital cost estimates do not reflect any potential need for acquisition of additional Red Line cars which have been estimated up to \$115 million in capital outlay. However, estimates do reflect the difference in operating costs between alternatives.

WORKSHEET

DESCRIPTION	QUANTITY	PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 14+00 to 16+00	300	\$2,575	RF	\$772,500
Guideway At-grade	12,200	\$1,800	RF	\$21,960,000
Aerial Guideway	2,000	\$5,400	RF	\$10,800,000
SUBTOTAL (GUIDEWAY COSTS)				\$33,532,500
<u>STATION COSTS</u>				
At-grade Station (3-car)	4	\$2,250,000	EA	\$9,000,000
Aerial Station (3-car)			EA	\$0
Subway Station (3-car)			EA	\$0
Traffic Control Improvement (Allow)	1	\$6,000,000	EA	\$6,000,000
Parking Spaces			EA	\$0
SUBTOTAL (STATION COSTS)				\$15,000,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	17	\$2,400,000	EA	\$40,800,000
SUBTOTAL (VEHICLE COSTS)				\$40,800,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	14,500	\$421	RF	\$6,104,500
Special Tie-in at Washington	1	\$500,000	LS	\$500,000
Train Control Station (LRT)	4	\$160,000	EA	\$640,000
Train Control Guideway (LRT)	14,500	\$500	RF	\$7,250,000
Traction Power Station (LRT)	4	\$1,100,000	EA	\$4,400,000
Traction Power Guideway (LRT)	14,500	\$270	RF	\$3,915,000
Communications	14,500	\$200	RF	\$2,900,000
Fare Collection (LRT)	4	\$250,000	EA	\$1,000,000
Signage & Graphics	4	\$100,000	EA	\$400,000
SUBTOTAL (SYSTEM COSTS)				\$27,109,500
TOTAL ESTIMATED COST				\$116,442,000

ECONOMIC/MARKET ANALYSIS

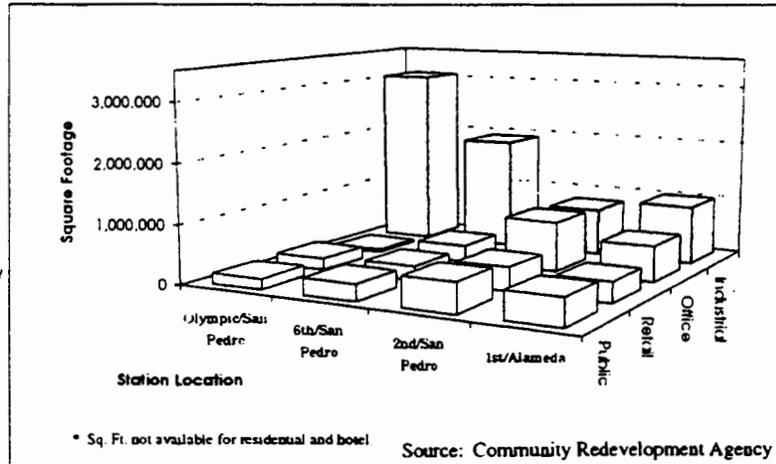
ALTERNATIVE D - SAN PEDRO STREET

(Within 0.25 miles of proposed station)

Current Land Use

SIGNIFICANT NOTES:

- Alternative D is the only alternative located in close proximity to public schools. San Pedro and 9th Street Elementary Schools. The two schools' combined enrollment is 1,579 of which over 99% are minority students.
- Alternative D proposes station locations that serve very distinct industry groups: Olympic/San Pedro serves the apparel and produce industries. 6th/San Pedro station serves the social service industry. 1st/Alameda and 2nd/San Pedro stations serve the office and toy industries.
- Industrial land uses are undergoing a transition from large to small-scale users, under 30,000 sq. ft.
- Lease rates range between \$0.60 and \$1.20 sq. ft. for industrial space.
- Vacancy rates for industrial space are under 10%.
- Approximately 3,483 residential units and 3,345 hotel rooms are located in the vicinity of Alternative D.

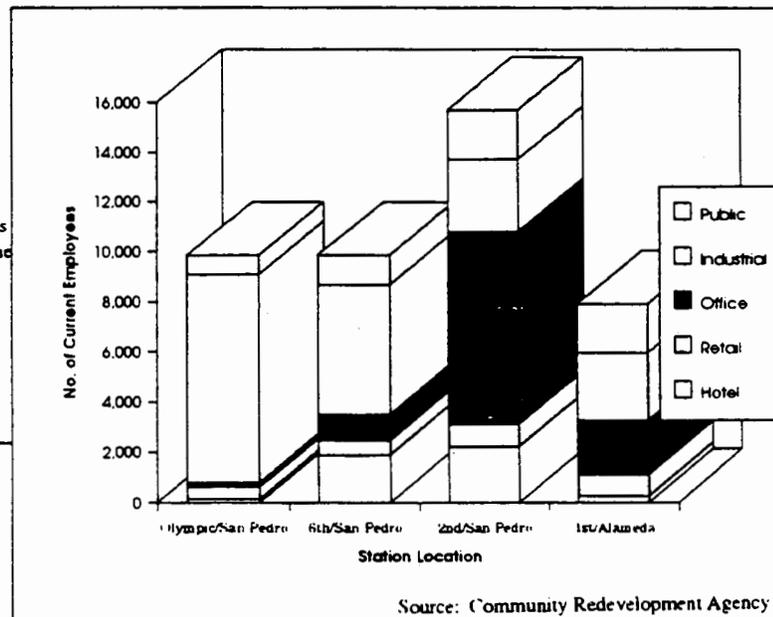


Station Location	Square Footage			
	Office	Retail	Industrial	Public
Olympic/San Pedro	54,642	201,176	3,064,001	180,712
6th/San Pedro	288,963	237,401	1,921,132	280,207
2nd/San Pedro	850,000	400,000	800,000	500,000
1st/Alameda	609,032	348,203	997,204	465,451

Current Employment

SIGNIFICANT NOTES:

- Employment along Alternative D consists primarily of light industrial workers and, secondly, office workers.
- The apparel industry is the strongest of the light industrial employment sector.
- Employment surrounding each of the proposed stations is just under 10,000 workers each, with the exception of the 2nd/San Pedro station which has the highest concentration of employment, over 15,000 workers, due primarily to the large office sector in Little Tokyo.
- Based on proposed development, planned employment includes an additional 12,475 jobs.



Station Loc.	No. of Employees					Total
	Office	Retail	Industrial	Public	Hotel	
Olym./S. Pedro	194	483	8,281	763	133	9,854
6th/S. Pedro	1,027	570	5,192	1,183	1,884	9,856
2nd/S. Pedro	2,200	900	2,900	2,000	200	8,200
1st/Alameda	2,166	837	2,695	1,980	253	7,931
Total	5,587	2,790	19,068	5,926	2,470	35,841

Origin of Industrial Employees

Southeast
(within five
miles)
80%



North,
West
20%

Source: Bamco Planners

ECONOMIC/MARKET ANALYSIS

ALTERNATIVE D - SAN PEDRO STREET

(Within 0.25 miles of proposed station)

Major Planned Projects

First Street North

(Alameda, 1st, Central, Temple)

- Office	785,000 s.f.
- Retail	95,000 s.f.
- Cultural	65,000 s.f.
- Housing	273 units
- Hotel	426 rooms

Mangrove Estates

(NE Corner - Alameda & 1st)

- Office	495,000 s.f.
- Retail	234,000 s.f.
- Recreational	15,000 s.f.
- Housing	1,200 units
- Hotel	433 rooms

First Street South

(SE Corner - Alameda & 1st)

- Office	389,000 s.f.
- Retail	215,000 s.f.
- Housing	640 units
- Hotel	400 rooms

Sunshine Pacific

(Sunset & Alameda)

- Retail	185,000 s.f.
- Housing	296 units

Status:

First Street North	- Waiting for City approval and financing. Construction expected to begin in 1994.
Mangrove Estates	- Completing EIR, with construction expected to begin in 1997.
First Street South	- Completing EIR, with construction expected to begin in 1997.
Sunshine Pacific	- Estimate of construction date not given.

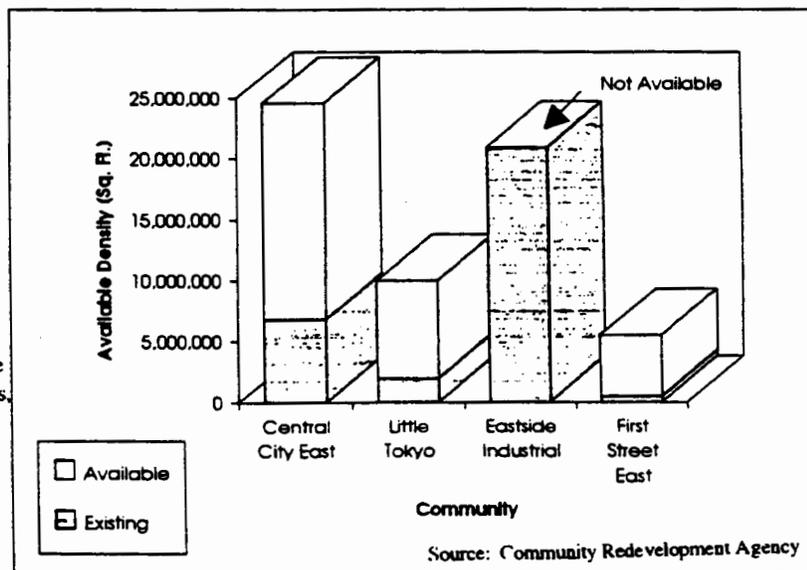
SIGNIFICANT NOTES:

Many of the business/real estate professionals interviewed stated that implementation of the Downtown Connector could contribute to a greater viability of future developments if a station were located nearby. In addition, for the major projects planned in Downtown, the LAUSD is recommending Primary Centers (defined as K-2 or K-3 grades) in the development projects.

Development Opportunities

SIGNIFICANT NOTES:

- o The garment market will continue to expand. The produce market on San Pedro may be redeveloped to garment uses.
- o Development opportunities exist all along the proposed alignment. Mixed-use developments, including retail/wholesaling, industrial and residential provide the best opportunity for joint development along San Pedro.
- o Developing an "incubator" may be beneficial to the area; informal incubators already exist in specialties, such as garment, toys and electronics.
- o The import industry for toy and electronics is very strong in the area. The proposed Downtown Connector may enhance existing opportunities for growth in this industry.
- o A demand for additional market-rate housing exists beyond Single Room Occupancy (SRO) projects.



Community	Existing Devlpmnt.	%	Available Density	%
Central City East	6,800,000	28%	17,800,000	72%
Little Tokyo	2,000,000	20%	8,000,000	80%
Eastside Industrial	20,898,269		N/A	
First Street East	500,000	9%	5,000,000	91%

Environmental Assessment

The following is a preliminary assessment of environmental impacts associated with **Alternative D - San Pedro Street**. In the following matrix, short and long-term impacts are presented in key impact areas, such as land use, traffic and parking, noise and vibration, air, aesthetics, cultural resources, and business impacts. As discussed in the Engineering Feasibility section, at-grade and aerial structures are proposed as two options, however, both would require an at-grade connection with Washington Boulevard and an aerial connection with Union Station. A subsequent Environmental Impact Report following this study will provide detailed analysis of anticipated impacts and proposed mitigation measures.

Short-Term Construction Impacts

At-Grade Segments - During at-grade construction, trackage would be laid within the existing street right-of-way between Washington Boulevard and Garey Street. The construction zone would require parking prohibitions and lane closures to provide an adequate work zone for workers and construction equipment. This would result in increased traffic throughout the corridor and restrict access to businesses. This is particularly true at the intersections of First and Alameda Streets, and Washington Boulevard and San Pedro Street. However, there are several parallel north-south routes, such as Los Angeles Street, Stanford Avenue, Central Avenue, or Alameda Street, which could serve as alternate routes during construction. In addition, due to the nature of at-grade construction, noise, air, dust and vibration would also impact the businesses located along San Pedro and First Streets throughout construction.

Aerial Segments - Construction of an aerial structure would result in similar impacts as at-grade, however, the aerial structure would cause a dramatic change in the aesthetics of the corridor both in the short term during construction and long term. In addition, heavier equipment would be required to construct the viaduct structure resulting in increased right-of-way requirements and potentially more noise, air, dust and vibration impacts during construction.

Another construction impact associated with all the alternatives, is construction of the aerial structure across the 101 Freeway for the connection to Union Station. A Traffic Management Plan will have to be prepared and approved by Caltrans identifying the construction procedures that will be employed to minimize impacts on the freeway.

Long-Term Impacts

At-Grade Segments - Most of the right-of-way and parking takes required during construction of an at-grade alignment will become permanent due to the reduction in available street right-of-way. The sidewalks along San Pedro Street would need to be narrowed to increase street right-of-way. This would result in a negative impact to pedestrian traffic, which use the sidewalk to access the businesses. This will also result in increased traffic congestion throughout the corridor and create a number of pedestrian safety-related impacts. These transportation impacts are discussed in greater detail in the following subsection. Furthermore, businesses in the area which depend on parking and pedestrian foot traffic will be negatively affected. Property acquisition is required at the intersection of First and San Pedro Street, where a five-story office building is located and also along the eastern end of the Mangrove site, south of Garey and Turner Streets. The five-story office building is located in the heart of Little Tokyo and would result in a business impact to the area.

Aerial Segments - Long-term impacts resulting from an aerial structure would be similar to an at-grade alignment, however, right-of-way and parking impacts would be less severe due to the small right-of-way requirements of the columns supporting the viaduct. Where the aerial alignment transitions to at-grade between 15th and 14th Streets, a transition wall will be constructed. The construction of this wall would restrict movements to right-in/right-out turns at the intersection of 14th Street and 14th Place.

ENVIRONMENTAL ASSESSMENT

ALTERNATIVE D - SAN PEDRO STREET

AT-GRADE/AERIAL

Segment/Station	Plan & Profile	Length	Type of Construction	Potential Impacts	Sensitive Receptors
San Pedro/Washington Intersection: San Pedro Street between Washington Blvd and 18th Street	0+00 to 2+00	225 ft	At-grade	<u>Short-Term/Construction Related:</u> - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Right-of-way acquisition - Vehicle traffic and parking - Visual	San Pedro Elementary Sch
Transition to Aerial Configuration: San Pedro Street between 15th and 14th Streets	14+00 to 21+80	425 ft	Aerial/ Trench wall	<u>Short-Term/Construction Related:</u> - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Lane closures - Right-of-way acquisition - Vehicle traffic and parking - Visual	None
9th & San Pedro Station: Between Ninth and Eighth Streets	42+00 to 45+00	275 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures and lost parking - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Right-of-way acquisition - Lost parking - Business development - Increased pedestrian traffic - Visual	None
6th & San Pedro Station: Between Sixth and Fifth Streets	66+50 to 69+50	275 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures and lost parking - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Right-of-way acquisition - Lost parking - Business development - Increased pedestrian traffic - Visual	Wesgart Center
2nd & San Pedro Station: Between Second and Third Streets	87+00 to 90+00	275 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures and lost parking - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Right-of-way acquisition - Lost parking - Business development - Increased pedestrian traffic - Visual	St. Vibiana Church & Sch
First/San Pedro Curve: Corner of First and San Pedro Streets	97+00 to 100+00	200 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Altered pedestrian and vehicle traffic - Lane closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition and displacement - Right-of-way acquisition - Visual	Koyasan Buddhist Temple
1st & Alameda Station: Corner of First and Alameda Streets	Not Shown on Plan & Profiles	275 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual - Cultural resources <u>Long-Term:</u> - Right-of-way acquisition - Business development - Increased pedestrian and vehicle traffic - Visual	None
Garey Street: Garey Street, between 1st & Alameda Station to Commercial Street	79+00 to 105+00	2,600 ft	Aerial/At-grade	<u>Short-Term/Construction Related:</u> - Increased truck traffic - Altered vehicle traffic - Altered business accessibility - Street closures - Noise, air, dust, vibration - Visual <u>Long-Term:</u> - Property acquisition and displacement - Right-of-way acquisition - Visual - Street closures	Los Angeles Home Hoogwanji Betsu (Temple)

Transportation Impacts

AT-GRADE IMPACTS

Traffic Impacts

With the at-grade option of **Alternative D San Pedro Street**, there will be considerable impacts to vehicular traffic. San Pedro Street has three lanes in each direction during peak hours, between Fifth Street and Washington Boulevard, with left turns being made from a shared through-left turn lane. Between Fifth Street and Temple Street, the Right-of-Way (ROW) varies on San Pedro Street and the roadway has either two or three lanes in each direction, with separate left turn lanes at major intersections. However, during non-peak hours, parking is generally permitted on both sides and reduces the effective number of travel lanes to two in each direction for the stretch between First Street and Washington Boulevard.

The at-grade option runs along the median of San Pedro Street, similar to current operation along Washington Boulevard. The rail line junction at the San Pedro/Washington intersection will be three-way to accommodate trains running through downtown to either Long Beach or Santa Monica. The at-grade rail line is assumed to displace two lanes on San Pedro Street and require narrowing of the sidewalks to a minimum of six feet. This will reduce the peak hour capacity of the street by approximately one-third in those blocks where there are currently three travel lanes. In order to maintain four lanes on San Pedro, parking will be displaced along both sides of the street near stations and at intersections, and along at least one side of the street for mid-block segments. Along First Street, the at-grade operation would result in a similar loss of parking and require sidewalk narrowing to maintain four lanes. (Conversely, the aerial configuration of this alternative would displace one travel lane or parking.) The aerial alignment along Garey Street is assumed to displace the on-street parking in order to maintain one lane in each direction.

A number of major east-west streets cross San Pedro Street serving as access routes to downtown Los Angeles from the eastside and the Golden State/Santa Ana Freeway. The at-grade alignment would affect these cross-streets. However, at-grade crossings can be made to work with acceptable levels of service depending upon the volume of traffic on the street being crossed by the trains. Generally, if the Average Daily Traffic (ADT) volume on the roadway is less than 20,000, an at-grade crossing is not a significant impact. For roadways with an ADT above 30,000, a grade separation is generally required to mitigate the impacts of train operations unless other intersection improvements can be provided to compensate for the loss of capacity associated with the train movements through the intersection. For streets in the 20,000 to 30,000 ADT range, at-grade operations may be workable depending upon the specific conditions at each intersection. Some of the major cross-streets along San Pedro Street and their ADTs include Pico Boulevard (11,250), Olympic Boulevard/9th Street (32,000), 8th Street (16,800), 7th Street (26,900), 6th Street (14,800), 5th Street (17,700), 4th Street (15,300), 3rd Street (15,800), 2nd Street (14,000), and First Street (24,800). The volume on Alameda Street is 27,400, south of First Street and 30,500 north of First Street. Mitigation measures, such as grade separations, may be required at some of these streets, particularly Olympic Boulevard and Alameda Street, to reduce the delay to through traffic. Further study will be done in the project EIR of impacts of goods movements and pedestrians.

The downtown connector will facilitate the potential addition of several new rail lines through downtown connecting Long Beach, Santa Monica, Pasadena and Glendale. Some of these lines will utilize the existing Blue Line corridor along Washington Boulevard affecting the at-grade intersection of San Pedro Street/Washington Boulevard (at least three different rail lines would pass through). Based on the preliminary operations plan for this alternative, a train could pass through the intersection once every 45 seconds, with two-thirds of them making turns either to or from San Pedro onto Washington Boulevard. This large number of potential train movements, many at reduced speeds while turning, would significantly affect the capacity of the intersection and reduce its ability to accommodate vehicular traffic. Further analysis of this intersection will be required to recommend possible mitigation measures.

There are a number of signalized intersections along San Pedro and First Streets. The at-grade alignment of San Pedro Street would affect the turning movements at these intersections and traffic signal modifications would be required to control left turn and other traffic movements. The aerial portion along Garey Street or First Street would have lower impacts at the intersections than the at-grade alignment.

Station Areas

The primary circulation issues in station areas are related to pedestrian access and integration with bus service. The stations also require a wider right-of-way to accommodate the station platform, which results in the inability to accommodate on-street parking on even one side of the street in station areas and could result in the prohibition of left turns at intersections adjacent to stations. The parking demand at these stations will be negligible because these stations primarily serve as destinations for employees coming into downtown and for internal downtown trips.

Three issues with regard to pedestrian circulation need to be evaluated: locations where pedestrians cross the light rail tracks, locations where the project causes changes in pedestrian travel patterns, and pedestrian access routes to the transit stations. The station at 1st Street/Alameda Street is intended to serve future travel demands of several major development projects proposed at that intersection. The 2nd Street/San Pedro Street station would serve the Little Tokyo area which has a relatively high pedestrian volume. The 6th Street/San Pedro station will serve the toy district and the transit dependent residents of SRO housing near the station. The station at Olympic Boulevard/San Pedro Street would serve the wholesale district and produce market with a large number of transit-oriented employees. The station platforms will be located in the center of the street similar to stations on Washington Boulevard and pedestrian treatments will be consistent with the existing and current Blue Line design. The bus service on San Pedro Street is less than on many other north-south corridors in downtown, but the corridor is served by seven MTA (former RTD) routes and one Santa Monica Municipal bus route, as well as crossed by many east-west routes. The accessibility to bus service for rail passengers of rail service will be analyzed in the project EIR.

Parking

Parking is not proposed at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking in public parking lots. However, on-street parking all along San Pedro Street will be negatively affected and may result in potential removal of approximately 220 parking spaces, which is significant. The parking displacement would be distributed as follows: approximately 70 spaces north of 6th Street, 100 spaces between 6th Street and Pico Boulevard, and 50 spaces south of Pico. Parking may also be affected along First Garey Streets, however, more nearby off-street parking is available along those streets than along San Pedro, so the impact of the displacement may not be as significant. The improved transit access to the San Pedro Corridor and the availability of some off-street parking facilities nearby would offset the loss of some of the parking spaces. In the EIR, the potential need for replacement parking would need to be evaluated.

Driveway Access Issues

The San Pedro Street at-grade alignment will affect driveway access along San Pedro and First Streets. There are a number of warehouses and distribution centers that would be affected by limited right-in/right-out access. Passenger cars may be able to turn around at signalized intersections, however, some trucks may have to circulate around the block to reach their destinations. Left turn access would likely need to be preserved at the City Market, between 9th and 10th Streets, which generates a large amount of truck traffic. A traffic signal at this location would need to be considered.

AERIAL IMPACTS

Traffic Impacts

The traffic impacts of the **San Pedro Street** aerial alignment are similar to those of the at-grade alignment however, the impacts would be reduced due to the elimination of most of the at-grade crossings of intersections. This alternative involves building an aerial viaduct in the median of San Pedro and First Streets. The guideway will be supported by concrete columns, approximately seven to ten feet in diameter, and spaced roughly 80 feet apart. To provide room for the median island to support the columns, the sidewalk widths will be reduced to a minimum of 11 feet. Four travel lanes would be provided on San Pedro Street at all times resulting in a one-third reduction in the peak hour capacity of the street south of 5th Street. However, unlike the at-grade option, parking will not have to be prohibited on one side of the street for the entire alignment, rather only in the immediate vicinity of stations.

The transition from at-grade to aerial structure will occur north of 15th Street and will require the conversion of the "T" intersections at both 14th Place and 14th Street to right in/right out intersections. These are both minor intersections and this should not cause a significant impact.

A number of signalized intersections exist along San Pedro and First Streets. However, it is anticipated that the median island and column placement would be designed to accommodate existing turn lanes, therefore, the aerial alignment would not significantly impact any turning movements. This could be done through the use of cantilever columns adjacent to the left turn lanes and, if necessary, bent structures at wide intersections. This alignment will have similar impacts on the Washington Boulevard/San Pedro Street intersection as the at-grade alternative.

Station Areas

The proposed station locations for this alignment are the same as for the at-grade alternative. Pedestrian access to each station will be analyzed in the EIR for items such as handicapped accessibility (access to platform via elevators) and pedestrian crossings. It is proposed that access to the stations be provided from walkways/escalators in the middle of the street which will be accessed via a walkway from the adjacent signalized crosswalk.

Parking

Parking is not proposed at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking public parking lots. However, on-street parking will be affected with the aerial alternative resulting in the potential removal of approximately 100 parking spaces. The displacement of parking spaces will largely be confined to the blocks which include a station, so the improved transit access provided by the light rail line will off-set the loss of parking. However, south of 14th Street, where the trains return to the at-grade alignment, approximately 50 spaces will be displaced to provide adequate right-of-way for the trains and travel lanes. The potential need to replace these displaced spaces will be evaluated in detail in the EIR.

Driveway Access Issues

The **San Pedro Street** aerial alignment will affect driveway access similar to the at-grade alternative. The median island and columns will result in the restriction of most driveways to right in/right out movements only. However, the median island does afford more flexibility than the at-grade alternative in terms of providing breaks in the median to accommodate the need for full access to major driveways. If needed, column spacing can be adjusted from the standard 80 foot spacing to accommodate a left turn pocket under the aerial structure.

UNION STATION



BUNKER HILL



7th CENTER METRO

RED LINE

SAN PEDRO

BLUE LINE

ALAMEDA

ALTERNATIVE E

ALEMEDA STREET

ALTERNATIVE E Alameda Street

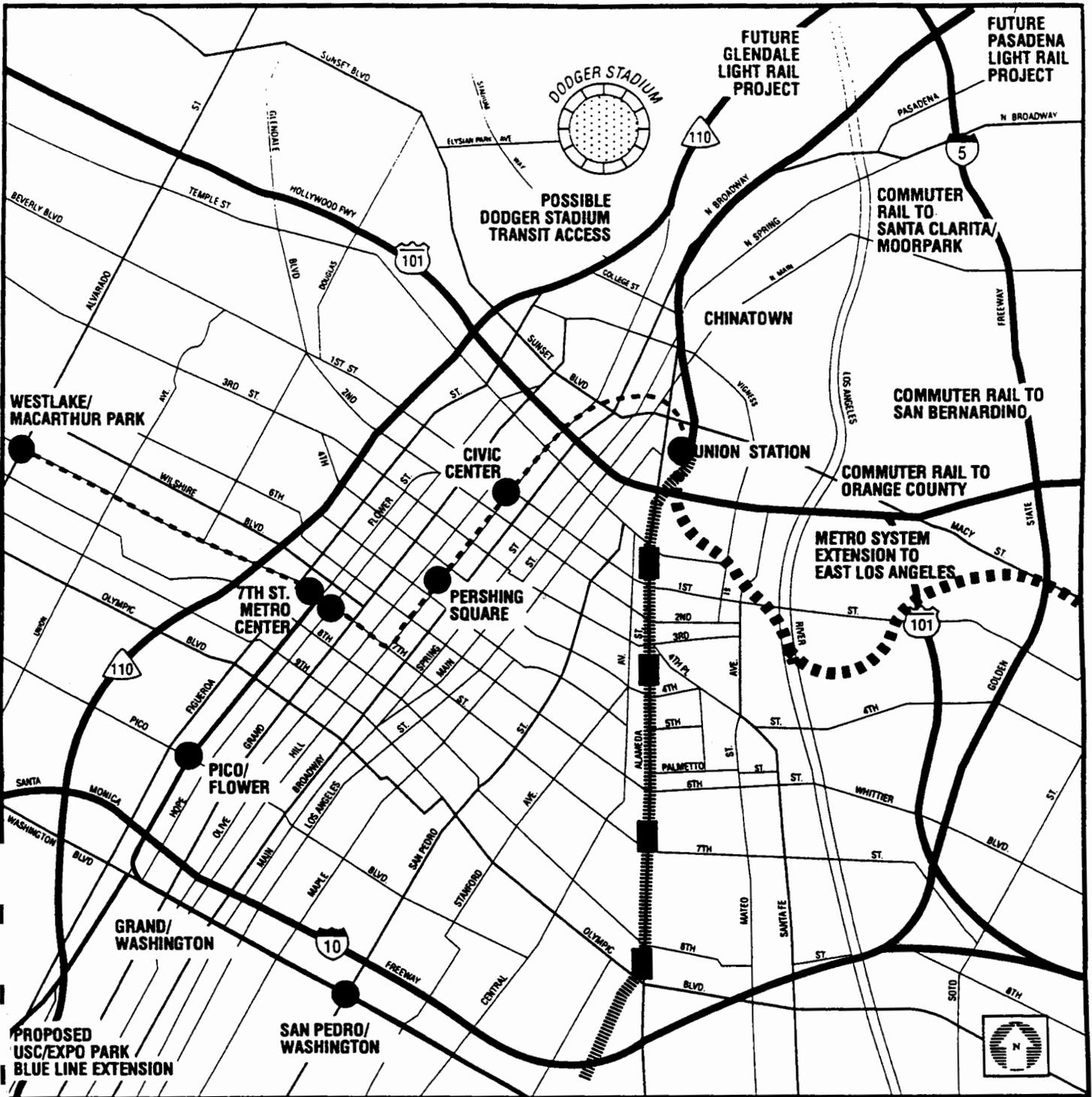
Technical Description of Alignment

Alternative	Subalternative	At-Grade	Tunnel	Cut & Cover	Aerial	Total
E	---	3,300'	---	---	12,000'	15,300'

Source: Transmetrics

Alternative E - Alameda Street is configured primarily as a single, aerial alternative. (Appendix E - Plan and Profile Alt. E.) The alternative begins with a "T" configuration at the intersection of Long Beach Avenue and Washington Boulevard. However, unlike the **San Pedro Street Alternative**, the "T" configuration is not entirely at-grade. As shown, the north-south trackage along Long Beach Avenue would be grade separated by a "fly-over" structure. The width of the overall Long Beach Avenue corridor is considered wide enough for this to be accomplished, along with the need for a localized four-track arrangement needed to split at Washington Boulevard. Light rail turning movements to and from Washington Boulevard would be accomplished at-grade, but the addition of a grade separation would have significant operational benefits. The alignment proceeds north within the Long Beach Avenue corridor. An at-grade configuration is achieved just south of 16th Street and remains at-grade under the Santa Monica Freeway to beyond 14 Street. Trackage is located in that part of the corridor which previously was a freight rail line. North of Newton Street, however, portions of this corridor have been developed. Specifically, west of Long Beach Avenue between Newton and 14th Streets, a significant new building has been constructed. To avoid this site, the alignment utilizes a reverse curve to the right to transition into the center of Long Beach Avenue. The transition to aerial structure begins at 14th Street and takes place between that point and the intersection of Alameda Street with Olympic Boulevard. Additional right-of-way is required from a two-block area bounded by 14th Street, Olympic Boulevard, Alameda Street and Long Beach Avenue. Between the two blocks involved, McGarry Street would be interrupted. The alignment enters the Alameda Street corridor at Olympic Boulevard and proceeds north along its centerline. The alignment eventually departs the corridor with a reverse curve to the right in order to transition to tie into trackage along Platform No. 1 of Union Station. At that location, the alignment connects with the terminal point of the Pasadena - Los Angeles Blue Line. An alternative alignment could involve a departure from the Alameda Street corridor further south. This alignment would turn right into First Street and subsequently be identical to the aerial option of the San Pedro Street Alternative.

Four station locations are proposed for **Alternative E - Alameda Street** including: Olympic & Alameda, 7th & Alameda, 4th & Alameda, and 1st & Alameda. On the following page is a study area map illustrating the proposed alignment through Downtown Los Angeles. (Figure V-E1.) In addition, a complete set of Plan and Profile drawings are presented in Appendix E. These drawings are to be viewed only as conceptual drawings completed to assess engineering feasibility.



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY
METROPOLITAN TRANSPORTATION AUTHORITY**

**ALTERNATIVE E
ALAMEDA STREET**
Figure V-E1

- Metro Red Line
- ■ ■ Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ||||| Downtown Connector Alternative

Engineering Feasibility and Constructibility

As with the Alternative D - San Pedro Street, Alternative E - Alameda Street also differs entirely from the Bunker Hill alternatives. Similarly, the issues inherent with underground options do not apply for Alameda Street as this alignment is configured as an aerial system. Therefore, the engineering issues encountered involve those inherent with aerial rail operations.

Aerial Configuration

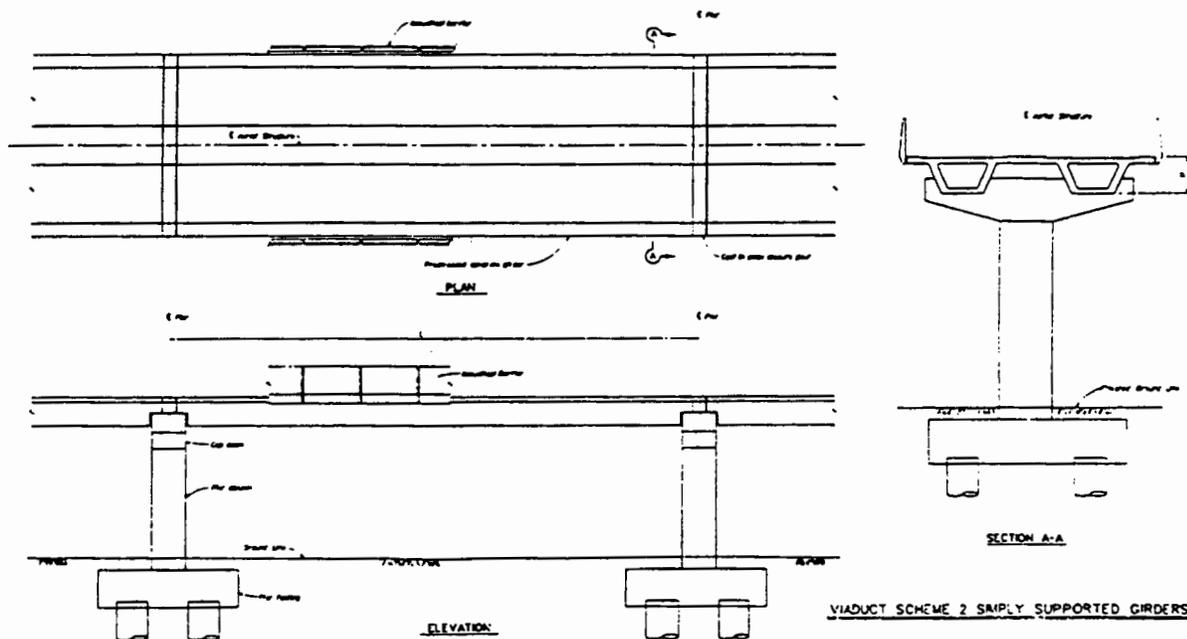
General engineering issues related to an aerial configuration include:

- Traffic impacts, primarily as resulting from the introduction of the viaduct structure
- Impacts during the construction of the viaduct
- Use of available space, particularly with regards to maintenance and the introduction of turning lanes
- Pier placement and configuration in general

Significant Issues

A number of more site-specific engineering issues can also be cited:

Freeway Viaduct - The viaduct crossing of the Hollywood Freeway will require careful monitoring. Special design considerations may be necessary to achieve the necessary vertical clearance over freeway lanes. It has already been concluded that the vertical curve just south of Platform No. 1 may have to already begin within Union Station right-of-way. Furthermore, Caltrans has on-going plans to introduce modifications to the freeway corridor at this location. The placement of piers for the transit structure and, in turn, the resulting span lengths and structural depths are all issues which could affect geometric definition. (Figures below, also see viaduct figures presented for Alt. D San Pedro Street.)



Freeway Clearance - Clearance under Santa Monica Freeway is assumed adequate, but must be verified.

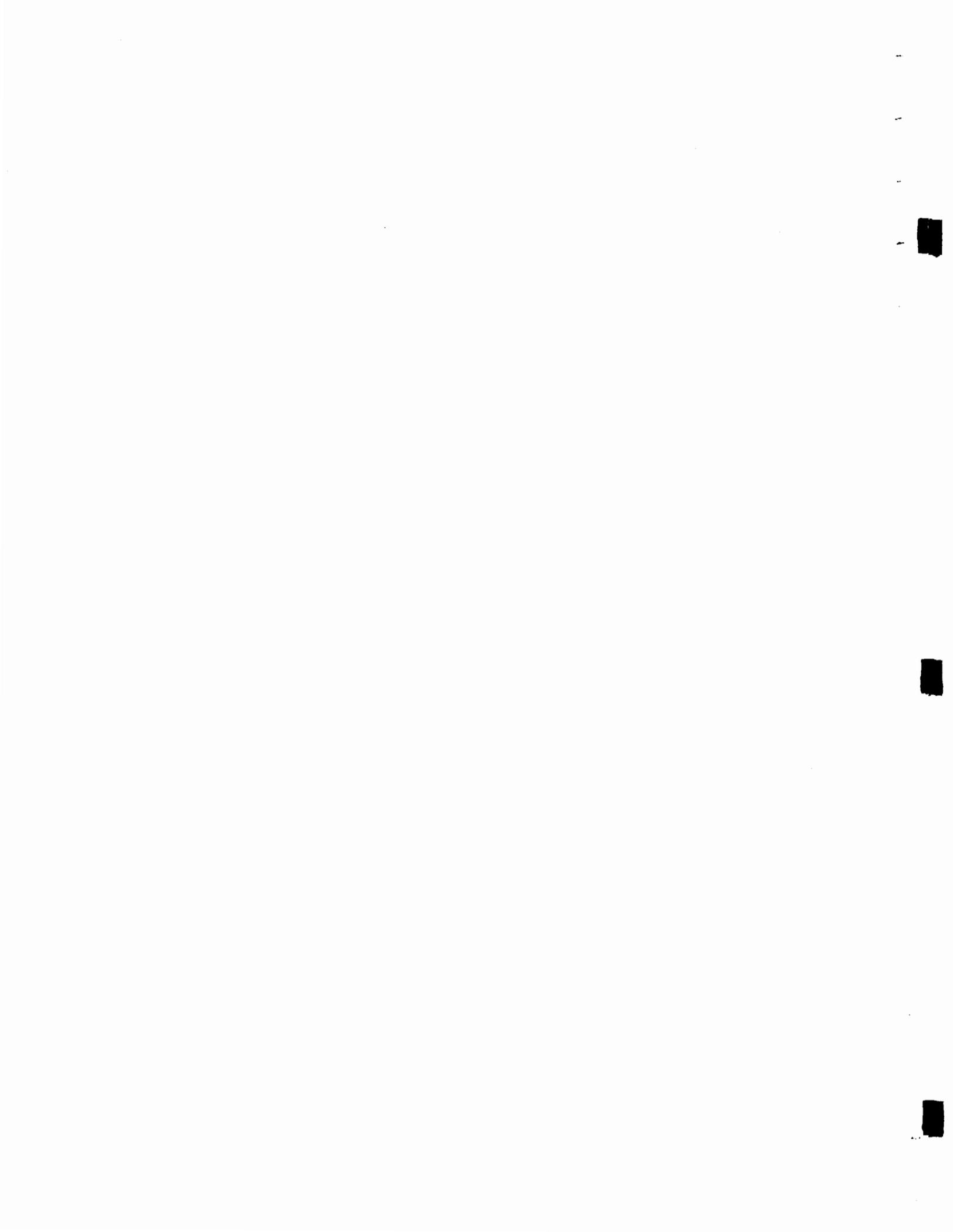
"Fly-over" - In order to minimize the length of "fly-over" structure at Washington Boulevard, shorter than normally desired vertical curves could be utilized.

Less-than-desired Horizontal Radii - Horizontal alignment between the Santa Monica Freeway undercrossing and the alignment's entry into the Alameda Street corridor is, by necessity, somewhat circuitous. Tighter than normally utilized horizontal and vertical curves would be introduced which would affect operational speeds, but tend to minimize right-of-way impacts.

Business Impacts - Efforts would be made to minimize impacts upon the existing service station located in the southeastern quadrant of the Alameda Street/Commercial Street intersection. To accomplish this, the viaduct structure would be located along Commercial Street within Caltrans property. This would have to be coordinated with that agency.

Existing Freight Rail Service - Active freight rail service still exists within the Alameda Street corridor. However, many spur lines have seemingly been abandoned; the legal status of rail service must be carefully coordinated and discussed with the Southern Pacific Transportation Company and all other involved agencies and possibly affected property owners. Of particular concern is the on-going freight rail service to the wholesale produce center located in the northwest corner of the Alameda Street/Olympic Boulevard intersection. At this location, existing freight rail trackage would cross under the light rail viaduct. (Any active freight rail service north of this point would have even greater impacts.) Future plans for Freight rail including the location and length of sidings and frequency and hours of service will need to be considered in detail during any further design work for the corridor.

Planned Development Impacts - The line location would also have to be coordinated with planned development within the Mangrove Site, and area bounded by Alameda Street to the west, First Street to the south, Temple and Turner Streets to the north, and private right-of-way to the east.



Station Location and Design Analysis

Given the alignment of **Alternative E** as determined by engineering feasibility and constructibility, more specific information is developed for each station location and configuration. The following narrative and graphic information presents a descriptive overview of the design implications surrounding each proposed station as well as a perspective on the stations' integration with adjacent land uses.

System Configuration

Alternative E - Alameda Street is a predominantly aerial system with only an at-grade segment to transfer below the Santa Monica Freeway from the south. A total of four aerial station locations are proposed:

- Olympic & Alameda Station (between Olympic Boulevard and 8th Street)
- 7th & Alameda Station (between 6th and 7th Streets)
- 4th & Alameda Station (between 4th and 5th Streets)
- 1st & Alameda Station (corner of 1st and Alameda Streets)

Station location choices were based upon existing and anticipated future ridership demands to and from local centers. Off-street stations may be considered for the **Alameda Street** alternative to minimize significant visual impacts. This would be further evaluated in the Route Refinement/EIR phase of this project.

Station Platforms

With respect to **Alternative E - Alameda Street** station designs would utilize side platforms. A side-loading configuration has been selected in an effort to promote pedestrian safety in this high-volume corridor, and also to facilitate left turn traffic lanes north of 7th Street and the existing freight alignment south of 7th Street. Pedestrians would enter the stations from the sidewalk and reach the platform via the station's ancillary facilities. It can be expected that the exact physical definition of station configurations will be refined during later design phases.

Engineering-Related Issues

Other related engineering issues include:

- The existing Blue Line station along Long Beach Avenue just south of Washington Boulevard would likely require major reconstruction or relocation due to the introduction of the **Alameda Street** Alternative as presently envisioned.
- All four **Alameda Street** stations would be aerial. As with the other alternatives, station locations are flexible and are only limited in location by the need to be within a horizontal tangent, as well as a vertical tangent with a 1% maximum to 0.3% minimum vertical grade.

The following pages graphically illustrate the proposed station locations for **Alternative E - Alameda Street**. Local land uses are highlighted specifically by building name and/or any prominent entity located near the station location to illustrate the potential ridership demands to and from these sites.



WASHINGTON & LONG BEACH

The Alameda Street Alignment Alternative would approach the Long Beach-Los Angeles Blue Line along the right-of-way paralleling Long Beach Avenue. Surrounding land uses in this area are principally comprised of light industrial, manufacturing, and commercial office buildings.

Because of the existing heavy congestion that results from the confluence of automobile, truck, and Metro Blue Line traffic at Washington Boulevard and Long Beach Avenue, the Alameda Street alignment would need to be grade separated at this intersection. It is anticipated that the alignment would traverse Washington Boulevard via an aerial configuration in order to connect with the Long Beach-Los Angeles Blue Line. Because the existing Washington & Long Beach Station is so closely spaced to Washington Boulevard, it can be expected that this station would require relocation, and will be studied in closer detail during the Route Refinement and EIR process.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments



View looking south at existing Washington & Long Beach Blue Line Station.



View from Blue Line platform looking north toward right-of-way approach of Alameda Street Alignment Alternative.



View west from center of Washington Boulevard. The Alameda Street Alignment Alternative would "flyover" the street to connect to the Long Beach-Los Angeles Blue Line.



Vacant property on southeast corner of Washington Boulevard and Long Beach Avenue.

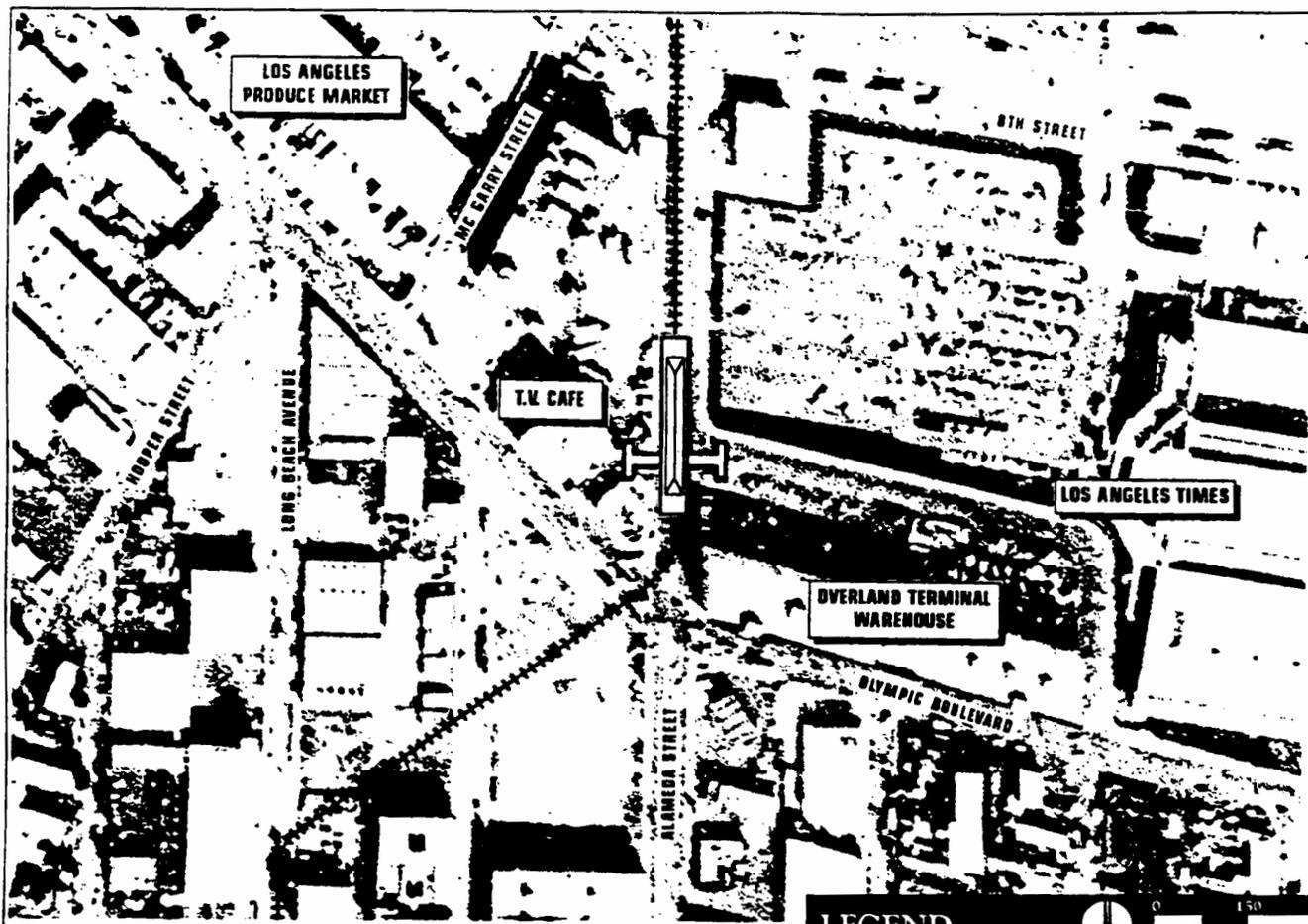
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E3
Station Site Visual Survey
Washington & Long Beach



LEGEND

0 150 300
FEET

ALIGNMENTS

- ==== Metro Red Line
- Metro Blue Line
- Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

- ▬ At-Grade
- ⊥ Aerial
- ▬ Subway
- Proposed or Existing Portal
- Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

OLYMPIC & ALAMEDA

The land uses surrounding the Olympic and Alameda Station consist primarily of warehousing and distribution uses, some of which are served by the existing freight transportation corridor located in the center of Alameda Street. Because of this condition, this station and the alignment's aerial guideway have been reconfigured to reflect the need to incorporate the freight corridor within the Alameda Street right-of-way (refer to Olympic & Alameda Station elevation). The dedication of the freight corridor results in a right-of-way configuration that consists of two-traffic lanes in each direction, 12-foot sidewalks on each side of the street, and a 20-foot freight corridor (plus 4-foot columns on each side).

The diagonal segment site between Long Beach Avenue to Alameda Street could serve as a truck staging area. This would represent a key improvement for expanded industrial development in this area.





View west along Olympic Boulevard. T.V. Cafe appears in center background.



Overland Terminal Warehouse.



View looking toward southwest corner of Olympic Boulevard and Alameda Street.



View looking east along Olympic Boulevard.

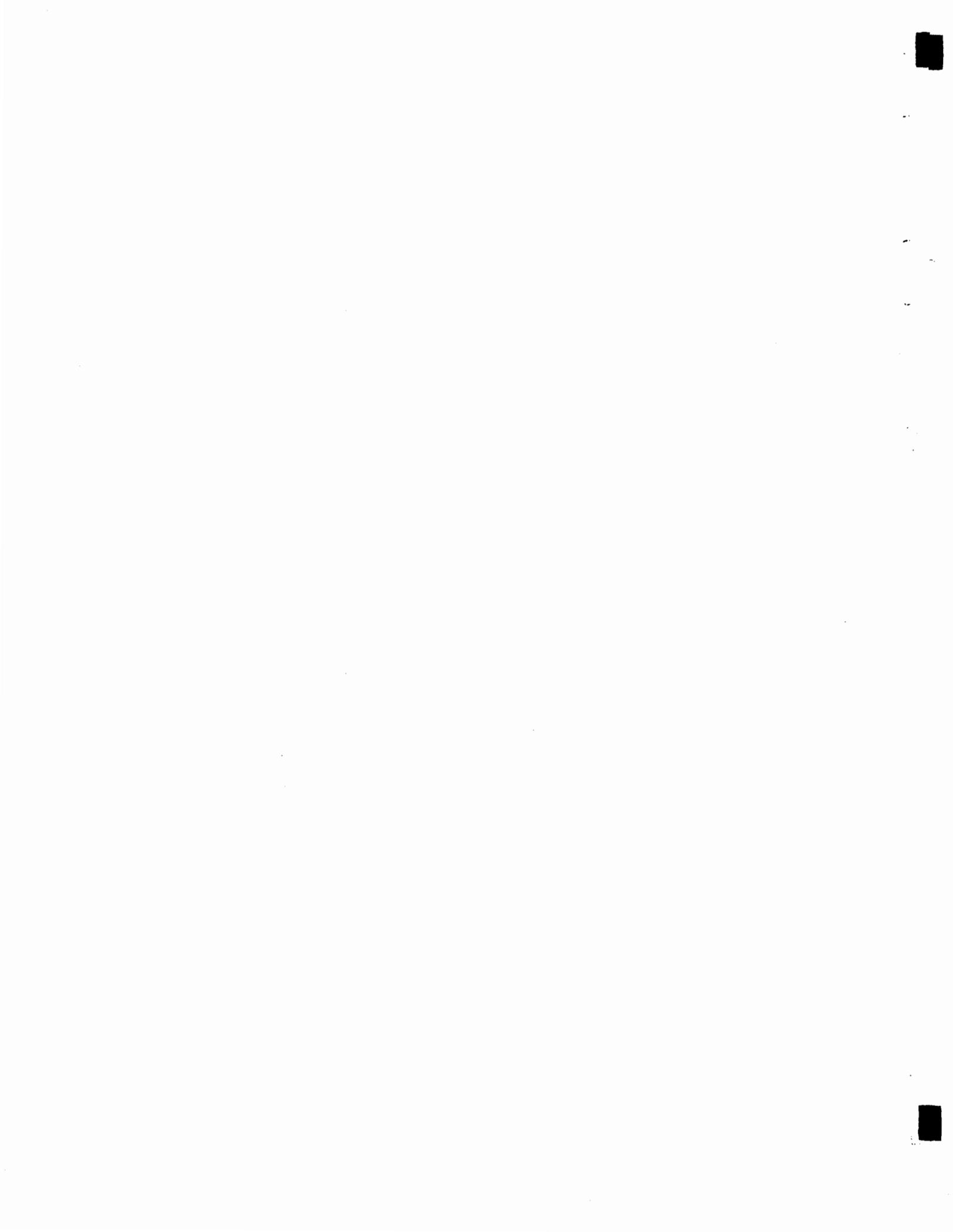
GRAPHICS BY GRUEN ASSOCIATES



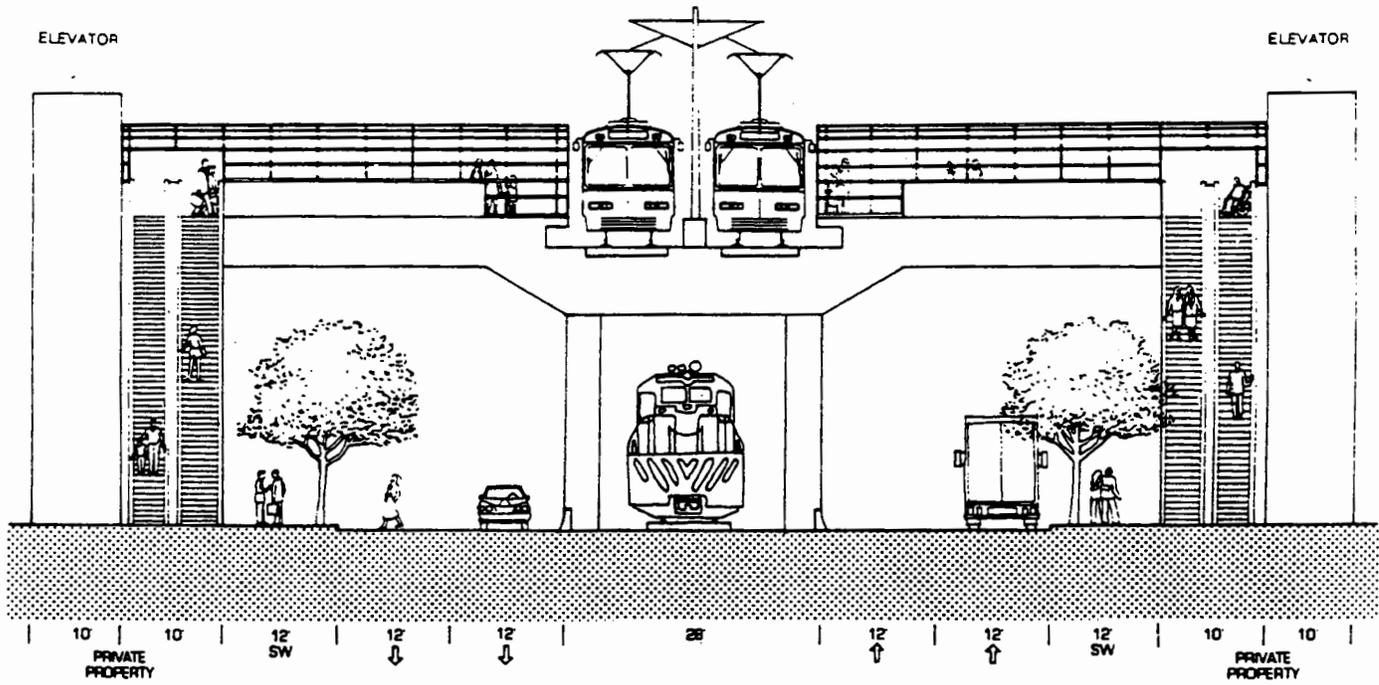
BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E5
Station Site Visual Survey
Olympic & Alameda



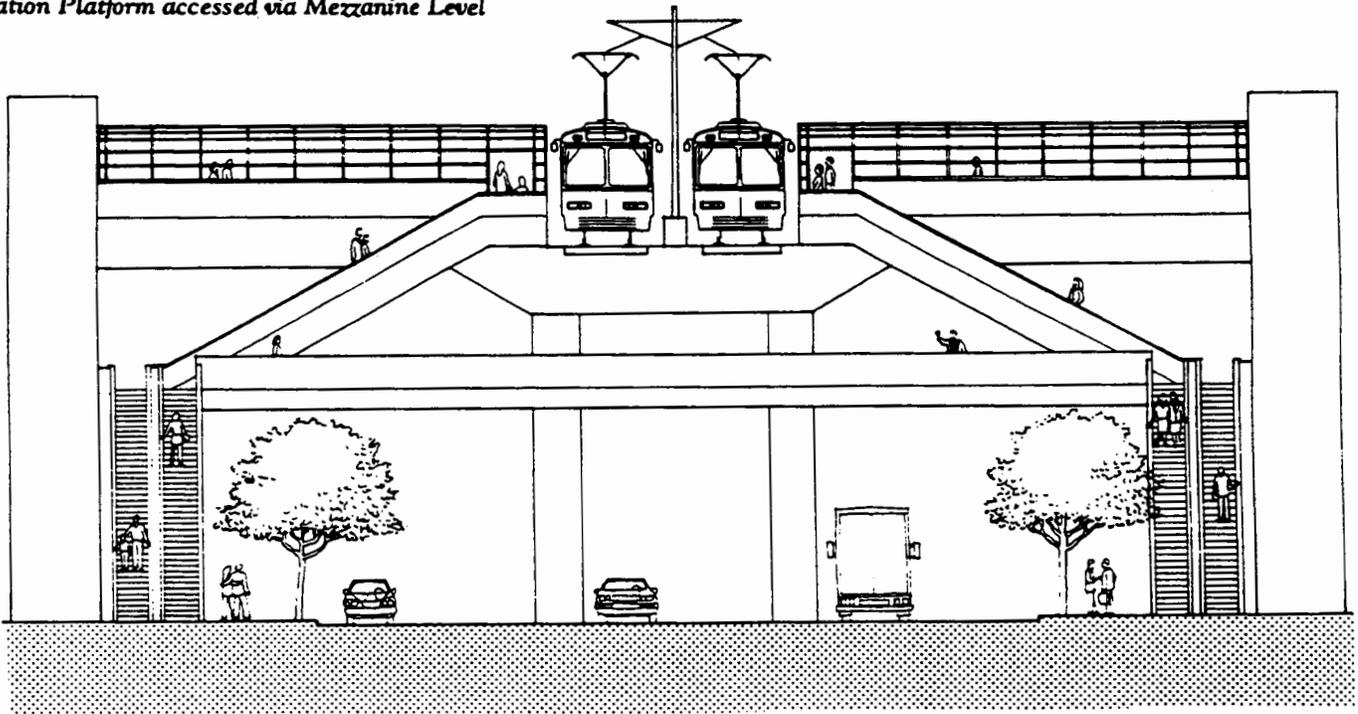
Station Platform accessed via Street Crossing



Typical Alameda Street Aerial Station Elevations. Although these elevations illustrate conditions which occur south of 7th Street (presence of freight service corridor), the side-loading design depicted in these elevations can also apply to stations north of 7th Street. The difference in configuration would be the use of a single column in the street rather than two. With respect to the station designs, the Mezzanine Pedestrian Level station concept would improve pedestrian safety at station locations, but would amplify the height and aesthetic impact caused by the aerial configuration. From street level to the top of the LRT's catenary wire system, the total height of the station would be more than 60 feet. These on-street stations plus off-street options will be evaluated in greater detail during the Route Refinement/EIR stage.



Station Platform accessed via Mezzanine Level



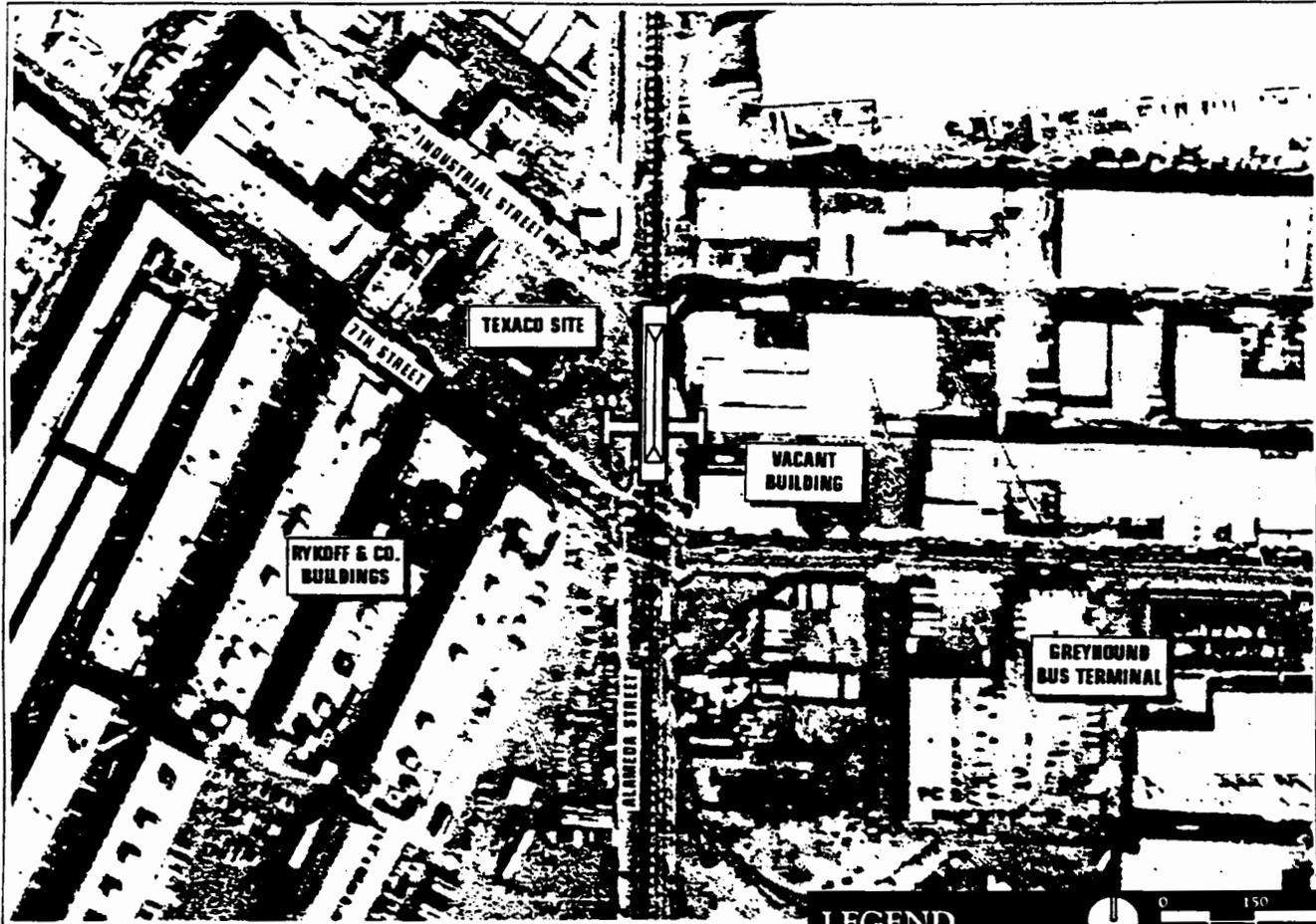
GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E6
Typical Aerial Station Elevations
Alameda Street Alignment Alternative



LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

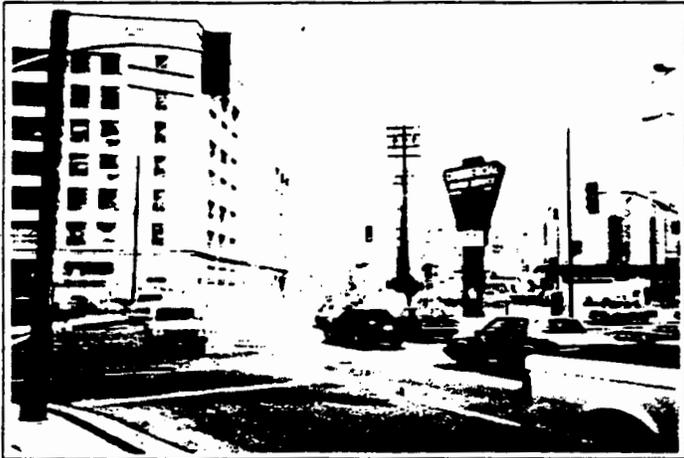
NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

7TH & ALAMEDA

Manufacturing, maintenance, and warehousing uses comprise the predominant land uses adjacent to the 7th and Alameda Station. Some of the more significant buildings and properties include the S.E. Rykoff & Company Buildings and Greyhound Bus Terminal on 7th Street, and the Ice Company, Showa Marine Cold Storage, and MTA (SCRTD) maintenance and storage yard on Alameda Street.

The aerial station platform would be constructed just north of the intersection of 7th and Alameda Streets, and resemble the station configuration of other Alameda Street alignment stations north of 7th Street. Accessed by side-loading platforms from each side of the street, the station's ancillary facilities could be incorporated into future development projects on two available sites: (1) the Texaco Gas Station on the northwest corner of the intersection and (2) the currently vacant 2-story building on the northeast corner.

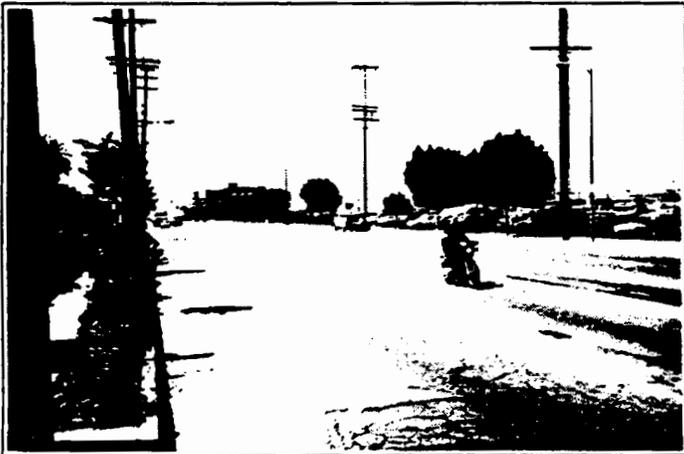




View west along 7th Street. Rykoff Buildings appear in left background.



View looking north on Alameda Street.



View looking south of Alameda Street.



Greyhound Bus Terminal.

GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E8
Station Site Visual Survey
7th & Alameda



4TH & ALAMEDA

Located south of Little Tokyo, the 4th and Alameda Station would provide service to Yaohan Plaza and nearby residential uses one block north at 3rd Street. The remaining adjacent land uses primarily consist of vacant properties or manufacturing and warehousing companies.

The aerial station platform would be constructed just north of the intersection of 4th and Alameda Streets. To accommodate three traffic lanes in each direction plus a left turn lane, station sites and guideway configurations spanning intersections would be supported using straddle bents (refer to typical Alameda Street aerial guideway section). Like all the Alameda Street alignment stations, this station would be accessed by side-loading platforms from each side of the street. Ancillary stairway, escalator, and elevator facilities could be constructed at the 4th and Alameda Station on two adjacent parking lots.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments





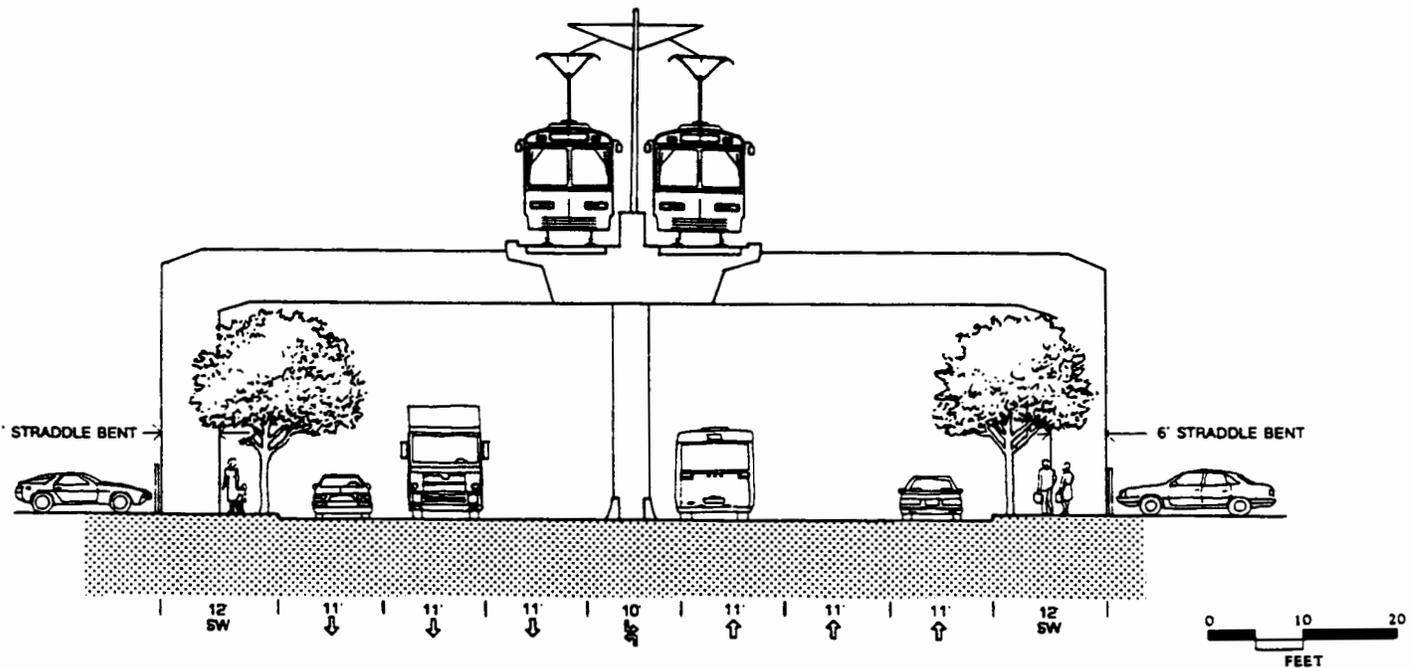
View looking toward southeast corner of intersection of 4th and Alameda Street.



View south on Alameda Street, just north of 4th Street.



View north of Alameda Street. Yaohan Plaza parking structure appears in left background.



Alameda Street Alignment Alternative Typical Elevation. The elevation above illustrates how the proposed rail transit route could fit within the built form context of Alameda Street north of Seventh Street. The guideway would be supported by straddle bents and a single column (background in elevation) at station locations and intersections. This would allow for three traffic lanes in each direction and a left turn lane within the 100-foot right-of-way.

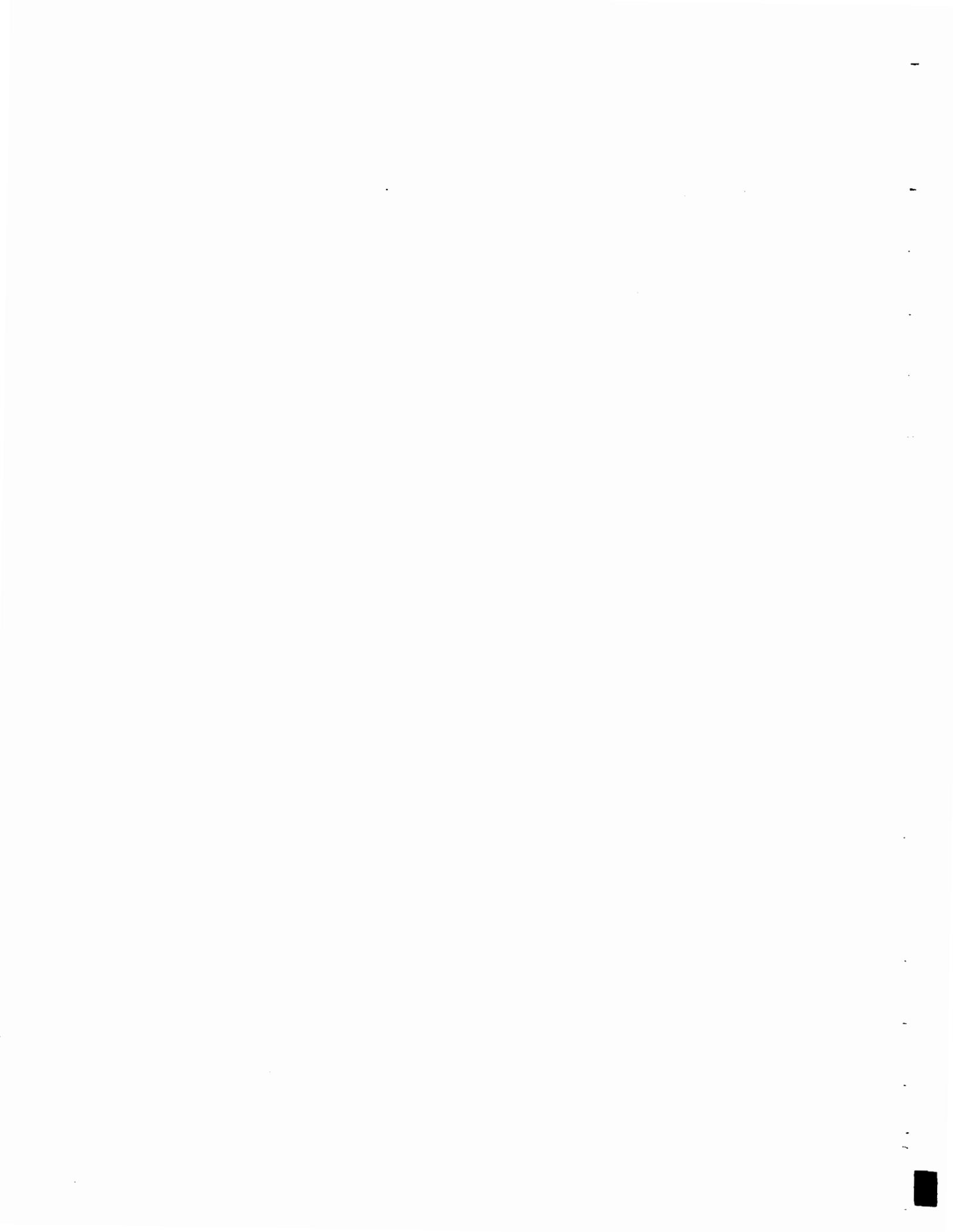
GRAPHICS BY GRUEN ASSOCIATES

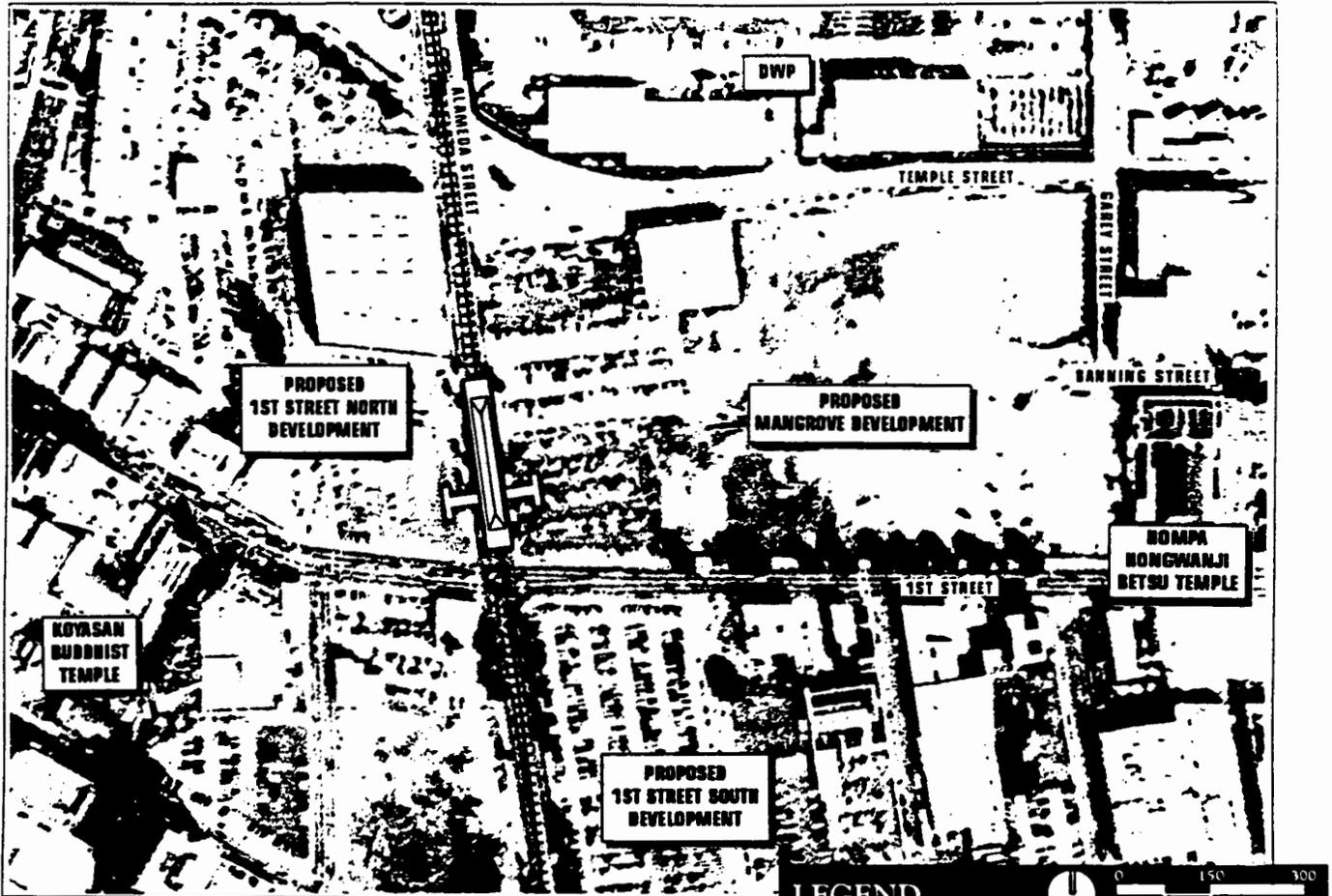


BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E10
Station Site Visual Survey
and Typical Guideway Elevation
4th and Alameda





1ST & ALAMEDA ALAMEDA STREET ALIGNMENT

Unlike the Bunker Hill alignment which approaches the 1st and Alameda intersection via Gary Street south and 1st Street west, the Alameda Street alignment alternative would travel north-south in the median of Alameda Street on an aerial guideway. As such, the 1st and Alameda Station would be an aerial configuration accessed by side-loading platforms from each side of the street (refer to typical station elevation for Alameda Street). The construction of ancillary stairway, escalator, and elevator facilities would require some property acquisitions or coordinated integration of the facilities as part of proposed development projects.

The design of the aerial guideway would need to be integrated with that of proposed new developments to avoid or minimize the creation of a visual barrier between the existing Little Tokyo west of Alameda and its natural expansion area to the east.

LEGEND

ALIGNMENTS

-  Metro Red Line
-  Metro Blue Line
-  Blue Line Connection Alignment Alternative

STATIONS AND PORTALS

-  At-Grade
-  Aerial
-  Subway
-  Proposed or Existing Portal
-  Optional Portal for Future Development

NOTE: Station/Portal Locations subject to change during the subsequent Route Refinement and EIR process, including possible integration with future adjacent developments

SOURCE: PACIFIC AEROGRAPHICS, January 1992.

GRAPHICS BY GRUEN ASSOCIATES



BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

METROPOLITAN TRANSPORTATION AUTHORITY

FIGURE V-E11
Station Area Site Context
1st & Alameda
Alameda Street Alignment

CAPITAL COST ESTIMATE

ALTERNATIVE E - ALAMEDA STREET

AERIAL

ITEM DESCRIPTION	ESTIMATED COST (1993 DOLLARS)
1. GUIDEWAY AND STRUCTURES	\$59,952,500
2. STATIONS	\$38,750,000
3. MAIN YARD AND SHOP	\$0
4. SYSTEMWIDE EQUIPMENT	\$27,722,300
5. VEHICLES	\$36,000,000
SUBTOTAL (A)	\$162,424,800 *
6. PRE-REVENUE OPERATION	\$4,060,620
7. OWNERS INSURANCE	\$12,993,984
8. MASTER AGREEMENTS	\$4,060,620
SUBTOTAL (B)	\$21,115,224
9. ART FOR TRANSIT	\$812,124
SUBTOTAL (C)	\$812,124
10. RIGHT-OF-WAY	\$1,315,056
SUBTOTAL (D)	\$1,315,056
11. PROFESSIONAL SERVICES	\$63,126,849
SUBTOTAL (E)	\$63,126,849
12. CONTINGENCY	
a. OF SUBTOTAL (A+B)	\$20,189,403
b. OF SUBTOTAL ITEM (D)	\$361,640
c. OF SUBTOTAL ITEM (E)	\$6,312,685
SUBTOTAL (F)	\$26,863,728
HAZARDOUS WASTE REMOVAL (ALLOWANCE)	\$65,753
GRAND TOTAL - 1993 DOLLARS	\$275,723,534

* See worksheet for detail.

Note: Capital cost estimates do not reflect any potential need for acquisition of additional Red Line cars which have been estimated up to \$115 million in capital outlay. However, estimates do reflect the difference in operating costs between alternatives.

WORKSHEET

DESCRIPTION	QUANTITY	UNIT PRICE	UNIT	TOTAL
<u>GUIDEWAY COSTS</u>				
Retained Guideway Station 14+00 to 16+00	850	\$2,750	RF	\$2,337,500
Guideway At-grade	3,300	\$1,800	RF	\$5,940,000
Aerial Guideway	11,150	\$4,500	RF	\$50,175,000
Relocate Off-ramp Including Traffic Control	1	\$1,500,000	LS	\$1,500,000
SUBTOTAL (GUIDEWAY COSTS)				\$59,952,500
<u>STATION COSTS</u>				
At-grade Station (3-car)			EA	\$0
Aerial Station (3-car)	4	\$6,500,000	EA	\$26,000,000
Subway Station (3-car)			EA	\$0
Traffic Control Improvement (Allow)	1	\$3,000,000	EA	\$3,000,000
Parking Spaces	1	\$9,750,000	EA	\$9,750,000
SUBTOTAL (STATION COSTS)				\$38,750,000
<u>MAINTENANCE FACILITY & YARD COSTS</u>				
Maintenance Facility			LS	\$0
SUBTOTAL (MAINTENANCE COSTS)				\$0
<u>VEHICLE COST</u>				
Light Rail Trains	15	\$2,400,000	EA	\$36,000,000
SUBTOTAL (VEHICLE COSTS)				\$36,000,000
<u>SYSTEM-WIDE EQUIPMENT COST</u>				
Trackwork	15,300	\$421	RF	\$6,441,300
Train Control Station (LRT)	4	\$160,000	EA	\$640,000
Train Control Guideway (LRT)	15,300	\$500	RF	\$7,650,000
Traction Power Station (LRT)	4	\$1,100,000	EA	\$4,400,000
Traction Power Guideway (LRT)	15,300	\$270	RF	\$4,131,000
Communications	15,300	\$200	RF	\$3,060,000
Fare Collection (LRT)	4	\$250,000	EA	\$1,000,000
Signage & Graphics	4	\$100,000	EA	\$400,000
SUBTOTAL (SYSTEM COSTS)				\$27,722,300
TOTAL ESTIMATED COST				\$162,424,800

ECONOMIC/MARKET ANALYSIS

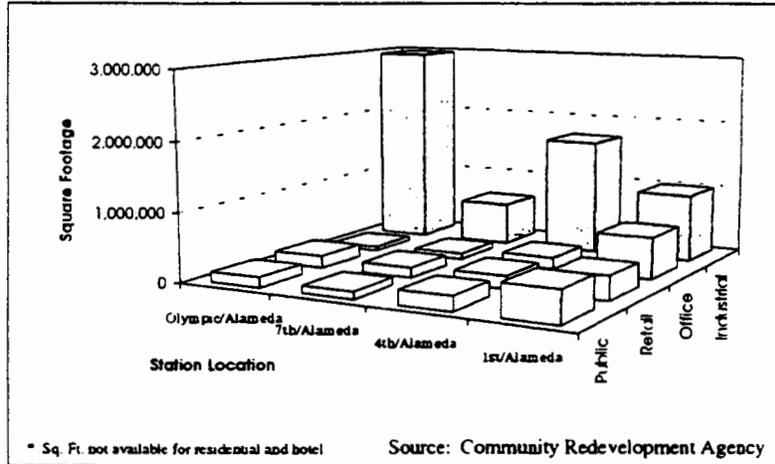
ALTERNATIVE E - ALAMEDA STREET

(Within 0.25 miles of proposed station)

Current Land Use

SIGNIFICANT NOTES:

- o Alternative E proposes station locations that serve primarily light industrial uses. Apparel is the largest sector.
- o Vacancy rates for industrial space are under 10%.
- o Lease rates range between \$0.60 and \$1.20 sq. ft. for industrial space.
- o Industrial land uses are going through a transition from large to small-scale users under 30,000 sq. ft.
- o The existing loft market is soft with lease rates between \$0.25 and \$1.00 sq. ft. This may provide an indicator for potential future users of the system.
- o Approximately 3,825 residential units and 1,457 hotel rooms are located in the vicinity of Alternative E.

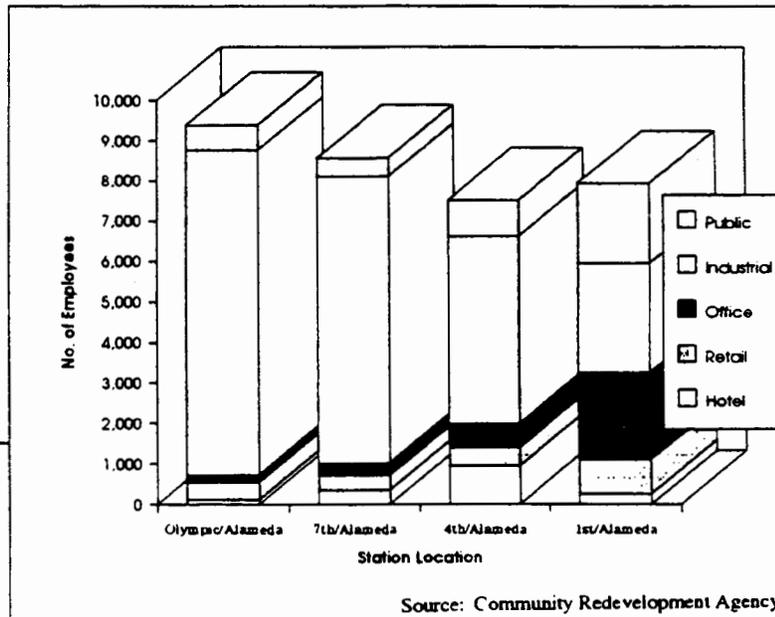


Station Location	Office	Retail	Industrial	Public
Olympic/Alameda	53,512	180,977	2,971,771	148,407
7th/Alameda	88,371	151,435	618,672	110,598
4th/Alameda	171,789	185,906	1,708,509	211,860
1st/Alameda	609,032	348,203	997,204	465,451

Current Employment

SIGNIFICANT NOTES:

- o Employment along Alternative D consists primarily of light industrial workers.
- o Employment surrounding the four proposed stations is over 33,000 workers. An estimated 80% live within five miles and the majority use mass transit.
- o S.E. Rycroft located at 7th/Alameda is moving to City of Industry resulting in a loss of approximately 800 jobs. Probable uses for the site include produce markets or wholesalers.
- o Based on proposed development, estimated employment includes an additional 13,175 jobs.



Station Loc.	Office	Retail	Industrial	Public	Hotel	Total
Olym./Almda	190	435	8,032	626	108	9,391
7th/Alameda	314	363	7,079	468	343	8,567
4th/Alameda	611	447	4,618	895	936	7,507
1st/Alameda	2,166	837	2,695	1,980	253	7,931
Total	3,281	2,082	22,424	3,969	1,640	33,396

Origin of Industrial Employees

Southeast
(within five miles)
80%



North West
20%

Source: Barro Planners

ECONOMIC/MARKET ANALYSIS

ALTERNATIVE E - ALAMEDA STREET

(Within 0.25 miles of proposed station)

Major Planned Projects

First Street North

(Alameda, 1st, Central, Temple)

- Office 785,000 s.f.
- Retail 95,000 s.f.
- Cultural 65,000 s.f.
- Housing 273 units
- Hotel 426 rooms

Alameda/Olympic

- Industrial 80,000 s.f.
- Restaurant 10,000 s.f.

First Street South

(SE Corner - Alameda & 1st)

- Office 389,000 s.f.
- Retail 215,000 s.f.
- Housing 640 units
- Hotel 400 rooms

Mangrove Estates

(NE Corner - Alameda & 1st)

- Office 495,000 s.f.
- Retail 234,000 s.f.
- Recreational 15,000 s.f.
- Housing 1,200 units
- Hotel 433 rooms

Sunshine Pacific

(Sunset & Alameda)

- Retail 185,000 s.f.
- Housing 296 units

LA Wholesale Apparel Mart

(Alameda/7th Street)

- Industrial 1,200,000 s.f.

Status:

- First Street North** - Waiting for City approval and financing. Construction expected to begin in 1994.
- LA Whisl Aprl Mrt** - Construction expected to begin in 1993 or 1994.
- Alameda/Olympic** - Construction expected to begin in late 1993.
- Mangrove Estates** - Completing EIR, with construction expected to begin in 1997.
- First Street South** - Completing EIR, with construction expected to begin in 1997.
- Sunshine Pacific** - Estimate of construction date not given.

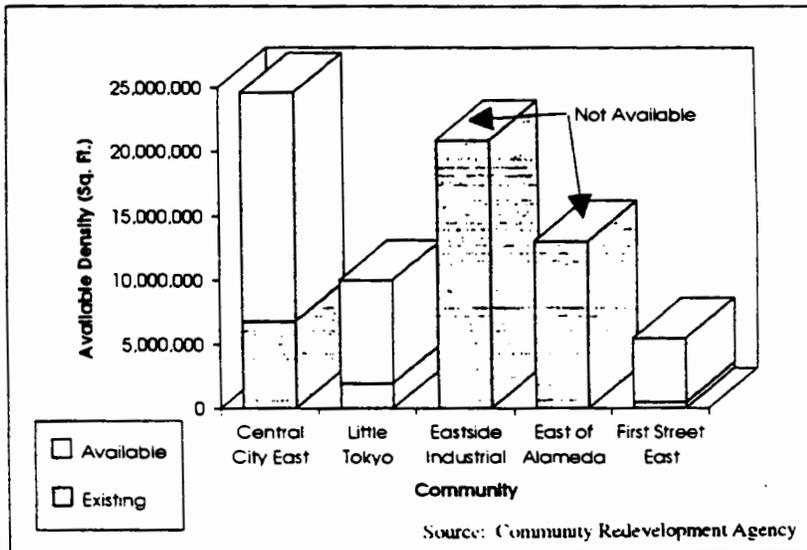
SIGNIFICANT NOTES:

Many of the business/real estate professionals interviewed stated that implementation of the Downtown Connector could contribute to a greater viability of future developments if a station were located nearby. In addition, for the major projects planned in Downtown, the LAUSD is recommending Primary Centers (defined as K-2 or K-3 grades) in the development projects.

Development Opportunities

SIGNIFICANT NOTES:

- o A number of vacant parcels and/or buildings along Alameda Street may provide incentive for development or rehabilitation to complement the proposed rail line.
- o Alternative E - Alameda Street has a number of vacant parcels and some under developed land that could be used for joint development opportunities. Mixed-use developments including: industrial, retail/wholesale, residential and hotel provide the best opportunity along Alameda Street.
- o Developing an "incubator" may be beneficial to the area: informal incubators already exist in specialties, such as garment, toys and electronics.
- o In the areas adjacent to Alameda Street, there is a stated lack of pedestrian-related amenities. The proposed Downtown Connector may increase pedestrian activity enough to support new development opportunities, such as a restaurant.
- o The import industry for toy and electronics is very strong in the area. The proposed Downtown Connector may enhance existing opportunities for growth in this industry.



Community	Existing Devlpmnt.	%	Available Density	%
Central City East	6,800,000	28%	17,800,000	72%
Little Tokyo	2,000,000	20%	8,000,000	80%
Eastside Industrial	20,898,269		N/A	
East of Alameda	13,065,011		N/A	
First Street East	500,000	9%	5,000,000	91%

Environmental Assessment

The following is a preliminary assessment of environmental impacts associated with **Alternative E - Alameda Street**. In the following matrix, short and long-term impacts are presented in key impact areas, such as land use, traffic and parking, noise and vibration, aesthetics, cultural resources, and business impacts. A subsequent Environmental Impact Report following this study will provide detailed analysis of anticipated impacts and proposed mitigation measures.

Short-Term Construction Impacts

Aerial Segments - Construction of an aerial structure along Alameda Street would cause a dramatic change in the aesthetics of the corridor both short term during construction and long term. The construction zone would require lane closures to provide an adequate work zone for workers and construction equipment in the center of the street. The heavy equipment would be needed to construct the viaduct structure resulting in increased right-of-way requirements and potentially more noise, air, dust and vibration impacts during construction. In each segment of the construction, a minimum of one lane in each direction would be maintained on Alameda Street. Two lanes would be maintained wherever possible. Alameda Street is currently designated as a "House Moving Corridor" which requires a 20' by 40' clearance. In addition, tractor trucks use the street as a trucking corridor. Therefore, truck traffic and business accessibility are potential impacts during construction due to the limited right-of-way available.

At-Grade Segments - Alternative E - Alameda Street is predominantly an aerial alignment, except at the southern end as it approaches the Santa Monica Freeway where it transitions down to an at-grade configuration to pass under the freeway. The construction impacts would be similar to the aerial impacts mentioned above. However, some property acquisition would be required just north of the freeway.

Another construction impact associated with all the alternatives, is construction of the aerial structure across the 101 Freeway for the connection to Union Station. A Traffic Management Plan will have to be prepared and approved by Caltrans identifying the construction procedures that will be employed to minimize impacts on the freeway.

Long-Term Impacts

Aerial Segments - Most of the right-of-way acquisitions required during construction would not be permanent long-term impacts. However, the columns supporting the viaduct structure would require some limited right-of-way requirements. In addition, a small amount of property would need to be acquired at the corner of each intersection for the straddle-bent structures, which allows tractor trucks to make left-turns without columns blocking the intersection, as well as at stations. These and other transportation impacts are discussed in greater detail in the following subsection. A dramatic change in the aesthetics of the area due to the aerial structure would also be a potentially significant impact. Business accessibility is another potential long-term impact due to the limited spacing between columns.

At-Grade Segments - Most of the property acquisition required for construction of the at-grade segment would become permanent. Loss of parking and pedestrian safety issues are also potential long-term impacts of the at-grade alignment north of the Santa Monica Freeway.

ENVIRONMENTAL ASSESSMENT

ALTERNATIVE E - ALAMEDA STREET

AERIAL

Segment/Station	Plan & Profile	Length	Type of Construction	Potential Impacts	Sensitive Receptors
Long Beach/Washington Intersection: Between Washington Boulevard and 16th Street	10+00 to 19+00	900 ft	Aerial/AI-grade	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Right-of-way acquisition - Vehicle traffic and parking - Visual - Station relocation 	None
Transition from Long Beach Boulevard to Alameda Street: Between 16th Street and corner of Olympic Boulevard and Alameda Street	20+00 to 40+00	2000 ft	Aerial/AI-grade	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Altered vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Lane closures - Right-of-way acquisition - Property acquisition - Visual 	None
Olympic & Alameda Station: Between Olympic Boulevard and Eighth Street	42+00 to 45+00	275 ft	Aerial	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Right-of-way acquisition - Business development - Increased pedestrian traffic - Visual 	None
7th & Alameda Station: Between Sixth and Seventh Streets	75+00 to 78+00	275 ft	Aerial	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Right-of-way acquisition - Business development - Increased pedestrian traffic - Visual 	None
4th & Alameda Station: Between Fourth and Third Streets	98+00 to 101+00	275 ft	Aerial	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Right-of-way acquisition - Business development - Increased pedestrian traffic - Visual 	None
1st & Alameda Station: Corner of First and Alameda Streets	119+00 to 122+00	275 ft	Aerial	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Increased truck traffic - Altered pedestrian and vehicle traffic - Altered business accessibility - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Right-of-way acquisition - Business development - Increased pedestrian and vehicle traffic - Visual 	Koyasan Buddhist Temple
Alameda/Commercial Curve: Corner of Alameda and Commercial Streets	135+00 to 137+00	200 ft	Aerial	<p><u>Short-Term/Construction Related:</u></p> <ul style="list-style-type: none"> - Altered pedestrian and vehicle traffic - Lane closures - Noise, air, dust, vibration - Visual <p><u>Long-Term:</u></p> <ul style="list-style-type: none"> - Property acquisition - Right-of-way acquisition - Visual - Noise, vibration 	None

Transportation Impacts

Traffic Impacts

With the Alameda Street aerial alignment and appropriate mitigation measures, there will only be minor impacts to vehicular traffic. Long Beach Avenue has one lane in each direction north of Washington Boulevard and is a low-volume street. Alameda Street has two lanes in each direction and a median left turn lane throughout the alignment. On-street parking is prohibited along Alameda Street except between 3rd and 4th Streets. The current ADT on Alameda Street varies between 28,000 and 30,000. It is designated as a Major Highway by the City of Los Angeles and will be widened to 80 feet in a 100 foot right-of-way to accommodate three lanes in each direction. This has already occurred in isolated sections where new development has provided dedications and frontage improvements. Trucks make up a large portion of the traffic on Alameda Street and it has been discussed as a potentially improved eastside truck access corridor for downtown. However, the City currently has no plans to improve Alameda Street to beyond a standard Major Highway.

The aerial viaduct will be supported by concrete columns, approximately seven to ten feet in diameter, and roughly 80 feet apart. Along Alameda Street, the viaduct is anticipated to run along the median of the street. Columns would support the aerial structure where possible, however, at major intersections where significant left turn storage is required, placement of a "bent" structure (on either side of a roadway) would be used. The placement of the columns on the median or placement of bents on either side of the roadway may require additional right-of-way. For most of the alignment, it will be possible to include the aerial viaduct within the 100-foot right-of-way and maintain the six-lane roadway and left turn lane through the use of narrower sidewalks and reduced lane widths. At station locations additional right-of-way will be required to accommodate the stairways, escalators and elevators required to access the station platforms. The proposed stations will include side platforms rather than center platforms, so pedestrians will access the stations from the sidewalks on either side of the street. It has not been determined whether an elevated pedestrian connection will be provided between the two sides of the platform or if pedestrian will cross Alameda Street at-grade to reach the other side of the station. These options will be further analyzed in the next (EIR) phase of this study.

Additional right-of-way may also be required between Olympic Boulevard and 8th Street, if the aerial viaduct is designed to accommodate continued train service to the Produce Market. The median lane on Alameda contains a single rail line which is still active to north of 8th Street. Train tracks are still in place north of there, all the way to Temple Street, but most of industries with sidings served by this rail line are no longer in operation. Several options are under consideration for this segment. One concept would maintain the train service underneath the aerial train structure with two sets of columns straddling the train tracks. The intention in designing this alternative is to maintain the planned Major Highway lane configurations the entire length of Alameda Street so the proposed light rail line would not negatively affect truck traffic operations along Alameda Street or on any of the east-west cross streets.

This downtown connector will facilitate the addition of several potential new rail lines through downtown utilizing the existing Blue Line corridor along Washington Boulevard and others continuing down Long Beach Avenue to Long Beach. This additional service will affect the intersection of Long Beach Avenue/Washington Boulevard, where the current right-angle turn junction will become a three-way junction to accommodate trains turning to/from Washington Boulevard onto the existing Blue Line and potentially the Alameda alignment. The preliminary operations plan indicates that a train could pass through this intersection once every 48 seconds (75 per hour) in both directions. To reduce the impacts of train operations on the signalized intersection, it has been proposed that the north-south train movements be grade separated using an aerial structure. This is easier than grade separating trains which are turning a corner. This will require the redesign and potential relocation of the Long Beach Avenue station, south of Washington Boulevard.

North of the San Bernardino Freeway, the alignment will cross 15th Street at-grade. The intersection of 15th Street/Long Beach Avenue is currently not signalized, so it will have to be redesigned and the train crossing incorporated into the signal.

Station Areas

The primary circulation issues associated with station areas are pedestrian access and integration with bus service. The parking demand at these stations will be negligible because these stations primarily serve as destinations for employees coming into downtown and for internal downtown trips.

There are three issues with regard to pedestrian circulation that need to be evaluated: locations where pedestrians cross the light rail tracks, locations where the project causes changes in pedestrian travel patterns and pedestrian access routes to the transit stations. Pedestrians will not cross the tracks at any of the stations. The stations at 1st Street/Alameda Street will serve the Little Tokyo area and several proposed new developments with a relatively high pedestrian volume. The station at 7th Street/Alameda Street will be in close proximity to the Greyhound Bus Terminal (long distance bus service) and provides opportunities for transfers between the two services. The station at Olympic Boulevard/Alameda Street serves the wholesale district and the produce market area with a large number of transit-oriented employees. Various measures and issues need to be analyzed during the route refinement phase such as appropriate pedestrian crossings for each station area. Pedestrian access to each station will be analyzed for items such as handicapped accessibility (access to platform via elevators) and the potential need for a mezzanine level to facilitate pedestrian crossings from one platform to the other. There is an abrupt shift in the nature of adjacent development and vehicular and pedestrian traffic as Alameda enters Little Tokyo north of 4th Street. This will need to be reflected in station area detailed design incorporated in the EIR.

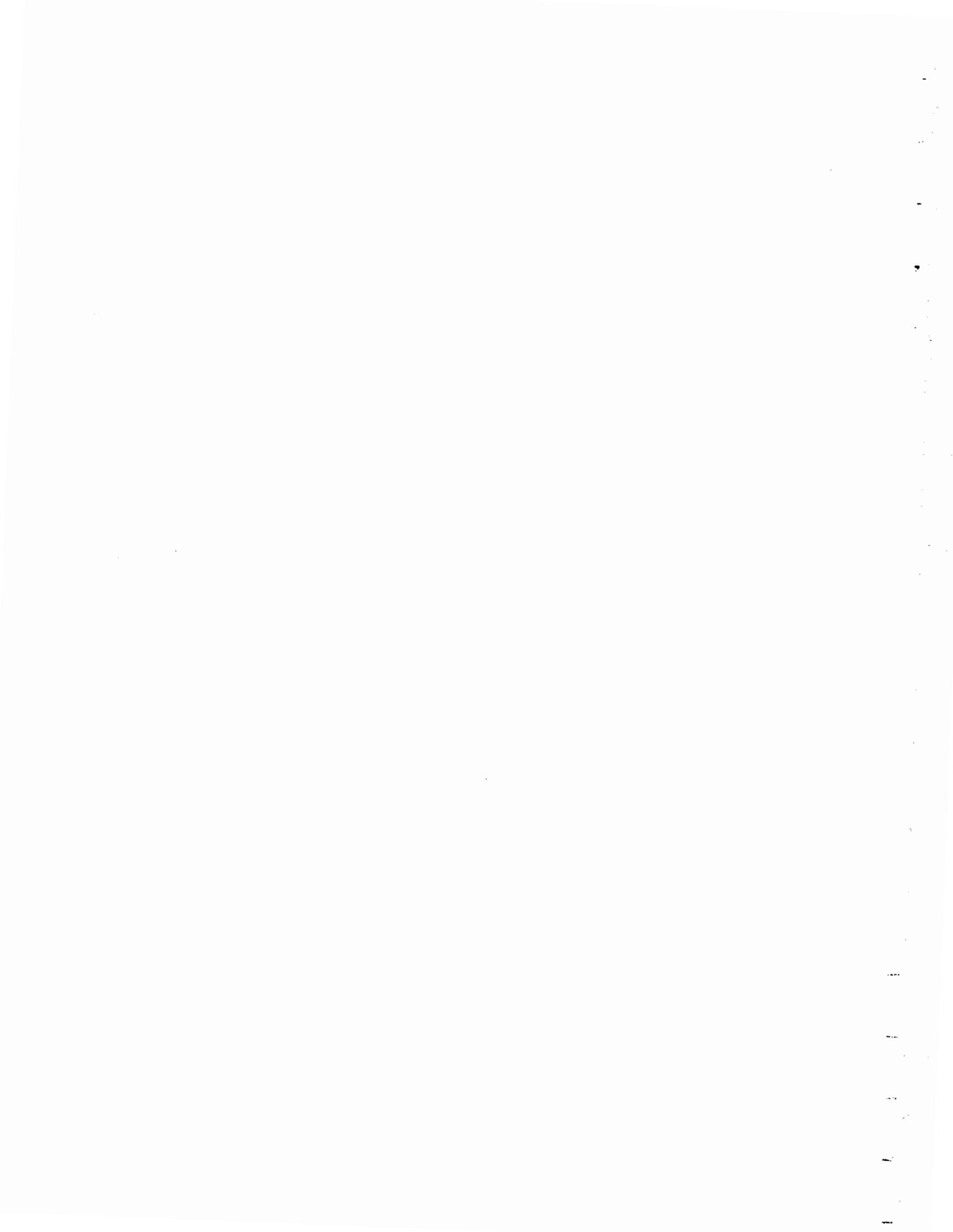
The bus service on Alameda Street is concentrated at the northern end of the corridor, closest to Union Station and the El Monte Transitway. South of 1st Street, there is limited bus service on Alameda Street itself, but there are numerous lines which cross Alameda providing connections to downtown and the eastside. Based on the refined locations of stations, pedestrian access routes should be analyzed and mitigation may be required.

Parking

Parking is not proposed at any of the stations by MTA. The primary modes of access at these stations will be walk-ins, bus transfer, kiss-and-ride (drop offs), or parking in public parking lots. There are only a few on-street parking spaces along Alameda Street (15) and these would be displaced. Parking may also be affected along Long Beach Avenue from south of 15th Street to north of 14th Street, to accommodate the trains and maintain two travel lanes. This would result in the displacement of about 45 on-street parking spaces. Replacement parking could potentially be provided on the right-of-way required to make the transition from Long Beach Avenue to Alameda Street.

Driveway Access Issues

The aerial viaduct will affect driveway access along Alameda Street where a number of warehouses and distribution centers could be affected. Access will be limited to right-in/right-out movements where there are columns in the median. Passenger cars will be able to turn around at signalized intersections, however, trucks may need to circulate around the block to reach their destinations. There are several land uses with major driveways that may require special design treatments to preserve full access. These include the MTA (former RTD) bus maintenance facility, a warehouse between 4th and 5th Streets and the Yaohan Plaza parking structure north of 4th Street. Column spacing may need to be modified to provide room for a left-turn pocket. These locations can be analyzed in further detail in the EIR.



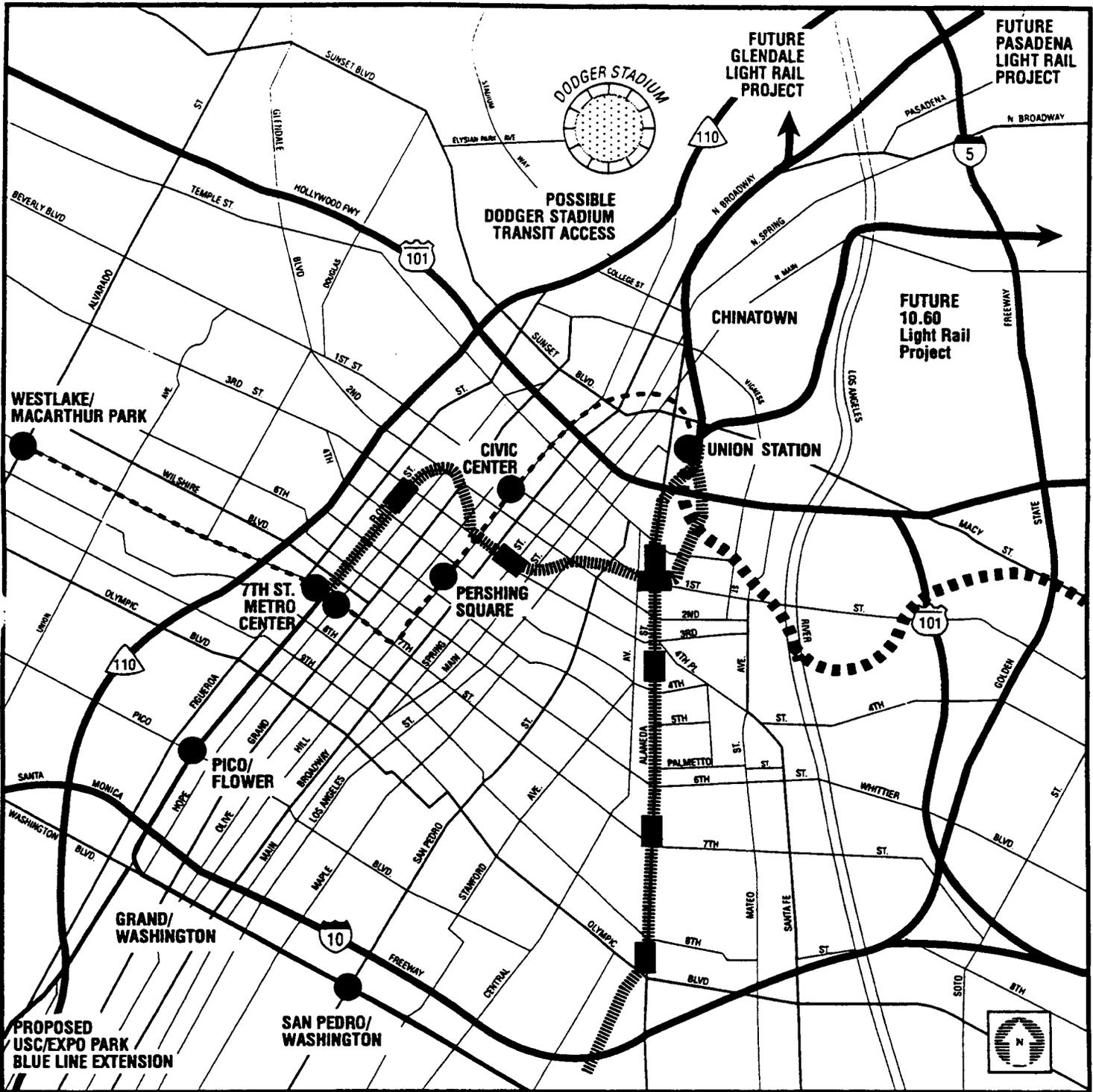
ALTERNATIVE F A Dual Connector

The near term goal of this project is to provide an efficient and cost effective connection between the existing Long Beach Line and the proposed Pasadena Blue Line. However, this connection will have far reaching repercussions for the entire regional system over the next 30 years. Preliminary operational analysis identified potential operations and planning benefits to a two connector option serving the Downtown area. Therefore, the possibility of building a "dual" connector was explored. This idea is to create a system through Downtown which would, in fact, allow for the simultaneous operation of two Downtown Connection alternatives. This would include two separate sets of light rail tracks in distinct segments of Downtown Los Angeles. Even if a dual light rail connector is not initially fundable, prudent design dictates that the issue be examined, such that the design for a single connector not preclude later development of a dual connector. While a complete analysis of the operation and feasibility of a dual connector was not completed within the scope of this study, the following considerations are presented for further discussion:

Support for the Downtown Area - The dual connector would most strongly support the redevelopment and revitalization efforts in the Downtown Area. The Downtown Strategic Plan supports the concept of two rail lines serving both the Bunker Hill area and the Central City East communities. An additional advantage in the dual connector concept is that downtown circulation would be greatly improved.

Patronage/Operational Considerations - Perhaps the strongest rationale for building a dual connector is to accommodate light rail trains entering (and leaving) Downtown Los Angeles from (to) peripheral destinations. According to MTA's 30-Year Integrated Transportation Plan, Los Angeles' light rail system will consist of a number of branches from distinct locations outside Downtown Los Angeles. These include the Exposition/Santa Monica Line, the Burbank/Glendale Line, the 10/60 Corridor Line, Crenshaw Line, and the Pasadena Line. While the immediate function of the Downtown Connection is to connect the existing Long Beach Line to the Pasadena Line (which has already been approved for construction), these additional branches will place an operational strain on the downtown light rail trunk. A preliminary analysis of the patronage and operations of a dual connector is included in THE OPERATIONS PLANS & PATRONAGE ANALYSIS section of this chapter. (For discussion purposes, the dual connector operations assumes a combination of an unspecified Bunker Hill alternative with the Alameda Street alternative.)

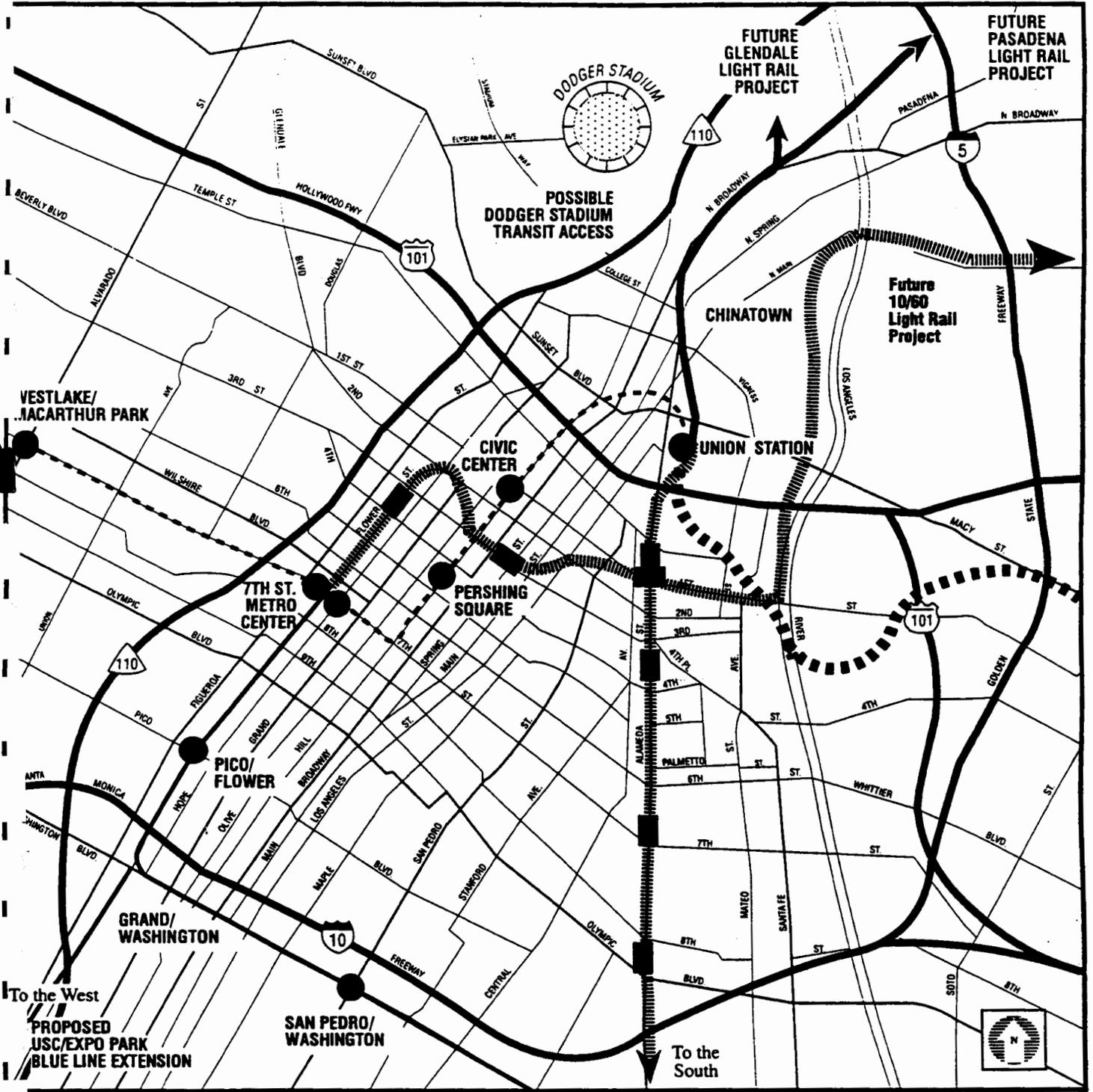
Joint Station: First and Alameda - To minimize the number of transfers, alleviate potential transfer congestion at Union Station and achieve an efficient operating system, a joint station location is suggested for the dual connector at the intersection First and Alameda. This would allow riders to transfer from one segment of the light rail system to another at one location. (see Figures V-F1, V-F2 showing two variations of this concept, and V-F3 showing an aerial of 1st/Alameda showing a concept of station layouts.) As presented in Figure V-F1, this would also imply that both connectors would pass through Union Station. *In order to maintain operating efficiencies, two sets of tracks (four tracks, bi-directional) would need to pass through and*



**BLUE LINE CONNECTION
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**Example Shared Northern Terminus
3rd Street/Alameda
Dual Connector
ALTERNATIVE F
Figure V-F1**

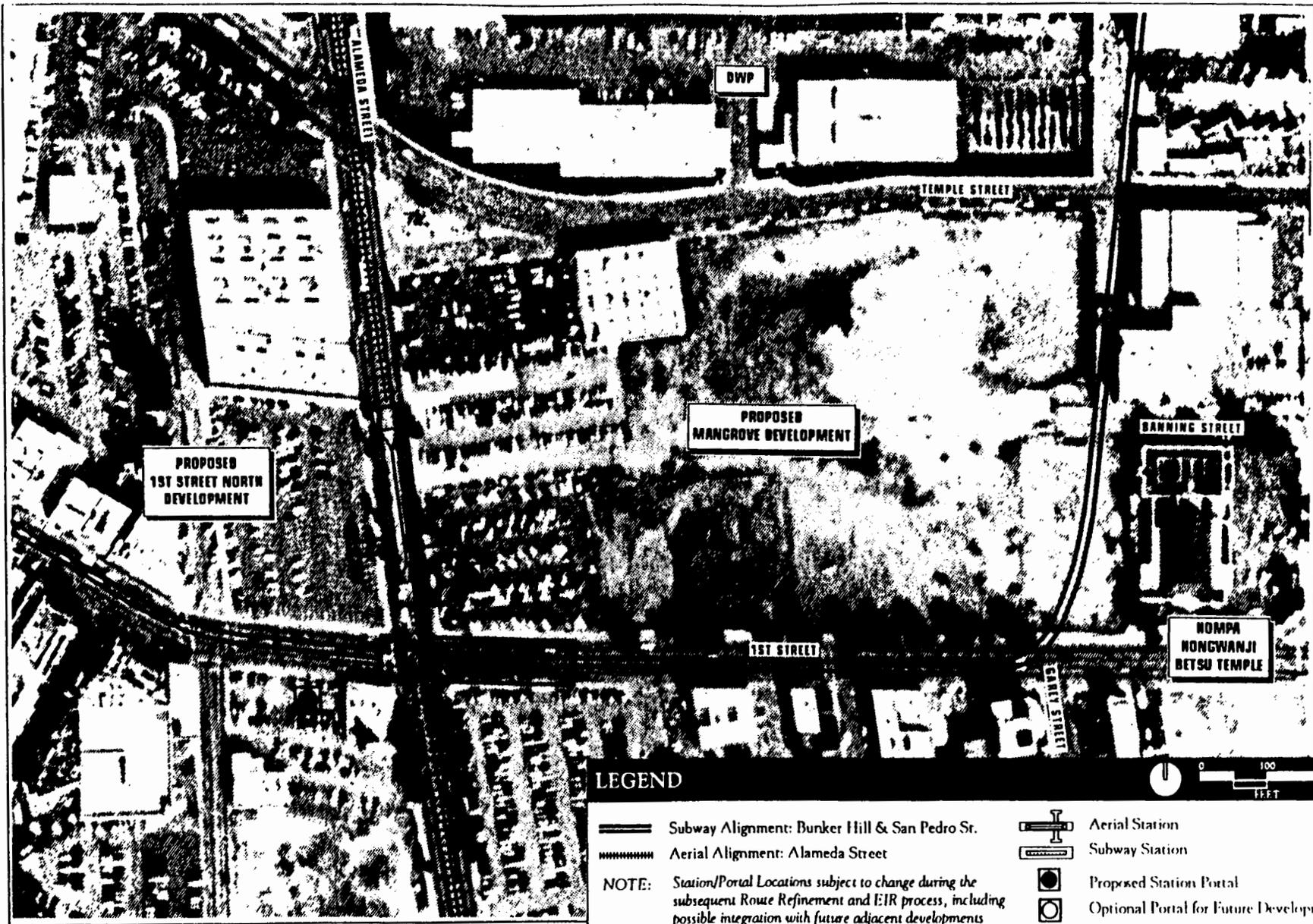
- Metro Red Line
- ▣▣▣▣ Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ▨▨▨▨ Downtown Connector Alternative



BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY
METROPOLITAN TRANSPORTATION AUTHORITY

**Example Northern Terminus Dual
 3rd Street/Alameda
 Dual Connector**
 ALTERNATIVE F
 Figure V-F2

- Metro Red Line
- ▬▬▬ Metro Red Line Eastern Extension Alternatives
- Metro Blue Line, Long Beach and Pasadena Segments
- ▨▨▨▨ Downtown Connector Alternative



SOURCE: PACIFIC AEROGRAPHICS, January 1992

GRAPHICS BY GRUEN ASSOCIATES



**BLUE LINE CONNECTION
PRELIMINARY PLANNING STUDY**

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FIGURE V-43
Dual Connector Alignments
@ 1st and Alameda Station Area

continue from Union Station. The two connectors could not share common tracks at Union Station; otherwise this would create a bottleneck in rail transit service at this point. Figure V-F2 shows a variation on the basic dual connector concept in which the joint First and Alameda Station is an even more crucial design element. In Figure V-F2 both connectors cross at First and Alameda, but only one pair of tracks continues to Union Station, the other proceeds directly to one or more peripheral light rail lines. In this variation, the joint First and Alameda Station is essential to allow direct trips to and from Union Station by those passengers on the Downtown Connector route not directly serving Union Station.

Operating and Capital Costs - Cost considerations for any rail alignment is a significant factor. A dual connector would require additional funding compared to building and operating a single connector. Anticipated operating costs for a dual connector are included in Appendix D. Capital costs for the alignment are estimated to be the individual capital cost of a Bunker Hill alternative combined with the Alameda alternative, *plus* some additional costs for likely engineering and design requirements at the joint station location. Since the three Bunker Hill capital cost estimates range from \$512 million to \$550 million and the Alameda Street capital cost estimate is \$215 million, a dual connector capital cost estimate is likely to be over the range of \$727 million to \$765 million (1993 dollars).

Dual Connector Route Options

A Dual Connector would logically consist of a combination of two of the preceding Alternatives (A through E), one from the West side of Downtown (Alternatives A, B or C) and one from the East Side (Alternatives D or E). There are no overriding technical reasons requiring one of the two Connectors to be built first.

Dual Connector Combinations

All three Bunker Hill Options could be paired with either of the central city east options as dual connectors. For example the Alternative C could be paired with Alternative D or Alternative E. The selection of which Bunker Hill Alternative would be paired with one of the eastern options would be determined by the alternative which best meets the transportation and revitalization goals for the area. Since both the Bunker Hill station and the little Tokyo Stations are the same in these alternatives, the determining factor would be where middle station would be placed.

Alternative D as part of a Dual Connector would have the most operational and traffic impacts on the Blue Line system. The transition from Washington Boulevard to San Pedro Street would cause serious operational and traffic impacts since this intersection would be very difficult to grade separate.

Patronage and Operational Analysis

The patronage and operational analysis and resulting conclusions for the dual connector are discussed in the Operations and Patronage section following this section.

Environmental Assessment and Traffic Impacts

These factors would be a combination of the impacts of the two Alternatives chosen and have been analyzed earlier in this chapter under the individual Alternatives A through E. Further evaluations of the environmental impacts would be conducted in the Route Refinement/Environmental Impact Phase of the project.

Economic Benefits

While these factors have been analyzed earlier in this Chapter under the individual Alternatives, it is at least possible that the combined benefit of both might be larger than the sum of the two, due to enhanced economic interaction between both of the rail served areas within the Downtown.

Some additional questions regarding a dual connector include:

- Under what conditions and timeframe will a dual connector be necessary? This question is heavily related to the timing of the construction of those Candidate Corridors which are constructed as light rail.
- What are the physical planning implications of providing for a future dual connector scenario? For example, land use policy for the vicinity of First and Alameda; possible partial grade separations at San Pedro/Washington and Alameda/Washington, etc.

ANALYSIS OF RIDERSHIP AND OPERATIONS (Alternatives A-F)

Rail operating plans were developed for each of the three basic variations of the final set of alternatives. These include **Alternative A-C** (all three Bunker Hill alternatives grouped together), **Alternative D San Pedro Street**, and **Alternative E Alameda Street**. In addition, an operating plan was developed for **Alternative F Dual Connector**. These operating plans were used as input to the patronage forecasting process. After the forecasts were produced (by MTA), the operating plans were used to estimate operating costs. This analysis presents the operating plans, the results of the patronage forecasts, and the corresponding operating and maintenance cost estimates.

Operating Plans

For each alternative alignment, two schematic diagrams of the peak period operating plans for the basic Blue Line Connector alternatives are presented. (Figures V-1 through V-6, and V-10 for the Dual Connector.) The first diagram shows the entire Blue Line system and indicates the terminal points and routing of each train service in the peak period. The second diagram shows the train routings through downtown Los Angeles.

As shown in the diagrams, for **Alternative A-C Bunker Hill**, four train routes would be operating through the Downtown Connector:

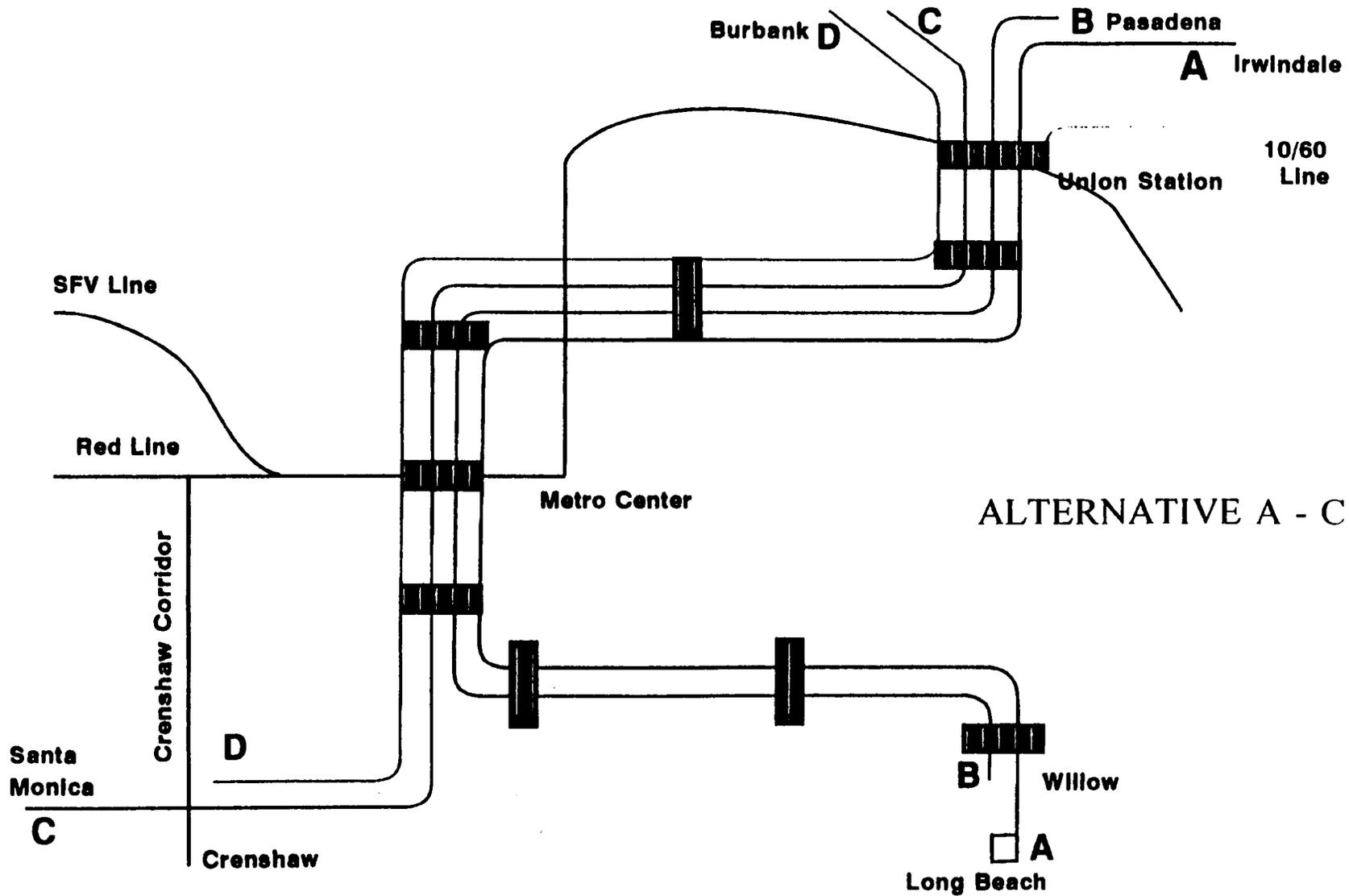
- Long Beach to Irwindale
- Willow to Del Mar
- Santa Monica to Burbank
- Crenshaw to Burbank

Each of the train routes would provide eight-minute service in the peak period, so that the combined headway through the connector would be at the limit of its capacity (two minutes). The turnback of trains short of the ends of the line (at Willow on the Long Beach Line, Del Mar on the Pasadena Line, and Crenshaw Station on the Exposition Line) was assumed in order to tailor the service to the anticipated demand, and thus reduce operating costs. In addition, these turnbacks provide for shorter train routes to improve service reliability.

For **Alternatives D San Pedro and E Alameda**, six train services would be operating in the peak period, each at eight minutes:

- Willow to Del Mar
- Long Beach to 7th/Flower
- Crenshaw to Burbank
- Santa Monica to 7th/Flower
- Burbank to 9th Street (at San Pedro or Alameda)
- Irwindale to 9th Street (at San Pedro or Alameda)

The more complex operating pattern of **Alternatives D and E** is dictated by the need to provide service from the south of downtown to two different sets of destinations: (1) Flower Street and (2) the stations on either the Alameda or San Pedro alignment to Union Station. Thus, the four train services from south of downtown (two from Long Beach and two from the Expo Line) are split between the two downtown routings. The two trains from the south which operate through to Union Station continue on the Pasadena and Glendale Branches.

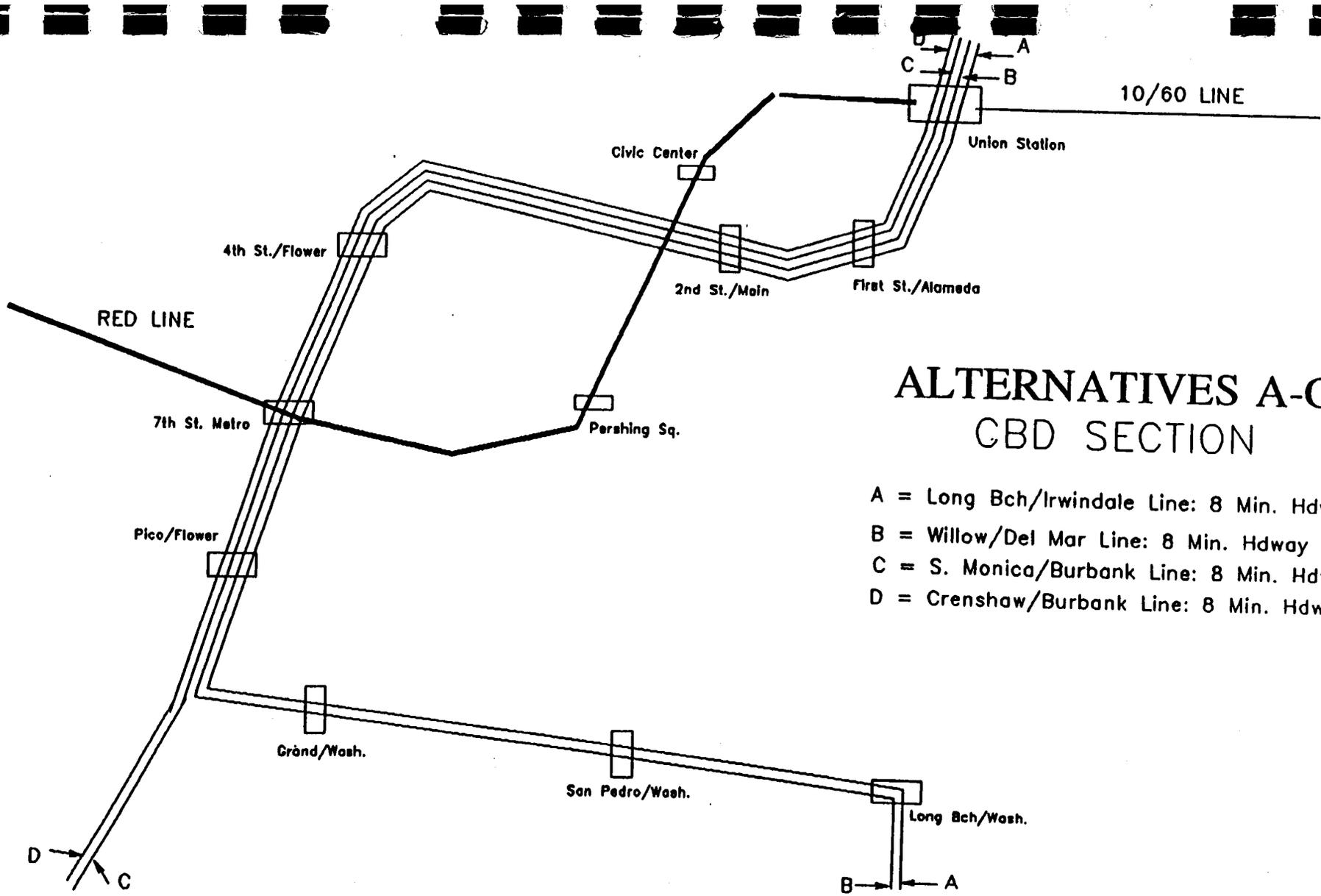


ALTERNATIVE A - C



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FIGURE V-1
Peak Period Operating Plan, Regional System
Alternative A - C



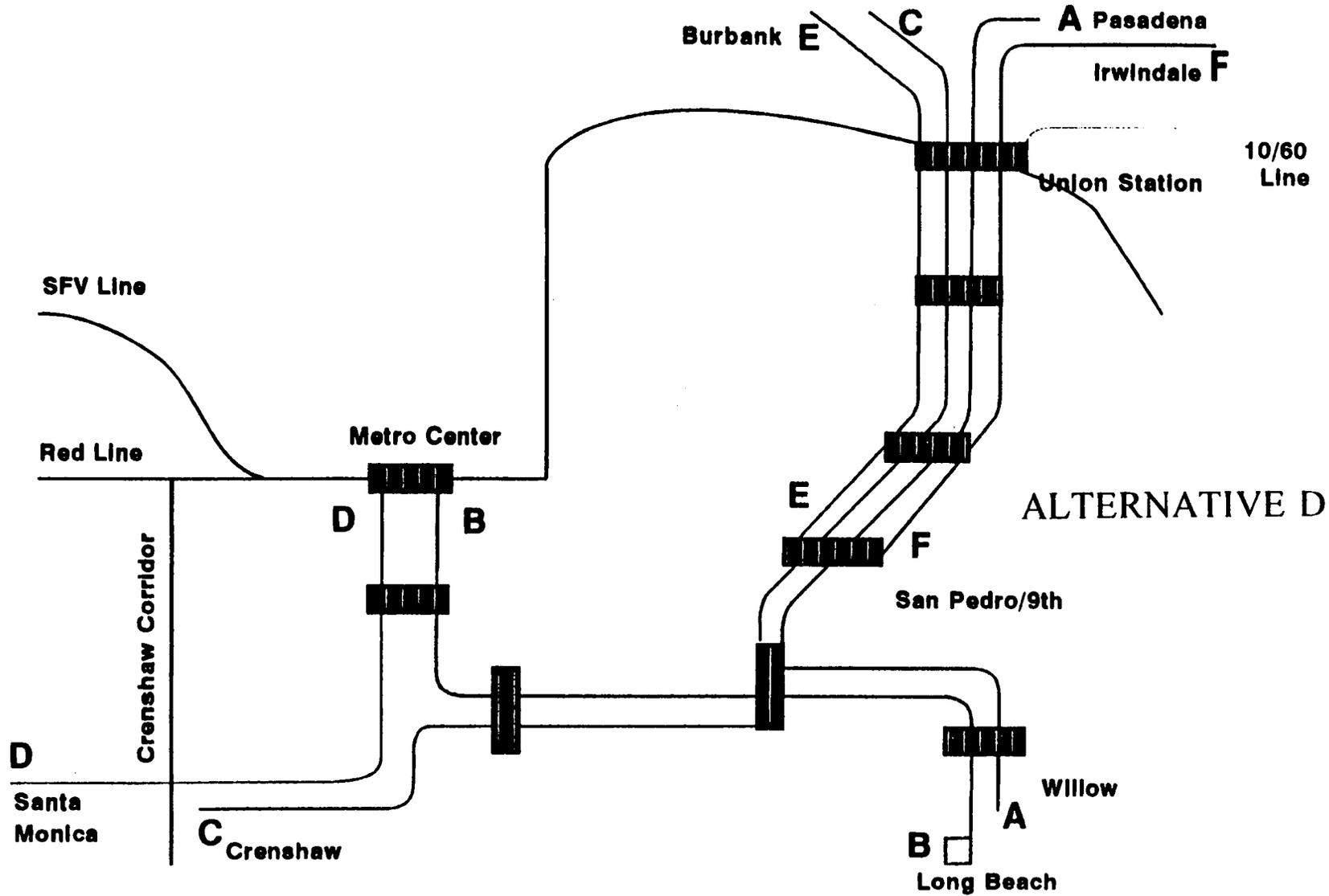
ALTERNATIVES A-C CBD SECTION

- A = Long Bch/Irwindale Line: 8 Min. Hdway
- B = Willow/Del Mar Line: 8 Min. Hdway
- C = S. Monica/Burbank Line: 8 Min. Hdway
- D = Crenshaw/Burbank Line: 8 Min. Hdway



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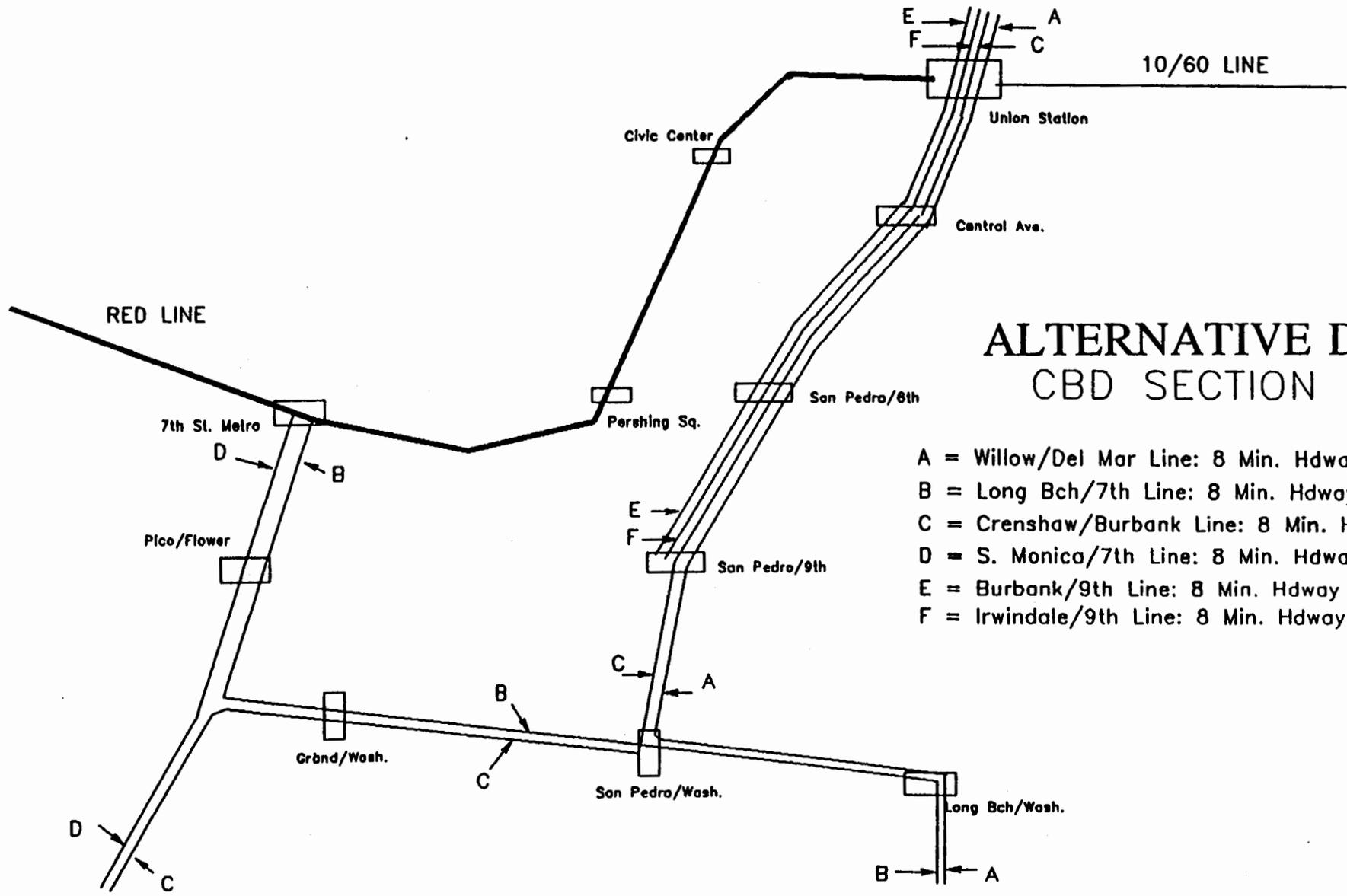
FIGURE V-2
Peak Period Operating Plan, Downtown Section
Alternative A-C



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**FIGURE V-3
Peak Period Operating Plan, Regional System
Alternative D**



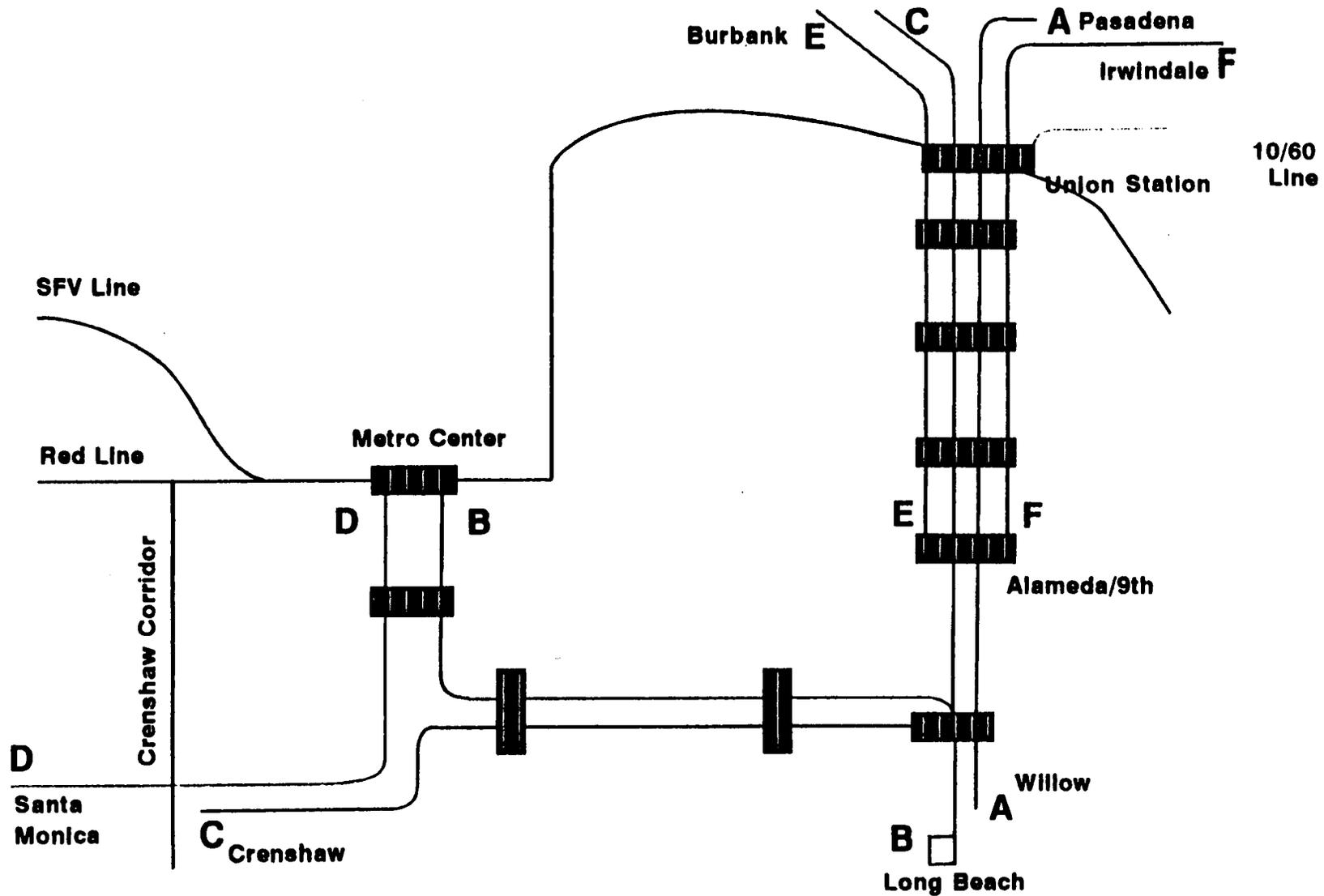
ALTERNATIVE D CBD SECTION

- A = Willow/Del Mar Line: 8 Min. Hdway
- B = Long Bch/7th Line: 8 Min. Hdway
- C = Crenshaw/Burbank Line: 8 Min. Hdway
- D = S. Monica/7th Line: 8 Min. Hdway
- E = Burbank/9th Line: 8 Min. Hdway
- F = Irwindale/9th Line: 8 Min. Hdway



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FIGURE V-4
Peak Period Operating Plan, Downtown Section
Alternative D



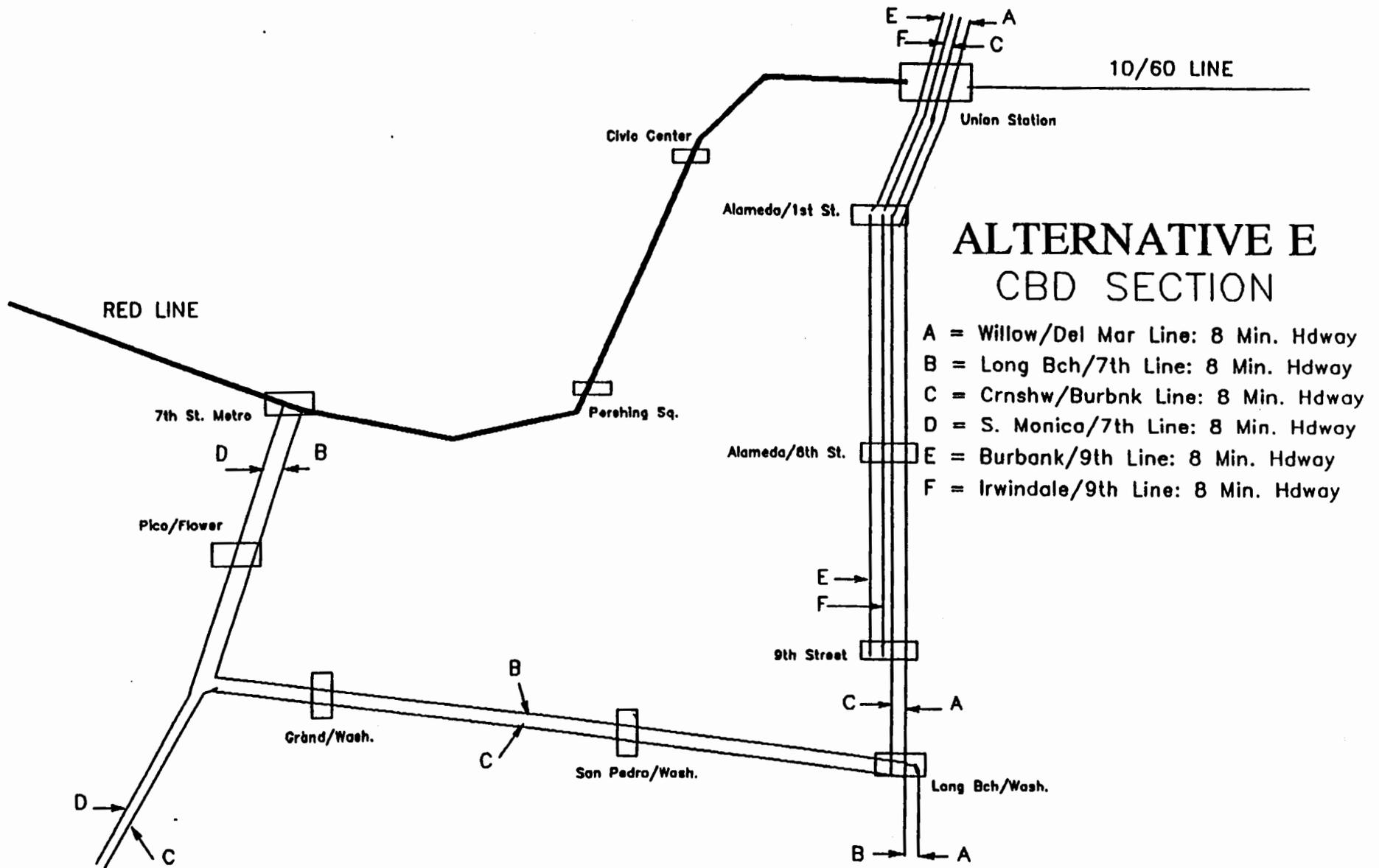
ALTERNATIVE E



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FIGURE V-5
Peak Period Operating Plan, Regional System
Alternative E



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FIGURE V-6
Peak Period Operating Plan, Downtown Section
Alternative E

Blue Line Connection Preliminary Planning Study

Two additional sets of trains are required to provide sufficient capacity to serve the Burbank and Pasadena lines. Since these trains are not needed to provide capacity on the lines south of downtown, these two train services from the north of downtown were assumed to turn back at the 9th Street Station on the San Pedro or Alameda alignment. This would also avoid running too many trains through the at-grade intersections with the existing Blue Line on Washington Boulevard.

Table V-1 contains operating plans for Alternatives A-C, D, and E, it shows the headways and train consists (length) by period of the day for each train service. Table V-1 also lists the vehicle requirements and annual operating statistics (car-miles and train-hours). The right-hand section of the table presents the projected ridership (peak hour, peak direction) at the maximum load points on each train route. The load factor compares the ridership to the seated capacity; e.g. a load factor of 2.0 means that there are 76 seated passengers plus 76 standing passengers.

Alternative D (due in part to the slower times with at-grade operation along San Pedro compared to the Bunker Hill subway) would require five more rail cars than A-C. Alternative E would require three more rail cars than Alternative A-C. Based on current Los Angeles rail car prices (1993), each additional car would cost about \$3 million. Relative to Alternative A-C, this would translate in an additional capital (vehicle) cost of \$15 million for Alternative D and \$9 million more for Alternative E.

Alternatives D and E would require slightly fewer car-miles than Alternative A-C, but more train-hours. The Blue Line operating costs for Alternatives A-C, D, and E are about the same: \$144 million annually. However, Alternatives D and E significantly affect Red Line operations, as discussed in more detail later in this section. Relative to Alternative A-C, Alternatives D and E would increase operating costs for the Red Line by \$3 million per year and would require as many as 38 additional vehicles in the Red Line fleet.

Other Operating Options

It is of importance to note that all three basic alternatives for the Downtown Connector could be operated differently than assumed in this study for estimating ridership, fleet vehicle requirements and operating costs. The scope of this study did not permit exploring the full range of operating options that may be possible, but other options may decrease operating costs, reduce vehicle requirements, improve connectivity (and therefore ridership) and, accordingly increase cost effectiveness.

For example, the off-peak train operating patterns of all three alternatives were assumed to be the same as during the peak, but with the headway for each train service lengthened by 50%, e.g., eight minutes to 12 minutes. This approach was used to avoid biasing the ridership forecasting process. In actuality, however, some of the train services that turn back short of the outer terminals could be discontinued during off-peak periods.

Specifically in Alternative A-C, the Willow-Del Mar and Crenshaw-Burbank services could be discontinued in the off-peak hours, while the remaining services operate every 10 minutes. This off-peak service pattern would appreciably reduce car-miles and train-hours, and accordingly the operating costs of Alternative A-C would be reduced by \$15 million per year, from \$144 million to about \$129 million. Although not tested through the forecasting model, this pattern would probably reduce off-peak ridership only slightly. This is because, while frequency in the inner line segments would decrease from six to 10 minutes, service in the outer line segments would be increased from 12 to 10 minutes.

Similar or other approaches could be applied and tested (in a follow-up study) to reduce operating costs for Alternatives D and E. However, the approach discussed above for Alternative A-C may not work as well for D and E, or produce comparable savings in operating costs. For example, if the Willow-Del Mar and Crenshaw

Line	From	To	Run Time (min.)	Distance (miles)	Headway			Train Const			Vehicles		Annual Oper. Statistics		Patronage & Loading		
					Peak	Base	E/L	Peak	Base	E/L	Peak	Total	Car-Mi. (million)	Tr-Hrs. (thous.)	Pk.Hr. MLP	Load Factor	Max. Load Point Location
Alternative A-C - Bunker Hill																	
A	Long Beach	Irwindale	109.2	46.1	8.0	12.0	12.0	2.0	2	1	60	6.47	161.3	1,750	1.54	LB/LA NB @ Wash.	
B	Willow	Del Mar	70.1	29.8	8.0	12.0	12.0	2.0	2	1	40	4.18	105.6	2,350	2.06	Irwindale>Chinatown	
C	Santa Monica	Burbank	66.9	31.2	8.0	12.0	12.0	2.0	2	1	38	4.39	104.1	1,700	1.49	LB/LA NB @ Wash.	
D	Crenshaw	Burbank	48.1	21.5	8.0	12.0	12.0	2.0	2	1	28	3.02	73.4	1,850	1.62	SB @ Chinatown	
Total/Average:					2.0	3.0	3.0				168	199	18.08	444.3	2,350	2.06	S.Monica > Flower
											2,000	1.75	Burbank>Chinatown				
											1,900	1.67	Crenshaw > Flower				
											2,000	1.75	Burbank>Chinatown				
											5,550	1.22	SB @ First St. (4 lines)				
Alternative D - San Pedro																	
B	Long Beach	7th/Flower	57.0	21.3	8.0	12.0	12.0	2.0	2	1	32	2.99	88.0	1,350	1.18	LB/LA NB @ Wash.	
A	Willow	Del Mar	65.7	28.1	8.0	12.0	12.0	2.0	2	1	36	3.95	96.8	1,400	1.23	LB/LA NB @ Wash.	
F	San Pedro/9th	Irwindale	55.1	24.5	8.0	12.0	12.0	2.0	2	1	32	3.45	82.2	1,900	1.67	SB @ Chinatown	
D	Santa Monica	7th/Flower	34.0	15.4	8.0	12.0	12.0	2.0	2	1	20	2.16	55.7	2,100	1.84	Irwindale>Chinatown	
C	Crenshaw	Burbank	53.7	21.8	8.0	12.0	12.0	2.0	2	1	30	3.06	80.7	1,900	1.67	S.Monica > Flower	
E	San Pedro/9th	Burbank	35.8	15.6	8.0	12.0	12.0	2.0	2	1	20	2.19	55.7	300	0.26	Crenshaw > Flower	
Total/Average: along San Pedro:					2.0	3.0	3.0				170	204	17.80	458.8	1,950	1.71	Burbank>Chinatown
along Flower St:					4.0	6.0	6.0						2,450	0.54	SB @ First St. (4 lines)		
Alternative E - Alameda																	
B	Long Beach	7th/Flower	57.0	21.3	8.0	12.0	12.0	2.0	2	1	32	2.99	88.0	1,350	1.18	LB/LA NB @ Wash.	
A	Willow	Del Mar	58.9	27.1	8.0	12.0	12.0	2.0	2	1	34	3.81	89.5	1,400	1.23	LB/LA NB @ Wash.	
F	Alameda/9th	Irwindale	52.3	24.7	8.0	12.0	12.0	2.0	2	1	30	3.47	80.7	1,900	1.67	SB @ Chinatown	
D	Santa Monica	7th/Flower	34.0	15.4	8.0	12.0	12.0	2.0	2	1	20	2.16	55.7	2,100	1.84	Irwindale>Chinatown	
C	Crenshaw	Burbank	54.9	22.6	8.0	12.0	12.0	2.0	2	1	32	3.18	82.2	1,950	1.71	S.Monica > Flower	
E	Alameda/9th	Burbank	33.0	15.7	8.0	12.0	12.0	2.0	2	1	20	2.21	55.7	100	0.09	Crenshaw > Flower	
Total/Average: along Alameda:					2.0	3.0	3.0				168	202	17.83	451.6	1,900	1.67	Burbank>Chinatown
along Flower St:					4.0	6.0	6.0						2,100	0.46	SB @ First St. (4 lines)		

Prepared by: Manuel Padron & Associates

NOTES:

- 2010 patronage estimates by LACMTA 5/93; network includes Crenshaw & 10/60 Corridor lines.
- Spare vehicles



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TABLE V-1
Blue Line Operating Plans

Burbank services were discontinued off-peak in **Alternative D**, there would be no off-peak service from the south or west of downtown to the San Pedro or Alameda corridor and Union Station. Other routing combinations are possible, but passengers from the Long Beach and Exposition corridors would have to transfer to reach one of the two sets of downtown destinations.

In the peak period, the connectivity provided by the three basic alternatives could be improved with minor modifications to offer additional no-transfer service and/or improved frequency in certain segments of the Blue Line system. For example, in **Alternative A-C**, both sets of trains from the Long Beach Line were assumed to operate through to the Pasadena Line, while both Expo trains were linked to Glendale-Burbank. We tested a different peak period operating plan for this alternative in which one set of trains from the Long Beach Line would run to Burbank and the other to Pasadena (Del Mar). Similarly, one set of trains from the Exposition Line would run to Burbank and the other to Pasadena (Irwindale). This improves opportunities for travel without transfers from the southern to the northern branches of the Blue Line system and accordingly this operating pattern would increase linked trips in the peak period by about 2%. Annual operating costs for the Blue Line system would be the same with this train service pattern as reported above for **Alternative A-C** (\$144 million).

Similar changes in the train operating pattern could be tested (in future studies) for Alternatives D and E. One such modification would be to continue the Pasadena and Burbank trains (turned back at 9th Street in **Alternatives D and E**) to 7th/Flower and/or another location (e.g., on the Exposition Line). This would improve through-downtown linkages, since the 9th Street Station on either the Alameda or San Pedro Corridor is not a primary trip destination point.

Travel Times

Running times for each downtown alignment were estimated in March 1993, using preliminary alignment sketches. These times were used for coding the networks used for ridership forecasting. After conceptual engineering was completed, the running times were re-estimated, using detailed assumptions concerning curve radii, etc. The resulting times are generally slower than those used for the ridership forecasts. The major change occurred just south of Union Station, where the more circuitous alignment and very slow curves (15 mph) added time to all three alignments. **Alternative A-C** (2nd Street alignment) would have a running time of 7.3 minutes from Union Station to 7th/Flower, compared to 6.1 minutes estimated earlier. **Alternative D** (San Pedro) would take 12.9 minutes from Union Station to Washington Blvd. (up from 10.9). The biggest change was the Alameda alignment (**Alternative E**). Here the time increased from 6.6 minutes to 10.1 due to a number of factors, including: very tight curves near Union Station and the at-grade configuration at the southern end, plus the addition of one more station.

The new run times were used to calculate travel times for several representative trips, on each of the three alternatives. Special emphasis has been given to trips passing through downtown Los Angeles. The locations chosen include Union Station and 7th/Flower Station, plus a representative station on each of the four branches of the Blue Line system; specifically:

- Vernon Station on the LB/LA Line
- Vermont/Exposition Station on the Exposition Branch
- Marmion/51st Station on the Pasadena Line
- Glendale Transportation Center Station on the Glendale Branch

Table V-2 lists the travel times for the selected origin-destination pairs, including the average wait times for the initial boarding and any required transfer, for each alternative. Since a major concern is the number of transfers, these have been tabulated also for each sample trip.

Origin	Destination	note	Alternative A-C Bunker Hill		Alternative D San Pedro		Alternative E Alameda	
			Time	# Trf's	Time	# Trf's	Time	# Trf's
7th/Flower	Union Station	(1)	6.5	0	6.5	0	6.5	0
	Vernon (LB/LA)		19	0	21	0	21	0
	Vermont/Expo		12	0	14	0	14	0
	Marmion/51st		19	0	19	1	19	1
	Glendale Tr. Ctr.		21	0	21	1	21	1
Union Station	Vernon (LB/LA)		26	0	24	0	17	0
	Vermont/Expo		20	0	29	0	31	0
	Marmion/51st		11	0	11	0	11	0
	Glendale Tr. Ctr.		13	0	13	0	13	0
Vernon (LB/LA)	Vermont/Expo		27	1	27	1	27	1
	Marmion/51st		36	0	33	0	27	0
	Glendale Tr. Ctr.		40	1	37	1	31	1
Vermont/Expo	Marmion/51st		31	1	41	1	42	1
	Glendale Tr. Ctr.		31	0	41	0	42	0
<i>Average of sample trips (unweighted): (percentage of trips requiring a transfer)</i>			23.6	21%	25.6	36%	24.4	36%

NOTES:

Travel times based on alignment drawings 4/29/93 (not used in ridership forecasts).

Travel times (in minutes) include first wait and transfer times.

Waiting times based on half of anticipated peak headways for year 2010 patronage.

Times shown in italics involve use of Red Line between 7th/Flower and Union Station

1. Can also travel from 7th/Flower to Union Station via Blue Line in Alt A & A-1 (8 min.).

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TABLE V-2
Travel Time Summary

The results show that **Alternative D San Pedro Street** generally has the longest travel times, due to the slower at-grade operation through downtown. The average times on the other alternatives are fairly closely grouped; some alternatives are much faster for certain trips, but slower for others. For example, the **Alternative E Alameda Street** allows faster trips from the LB/LA Line to Pasadena and Glendale; however, this is offset by slower times from the Exposition Branch to Pasadena and Glendale.

It should be noted that the averages are *unweighted*, that is, each selected origin-destination pair is counted equally. In reality, there will be more people making certain trips than others. The patronage results (see below) indicate that through-downtown riding is not as important as trips to certain portions of downtown (e.g., Bunker Hill) from each of the four Blue Line system branches.

The proportion of trips requiring transfers is highest for **Alternative D and E** (36% of the selected trips). **Alternative A-C** potentially minimizes transferring (7% to 21% for the selected trip interchanges, depending on the train operating pattern), by providing direct service for all through-downtown combinations. The only selected trip requiring a transfer would be between the Long Beach and Exposition branches.

Ridership Analysis

MTA coded the networks and ran the ridership forecasting models for each of the three alternatives. The results are summarized in Table V-3.

As shown in this table, although **Alternative A-C** attracts slightly more passengers (linked trips¹) than **Alternative E**, and **Alternative E** more than **Alternative D**. The differences among all three alternatives in this respect is small. However, there are substantial differences among the alternatives in terms of total boardings. In **Alternative A-C**, the Blue Line system would have 373,000 total daily boardings on the four operating lines. In **Alternative D** the number is 282,000, and **Alternative E** is lower at 270,000. However, the lower number of passengers using the Blue Line system in **Alternatives D and E** is more than offset by the larger number of passengers boarding the Red Line in these two alternatives.

These shifts in ridership are also illustrated by comparing the line volumes on the downtown trunk lines of the Blue and Red Lines, just southwest of Union Station. The projected AM peak hour volumes for **Alternatives A-C, D, and E** are listed in Table V-4, and are shown in the attached patronage diagrams (Figures V-7, V-8, and V-9.) In **Alternative A-C**, the Blue Line carries about 5,500 passengers in the AM peak hour southbound at First Street, while the Red Line carries 8,800 passengers at the same cordon line. In **Alternative D**, the Blue Line volume falls to 2,450, while the Red Line volume increases to nearly 14,000. The same shift pattern is even more pronounced in **Alternative E**, where the Blue Line is further removed from the major concentration of downtown destinations; the Blue Line volume decreases to 2,100, while the Red Line increases to 14,600.

Several explanations exist for the differences in the line loads of the alternatives:

- Without the Bunker Hill subway, many passengers in **Alternatives D and E** would use the Red Line and not the Blue Line to reach destinations in Bunker Hill. This is because an extra transfer and/or longer walks would be required for many trips.

¹ A linked trip is a complete trip from an origin to a destination: it may include more than one unlinked trip, or boarding. Thus a person who transfers from bus to rail to travel from home to work makes two unlinked trips (one on bus and one on rail), but only one linked trip.

From	To	Run Time (min.)	Distance (miles)	Headway			Consist			Vehicles		Annual Oper. Statistics:		Patronage & Loading		
				Peak	Base	E/L	Peak	Base	E/L	Peak	Total	Car-Mi. (million)	Train-Hrs. (thous.)	Pk.Hr. MLP	Load Factor	Max. Load Point Location
Alternative A-C - Blue via Bunker Hill																
N. Hollywood	Union Sta.	27.6	14.5	6.0	10.0	10.0	4	4	2	44	5.05	57.1	5,500	2.33	SB on Vermont	
Wilshire/ Federal	Whit./Atlantic	42.8	21.8	6.0	10.0	10.0	4	4	2	64	7.51	82.0	4,900 3,400	2.08 1.44	EB @ Normandie WB to Union Sta.	
		Totals:								108	132	12.57	139.1	9,650	2.04	EB-Alvarado
		Trunk Average:		3.0	5.0	5.0								8,800	1.86	WB from Union Sta.
														5,800	2.46	E.LA WB from U.Sta.
Alternative D - Blue via San Pedro																
N. Hollywood	Union Sta.	27.6	14.5	6.0	10.0	10.0	4	4	2	44	5.05	57.1	5,650	2.39	SB on Vermont	
Wilshire/ Federal	Whit./Atlantic	42.6	21.8	6.0	10.0	10.0	6	4	2	96	8.81	82.0	5,900 3,900	1.67 1.10	EB @ Normandie WB to Union Sta.	
		Totals:								140	170	13.86	139.1	11,000	1.86	EB-Alvarado
		Trunk Average:		3.0	5.0	5.0								13,950	2.36	WB from Union Sta.
														8,600	2.43	E.LA WB from U.Sta.
Alternative E - Blue via Alameda																
N. Hollywood	Union Sta.	27.6	14.5	6.0	10.0	10.0	4	4	2	44	5.05	57.1	5,650	2.39	SB on Vermont	
Wilshire/ Federal	Whit./Atlantic	42.6	21.8	6.0	10.0	10.0	6	4	2	96	8.81	82.0	5,900 3,750	1.67 1.06	EB @ Normandie WB to Union Sta.	
		Totals:								140	170	13.86	139.1	11,000	1.86	EB-Alvarado
		Trunk Average:		3.0	5.0	5.0								14,800	2.47	WB from Union Sta.
														8,850	2.50	E.LA WB from U.Sta.

Prepared by Manuel Padron & Associates

NOTES:

1. 2010 patronage forecasts by LACMTA 5/93 for Blue Line Connector Study.
2. SFV Line assumed to be Independent ALR Line along Ventura Freeway, connecting to Red Line at Universal City.
3. Total vehicles includes 15% spares plus two stand-by trains.



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**TABLE V-3
Red Line Operations**

	ALTERNATIVE A-C Bunker Hill	ALTERNATIVE D San Pedro	ALTERNATIVE E Alameda
PATRONAGE			
BLUE LINE			
Daily Boardings	373,000	282,000	270,000
Peak Line Load (AM)			
Long Beach	3,450	2,800	3,250
Exposition	4,250	2,150	2,050
Pasadena	4,200	4,000	3,950
Burbank/Glendale	4,000	3,850	3,800
SUM @ CBD Cordon:	15,900	12,800	13,050
SB from First Street	5,550	2,450	2,100
RED LINE			
Daily Boardings	426,000	530,000	533,000
Peak Line Load (AM)			
WB to Pershing Square	8,800	13,950	14,600
EB from Vermont	9,650	11,000	11,000
AM Peak Period Linked Trips	322,800	321,800	322,200
OPERATIONS			
BLUE LINE			
Fleet Vehicles	199	204	202
Annual Veh-Mi. (millions)	18.06	17.8	17.8
Annual Tr.-Hrs. (000)	444	459	452
Annual Oper. Cost (millions)	\$144	\$144	\$144
Cost/Boarding	\$1.26	\$1.67	\$1.73
RED LINE			
Fleet Vehicles	132	170	170
Annual Veh-Mi.	12.6	13.9	13.9
Annual Tr.-Hrs.	139	139	139
Annual Oper. Cost (millions)	\$116	\$119	\$119
Total Operating Cost, Red + Blue Lines (millions)	\$260	\$264	\$263

Prepared by: Manuel Padron Associates

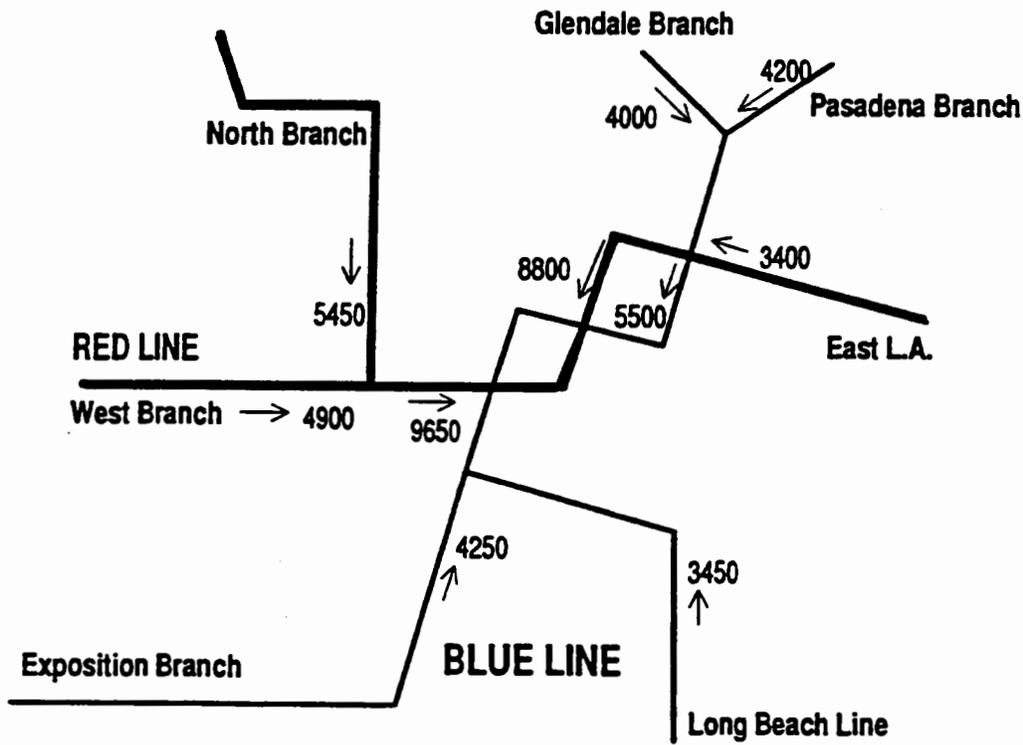


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**TABLE V-4
Summary of Patronage and Operations**

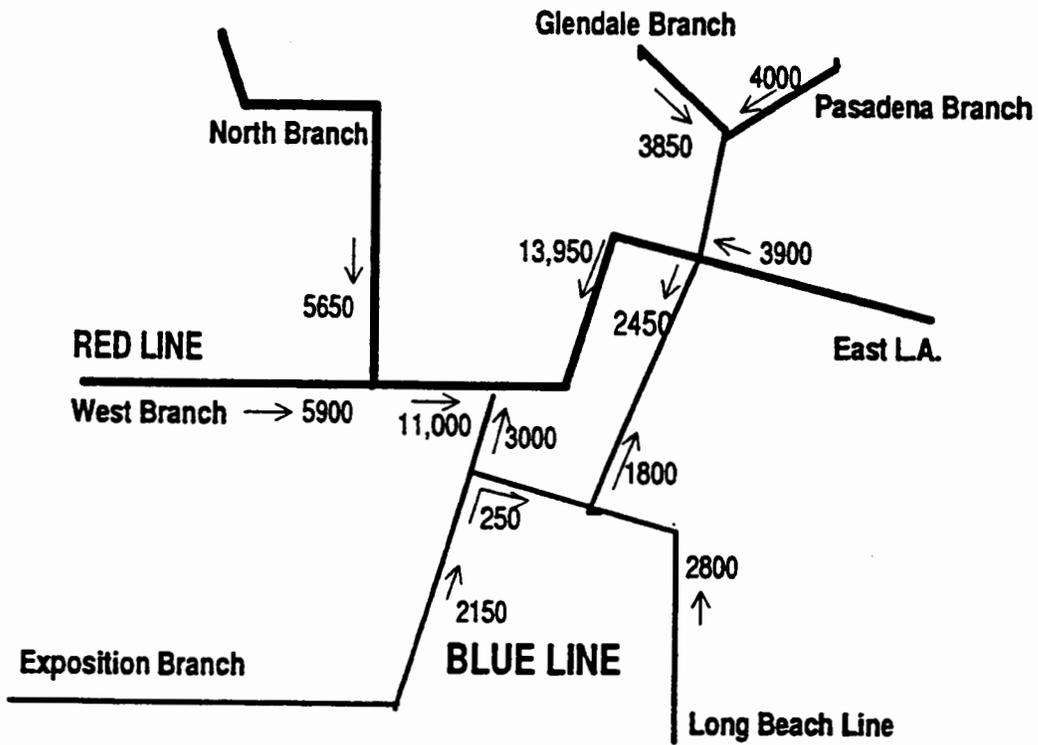
ALTERNATIVES A-C



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FIGURE V-7
Patronage Diagram
Alternatives A-C

ALTERNATIVE D

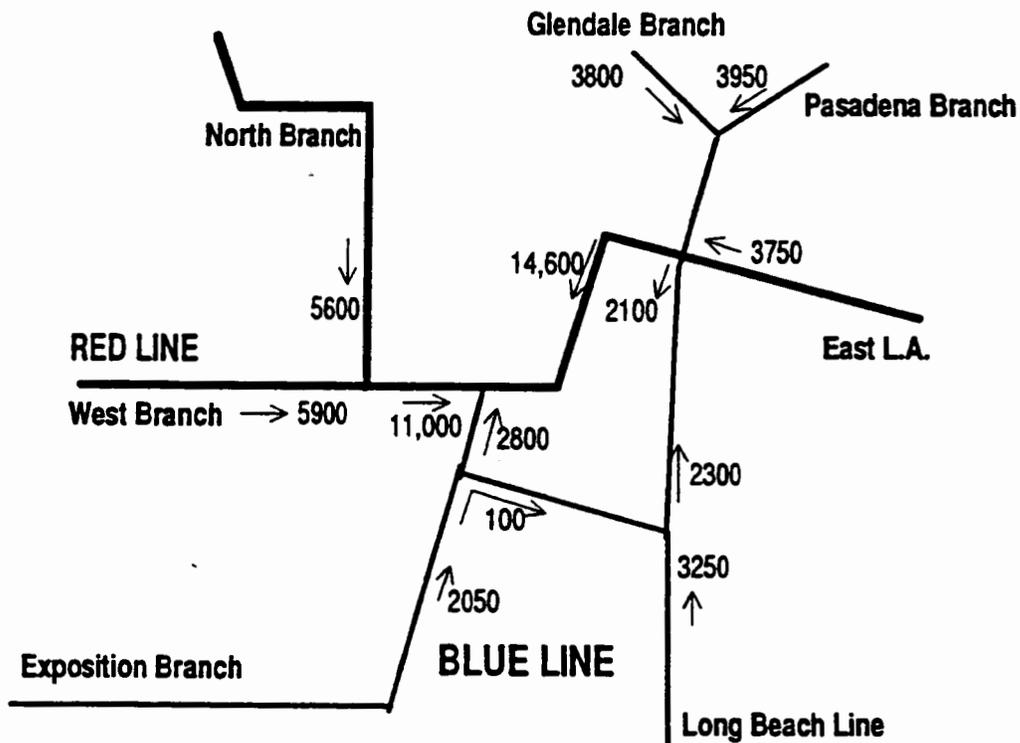


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FIGURE V-8
Patronage Diagram
Alternatives D

ALTERNATIVE E



- Many passengers that would use the Expo Line in **Alternative A-C** shift to the Western extension of the Red Line (Pico/Wilshire) in **Alternatives D and E**. This occurs because the trains from the Expo Branch in **Alternatives D and E** do not serve desired destinations for many passengers originating in West Los Angeles.
- In **Alternative A-C**, many passengers from Harbor Busway routes would transfer to the Blue Line to complete their trips to downtown destinations. Since the Flower Street subway ends at 7th Street in **Alternative D and E**, it would be a less attractive route for these passengers.

All three of these factors contribute to a substantial decrease in ridership on the Expo Line in **Alternatives D and E** relative to **Alternative A-C**. In **Alternative A-C** the AM peak hour line load, northbound along Flower Street approaching Washington Blvd., would be about 4,250. In **Alternatives D and E** this volume falls to about 2,100. The trains from the Expo Line through downtown on San Pedro in **Alternative D** would only carry 250 passengers approaching Washington Blvd, while in **Alternative E** the volume would be only 100. By contrast, the Expo trains to 7th/Flower would carry 1,900 to 2,000 passengers.

The line loads entering downtown are also lower on each of the other three lines (Long Beach, Pasadena, and Glendale) in **Alternatives D and E** compared to **Alternative A-C**, but the decreases are not as large as for the Expo Line. Table V-4 also shows the total peak hour passenger volumes entering downtown on all four Blue Line branches.

As noted above, the patronage forecasts were based on preliminary estimates of running times. The slower revised times would tend to decrease patronage slightly for all three alternatives.

Impact on Red Line Operations

As noted above, the absence of a through link from 7th/Flower to Union Station (**Alternatives D and E**) results in a large shift of passengers to the downtown segment of the Red Line (relative to **Alternative A-C**). This shift is so large that it affects Red Line operations. Table V-3 shows the Red Line operating plan for all alternatives.

The peak line load in the Red Line would increase from 8,800 in **Alternative A-C** to about 14,000 in **Alternatives D and E**. Almost all of this increase is comprised of additional passengers boarding (transferring to) the Red Line at Union Station. To accommodate this additional load, longer trains or shorter headways would be required. The most efficient way of handling the added passenger load we were able to find in this study would be to lengthen the trains from East Los Angeles (to Westwood) from four to six cars. These trains are more heavily loaded than the trains originating at Union Station (to North Hollywood), since they would carry all the through passengers from the Eastern Extension of the Red Line, plus half of the large boarding volume at Union Station.

The longer trains for the East LA to Westwood service would increase the Red Line fleet by 38 cars. The capital cost for the additional cars would be approximately \$115 million. The larger fleet could affect the Red Line's yard and shop capacity. In addition, the corresponding increase in car-miles and hours would increase annual operating costs for the Red Line by \$3 million annually in **Alternatives D and E** relative to **Alternative A-C** (about \$119 million in **Alternatives D and E** vs. \$116 million for **Alternative A-C**).

Other operating strategies were considered to try to reduce the need for additional Red Line cars with **Alternatives D and E**. The following statistics refer to **Alternative D**, and would apply to **Alternative E** as well, except load factors for the latter would be higher.

- Using six-car trains for the service originating at Union Station, instead of the service from East Los Angeles to Westwood, would reduce fleet requirements by 10 cars (28 more than **Alternative A-C**).

However, the resulting load factor in the trains from East Los Angeles (3.64) would far exceed vehicle capacity (maximum load factor = 2.69).

- Using all four-car trains, but reducing branch headways from six to five minutes (a trunk headway of 2.5 minutes) would also require fewer Red Line cars (22 more than **Alternative A-C**). However, the load factor on East Los Angeles trains would still be unacceptably high (over 3.0).
- Inserting a six-minute peak period shuttle between Union Station and West Lake/Alvarado would require the fewest additional Red Line cars (18 more than **Alternative A-C**). However the load factor on East LA trains would still be higher than acceptable (2.89 vs. 2.69). Furthermore, this strategy may be operationally unacceptable: two out of every three trains would have to turn back at Union Station, with a two-minute intervening headway, which may not be possible with a single turnback track.

Blue Line Operational Issues

The merging of trains from two or more branches on each side of downtown would result in very short headways on downtown segments of the Blue Line system. In some alternatives, there would be complex junctions where trains merge and diverge. The operational implications of these junctions need to be considered.

In **Alternative A-C**, there would be two junctions: at Flower/Washington on the south side of downtown, and at the Los Angeles River north of downtown. Both junctions would be similar in terms of the number and type of train movements. At each location, the trains from two branches would merge into the downtown trunk. Based on current ridership forecasts, the number of trains on all branches would be equal. In the outbound direction, half the trains from the downtown trunk would operate onto each of two branches. Peak volumes are estimated to be 30 trains per hour approaching the junction from the trunk, and 15 from each branch. There should be relatively little interference among trains at the junction, since there is only one crossing movement. Merging movements would be scheduled with two-minute offsets to avoid conflicts.

The Flower/Washington junction would be more complex than the Pasadena/Burbank junction, since it is in a busy street intersection. With a train passing through the intersection an average of once a minute (one train every two minutes in each direction), there would be some delays resulting from the conflict of trains and vehicular traffic.

With **Alternative D**, a second at-grade, in-street junction would be created, at San Pedro and Washington. In addition, several new, conflicting train movements would be added at the Flower/Washington junction. Both junctions would be more complex than those in **Alternative A-C**, since train movements would occur along three routings instead of two, and there would be three crossing points instead of one. This greatly increases the likelihood of conflicts between trains at the junction. Since the green phases for trains have to be worked into the traffic signal cycle, the likelihood of conflicts would be even greater.

A similar situation was analyzed for the Aviation Wye of the Green Line. A computer simulation analysis concluded that the likelihood of delays was as much as 10 times greater with three-way operation than with two-way operation. This analysis was based on an automated, fully grade-separated system. Since the Blue Line is subject to traffic delays at several locations, the schedule variability would be even greater. Therefore, the number of conflicts at three-way Blue Line junctions can be expected to be much larger than for the Green Line junction at Aviation.

If **Alternative D** is modified to carry the two train services from the north through to the South (e.g., to 7th/Flower) there would be additional conflicts, since the total train volume at San Pedro/Washington would increase from 45 to 75, or one every 48 seconds. In addition, the scheduling of merging and diverging train movements on two-minute headways would result in some direct schedule conflicts for crossing movements. For example, inbound trains from Exposition would conflict with outbound Long Beach trains. One possible improvement would be to grade-separate some or all of the rail lines from street traffic. A partial grade-separation for the Flower/Washington

intersection would also be desirable. However, this would be complicated by the at-grade Grand Avenue Station just east of Flower.

Another design issue is the existing San Pedro Station. Trains serving the Exposition Branch would miss the station, which is just east of San Pedro on Washington. Constructing a separate platform for Exposition trains is a possibility, but would require, of course, additional cost. It would also present problems for patrons, who would have to choose between platforms depending on destination, and even depending on which train would arrive next.

Operationally, **Alternative E** would be similar to **Alternative D**, except the new three-way junction would be at Washington and Long Beach Boulevards, instead of San Pedro and Washington. A similar situation would exist with the existing Washington Blvd. Station, which would not be served by Exposition Branch trains.

Dual Connector

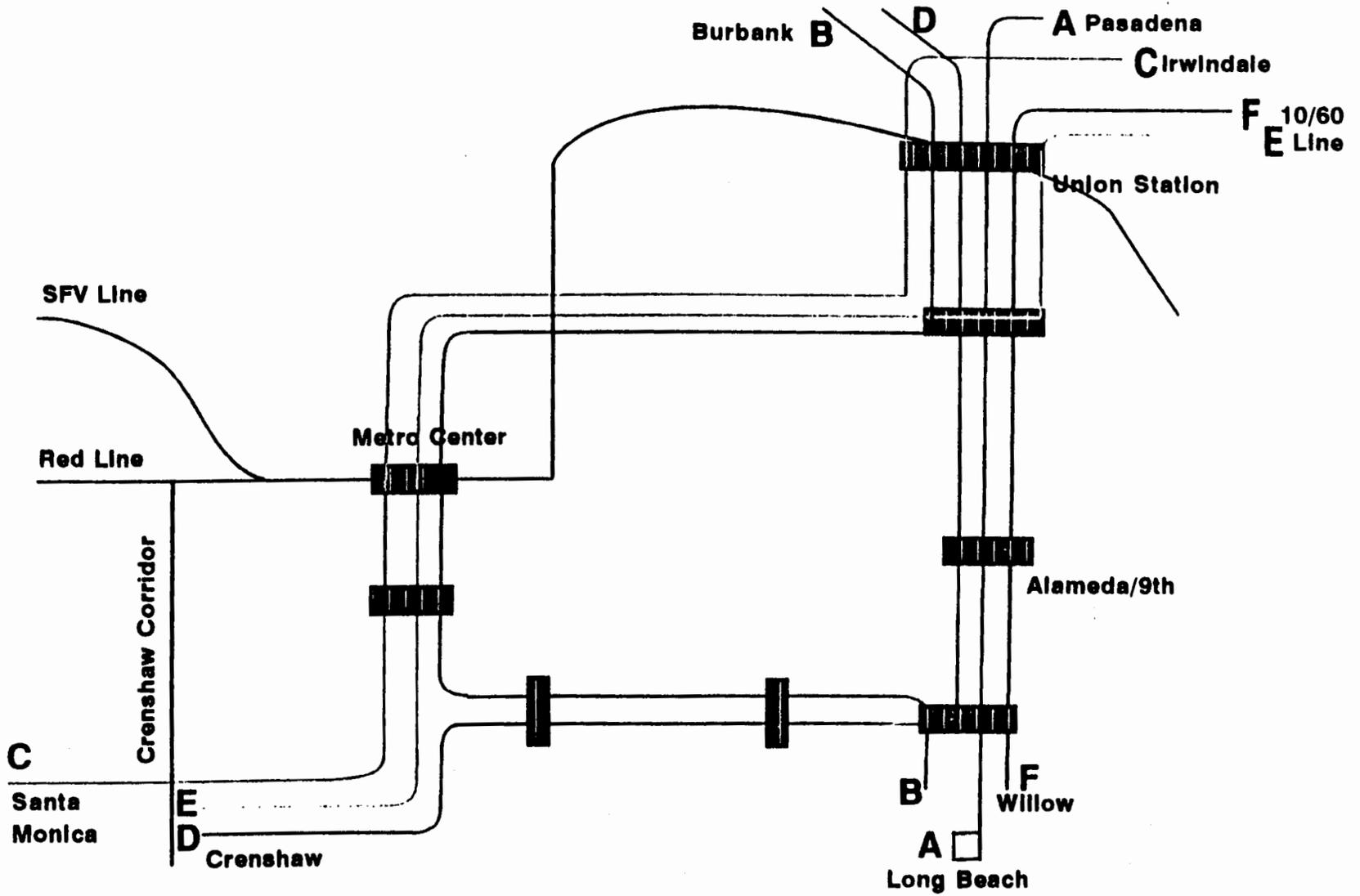
The dual connector would provide additional operational advantages and extend the area serviced by light rail. The Downtown Connector could be used to spur the development of direct north-south and east-west light rail lines (see Figure V-F2). **Alternative F** includes both the Bunker Hill connector and the Alameda Street connector. The Route 10/60 Corridor LRT Line would be linked with the Blue Line, so that trains from Pasadena, Burbank, and 10/60 would merge north of Union Station, and then travel through downtown on either the Bunker Hill or Alameda alignments. The proposed operating plan for a generalized **Alternative F** is shown in Figure V-10 and detailed in Table V-5.

Alternative F would have six peak train services:

- Long Beach to Del Mar via Alameda
- Willow to Burbank via Flower
- Santa Monica to Irwindale via Flower
- Crenshaw to Burbank via Alameda
- Willow to 10/60 via Alameda
- Crenshaw to 10/60 via Flower

The first four would operate on 8 minute headways, to be consistent with the single-connector alternatives. The last two would each operate on 12-minute headways, so that the combined headway of 6 minutes along the 10/60 corridor is the same as in all other alternatives. The combined service would result in 3-minute peak headways on each of the downtown connectors. The section from north of Union Station to about First Street would have a combined headway of 90 seconds. This would probably have to be a four-track section, including the stations at Union Station and First Street.

The statistics for this plan in Table V-5 include the operation of the 10/60 corridor, which was not included in **Alternatives A-C** through **E**. We have therefore subtracted amounts that reflect the operation of the 10/60 corridor itself. The resulting statistics are shown in Table V-6. The estimated annual operating cost would be about \$158 million. This is higher than most of the other alternatives, which would cost about \$144 million per year.



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FIGURE V-10
Peak Period Operating Plan, Regional System
Alternative F

Line	From	To	Via	Run Time (min.)	Dist. (miles)	Headway			Train Consist			Vehicles		Annual Oper. Statistics		Patronage & Loading		
						Peak	Base	E/L	Peak	Base	E/L	Peak Total	Car-Mi. (million)	Tr-Hrs. (thous.)	Pk.Hr. MLP	Load Factor	Max. Load Point Location	
Alternative F -- Dual Connector																		
A	Long Beach	Del Mar	Alam.	75.4	30.0	8.0	10.0	10.0	2.0	2	2	42	5.54	130.2	2,200	1.93	LB/LA NB @ Wash.	
B	Willow	Burbank	Flower	73.4	34.2	8.0	10.0	10.0	2.0	2	2	42	6.31	130.2	1,650	1.45	SB @ Chinatown	
D	Crenshaw	Burbank	Alam.	54.9	22.6	8.0			2.0	-	-	32	1.04	24.5	450	0.39	LB/LA NB @ Wash.	
C	Santa Monica	Irwindale	Flower	66.2	40.2	8.0	10.0	10.0	2.0	2	2	48	7.41	146.4	2,100	1.84	Burbank > Chinatown	
E	Crenshaw	10/60 terminal	Flower	48.5	20.5	12.0	20.0	20.0	2.0	1	1	18	1.33	48.4	50	0.04	Crenshaw > Flower	
F	Willow	10/60 terminal	Alam.	62.6	30.6	12.0	20.0	20.0	2.0	1	1	24	2.00	58.8	1,700	1.49	Burbank > Chinatown	
Total/Average:						3.0	6.7	6.7				206	247	23.62	536.4	2,450	2.15	S.Monica > Flower
along Alameda:						3.0	4.0	4.0								2,400	2.11	Irwindale > Chinatown
along Flower St:															1,350	1.78	Crenshaw > Flower	
															500	0.66	10/60 > Union Station	
															1,400	1.84	LB/LA NB @ Wash.	
															550	0.72	10/60 > Union Station	
															2,650	0.70	SB @ First St. (4 lines)	

NOTES:

- 2010 patronage estimates by LACMTA 6/93; network includes Crenshaw & 10/60 Corridor lines.
- Spare vehicles = 20%

Prepared by Manuel Padron & Associates

08-Jun-93



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**TABLE V-5
Operating Plans - Dual Connector**

	ALTERNATIVE A-C Bunker Hill	ALTERNATIVE D San Pedro	ALTERNATIVE E Alameda	ALTERNATIVE F Bunker Hill/Alameda
PATRONAGE				
BLUE LINE				
Daily Boardings	373,000	282,000	270,000	387,000 (excl. 10/60 line)
Peak Line Load (AM)				
Long Beach	3,450	2,800	3,250	4,050
Exposition	4,250	2,150	2,050	3,800
Pasadena	4,200	4,000	3,950	4,050
Burbank/Glendale	4,000	3,850	3,800	3,800
SUM @ CBD Cordon:	15,900	12,800	13,050	15,700
SB from First Street	5,550	2,450	2,100	Bunk.Hill: 2,900 Alameda: 2,250
RED LINE				
Daily Boardings	426,000	530,000	533,000	457,000
Peak Line Load (AM)				
WB to Pershing Square	8,800	13,950	14,600	10,800
EB from Vermont	9,650	11,000	11,000	9,950
AM Peak Period Linked Trips	322,800	321,800	322,200	324,600
OPERATIONS				
BLUE LINE				
Fleet Vehicles	199	204	202	235
Annual Veh-Mi. (millions)	18.06	17.8	17.8	20.1
Annual Tr.-Hrs. (000)	444	459	452	500
Annual Oper. Cost (millions)	\$144	\$144	\$144	\$158
Cost/Boarding	\$1.26	\$1.67	\$1.73	\$1.33
RED LINE				
Fleet Vehicles	132	170	170	152
Annual Veh-Mi.	12.6	13.9	13.9	13.2
Annual Tr.-Hrs.	139	139	139	139
Annual Oper. Cost (millions)	\$116	\$119	\$119	\$118
Total Operating Cost, Red + Blue Lines (millions)	\$260	\$264	\$263	\$276



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TABLE V-6
Summary of Patronage & Operations
Dual Connector

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The incremental capital cost (for vehicles only, and excluding the fleet for the Route 10/60 Line) would be about \$108 million more relative to **Alternative A-C**.

MTA tested the ridership for this configuration, and the results are summarized in Table V-6. This table is Table V-4, comparing **Alternatives A-C, D, and E, with the addition of Alternative F**. As shown in this table, Alternative F would have overall patronage in the same range as **Alternative A-C**. The number of Blue Line boardings (excluding 10/60) is higher than any other alternative. The number of peak period linked trips is only slightly higher, meaning that most of the additional boardings are transfers. One example of this is trips from the Long Beach Line, most of which are assigned to the Alameda link, with much transferring occurring at First street and Union Station. (It should be noted that the patronage model was run with the preliminary set of run times. The revised run time along Alameda, reflecting the alignment drawings, was several minutes slower.)

The number of daily linked trips for **Alternative F** is slightly higher than **Alternative A-C**.

The line loads south of Union Station would be split between the two corridors, with about 2,900 via Bunker Hill, and 2,250 via Alameda. The total of 5,150 is slightly lower than in **Alternative A-C** (5,400 via Bunker Hill). This probably reflects the longer headway on each of the two connectors (3 minutes), versus 2-minutes via Bunker Hill in **Alternative A-C**. It also appears that more patrons are transferring to the Red Line; the line load south of Union Station is somewhat higher in **Alternative F** than in **A-C**.

The shifting of riders to the Red Line is sufficient to require some additional service on the Red Line, although not as much as for **Alternatives D and E**. The estimated Red Line operating cost would increase by about \$2 million annually compared to **Alternative A-C**. The capital cost for additional Red Line vehicles would be about \$60 million.

Alternative F would have two three-way junctions along Washington Street, as in **Alternative E**. These locations would likely result in delays for trains and/or street traffic, and some grade separation would be desirable.

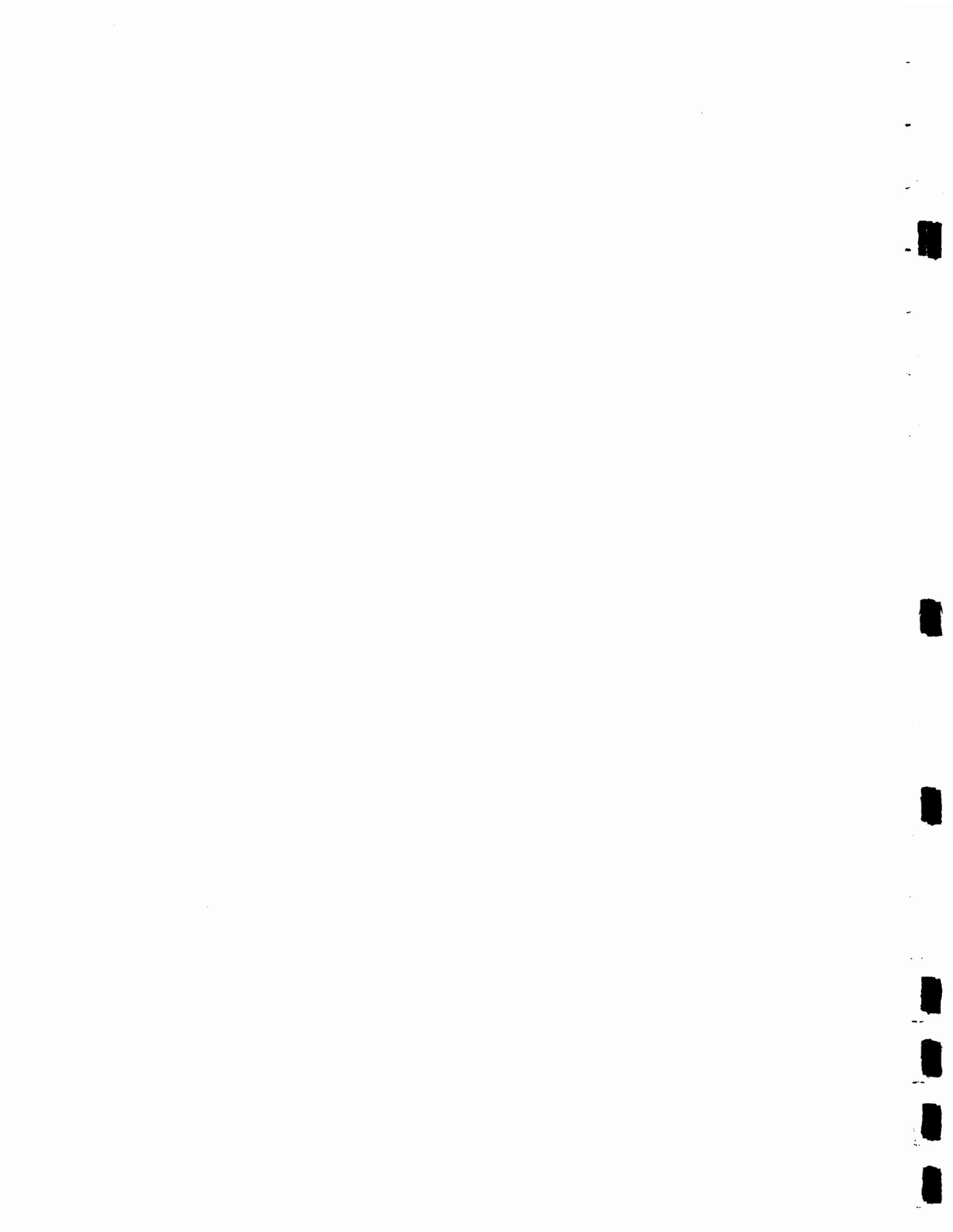
Alternative F would also have a very complex segment at Union Station, where three northern branches would have to merge, run through two stations, and then diverge into two downtown branches. The projected frequency of trains could probably not be handled with a two-track section. A four-track section would present problems of station layout and operation. There are no extra platforms at Union Station. Station operation might be complicated, since it might not be possible to have all trains with common destinations use the same track. Offsetting these possible complexities would be the enhanced potential to reach a wide variety of CBD destinations afforded by the availability of geographically dispersed Downtown Connectors when much or all of the outlying light rail network is completed. In addition with two Downtown Connectors, service and train routing could be extensively modified based on service experience and shifting popular demand over time.

Conclusions

- Average travel times for representative trips through downtown would be about the same for **Alternatives A-C and E**. **Alternative D** (via at-grade San Pedro) would have slower times. **Alternatives D and E** would require the most transfers for passengers travelling through downtown Los Angeles.
- Although **Alternative A-C** attracts slightly more passengers (linked trips) more than **E**, and **Alternative E** slightly more than **Alternative D**, the differences among all three alternatives in this respect is very small.
- **Alternative A-C** would have the most reliable operation (fewest delays), since there would be no three-way in-street track junctions. **Alternatives D and E** would each have two such junctions. **Alternative D** would also be subject to delays due to at-grade operations along San Pedro.

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- The Blue Line system would cost about the same to operate in all three alternative connectors. However, **Alternative A-C** would have the lowest combined operating cost, when considering the Blue Line and the Red Line together - approximately \$260 million annually. In these terms, **Alternatives D and E** would cost \$3 to 4 million per year more to operate because of their effect on Red Line operations.
- The operating costs of **Alternative A-C** could be reduced by as much as \$15 million by discontinuing off-peak turnback services. Similar reductions in the operating cost of **Alternatives D and E** may be possible but may not be comparable in magnitude or in the level of passenger service.
- **Alternatives A-C** would have the lowest capital costs for vehicle procurement. **Alternatives D and E** would require additional car purchases of about \$124-130 million of which \$115 million would be for additional vehicles for the Red Line and the balance (\$9 to \$15 million) for additional vehicles for the Blue Line system.
- **Alternative F** provides more choices of direct service to various downtown destinations, as well as more through service to LRT branches on the far side of downtown, than any other alternative.
- **Alternative F** provides more through-downtown capacity for future growth than any other alternative. However, there is no capacity constraint with the other alternatives, based on 2010 patronage. In fact, there is considerable potential capacity available by running 3-car trains instead of 2-car trains on the single-connector alternatives.
- **Alternative F** would have fairly high annual operating costs: \$158 for Blue Line operations vs. \$144 million for **Alternative A-C**. Extra Red Line costs would increase the overall operating cost differential to about \$16 million annually.
- **Alternative F** would require additional Blue Line and Red Line rail cars, with a cost about \$168 million more than **Alternative A-C**.
- The operation of **Alternative F** would offer a maximum degree of routing flexibility compared to any of the other Alternatives. Many variations of service could be developed beyond those shown, based on operational experience.



VI. SUMMARY ANALYSIS OF ALTERNATIVES

As a result of this Preliminary Planning Study, a body of information exists from which a good understanding can be achieved about each of the alternatives. Further, a preliminary evaluation can be completed to extract a set of findings about the similarities and differences between the final five alternatives. This analysis is useful to begin to understand the relationship between alternatives, their relative strengths and weaknesses. For purposes of drawing a preliminary comparison, a natural geographic categorization of the final five alternatives is useful; that is, the Bunker Hill (west downtown) alternatives and the Eastside (east downtown) alternatives.

A. *Preliminary Observations*

A comparison of the different alternatives indicates two very different approaches to the connector. A recommendation on which of the alternatives best meets the overall needs of the Blue Line system should be done only after a careful review of the findings of this report and additional evaluation of long term impacts on the system. From a review of the comparative analysis matrix (Table V-6 and VI-1), the following preliminary observations can be made:

- The Bunker Hill alternatives generate a higher level of patronage (373,000 total daily boardings) compared to the Eastside alternatives (282,000 and 270,000 total daily boardings for San Pedro and Alameda, respectively).
- The estimated capital costs for Bunker Hill alternatives (\$561 to \$598 million) are higher than those estimated to the San Pedro (at-grade and aerial) and Alameda alternatives (\$252, \$319 and \$275 million, respectively). However, the No-Build, San Pedro and Alameda Alternatives may require up to \$115 million in added Red Line vehicles purchases based on preliminary evaluation. A more detailed evaluation should be done to better determine the full financial impacts of these alternatives.
- The Bunker Hill Alternatives offers some operational advantages which need to be evaluated fully. These advantages need to be evaluated and balanced against other determining factors such as cost and geographic distribution of transit service.
- The Alameda and San Pedro Alternatives service a geographic area which is not currently service by rail transit.
- Since the Eastside alternatives are not underground systems, the capital costs are significantly less than the Bunker Hill alternatives, in spite of the fact that these alternatives are longer and offer four stations compared to only three for the Bunker Hill alternatives.
- The Bunker Hill Alternatives service two major job centers (Bunker Hill and the Civic Center) as well as Little Tokyo community. The Eastern Alternatives would provide transit service to a less dense commercial and industrial sector of downtown as well as Little Tokyo.

The level and type of construction required to build a subway, at-grade or an aerial system through the Downtown landscape will cause significant environmental impacts. Therefore, the anticipated impacts for the Bunker Hill or the Eastside alternatives are expected to be significant. As presented in the Environmental Assessment section, a variety of impacts are anticipated with each of the alternatives. Appropriately, proper mitigation measures, planning and coordination of activities will be essential to allow for construction within a highly active Downtown environment.

B. *The Bunker Hill and Eastside Alternatives: A Qualitative Discussion*

While ranking the final five alternatives is not the purpose of this study, some preliminary observations can be made about the respective opportunities and constraints. As presented above, some preliminary observations can be made about the relative strengths and weaknesses of an alignment depending upon its qualities against a certain variable, i.e., patronage, costs, environmental impacts, etc. Beyond this, a *qualitative* discussion can begin to reveal the more complex issues associated with selecting a Downtown Connection. While not an exhaustive list, the following presents some critical issues which can now be identified in relation to the final five alternatives.

Service Populations - The Bunker Hill and Eastside alternatives provide identical service on the northern segment between First/Alameda and Union Station; all propose a station at the intersection of First and Alameda Streets, which serves the Little Tokyo residential and business community. However, the southern segments differ considerably. The three Bunker Hill alternatives are geared toward serving the office-related work force, residential community, cultural resources (near historic core) and retail uses on Bunker Hill. The Bunker Hill alternatives could also serve as a shuttle between the convention center and hotels located from South Park to Little Tokyo. The two eastside alternatives serve primarily the light industrial employee base, although some office-related workers are also served along the two eastside alignments as well as a residential population. How we distribute rail service among diverse service populations is a significant issue which will continue to part of the decision-making process for the Downtown Connection.

Engineering Requirements & Cost - Due to the land use differences between the Bunker Hill and Eastside alternatives, the engineering requirements and therefore cost factors are similarly distinct. Due to the existing subterranean station at Metro Center and the subsequent dense development existing along the corridor of the Bunker Hill alternatives, a subway configuration is essential to provide service to this area without unacceptable levels of environmental impacts. It is not until east of Alameda that these alignments can surface from a subway configuration to an at-grade configuration without significant disruption. Due to these engineering requirements, the associated costs of these alternatives are significantly higher than the Eastside alternatives, which are not required to utilize a subway configuration.

For the San Pedro and Alameda alternatives, the existing land use is quite different from that of the Bunker Hill alternatives. Densities along these corridors are significantly less than that of Bunker Hill and, thereby allow the opportunity for at-grade or aerial configurations here. Also, the greater lengths of these two alternatives compared to the Bunker Hill set suggest an extremely

ALTERNATIVE	System Type	Length (Feet)	No. of Stns.	AM Peak Period Linked Trips	Estimated Costs		Major Land Use	Sensitive Receptors
					Capital	Operating* (annual)		
Alternative A: BUNKER HILL FIRST STREET	Subway	11,040'	3	322,800	\$581,862,949	\$260,000,000	Commercial	Downtown Library Buddhist Temples**
Alternative B: BUNKER HILL SECOND STREET	Subway	10,970'	3	322,800	\$581,218,307	\$260,000,000	Commercial	Downtown Library St. Vibiana Church Buddhist Temples**
Alternative C: BUNKER HILL THIRD STREET	Subway	11,520'	3	322,800	\$598,876,550 ¹ \$573,294,862 ²	\$260,000,000	Commercial	Downtown Library Union Church Buddhist Temples**
Alternative D: SAN PEDRO STREET	At-Grade Aerial	14,400'	4	321,800	\$252,807,999 \$319,735,958	\$284,000,000	Light Industrial	San Pedro Elem. Weingart Center St. Vibiana Church Buddhist Temples**
Alternative E: ALAMEDA STREET	Aerial	15,300'	4	322,200	\$275,723,534	\$283,000,000	Light Industrial	Buddhist Temple**

* Operating Costs include combined costs for Blue Line and associated Red Line costs. (Blue Line operating costs is \$144 million for all alternatives.) Estimates do not include any required additional capital (vehicle) costs.

** The Buddhist Temples referred to include: Koyasan Buddhist Temple and the Los Angeles Homba Hongwanji Betsu Temple.

¹ High Profile (over Red Line Tunnels)

² Low Profile (under Red Line Tunnels)



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**FIGURE VI-1
Comparative Analysis of Alternatives**

high cost of construction if a subway alignment were recommended. Both at-grade and aerial options appear feasible for the San Pedro alternative, while only an aerial configuration is recommended for the Alameda alternative. (Significant freight and other vehicle traffic on and across Alameda would be adversely affected with an at-grade urban rail line.) As a result of these configuration possibilities, the construction costs for both the San Pedro and Alameda alternatives are less than the Bunker Hill alternatives.

Ridership and Operations - The three Bunker Hill alternatives are nearly identical from an operational and patronage standpoint. Therefore, Bunker Hill is grouped into one category and compared to the Alameda and San Pedro alternatives. These three operational plans provide very distinct and different operational challenges due to their respective proposed structure types, including subway, at-grade and aerial. Subway would provide the most efficient service with aerial and then at-grade following. In addition to the structural differences, the Bunker Hill alternatives connect the terminus of both the Long Beach and Pasadena Blue Lines, while the eastside alternatives branch off the existing Long Beach system along Washington. This allows the Bunker Hill alternatives to be more simple operationally and presents additional challenges for the eastside alternatives due to the three-way in-street track junctions on Washington Blvd..

The difference in ridership between the three operational plans is very small. Bunker Hill attracts slightly more passengers (linked trips) than the eastside alternatives. Similarly, operating costs are nearly the same for all three operational plans. The San Pedro alternative would be significantly slower when comparing average travel times for representative trips through downtown while Alameda and Bunker Hill alternatives would be about the same. Eastside alternatives would require a higher capital cost for vehicle procurement due to the large number of transfers to the Red Line requiring additional rail cars to be purchased and require a relatively small annual increase in Red Line operating cost.

Development Opportunities - Given the limited availability of public funds for conventional economic development programs, transportation projects are increasingly viewed as vehicles for economic stimulus strategies. The Downtown Connection project is no exception. Particularly within the Downtown Los Angeles community, consistent and critical attention is paid to the level, balance and type of development which is planned or spurred. Accordingly, an assessment of the development opportunities which may exist as a result of the Downtown Connection is a significant issue. While additional analysis and planning will be required to evaluate the potential for development appropriately, an observation can be made at this time. When comparing the Bunker Hill alternatives with the Eastside set, the Eastside alternatives serve areas where development densities do not appear to be maximized and vacant land is available. However, available development densities on Bunker Hill would include the development of the existing steam plant site and of county parcels along First Street. This is however balanced by the larger Floor Area Ratio which is available in Bunker Hill compared to the Eastside where most structures are industrial which is more conducive to buildings under three stories. Therefore, differing development opportunities exist for future economic development in both Bunker Hill and the Eastside areas. A market analysis would be required to determine the level of demand for increased light industrial or compatible uses in the Eastside and office, retail, residential, cultural in Bunker Hill. This does not imply that having available density will cause development to occur, however, various economic development strategies may be implemented to maximize development of existing underutilized land either in Bunker Hill or the Eastside.

A Critical Trade-Off: Patronage vs. Transit Dependent - The objective of the MTA is to lead the way to greater mobility in Los Angeles County. However, as the 30-Year Integrated Transportation Plan itself states, "the mission ... is clear, but far from simple." As with the Downtown Connection, the attempt to create an efficient and cost-effective system quickly raises the issue of how much and for how many. Presented as a preliminary observation, the Bunker Hill alternatives are the most expensive, yet, they serve the highest employment sectors in Downtown compared to the Eastside alternatives. However, the Eastside alternatives may serve a higher percentage of transit dependent riders. This trade-off will continue to be an on-going issue with this project, requiring a qualitative discussion of issues and subsequent trade-offs. Existing and future increased public opinion about the advantages and disadvantages of the Downtown Connection alternatives will surely raise this issue in the public decision-making process.

C. *No Build*

What if the Downtown Connector is not built? What will be the impacts upon the regional rail system and the downtown community? Many of the assumptions about the future demands of urban rail in Los Angeles combined with what will actually be built to serve these demands will determine the degree to which a downtown connection is needed. For example, if the Downtown Connection is not built and ridership for the Red Line continues to grow considerably (as extensions are built into East Los Angeles, North Hollywood and the Westside), the volume of passengers needing to travel to north/south destinations through downtown between the Long Beach Line and the Pasadena Line will become congested with those passengers traveling to east/west destinations on the Red Line (or some combination thereof). At some point, operating capacity for the Red Line trunk in Downtown may be exceeded. This is a potential scenario if the downtown connection for the light rail lines is not built. This scenario would be exacerbated if new light rail lines, i.e., Exposition, Burbank, Glendale, are built requiring transfers to the Red Line to get through downtown. A preliminary assessment of the No Build scenario is presented in Appendix D.

As MTA rail planning continues, the demand and system requirement for the Downtown Connection presents itself as a significant issue which should be monitored regularly. *It is inherently tied to the overall system operations of the Los Angeles urban rail program. As such, the estimated need for the Downtown Connection should be further evaluated and coordinated with on-going improvements to the system.*



VII. SIGNIFICANT ISSUES & NEXT STEPS

As part of the scope of this study, a number of the critical issues are addressed regarding the preliminary planning of a light rail system through Downtown Los Angeles. To facilitate a clear logical understanding, the study findings, data analysis and information are presented *by alternative*. In this fashion, the reader receives a set of information which is directly applicable to one alternative for the Downtown Connection. Furthermore, the comparative analysis of alternatives which follows the individual alternatives is useful to highlight and identify the similarities and differences between alternatives, which is not readily apparent from the individual discussions.

Beyond the observations which are specific to each alternative, an additional set of significant issues are identified which pertain to *all five final alternatives and/or the overall project*. The critical purpose of this section is to raise awareness of these issues as they relate to the Blue Line Downtown Connection. For purposes of continued discussion through the next phase of this project (Route Refinement/EIR), these issues are presented here. They have been a collaboration of MTA staff and the Consultant Team, evolving over this process of preliminary planning. The issues are presented both as a discussion and as questions for further research. Lastly, they are presented in no order of importance; the purpose is to highlight their overall importance to the success and shape of the Downtown Connection.

A. *Urban Design and Land Use Implications*

Local Integration - The Eastside alternatives are systems proposed as an at-grade or aerial configuration. Consequently, the issues of urban design and land use become increasingly evident. As opposed to the subway alignments for Bunker Hill, the station locations and the segments between stations are visible to street traffic, pedestrians, store fronts and all users of the street area. Perhaps the most significant issue here is how the system will be integrated locally. That is, how will the system interact with and/or change the existing land uses? Will it be compatible and to scale with the local environment? What environmental impacts will cause irreversible stress to the area? These are significant issues which can be readily identified in relation to the Eastside alternatives and should be addressed in the next phase.

House Moving Corridor - In addition, the "House Moving Corridor" (minimum clearance requirement of 20' by 40'), which exists along some portion of Alameda Street, is an issue which may affect the operation of any light rail system along this corridor. Additional review of this issue will be required to determine the extent to which the Alameda Street alternative is affected. Also, in spite of the corridor designation, the extremely low level of actual house moving activity may alter the requirements for street clearances.

Freight Traffic Corridor - Alameda Street is perhaps the most significant freight rail and diesel truck traffic corridor in Downtown Los Angeles. While proposed design configurations for the Alameda Street alternative incorporate freight traffic, increased review of the implications of a light rail system integrating with a freight traffic corridor is recommended (Figure V-E6.).

Washington Blvd. Mitigation Plan - Lastly, due to three-way junctions proposed for the San Pedro Street and Alameda Street alternatives at Washington Boulevard, a Mitigation Plan will be required to address significant traffic impacts to the surface streets. The San Pedro Street alternative proposes an at-grade three-way junction at the intersection of San Pedro Street and Washington Boulevard. The existing San Pedro Street Station on Washington Boulevard may require relocation or modifications due to this junction. The Alameda Street alternative proposes a grade-separated three-way junction at Long Beach Avenue and Washington Boulevard. The existing station just south of Washington Boulevard on Long Beach Avenue will likely require relocation due to the grade-separated junction with the Alameda Street alternative when the light rail system reaches maturity, with several branch lines in service.

B. Coordination with Other Downtown Projects

A comprehensive review of other Downtown projects which may affect the Downtown Connection was completed as part of this Preliminary Planning Study. (Appendix B.) Coordination with existing projects and those planned to come on-line will be critical for proper implementation of the Downtown Connection. Significant existing and planned projects with which this project should be coordinated include (in no order of importance):

- Alameda District Plan
- Downtown Strategic Plan
- Electric Trolley Bus (Broadway/First/Alameda)
- Metro Red Line Eastern Extension
- Bunker Hill Transit Tunnel (existing)
- Long-term street improvements to Alameda Street
- Mangrove Estates (private development)
- First Street North (public/private development)
- First Street South (private development)
- Central Plants Project (private development)
- Other private development projects at various stages of completion

Specifically, any potential use of the Bunker Hill Transit Tunnel should be reviewed as it relates to the subsequent demand for the Downtown Connection system. For example, if the tunnel were to initiate service, would this duplicate any service provided by the Bunker Hill alternatives or vice versa?

C. Existing Budget Considerations

The current review of MTA's 30-Year Integrated Transportation Plan has a significant effect upon the future of the Downtown Connection. While at the commencement of this Preliminary Planning Study, \$800 million was allocated for the construction of the Downtown Connection as part of the 30-Year Integrated Transportation Plan, its current status is uncertain. Pending resolution of budget priorities by the MTA Board, the status of the planning effort for the Downtown Connection is, at a minimum, the body of information presented by this study and then a subsequent Route Refinement/Environmental Impact Report. It is within this next phase that analysis of the significant issues and questions presented here will be resumed and refined for a comprehensive assessment of the five Downtown Connection alternatives.

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and
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APPENDIX B

Review of Transportation System Documents



REVIEW OF OTHER REPORTS FOR THE BLUE LINE DOWNTOWN CONNECTION STUDY

A number of reports and studies were reviewed to gain an understanding of existing studies as they relate to the Blue Line Connector study. A summary of information from the following reports is included in this report:

- **CRA Fact Book-Los Angeles Downtown Strategic Plan**
- **Transportation Improvement Plan for Union Station**
- **LACTC Proposed 30-Year Integrated Transportation Plan**
- **Central City West Specific Plan**
- **Exposition Park Branch Line Rail Transit Corridor Route**
- **Pasadena-Los Angeles Light Rail Transit Project FEIR**
- **Final Report Part A-Electric Bus Study for RTD and the LACTC**
- **Bunker Hill Transit Tunnel Study Phase II**
- **The Long Beach-Los Angeles Rail Transit Project FEIR**
- **Los Angeles Rail Rapid Transit Project-Metro Red Line FEIR**

CRA FACT BOOK-LOS ANGELES DOWNTOWN STRATEGIC PLAN (October 1990)

Key Facts:

- In the Los Angeles region the generation of auto trips is racing ahead of the rising population and Downtown is positioned at the hub of the regional freeway system. Vehicles are trying to get through Downtown providing more and more competition to those trying to get to and from Downtown.
- An increasing number of vehicles, between 50% and 70%, do not have Downtown destinations. They are only coming here because it is the quickest way to get to somewhere else. However, many vehicle trips do end in Downtown. In 1987, between the hours of 6:00 a.m. and 10:00 p.m., and estimated 831,600 vehicle trips entered or left Downtown daily. This was a 23% increase over 1980 traffic levels.
- For Downtown as a whole, 38% of Downtown's office workers rideshare or use transit; in the most congested part of Downtown only 34% use transit or rideshare. An estimated 59.8% of office workers continue to drive alone to work.
- Better accommodating regional traffic through Downtown is the objective of proposals for a high-capacity facility along Alameda Avenue and for a second deck (a "thru-way") over the Harbor Freeway.

Facts Related to the Blue Line Connector:

- The Red Line and the Long Beach Blue Line provide relatively quick travel between the points they serve Downtown and have ample capacity. The primary purpose of these rail transit facilities is to distribute regional access, not for internal circulation.
- The "Metro Center" station, where the Red Line and Blue Line cross, is projected to be the second busiest station (after the Red Line 5th and Hill station), although it will have only 65% of the patronage of 5th and Hill; a higher proportion of patrons will access the station by bus than any other Downtown station.
- It is believed that improving Downtown's internal circulation is to be done on its surface streets. However, it appears that a majority of Downtown's trip makers have not, for a number of reasons, made use of any form of street transit Downtown.
- Unlike the Orange Line, which will provide through-service from east to west, travellers crossing north and south across Downtown may have to contend with a "Blue Line" gap.

TRANSPORTATION IMPROVEMENT PLAN FOR UNION STATION (November 1992)

Key Facts:

- This study analyzes plans for new transit facilities in Union Station and assesses the adequacy of these facilities to meet anticipated demand. Two time frames were analyzed: 1998 and 2010. The analysis primarily focused on pedestrian demand and adequacy of proposed pedestrian facilities. In general, capacity analysis confirms that the modified Transit Master Plan for Union Station is adequately designed for transit use and pedestrian transfer activity.
- It states that Union Station should not be thought of as the control hub of all future transit services in the area. Some of the transfer opportunities, and even some transit routes, may be more appropriately located away from the station. If too many transfers occur at Union Station, the facility may not be able to handle all of the demand. The solution to this problem is to better understand all of the transfer movements that will be desired and to determine whether some transfer opportunities may be more appropriately located elsewhere.

Facts Related to the Blue Line Connector:

- The Blue Line capacity will be 435 persons per train (3-car trains) in 1998 and 363 persons per train (average of 2.5 car trains) in 2010. In 2010, trains running through downtown and continuing to Long Beach can only be two cars long because of design limitations on the Long Beach line. Capacities of two-car trains is 290 (152 seats plus 138 standees) and the capacity of three-car trains is 435 (228 seats plus 207 standees).
- In 1998, the Blue Line will terminate at Union Station. The peak hour load is projected to be about 4,000. In the AM peak hour in 2010, it is estimated that 3,960 riders who arrive at Union Station on all modes will board Blue Line trains. 3,564 of these will be toward downtown. The Blue Line trains from Burbank/Glendale and Pasadena will already be carrying 4,000 through trips to downtown. The resulting total ridership of 7,564 peak hour trips will exceed capacity of the Blue Line downtown connector if only two-car trains are used and the planned 2010 headway of 2.7 minutes is provided. Two-car trains are the largest trains that can proceed along the Long Beach Line due to design limitations. If the trains leaving Union Station can average 2.3 to 2.5 cars per train, then the peak hour demand will be 93 percent to 100 percent of full capacity. This

will still be an unacceptable condition as patrons will be forced to wait on platforms unable to board fully loaded trains for a substantial portion of the peak hour. The trains will need to average 2.7 to 3 cars per train before an acceptable condition will exist during the normal peak hour. This assumes that 2.7 minute headway can be achieved. Currently, the Blue Line control system is designed to handle a minimum 3 minute headway. The reduced headway will require a design change.

- In the 2010 surge condition, operation of the Blue Line Downtown Connector faces a serious challenge. The five-minute surge adds 476 more people to the Blue Line Downtown Connector than in normal peak conditions. The size of the Blue Line trains becomes critical in this situation. If the trains average 2.5 cars per train or less, then it will take 48 minutes (18 trains) or longer to dissipate the queue that will be on the Blue Line platform. At 2.7 cars per train, the time to dissipate the queue drops to 23 minutes (9 trains). At 3 cars per train, the time drops to 13 minutes (5 trains). Again, this assumes that 2.7 minute headways are achieved.
- One of the conclusions of the study was the Blue Line Downtown Connector may not be able to handle the demand during the surge break (peak few minutes of peak hour) conditions, and may be overburdened during normal peak hours as well.

LACTC PROPOSED 30-YEAR INTEGRATED TRANSPORTATION PLAN (April 1992)

Key Facts:

- This plan is a strategic planning tool which provides the framework necessary to develop and evaluate the most cost-effective means of improving mobility in Los Angeles County over the next 30 years. It includes a variety of transportation modes and solutions such as highway, bus, rail, and demand management strategies.
- There are three versions of the 30-Year Plan, each defined by the assumed level of resources available to the LACTC for implementing transportation improvements: The Fundable Plan, The Expanded Plan, and The Unconstrained Plan.
- *The Fundable Plan* is based on revenue and expenditures derived using best available information about future transportation revenues and costs in Los Angeles County. The Fundable Plan was developed using revenue estimated from existing, voter-approved funding sources, and does not assume that any new taxes or tax increases will be imposed over the next 30 years.
- *The Expanded Plan* assumes that reasonable revenue increases will occur in the second and third decades of the 30-Year Plan including a new Federal Gas Tax and another issue of State Rail Bonds. These assumptions permit program expansions and new projects to be added in the second and third decades of the 30-Year Plan.
- *The Unconstrained Plan* represents the universe of transportation improvements which have been identified for Los Angeles County. It provides a useful perspective of the magnitude of what needs to be done.

Facts Related to the Blue Line Connector:

- The Blue Line Connector is the Fundable Plan and is scheduled to be implemented between fiscal years 1999 through 2005. It is described as the connection between 7th/Flower and Union Station. According to the report, it has regional significance and is essential to prevent severe bottlenecks in downtown Los Angeles as more rail lines are opened.

CITY OF LOS ANGELES CENTRAL CITY WEST SPECIFIC PLAN FINAL EIR (May 1990)

Key Facts:

- The Central City West (CCW) Specific Plan provides a future land use forecast of about 25 million square feet and 12,000 dwelling units total in the year 2010, or 35 million square feet and 14,500 dwelling units at build-out. The study area is approximately 464 acres and bounded generally by the Hollywood Freeway (U.S.-101) on the north, the Harbor Freeway (SR-110) on the east, Olympic Boulevard in the south, and on the west by Glendale Boulevard/Lucas Avenue.
- The Specific Plan includes an integrated package of development of freeway and street improvements, transit and TDM facilities and programs, and revised parking requirements. The plan provides linkages to existing and proposed transit facilities serving central Los Angeles, as well as the opportunity to significantly improve bus transit access to both CBD and Central City West.
- A new Metro Rail Station is proposed at Bixel and Seventh, to provide a direct connection for CCW to the Red Line subway system. An automated or pedestrian linkage is proposed across the Harbor Freeway which would provide convenient access to the planned Blue Line Station at 4th/Flower (assumes our proposed subway alignments). A number of other improvements are proposed including shuttle service to the 7th/Flower station (Blue Line and Red Line service), extension of Harbor Freeway Transitway, and HOV/Busways.
- The proposed development and improvements would be implemented in four phases.

EXPOSITION PARK BRANCH LINE RAIL TRANSIT CORRIDOR ROUTE (April 1992)

Key Facts:

- The Exposition Park Branch Line would operate as a branch of the Metro Line. The proposed alignment would extend south along Flower Street from Washington Boulevard and continue to the Exposition Boulevard median right-of-way to the proposed terminus at Vermont Avenue.
- The light rail technology to be used for this project would be identical to the vehicles currently being used on the Metro Blue line. The maximum capacity of each car is 237 passengers (76 seated and 161 standing). The estimated overall time to travel the route from 7th/Flower to Vermont/Exposition would be about 11 minutes.
- The proposed 30-year Plan prepared by LACTC, estimates a daily ridership of 15,000 upon project completion. The headway is anticipated to be 6 minutes during peak hours.
- The proposed line would provide transfer opportunities to the Harbor Freeway Transitway (currently under construction) near 23rd Street Station.

PASADENA-LOS ANGELES LIGHT RAIL TRANSIT PROJECT FEIR (February 1990)

Key Facts:

- The proposed Pasadena-Los Angeles Rail Transit Project involves the extension of the Long Beach-Los Angeles Light Rail (LRT) facility from downtown Los Angeles through Pasadena.
- The proposed project considers two main alignments alternatives: the Highland Park alignment through Highland Park, South Pasadena, and Pasadena; and the North Main Street alignment through Lincoln Heights and El Sereno.
- The proposed LRT project offers operational and resulting environmental advantages to the expansion of existing bus service. While bus service expansion would be difficult given the constraints of a heavily congested corridor, the LRT operating on its own right-of-way will allow for the movement of more people with a higher frequency especially during the peak hours. Each electrically powered, two or three car LRT train will remove six to nine diesel-powered buses from the congested roadway system resulting in improved regional mobility and air quality. Also, the project will have a beneficial impact on a regional scale through an overall reduction in vehicle miles traveled.

Facts Related to the Blue Line Connector Study:

- In downtown Los Angeles, one of a number of downtown alignment options will connect the Highland Park or North Main Street alternative alignments with the Long Beach LRT or provide a Metro Rail connection with a station at Union Station.
- The three route "downtown options" considered to connect the Long Beach Light Rail to the Highland Park alignment are: Chinatown, Second Street, or Second Street-Union Station. Alternatively, this alignment can begin at Union Station using the Union Station "No Subway" option or a phased construction of the Second Street-Union Station option.
- The two route "downtown options" considered to connect the Long Beach Light Rail to the North Main Street Alternative are: Chinatown and Second Street.

FINAL REPORT PART A-ELECTRIC BUS STUDY FOR RTD AND THE LACTC (December 1991)

Key Facts:

- The development of this report focused on gathering, organizing, and interpreting information from many sources to evaluate the conversion of motor bus routes in RTD's system to trolley operation.
- RTD is aggressively moving toward implementation of alternatively fueled motor coaches but at a substantial increase in cost compared to today's diesel operations. Durability and reliability of alternatively fueled coaches is improving, but still falls short of a conventional diesel fleet.
- A mixed fleet of both electric trolleys and alternatively fueled motor coaches can be part of an integrated solution to Southern California's public transit needs. Capital costs associated with establishing the overhead wire system suggest that trolley buses will be most cost effective on heavily travelled routes where utilization of the overhead wire system is high.

- The proposed method of control is to install overhead trolley wires for power transmission to transit buses operating along major fixed routes. Services that run continuously along major arterials at intervals of 15 minutes or less would be candidates for conversion from diesel operation directly to electric operation.
- The emission reduction impact from this control measure would be equivalent to reducing the emission levels from 30 percent of the bus transit fleet (30 percent of about 3,000 buses) to near zero levels. Trolley Buses are a reasonable and proven technology for reducing emission below emerging clean fuel technologies.

Facts Related to the Blue Line Connector:

- An eleven route system has been identified for a Phase 1 trolley bus program. The routes selected are among the most heavily used in RTD's system and cover a wide geographic region. The majority (10 of the 11) routes chosen for Phase 1 either have partial or major coverage in the Los Angeles downtown area.
- Bus routes covering major areas of downtown included in Phase 1 are: Line 16 W. 3rd St., Line 18 W. 6th Street-Whittier Blvd., Line 30 W. Pico-Floral Dr., Line 33 Venice Blvd., Line 40 Hawthorne-Union Station, and Line 45 Broadway.
- Bus routes covering partial areas of downtown included in Phase 1 are: Line 76 Valley Blvd., Line 424 Ventura Blvd., and Line 420/560 Van Nuys Blvd.

BUNKER HILL TRANSIT TUNNEL STUDY PHASE II (June 1990)

Key Facts:

- The City of Los Angeles is reviewing opportunities for fully utilizing the Bunker Hill Transit Tunnel. The BHTT consists of easements and actual tunnel segments that bisect office, retail, residential and entertainment-related space in downtown Los Angeles. The BHTT is potentially a highly valuable element of transportation infrastructure serving the Central Business District area.
- In this study, six alternatives or scenarios were chosen for use of the Bunker Hill Transit Tunnel, in terms of physical feasibility, patronage, connectivity to existing and planned transportation facilities, and consistency with City goals and policies.
- The six alternatives for the BHTT are: Alternative #1-Use of the tunnel as pedestrian concourse for circulation within Bunker Hill, Alternative #2-Use of the tunnel as an exclusive busway for part of a new DASH route serving Bunker Hill, Alternative #3-Provide a shuttle service within the Bunker Hill tunnel with an automated Guideway Transit system, Alternative #4-Extend Alt.#3 to provide Automated Guideway Transit connection to Central City West and Little Tokyo, Alternative #5-Extend Alternative #4 into a loop system providing Automated Guideway Transit connection to the whole of the central core of downtown, and Alternative #6-Further extend Alt.#5 in phases to provide comprehensive Automated Guideway Transit coverage to the whole downtown area.
- System alternatives recommended for second-level evaluation screening include: more detailed study of alternatives to the Greater Downtown Circulation/Distribution System (Alt #6), more detailed study of the Central Core Circulation/Distribution System (Alt #5), more detailed study of the Pedestrian Concourse System (Alt #1) and potential non-transportation uses of the BHTT.

Facts Related to the Blue Line Connector:

- Alternative #5-Central Core Circulation/Distribution System-would have an advantage of providing a connection to Red Line at 4th/Hill St. and also the Blue Line at 7th and Flower.
- Alternative #6-Greater Downtown Circulation/Distribution System-would have an advantage of providing a connection with the Red Line at 7th and Flower, 4th and Hill and Union Station and to the Blue Line at 7th and Flower, Pico and Flower and Washington and Grand.

THE LONG BEACH-LOS ANGELES RAIL TRANSIT PROJECT FEIR (May 1984)

Key Facts:

- The Long Beach-Los Angeles Rail Transit Project is the first light rail corridor to be undertaken as part of a transit improvement program by the Los Angeles County Transportation Commission (LACTC).
- The rail transit project is being proposed as conventional light rail system in the existing Southern Pacific rail rights-of-way (Wilmington and East Long Beach Branches) extending from downtown Los Angeles to downtown Long Beach to serve between 54,000 and 76,000 passengers per day.
- For purposes of evaluating alternative routes, this corridor has been divided into 3 segments: downtown Los Angeles, mid-corridor, and Long Beach segments. The proposed line would pass through the cities of Compton and Carson, and the unincorporated county areas of Florence-Firestone, Willowbrook, and Dominguez Hills.
- A total of 13 alternatives were chosen to be evaluated for the Long Beach Light Rail, they include: Downtown Los Angeles Segment-Alternative LA-1 (Broadway/Spring Couplet), Alternative LA-2 (Flower St. Subway), and Alternative LA-3 (Olympic/9th Aerial). Mid-Corridor-Alternative MC-1 (Compton At-Grade), Alternative MC-2 (Compton Grade Separation), and Alternative MC-3 (SPTC Railroad Relocation). Long Beach-Alternative LB-1 (Atlantic Avenue Two-Way), Alternative LB-2 (Atlantic/Long Beach Couplet), Alternative LB-3 (Los Angeles River Route), and LB-4 (Atlantic with Pacific avenue Loop).
- Three additional proposed routes include LB-3 (Broadway Aerial-Modified River Route), LB-5 (Long Beach Boulevard, Two Way), and LB-6 (Willow Street Terminus).

Facts Related to the Blue Line Connector:

- Downtown Los Angeles-Alternative LA-2 (Flower Street Subway): A possible future extension of this alignment to Union Station has been assessed. Such an extension is not part of this project, and Union Station may not be the ultimate terminus. However, the extension studied would continue in a subway north on Flower Street to 1st and then turn easterly on 1st to Main Street. There the tracks would turn north, then east along and under the Hollywood Freeway and finally north to Union Station.
- Downtown Los Angeles-Alternative LA-3 (Olympic/9th Aerial): A possible future extension of this alignment could proceed as follows: At 3rd Street, the line would turn east and go underground through the Bunker Hill area. It would then portal on 1st Street to an aerial line east of Hill Street. The line would continue on 1st Street to Los Angeles where it would turn north and proceed to the Hollywood Fwy. After swinging northeast along and over the Hollywood Fwy, it would terminate at Union Station.

LOS ANGELES RAIL RAPID TRANSIT PROJECT-METRO RED LINE FEIR (November 1987)

Key Facts:

- The Metro Rail Project is an 18.6 mile rail rapid transit line designed and located to serve the core of the Southern California Region.
- To foster the goals of improving mobility and achieving efficient land use and urban form in the Regional Core, the SCRTD designed a rail rapid transit system. The system extends from the high-rises of the Los Angeles Central Business District (CBD) west along the intensely developed Wilshire Corridor, and through Hollywood and the Cabuenga Pass to the San Fernando Valley.
- Several alternatives have been formulated to offer some improvement to travel conditions in the Regional Core. These Alternatives include a Locally Preferred Alternative, a Locally Preferred Alternative with an Aerial Option, a Minimum Operable Segment, and a No Project Alternative. The Locally Preferred Alternative (LPA) was chosen as the most feasible alternative for construction.
- As a result of the Congressional mandate the Original Locally Preferred Alternative (LPA) adopted in 1983 and evaluated in the FEIS no longer could be constructed. The Congressionally Ordered Re-Engineering (CORE) Study was formally initiated in January 1986 to review, identify, and adopt, modification/re-alignment of the LPA to meet Congressional requirements.
- To promote discussion of modification/re-alignment of the Original LPA with the community, the SCRTD developed an initial set of six candidate alignments. Each of the six initial alignments was designed to provide rail transit service to the Regional Core and was configured to avoid the methane risk areas by either routing the system around the risk area or by using an aerial (above-ground) profile through the risk area. The six alignments are: Fairfax Aerial, La Brea Aerial, Vermont-Pico, Western-Pico, Vermont-Olympic and Western-Olympic.
- Based on comments received at the first series of public meetings, the six initial alignments were revised and expanded to include twelve alignments, they include: A-1, A-2, A-3, Alignment B, C-1, C-2, C-3, Alignment D, Alignment E, Alignment F, Alignment G, and Alignment H.
- The Los Angeles City Council and the SCRTD Board of Directors adopted a set of four candidates alignments for a second level, more detailed analysis. The four alignments were considered the most feasible and effective for providing rail transit service to the areas that would have been served by the Original LPA. The Alignments include: A-3, C-1, Alignment H and Alignment J.
- In November 1986, the SCRTD broadened its community outreach program by establishing the 120-member CORE Forum, a group of community leaders with direct interest in the Metro Rail system. This group was convened to provide additional advice to the SCRTD on modification options.
- Additional "mix-and-match" alignments were added. These alignments typically consisted of combinations of segments of the four alignments. Also, recommendations for the Hollywood candidate stations were made. Ten additional "mix-and-match" lines that were evaluated include: (Modified)-C-1, J, MM1, MM2, MM3, MM4, MM5, MM6, and MM7.
- The Alignments were narrowed down to four possible candidates. The Congressionally Ordered Re-Engineering Study Candidate Alignment 4 was chosen as the New Locally Preferred Alternative (LPA) for the Metro Rail Project.

APPENDIX C
Continuity at Union Station



BLUE LINE CONNECTION PRELIMINARY PLANNING STUDY

Continuity at Union Station

THE BASIC ISSUE:

The now-completed FINAL ENVIRONMENTAL IMPACT REPORT for the Pasadena Blue Line identifies the southern terminal at Union Station. The two-track line would approach Union Station from the north on viaduct structure, and eventually terminate with an at-grade station utilizing the existing Platform 1. The geometrics so presented are in accordance with the "Highland Park Alternative-Union Station 'No Tunnel' Option".

It is imperative, however, that this selected alternative provides the opportunity for a continuity between it and the existing Long Beach-Los Angeles Blue Line, utilizing a "Downtown Connection" presently under study. The document to follow will briefly summarize the issues and basic technical considerations associated with accomplishing this necessary continuity.

GEOMETRIC ISSUES:

South of Union Station the Santa Ana Freeway (Route 101) is locally in a depressed section. As the freeway approaches from the east, it transitions from an aerial structure to an undercrossing at Alameda Street. Further west, the freeway again increases in elevation. A convenient low point is created in the area opposite from Tracks 1 and 2 of Platform 1.

The track and platform area of Union Station is on an embankment significantly higher than the freeway and its adjacent ramps and service roads, all immediately to the south. This configuration readily lends itself to a continuity of the Blue Line utilizing an aerial structure over the Santa Ana Freeway.

It must be assumed that no vertical adjustments are possible to the freeway. The profile of the extended Blue Line would be governed by a 16'-6" clearance over freeway lanes and ramps. A slightly lesser clearance could be accepted over service roads. Further study and a need for additional field data is needed to ascertain if a track profile adjustment would be required within the track and platform area of the station. If such an adjustment is required, the available space for the light rail platform would be reduced. At present, it is envisioned that the length of the light rail platform would be a minimum of 600 feet, adequate for the anticipated number of articulated LRT units concurrently using the platform.

If an above-grade transit/HOV structure is introduced within the freeway corridor, it will be governed by the profile of the Blue Line and its required clearance. The transitway would then occupy the uppermost level.

A Blue Line connection approaching from the south in a tunnel section would not be compatible with the proposed Pasadena Blue Line geometrics.

STRUCTURAL ISSUES:

When considering an aerial crossing of the Blue Line from Union Station to the south side of the freeway, it is desirable to avoid long spans (in excess of 100 feet) in order to facilitate conventional construction,

minimize structural depth, more readily achieve clearance requirements and increase economy. The placement of columns becomes critical. Visual inspection would indicate that one column could be placed in the unpaved median area between Aliso Street and the extreme right lane of the westbound Santa Ana Freeway. Another column could be placed between the extreme right lane of the eastbound Santa Ana Freeway and the ramp from Commercial Street. (Space for columns diminishes as Blue Line trackage would cross further east, as would be the case when utilizing Tracks 3 and 4.)

Precast prestressed concrete or shop-fabricated structural steel girders could both be used for the overcrossing LRT structures, utilizing spans made possible by the previously mentioned column locations. Conventional construction would be utilized, similar to numerous existing light rail systems. Using precast concrete or prefabricated steel sections would have the added benefit of minimizing falsework, thereby reducing construction time and the period of disruption to existing traffic.

As part of the structural design process, complete geotechnical data would have to be provided. In soft-soil conditions, column footings would likely require lengthy piles to meet California seismic design criteria. Some temporary disruption to traffic during construction must be anticipated. Larger spread footings, possibly reducing pile requirements, would be even more disruptive to existing traffic.

The exact location of Red Line tunnels south of the freeway may affect the horizontal location of the Blue Line Connection. The effect of columns located directly above a tunnel depends on the depth of soil above a tunnel, and footing details. It is essential to avoid inducing concentrated load to the tunnel lining. If necessary, the Blue Line structure would have to be supported by members which straddle the tunnel on each side of it.

Fire codes relevant to viaduct construction are not expected to become a significant issue.

FREEWAY/HIGHWAY ISSUES:

Both permanent and temporary conditions imposed on impacted roadways would have to recognize design and safety standards of CalTrans and all other involved agencies. Barriers would have to be introduced at column locations. Additional highway lighting may have to be provided under LRT structures. Adjustments may be required to the location of overhead freeway signs, with the possible desirability to utilize the LRT structures as overhead sign supports.

Maintenance of existing traffic during construction becomes a major issue. It must be assumed the existing number of lanes are to be maintained at all times. Temporary compromises to lane or shoulder widths could become necessary. Reducing existing two-lane ramps to single-lane ramps, thereby eliminating HOV bypass lanes, may also have to be accepted for temporary periods.

UNION STATION ISSUES:

In the event the profile of the Blue Line Connection results in an adjustment to track elevations within the Union Station platform area, internal vehicle circulation would be affected. This would have to be resolved or, as a worst case, could result in the requirement for the Pasadena Blue Line from the north to remain on structure. The Union Station LRT stop would then be aerial.

In any event, careful coordination would be required between light rail development and projects presently underway for Union Station. This includes the present development of a new at-grade rail station involving both Amtrak and commuter rail services, as well as the planned construction of a new terminal building at the end of Amtrak trackage.

OTHER TRANSIT ISSUES:

Existing and proposed bus circulation in the Union Station area would also have to be coordinated with light rail design and anticipated construction processes.

UTILITY ISSUES:

At this time, serious utility conflicts are not anticipated. The Santa Ana Freeway right-of-way should be relatively free of public utilities. The freeway does have an existing closed storm drainage system, including longitudinal lines paralleling concrete barriers along which drainage inlets are located. These lines may be impacted in the event structural columns are placed within the freeway median, as would be the case if an aerial transitway would be introduced.

CONTINUING STUDIES:

Subsequent to the crossing of the Santa Ana Freeway, the Blue Line alignment enters into the Los Angeles Central Business District. Numerous alignment options are available and must be thoroughly investigated with regards to station locations, LRT operations, cost, transit interconnectivity and community impact.

Immediately south of the Santa Ana Freeway, the alignment would generally coincide with Hewitt Street or be immediately adjacent to Hewitt Street. The taking of additional right-of-way along Hewitt Street may be feasible, specifically between Commercial Street and Ducommun Street. However, Hewitt Street ends at Ducommun Street, and any extension of the alignment beyond would confront utility facilities along the south side of Ducommun Street. Alignment adjustments are most likely available to avoid specific, localized facilities within the large block between Ducommun and Temple Streets, but right-of-way acquisition and/or easements would be required in any event.

To extend the LRT alignment into this large block, also bounded by Alameda and Garey Streets would most likely require an extension of the viaduct structure in order to maintain through traffic on Ducommun and Commercial Streets. At this time, a full inventory of properties within this large block has not been undertaken. Such efforts have been assumed to be part of the concurrent Blue Line Connector Study.

Available alternatives could involve the use of either Commercial or Ducommun Streets for LRT by turning the alignment towards the west immediately after the freeway crossing. Numerous issues would have to be investigated, including the limited use of the Alameda Street corridor, or how to best cross Alameda Street, how long to maintain LRT on structure, when to transition to either an at-grade or tunnel section, whether spatial limitations may indicate the localized use of paralleling streets for separate northbound and southbound trackage, and many other considerations.

CONCLUSIONS:

Not fully addressed at this time are issues directly related to light rail operations. It is not fully known at this time whether the Blue Line crossing of the Santa Ana Freeway will involve two or four tracks. Additional studies will be needed in the event Union Station becomes a terminal point of light rail operations. End-of-line turn-around operations, as well as the probable need for storage tracks, would have to be fully investigated. Considerations identified could affect the overall timing of rail development in the Los Angeles area, and also affect the priority of a downtown Blue Line Connection. In summary, a southerly extension of the Blue Line on an aerial structure appears feasible using conventional construction techniques.

APPENDIX D

No-Build Alternative - Analysis of Patronage and Operations



**BLUE LINE CONNECTION STUDY
ANALYSIS OF PATRONAGE AND OPERATIONS
NO-BUILD ALTERNATIVE**

The No-Build Alternative does not include any connector between the north and south segments of the Blue Line. Trains from Pasadena and Burbank (and the 10/60 corridor) would terminate at Union Station. Trains from Long Beach and Santa Monica would terminate at Metro Center (7th/Flower).

The operating plan for the No-Build Alternative would have four peak train services on the south, and three on the north (see also enclosed Table N-1):

SOUTH:

- Long Beach to 7th/Flower
- Willow to 7th/Flower
- Santa Monica to 7th/Flower
- Crenshaw to 7th/Flower

NORTH:

- Irwindale to Union Station
- Del Mar to Union Station
- Burbank to Union Station

Each of these train services would operate on 8 minute headways, except the Burbank trains, which would run every 4 minutes, since no turnback is proposed on that line. There would be 4-minute headways between the turnback location and downtown on each of the four system branches.

The estimated annual operating cost would be about \$142 million. This is lower than any of the build alternatives, since the system is smaller, with less service operated. The cost could be reduced by not operating all of the turnback services during off-peak periods, as discussed in the main report for Alternative A-C.

The fleet size for the No-build Alternative would be 187 cars. This is 12 less than the lowest of the "build" alternatives, Alternative A-C, which would require 199 cars. Therefore the capital cost (for vehicles only) would be about \$36 million less than Alternative A-C.

MTA tested the ridership for this configuration, and the results are summarized in Table N-2. This table also includes Alternatives A-C, D, and E, for comparison. The No-build Alternative would have 265,000 Blue Line boardings, fewer than any of the build alternatives. The number of peak period linked trips for the No-build Alternative is also lower than in other alternatives.

The total of the four line loads entering downtown is lower than for Alternative A-C (see table N-2). Surprisingly, however, this total volume is higher than for Alternatives D and E. The

biggest difference is in the passenger volume entering downtown on the Exposition Line, which is considerably higher with the No-build alternative than in Alternatives D and E. This reinforces the earlier conclusion that patrons from the Exposition Line are not well served by either the San Pedro or Alameda Connector. The Flower Street alignment, even terminating at 7th Street, attracts more riders.

With no downtown connection, many passengers use the Red Line for downtown distribution, as well as for through-downtown trips. The southwest-bound volume at Hill/5th would be over 13,000, compared to under 9,000 for Alternative A. The shifting of riders to the Red Line would require additional service on the Red Line, as with Alternatives D and E. The estimated Red Line operating cost would be about \$3 million higher than with Alternative A-C. The capital cost for 38 additional Red Line vehicles would be about \$115 million.

Conclusions

- The No-build Alternative provides no direct Blue Line service through downtown. Through passengers would have to ride the Red Line between Union Station and Metro Center to travel between the Long Beach or Exposition corridors and the Pasadena or Burbank corridor.
- The No-build Alternative would have the lowest annual Blue Line operating cost: \$142 for Blue Line operations vs. \$144 million for Alternative A. Extra Red Line costs would offset the cost advantage, for a net increase of about \$2 million. In addition, extra downtown shuttle bus routes may be needed to distribute passengers from Union Station and Metro Center to areas served by the Blue Line connector.
- The No-build Alternative would require 12 fewer Blue Line cars, but 38 more Red Line cars, than Alternative A-C. The net estimated capital cost for vehicles would be about \$70 million more than Alternative A-C.

LACMTA Blue Line Connector Study

Blue Line Operating Plans

Table N-1

Line	From	To	Run Time (min.)	Dist. (miles)	Headway			Train Consist			Vehicles		Annual Oper. Statistics		Patronage & Loading		
					Peak	Base	E/L	Peak	Base	E/L	Peak	Total	Car-Mi. (million)	Tr-Hrs. (thous.)	Pk.Hr. MLP	Load Factor	Max. Load Point Location
<i>No-Build Alternative</i>																	
A	Long Beach	7th/Flower	57.0	21.3	8.0	10.0	10.0	2.0	2	2	32	3.92	99.5	1,650	1.45	LB/LA NB @ Wash.	
B	Willow	7th/Flower	40.5	18.4	8.0			2.0	2	2	24	0.84	18.4	1,500	1.32	LB/LA NB @ Wash.	
D	Crenshaw	7th/Flower	15.2	5.6	8.0			2.0	-	-	10	0.26	7.7	1,600	1.40	Crenshaw > Flower	
C	Santa Monica	7th/Flower	34.0	15.4	8.0	10.0	10.0	2.0	2	2	20	2.84	61.5	2,050	1.80	S.Monica > Flower	
	<i>Subtotals South Side:</i>				2.0	5.0	5.0				86	103	7.86	187.0	6350	1.39	along Flower St.
X	Irwindale	Union Station	44.9	22.5	8.0	10.0	10.0	2.0	2	2	26	4.16	77.6	2,050	1.80	Irwindale > Chinatown	
Y	Del Mar	Union Station	22.3	9.1	8			2.0	-	-	14	0.42	10.7	1,700	1.49	SB @ Chinatown	
Z	Burbank	Union Station	25.6	13.6	4.0	10.0	10.0	2.0	2	2	30	3.13	57.8	3,650	1.60	Burbank > Chinatown	
	<i>Subtotals North Side:</i>				2.0	5.0	5.0				70	84	7.71	145.9	7,400	1.62	SB @ Chinatown
TOTAL ALL LINES:											156	187	15.56	332.8			

NOTES:

- 2010 patronage estimates by LACMTA 6/24/93; network includes Crenshaw & 10/60 Corridor lines.
- Spare vehicles = 20%

Prepared by Manuel Padron & Associates

LACMTA Blue Line Connector Study
 Summary of Patronage and Operations

Table N-2

	NO-BUILD ALTERNATIVE	ALTERNATIVE A-C Bunker Hill	ALTERNATIVE D San Pedro	ALTERNATIVE E Alameda
PATRONAGE				
BLUE LINE				
Daily Boardings	265,000	373,000	282,000	270,000
Peak Line Load (AM)				
Long Beach	3,100	3,450	2,800	3,250
Exposition	3,700	4,250	2,150	2,050
Pasadena	3,750	4,200	4,000	3,950
Burbank/Glendale	3,650	4,000	3,850	3,800
SUM @ CBD Cordon:	14,200	15,900	12,800	13,050
SB from First Street	NA	5,550	2,450	2,100
RED LINE				
Daily Boardings	492,000	426,000	530,000	533,000
Peak Line Load (AM)				
WB to Pershing Square	13,050	8,800	13,950	14,600
EB from Vermont	10,200	9,650	11,000	11,000
AM Peak Period Linked Trips	321,100	322,800	321,800	322,200
OPERATIONS				
BLUE LINE				
Fleet Vehicles	187	199	204	202
Annual Veh-Mi. (millions)	15.6	18.06	17.8	17.8
Annual Tr.-Hrs. (000)	333	444	459	452
Annual Oper. Cost (millions)	\$142	\$144	\$144	\$144
Cost/Boarding	\$1.75	\$1.26	\$1.67	\$1.73
RED LINE				
Fleet Vehicles	170	132	170	170
Annual Veh-Mi.	13.9	12.6	13.9	13.9
Annual Tr.-Hrs.	139	139	139	139
Annual Oper. Cost (millions)	\$119	\$116	\$119	\$119
Total Operating Cost, Red + Blue Lines (millions)	\$262	\$260	\$264	\$263

APPENDIX E

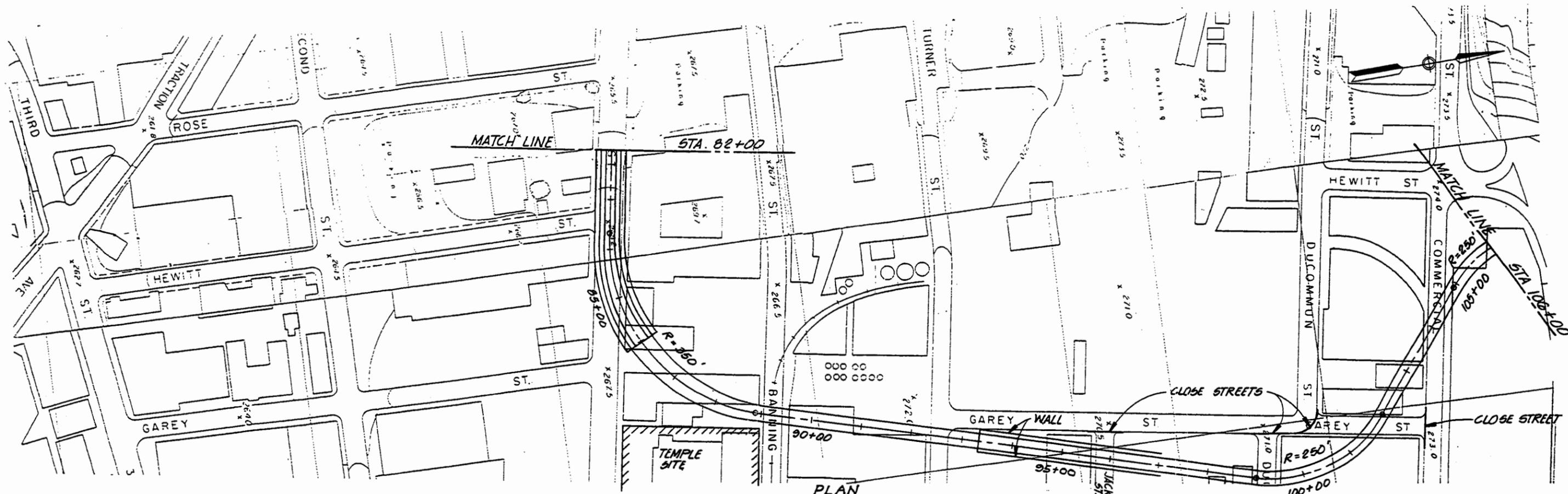
Plan and Profile Drawings - Alternatives A - E



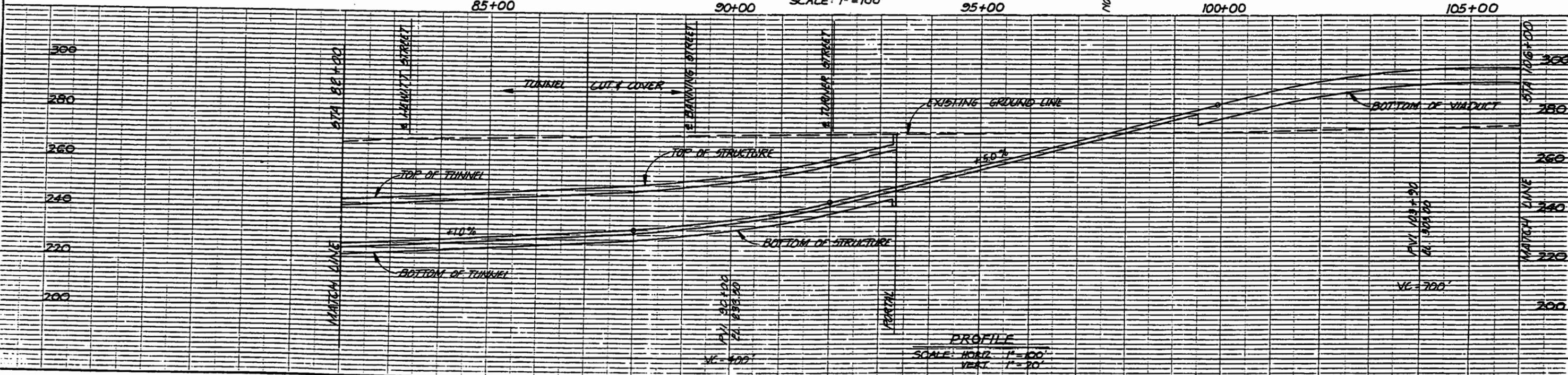
PLAN AND PROFILE

ALTERNATIVE A - BUNKER HILL FIRST STREET





PLAN
SCALE: 1" = 100'

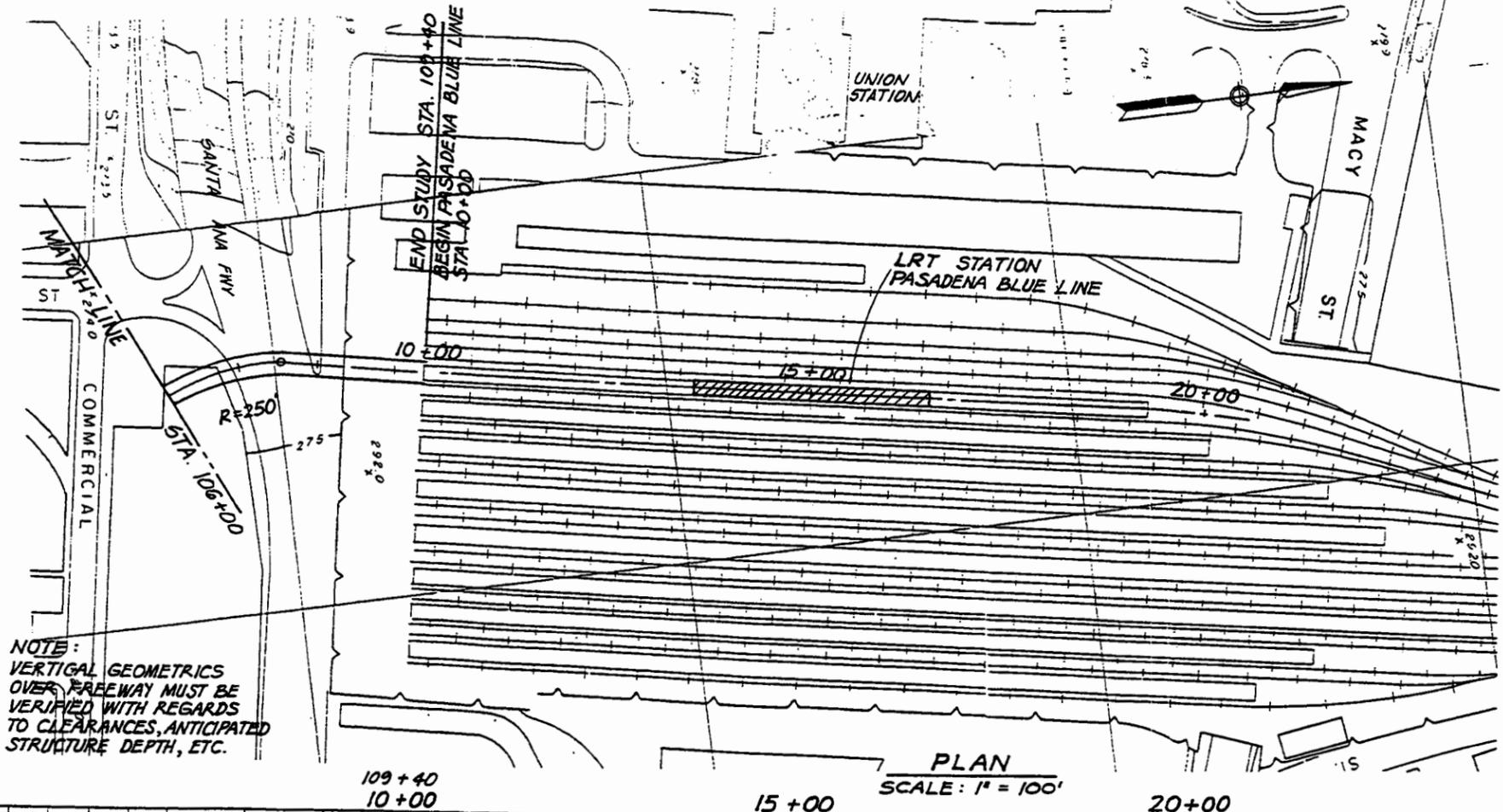


PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

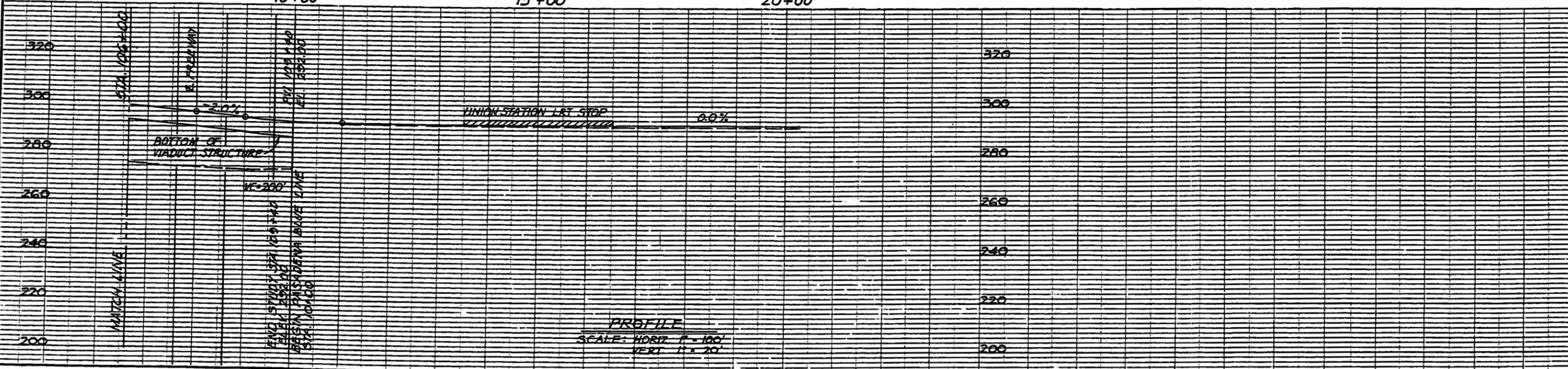
NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

DRAWN: E.V.E.	 LOS ANGELES COUNTY TRANSPORTATION COMMISSION DOWNTOWN BLUE LINE CONNECTION STUDY
DESIGNED: J.A.S.	
APPROVED:	
TRANSMETRICS, INC.	
IN ASSOCIATION WITH: CORDOBA CORPORATION GRUEN ASSOCIATES MANUEL PADRON ASSOCIATES MEYER MOHADDIS ASSOCIATES SVERRUP CORPORATION	

PLAN AND PROFILE DOWNTOWN CONNECTION SCHEMATIC DESIGN BUNKER HILL ALTERNATIVE A	
CONTRACT NO.	
DRAWING NO.	1-6
SCALE	DATE
1" = 100'	4/29/93
SHEET NUMBER	



NOTE: VERTICAL GEOMETRICS OVER FREEWAY MUST BE VERIFIED WITH REGARDS TO CLEARANCES, ANTICIPATED STRUCTURE DEPTH, ETC.



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DRAWN: C.S.D.
DESIGNED: J.A.S.
APPROVED:

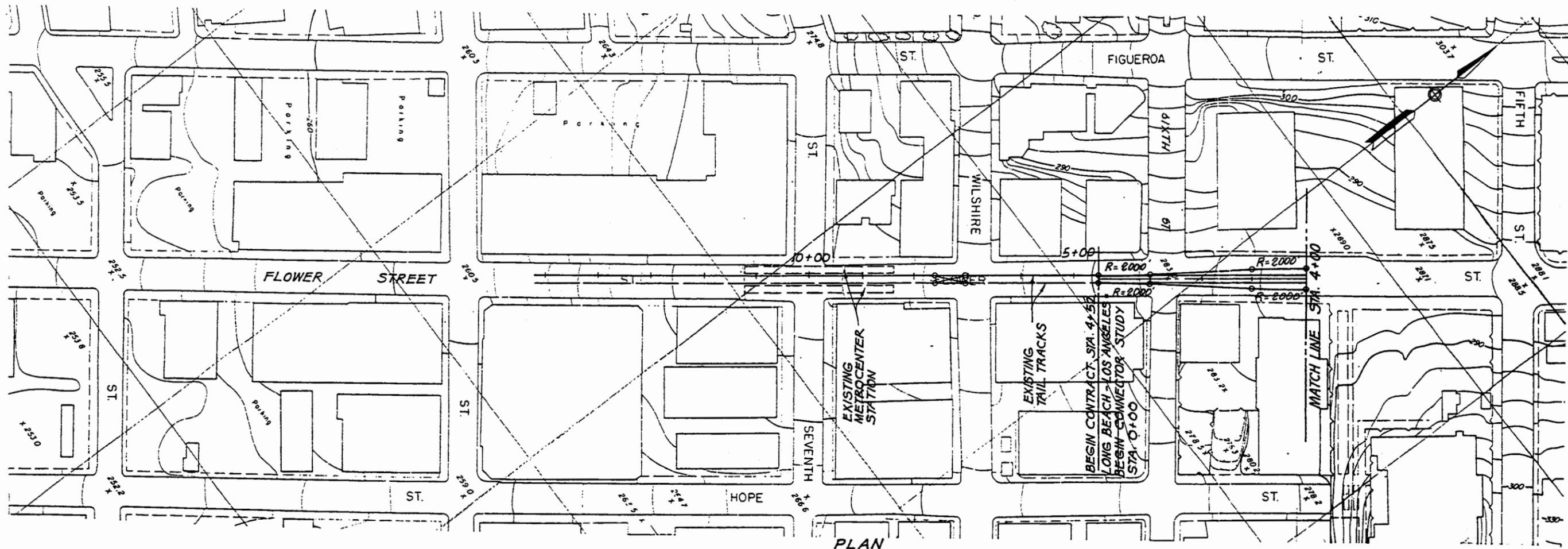
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

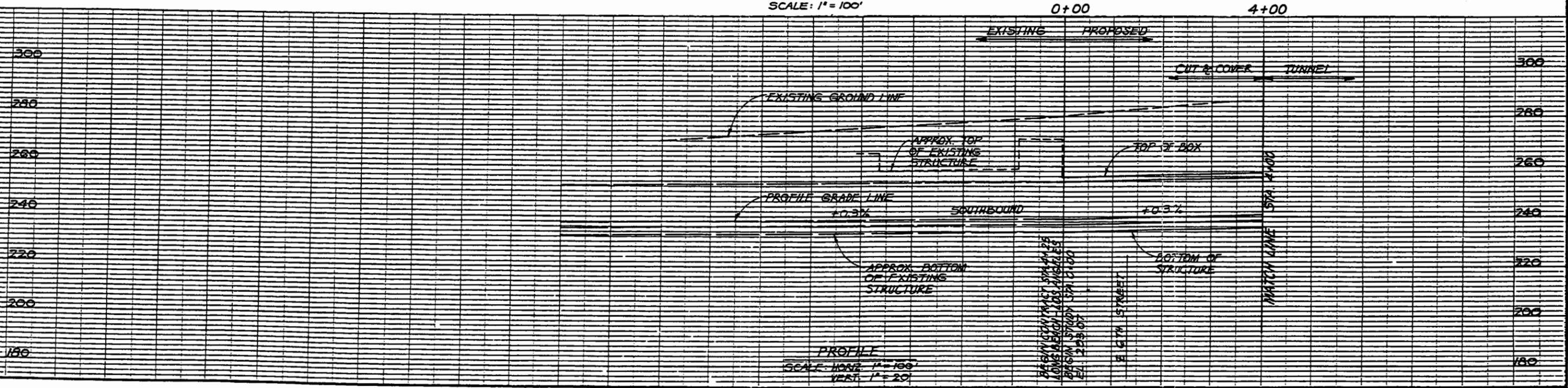
IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE A

CONTRACT NO.
DRAWING NO. 1-7
SCALE 1" = 100'
DATE 4/29/93
SHEET NUMBER



PLAN
SCALE: 1" = 100'



PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

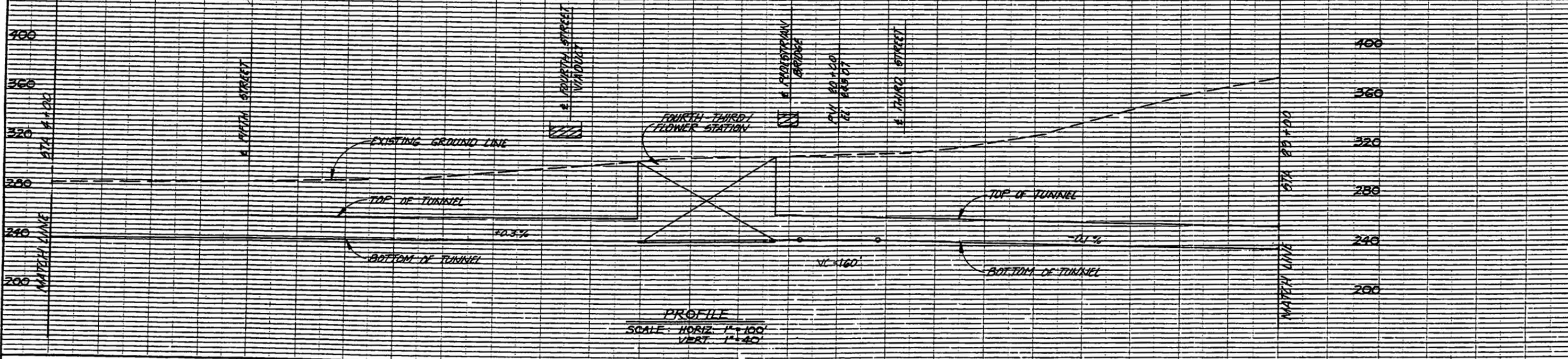
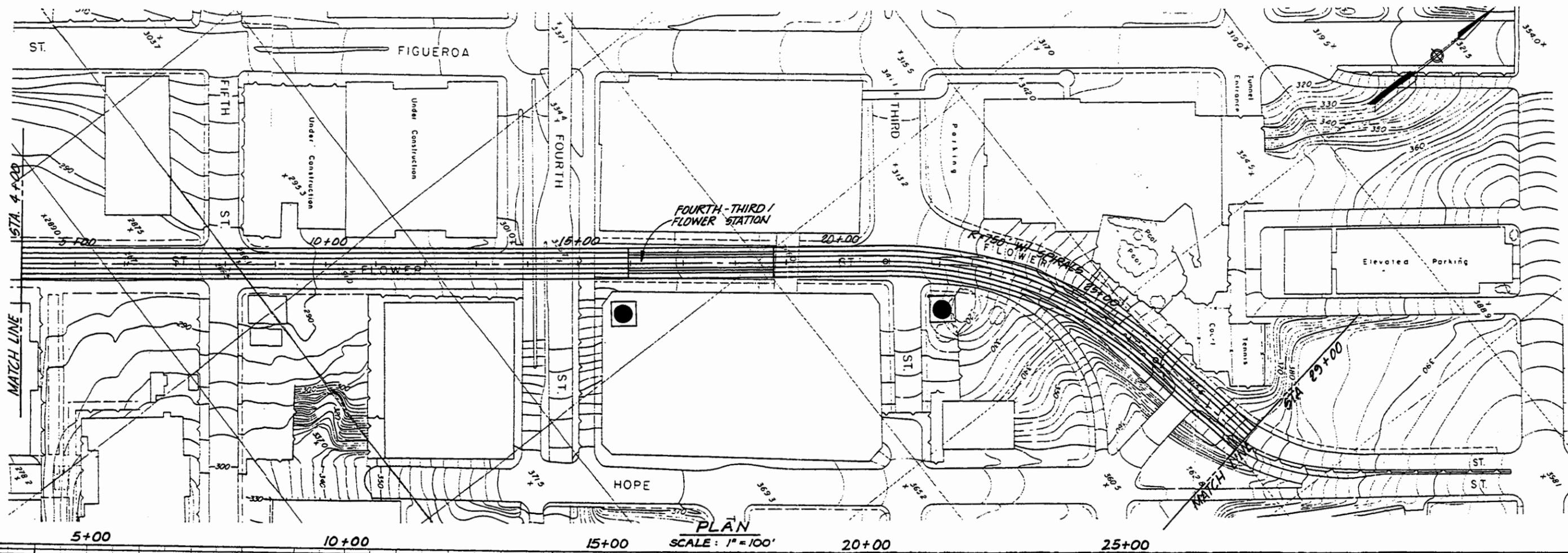
DRAWN:
N.B.T.
DESIGNED:
J.A.S.
APPROVED:

LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY
TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
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SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE A

CONTRACT NO.
DRAWING NO. 1-1
SCALE 1" = 100'
DATE 4/29/93
SHEET NUMBER



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DRAWN:
E.V.E.
DESIGNED:
J.A.S.
APPROVED:

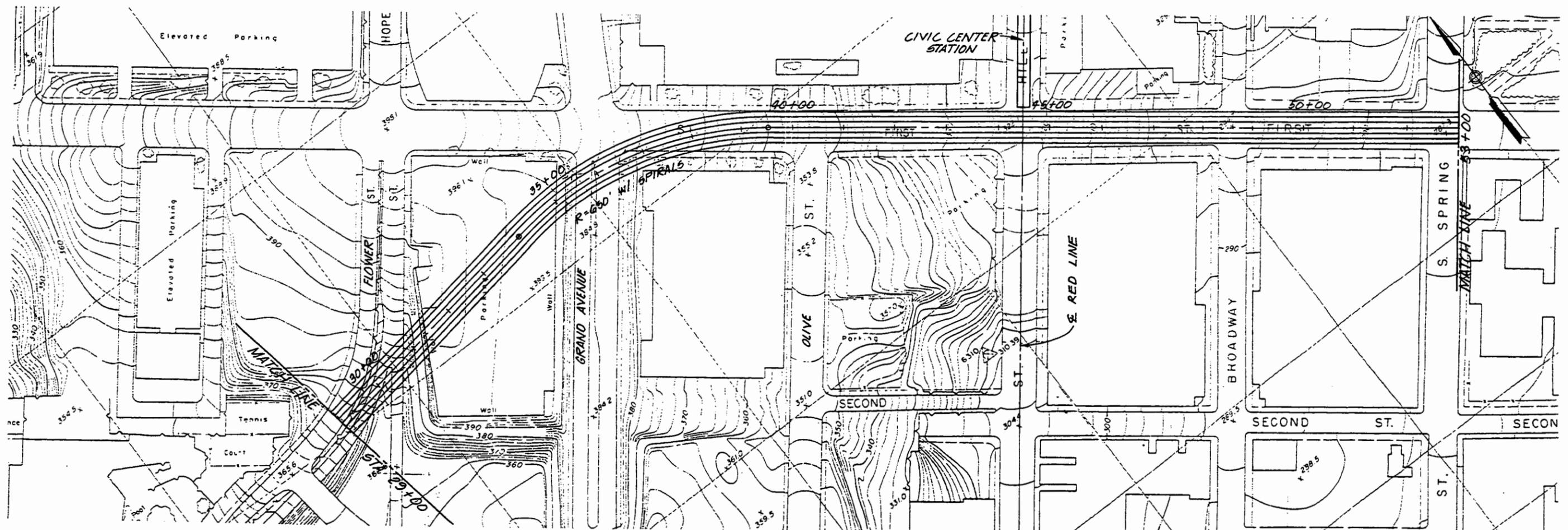
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

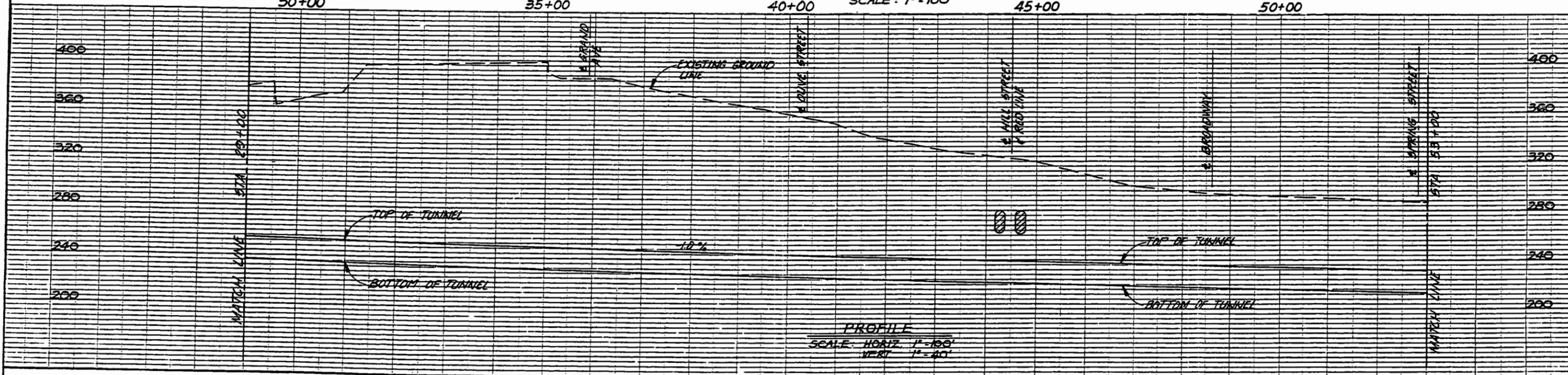
IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDDES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE A

CONTRACT NO.
DRAWING NO. 1-2
SCALE 1"=100'
DATE 4/29/93
SHEET NUMBER



PLAN
SCALE: 1" = 100'



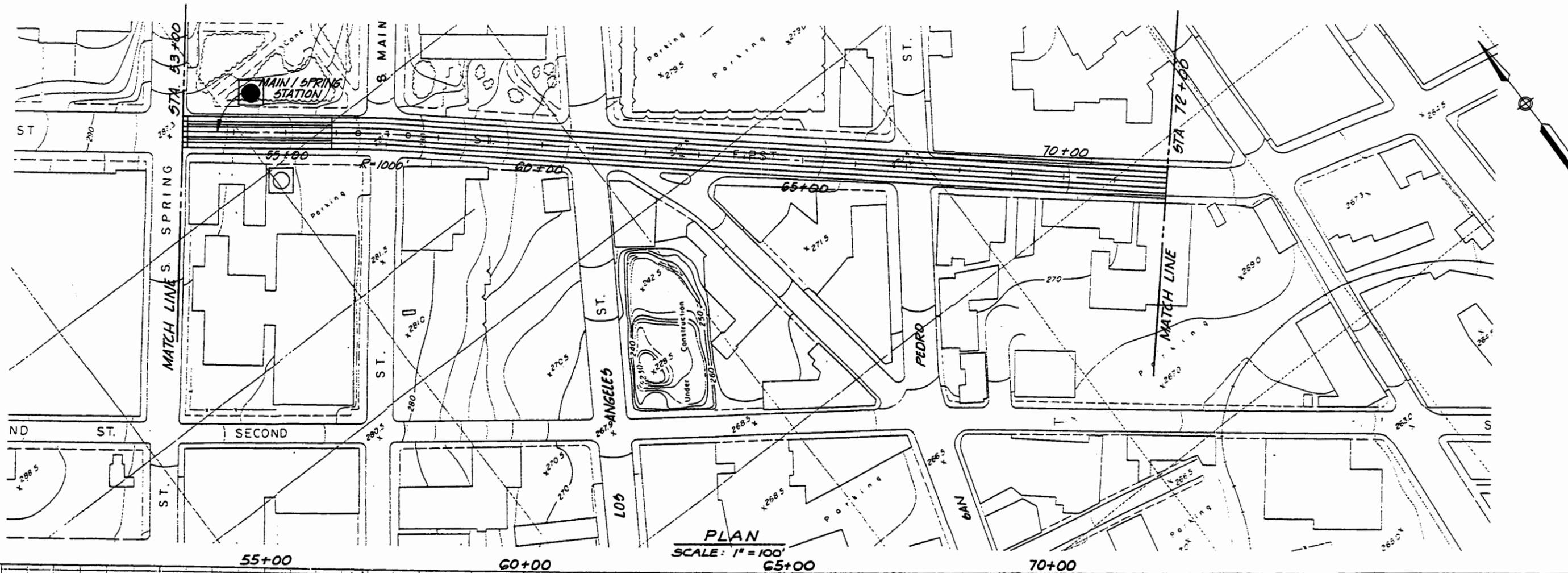
PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 40'

NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

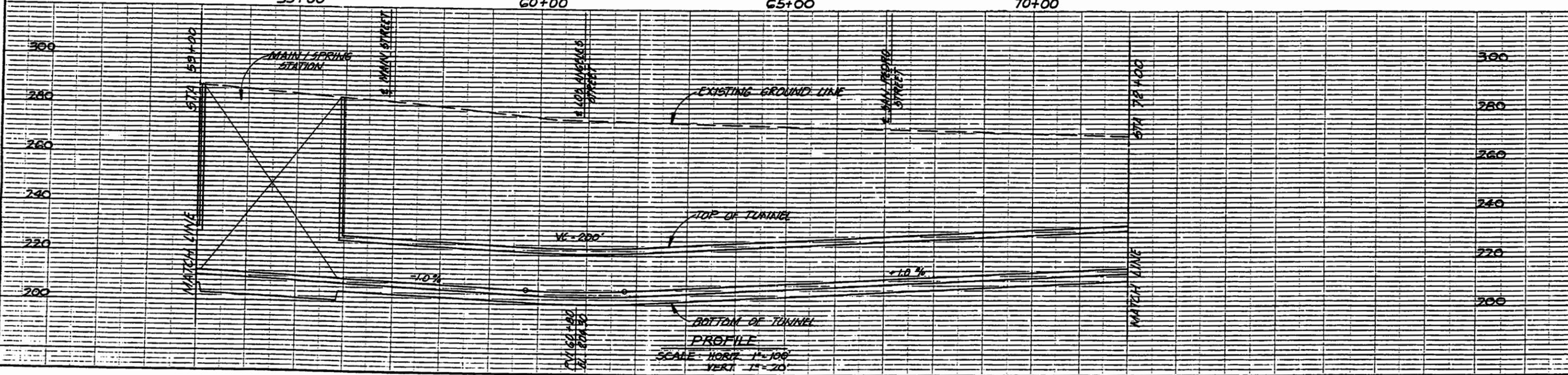
DRAWN: E.V.E.	 LOS ANGELES COUNTY TRANSPORTATION COMMISSION DOWNTOWN BLUE LINE CONNECTION STUDY
DESIGNED: J.A.S.	
APPROVED:	
TRANSMETRICS, INC.	
IN ASSOCIATION WITH: CORDOBA CORPORATION GRUEN ASSOCIATES MANUEL PADRON ASSOCIATES MEYER MOHADDIS ASSOCIATES SVERDRUP CORPORATION	

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE A

CONTRACT NO.	
DRAWING NO.	1-3
SCALE	DATE
1" = 100'	4/29/93
SHEET NUMBER	



PLAN
SCALE: 1" = 100'



PROFILE
SCALE - HORIZ 1" = 100'
VERT 1" = 20'

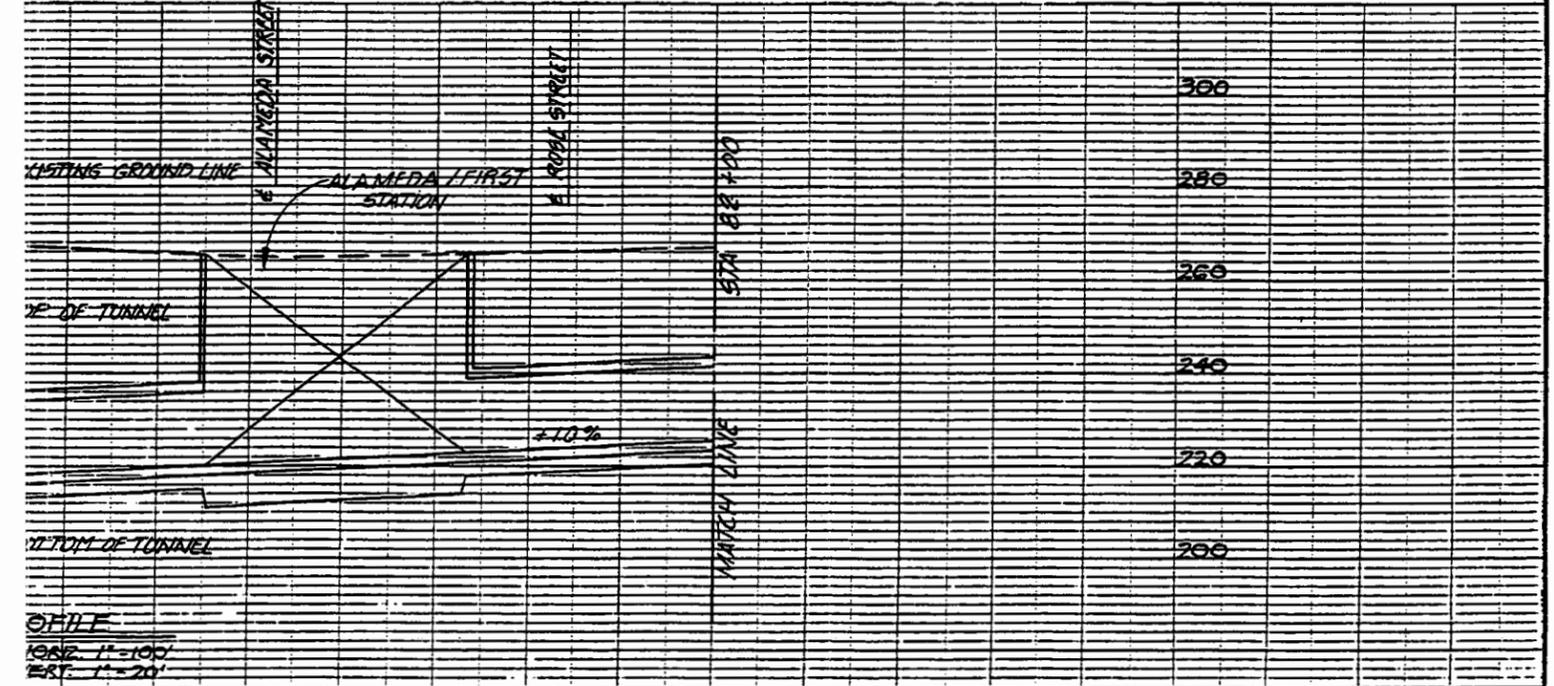
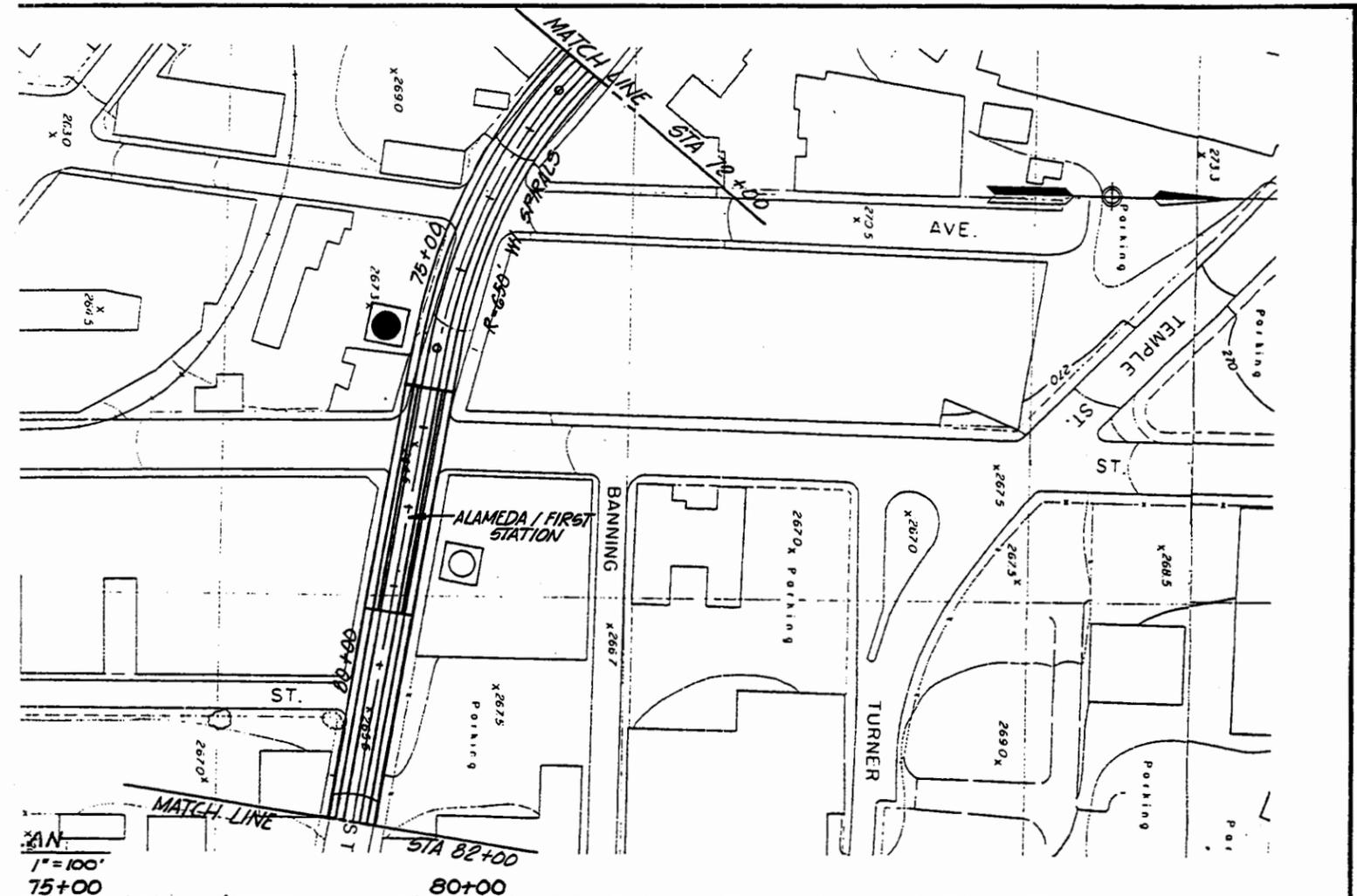
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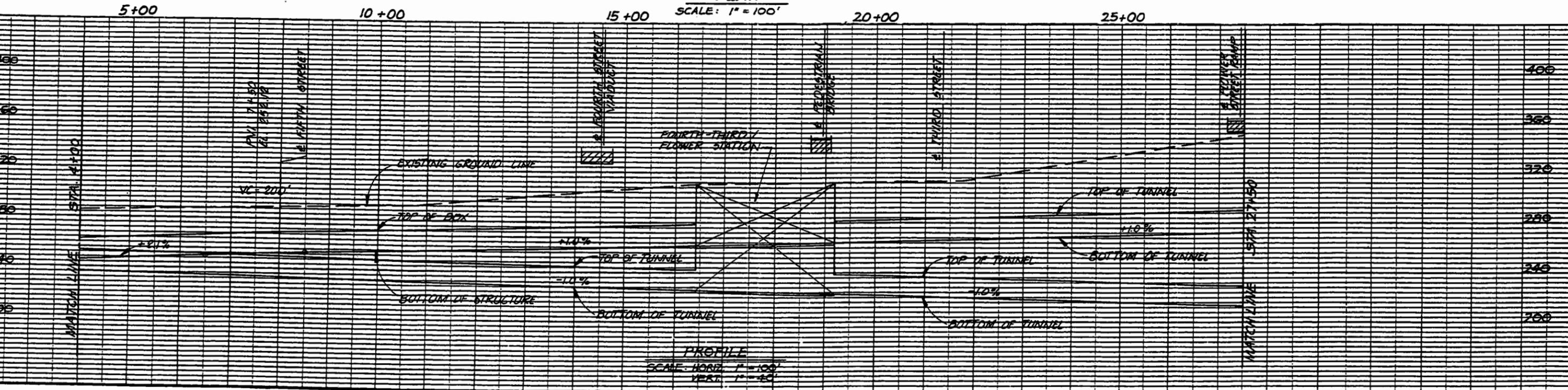
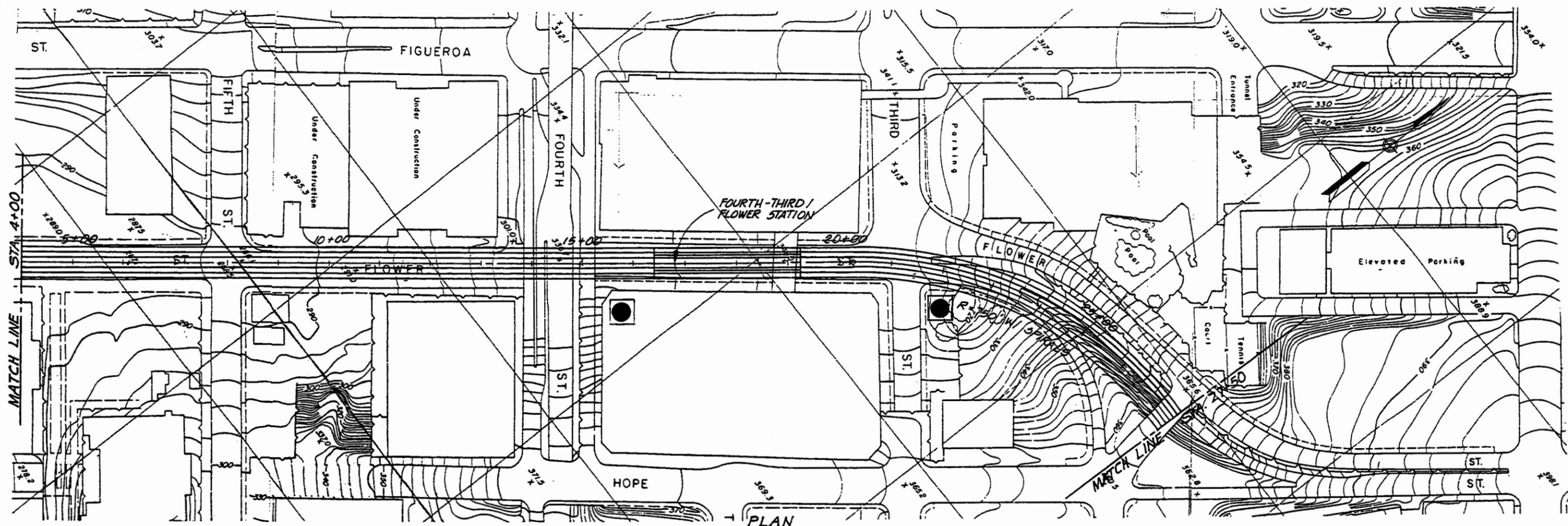
DRAWN: C.G.D.	 LOS ANGELES COUNTY TRANSPORTATION COMMISSION DOWNTOWN BLUE LINE CONNECTION STUDY
DESIGNED: J.A.S.	
APPROVED:	
TRANSMETRICS, INC.	
IN ASSOCIATION WITH: CORDOBA CORPORATION GRUEN ASSOCIATES MANUEL PADRON ASSOCIATES MEYER MOHADDIS ASSOCIATES SVERDRUP CORPORATION	

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE A

CONTRACT NO.	
DRAWING NO. 1-4	
SCALE 1" = 100'	DATE 4/29/93
SHEET NUMBER	

PLAN AND PROFILE
ALTERNATIVE B - BUNKER HILL SECOND STREET





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DRAWN:
N.B.T.
DESIGNED:
J.A.S.
APPROVED:

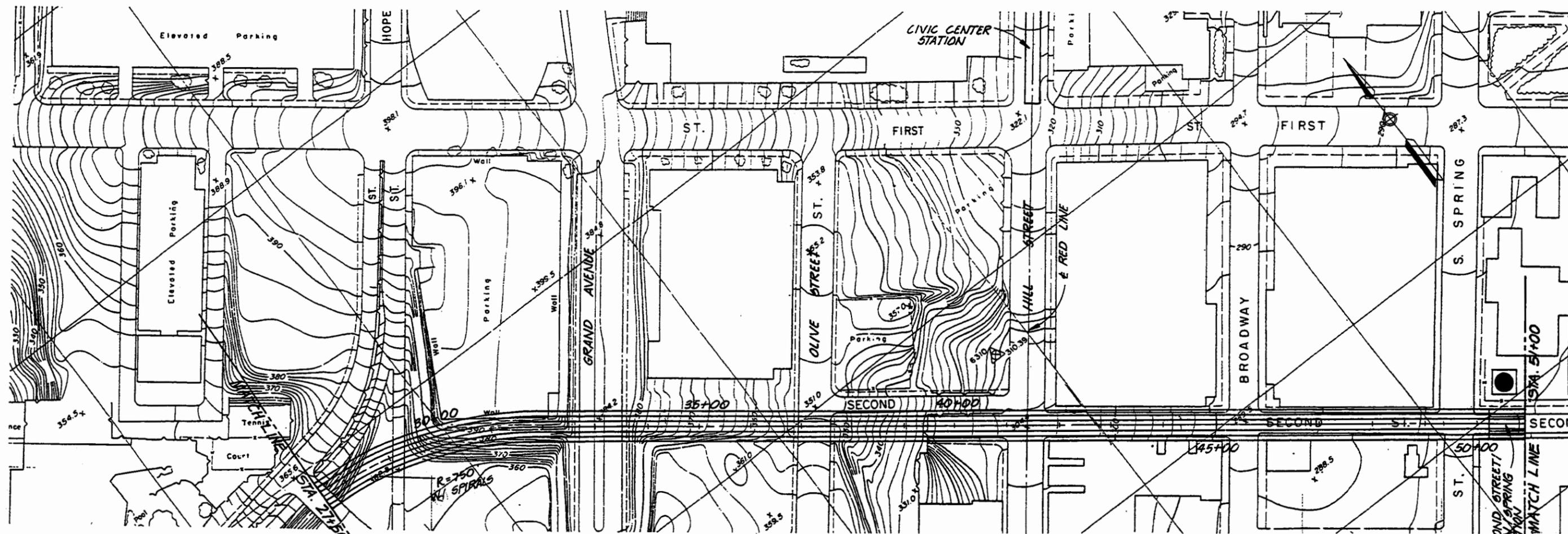
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

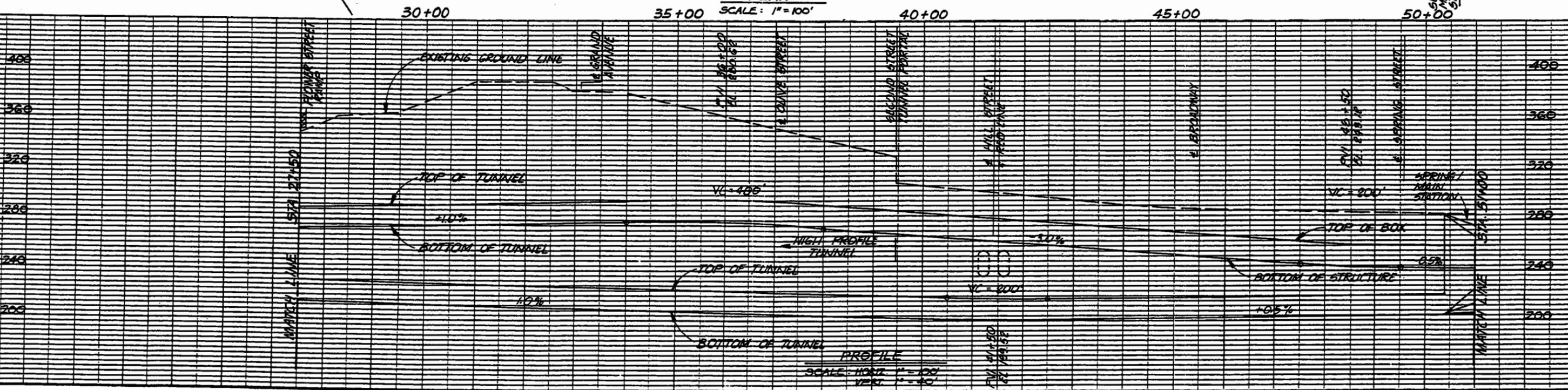
IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE B

CONTRACT NO.
DRAWING NO. 2-2
SCALE 1"=100'
DATE 4/29/93
SHEET NUMBER



PLAN



PROFILE

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DESIGNED:
J.A.S.
APPROVED:

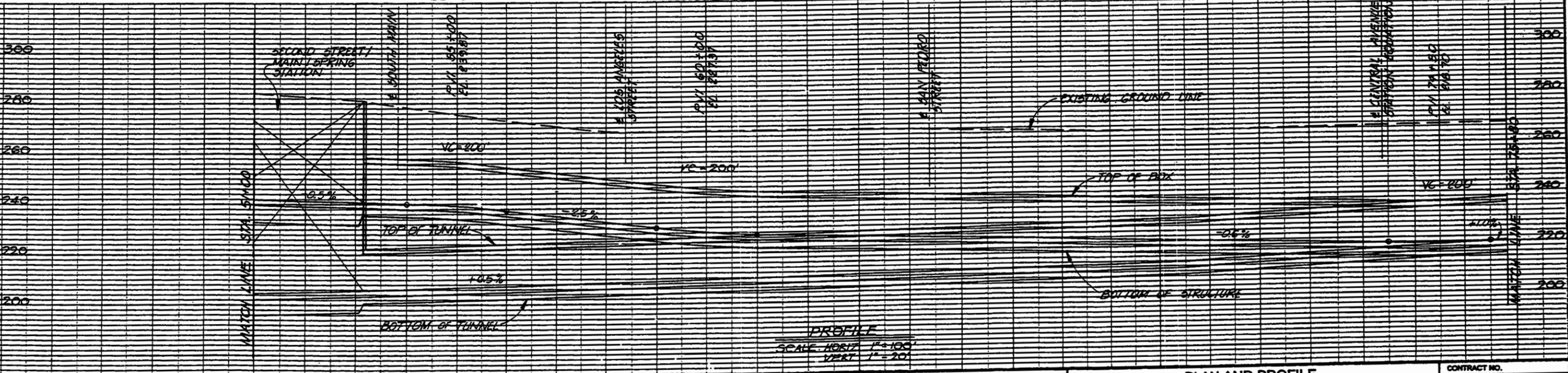
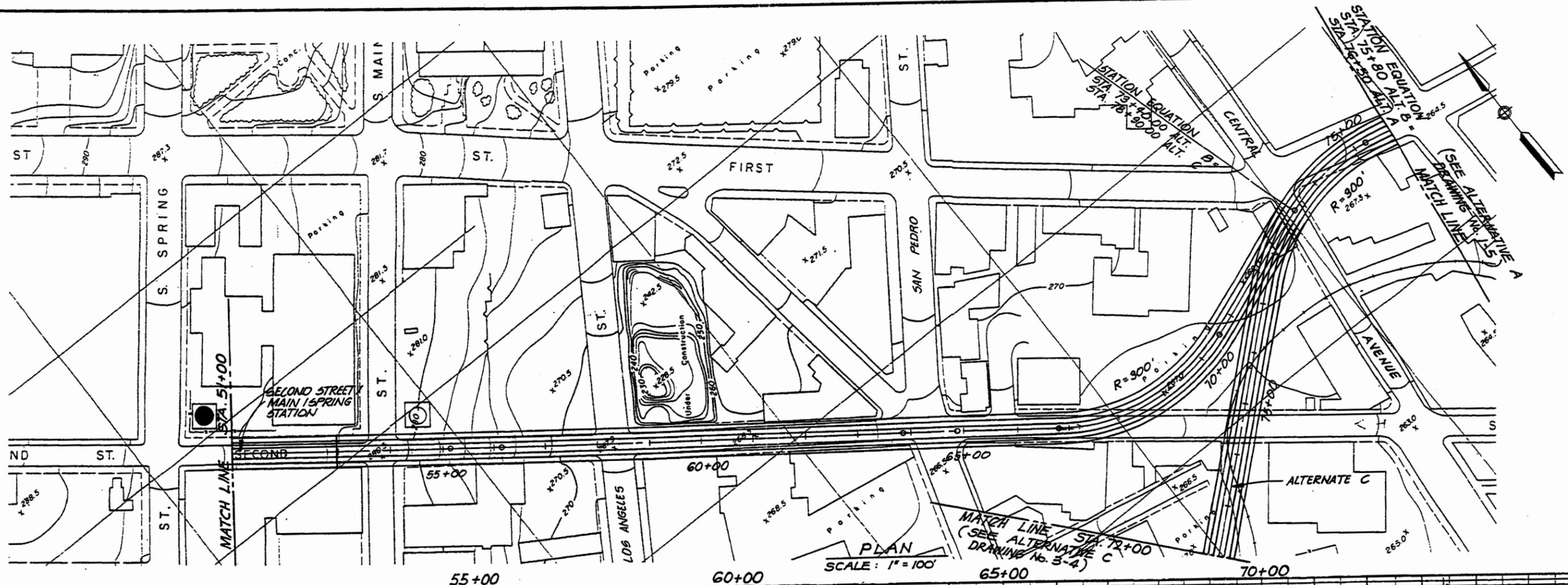
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
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GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MONAGHAN ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE B

CONTRACT NO.
DRAWING NO. 2-3
SCALE 1" = 100'
DATE 4/29/93
SHEET NUMBER



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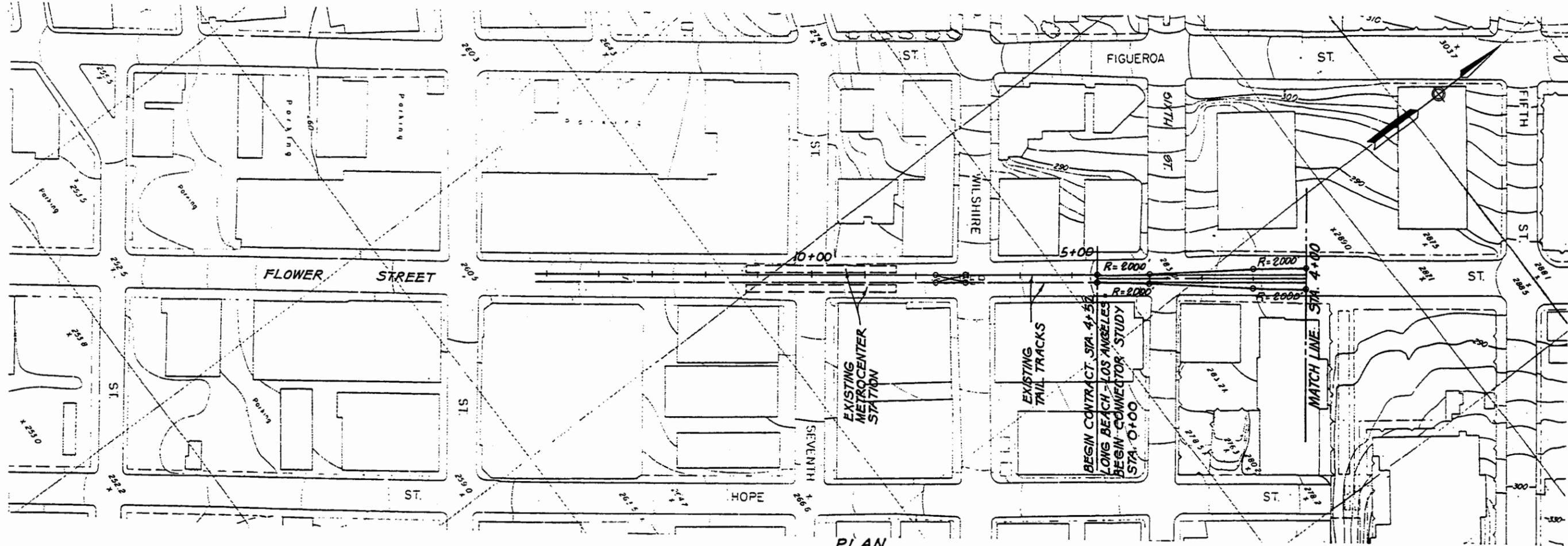
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY
TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PARRON ASSOCIATES
MEYER MONAGHAN ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE B

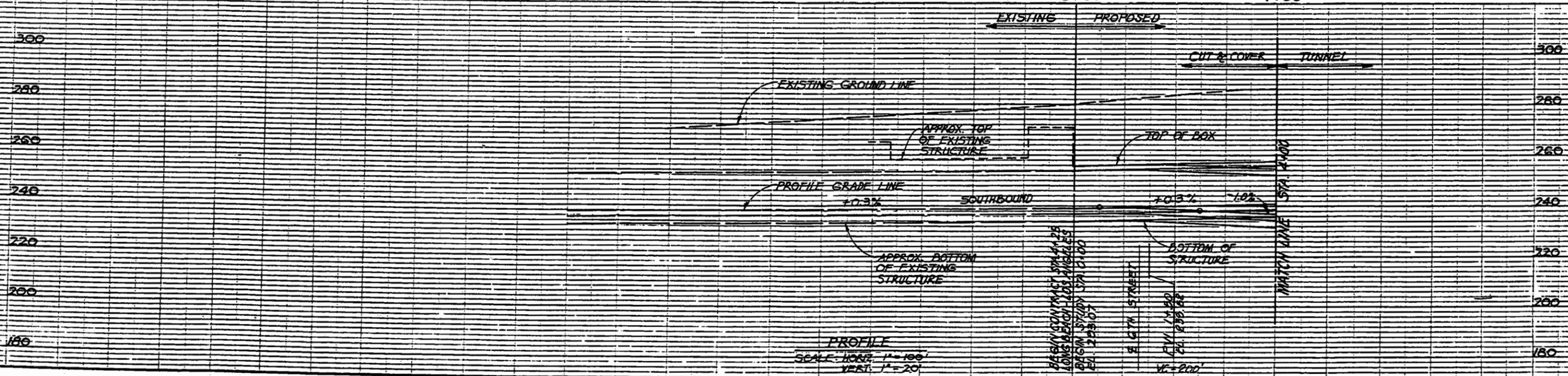
CONTRACT NO.
DRAWING NO. 2-4
SCALE 1"=100'
DATE 4/29/93
SHEET NUMBER

PLAN AND PROFILE
ALTERNATIVE C - BUNKER HILL THIRD STREET



PLAN
SCALE: 1" = 100'

0+00 4+00



PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

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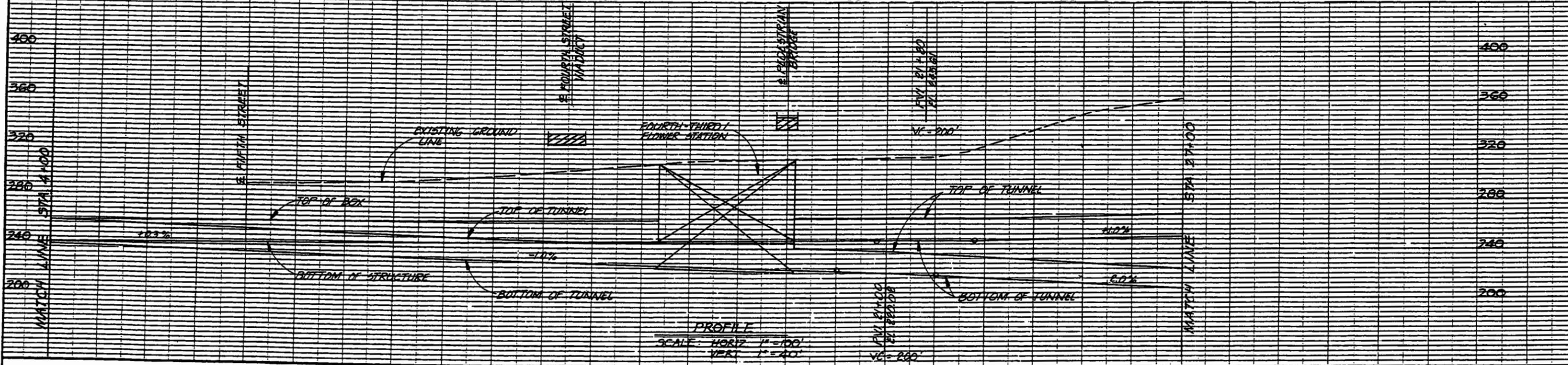
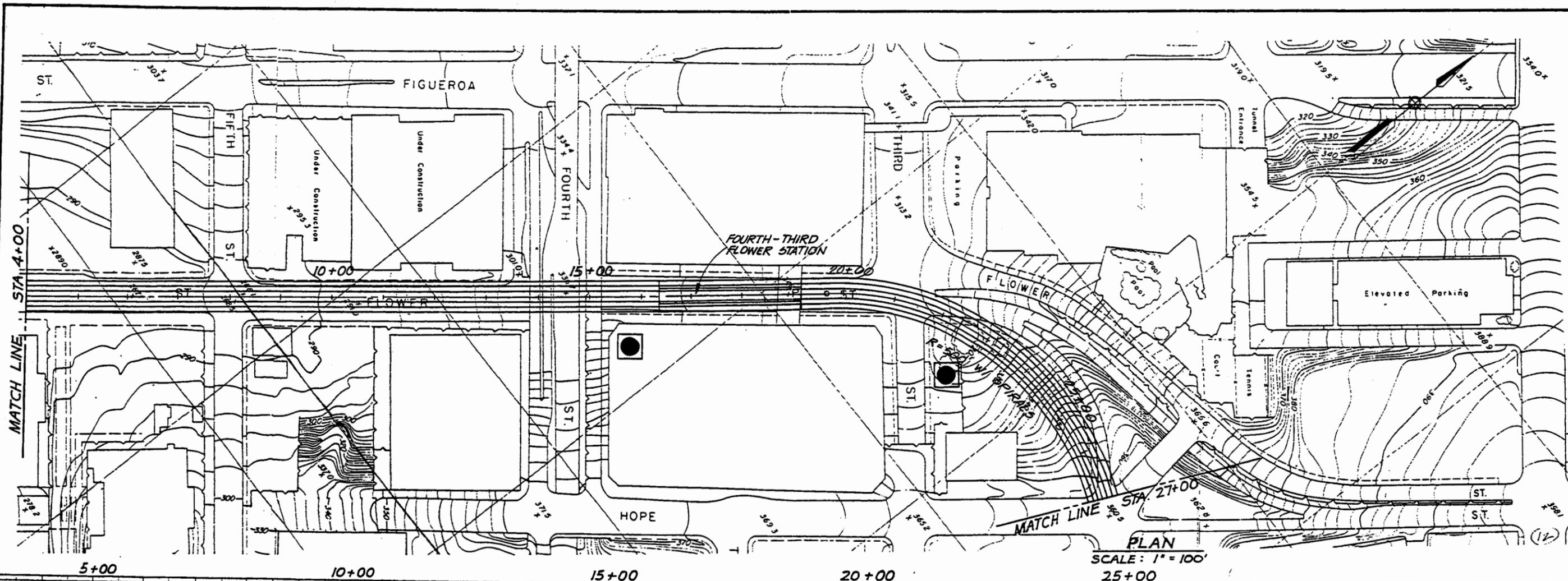
DRAWN:
N.B.T.
DESIGNED:
J.A.S.
APPROVED:

LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY
TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDIS ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE C

CONTRACT NO.
DRAWING NO. 3-1
SCALE 1" = 100' DATE 4/29/93
SHEET NUMBER



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DRAWN:
E.V.E.
DESIGNED:
J.A.S.
APPROVED:



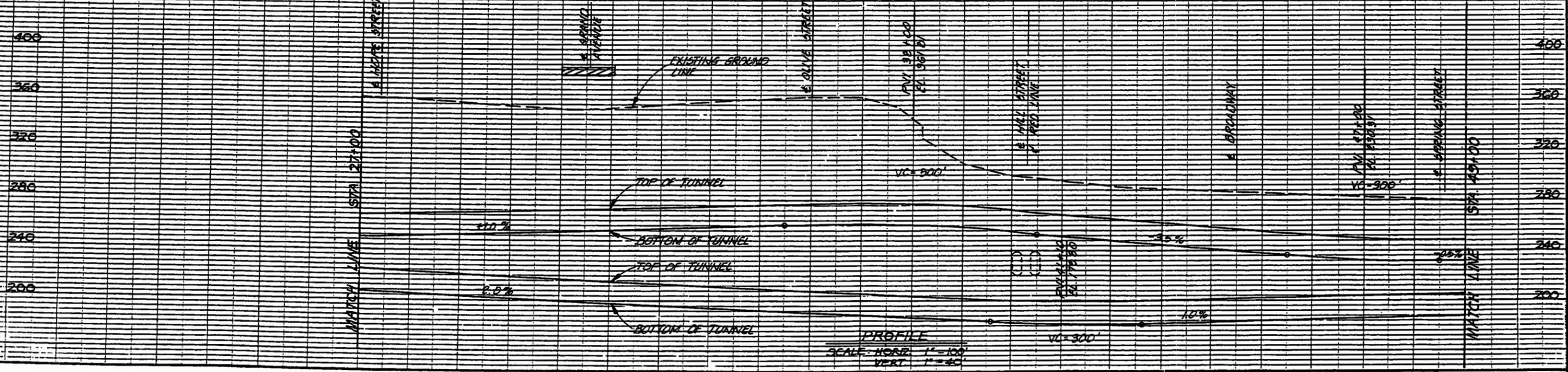
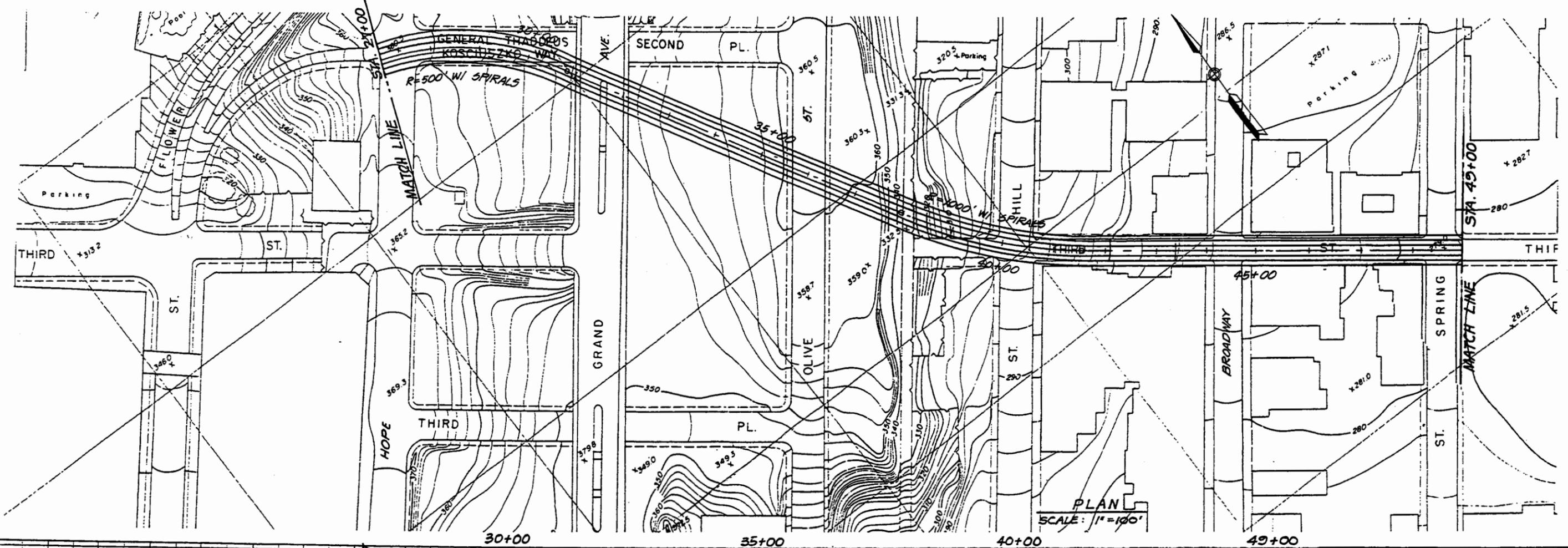
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHAMMAD ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE C

CONTRACT NO.
DRAWING NO. 3-2
SCALE 1"=100' DATE 4/29/93
SHEET NUMBER



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DRAWN:
C.G.D.
DESIGNED:
J.A.S.
APPROVED:

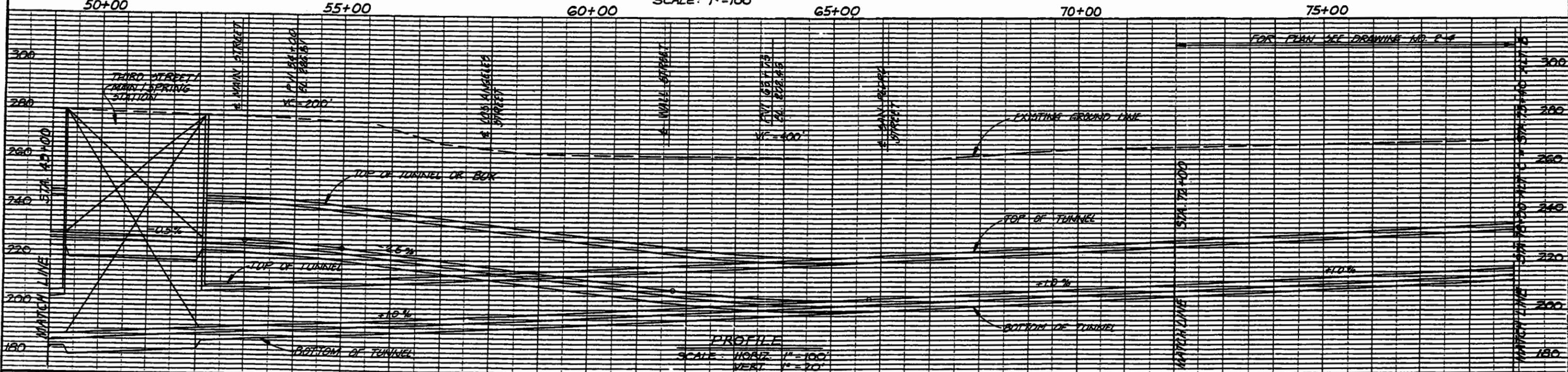
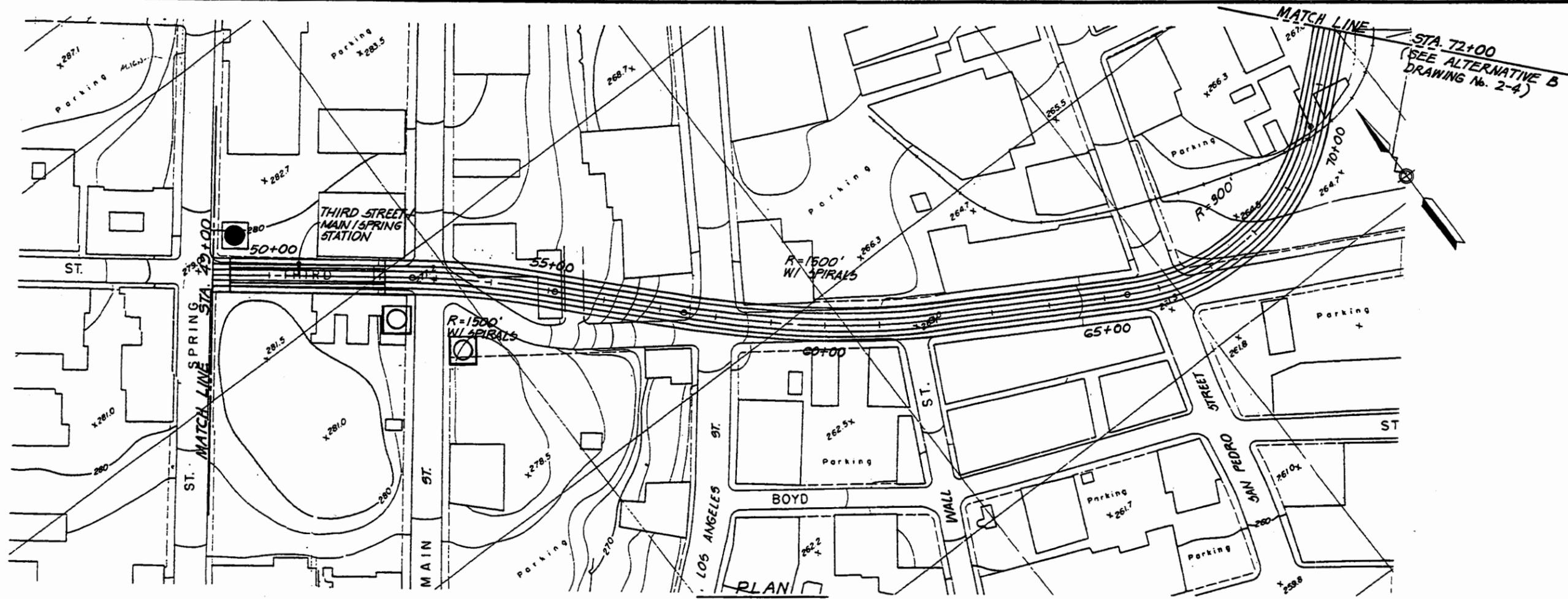
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
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GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDDES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE C

CONTRACT NO.
DRAWING NO. **3-3**
SCALE **1"=100'** DATE **4/29/93**
SHEET NUMBER



NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

DRAWN:
E.V.E.
DESIGNED:
J.A.S.
APPROVED:

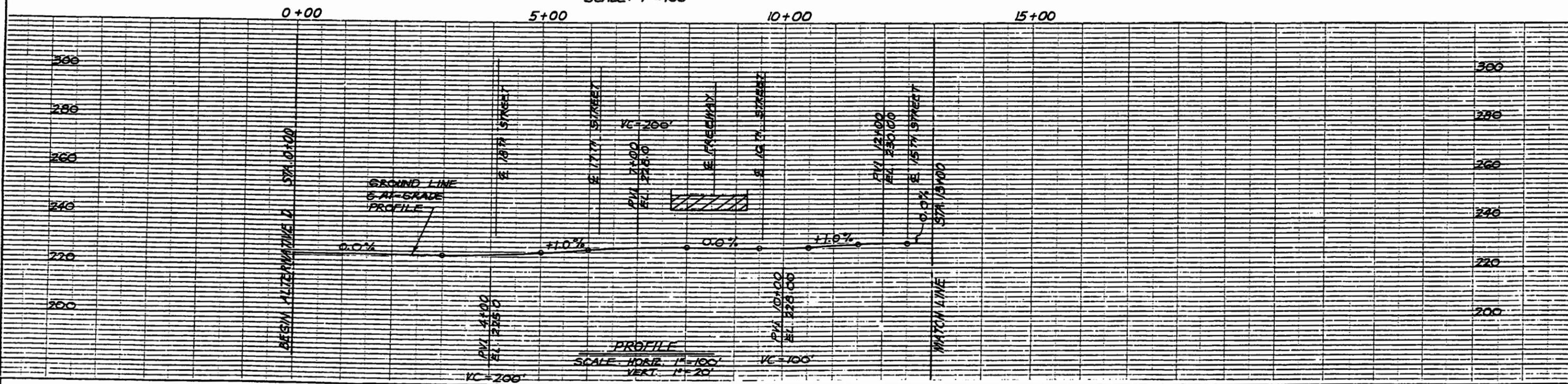
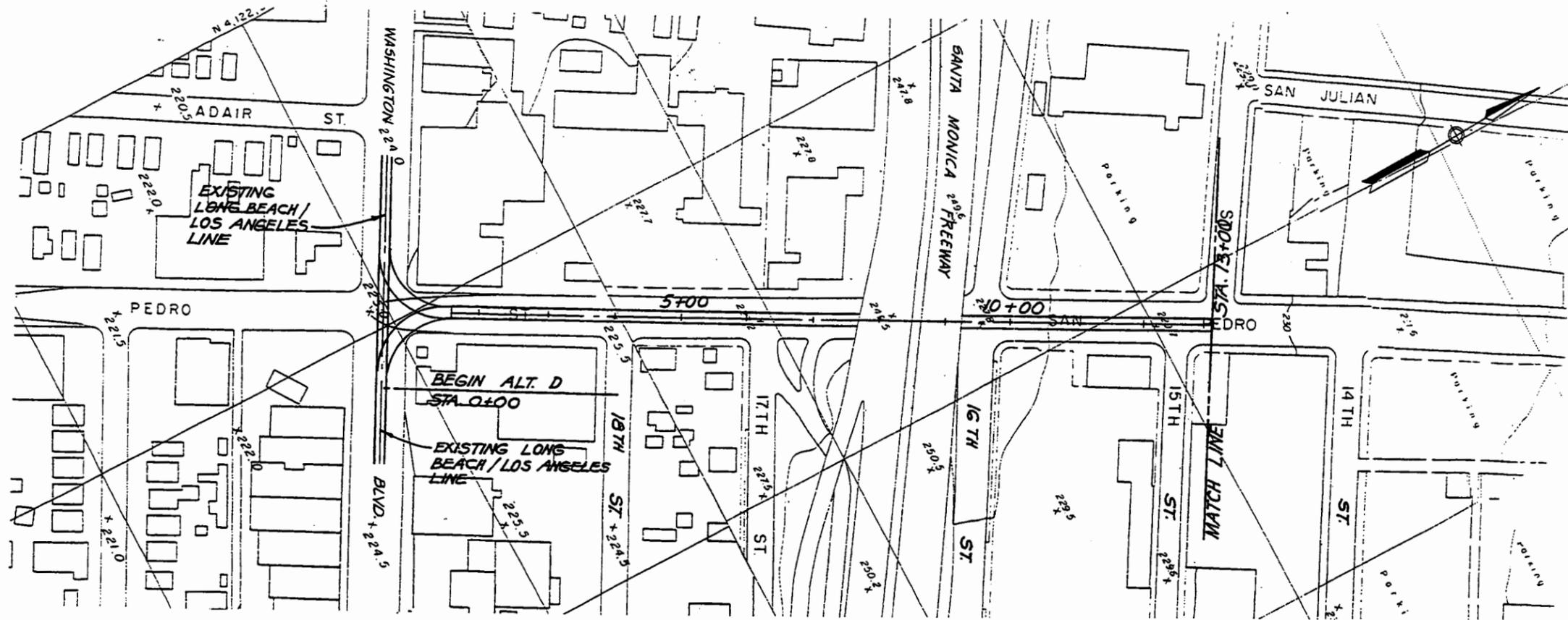
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY
TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CIVILICA CORPORATION
JULIEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHARRER ASSOCIATES
OVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
BUNKER HILL ALTERNATIVE C

CONTRACT NO.
DRAWING NO. 3-4
SCALE 1"=100' DATE 4/29/93
SHEET NUMBER

PLAN AND PROFILE
ALTERNATIVE D - SAN PEDRO STREET



NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

DRAWN:
C.G.D.
DESIGNED:
J.A.S.
APPROVED:



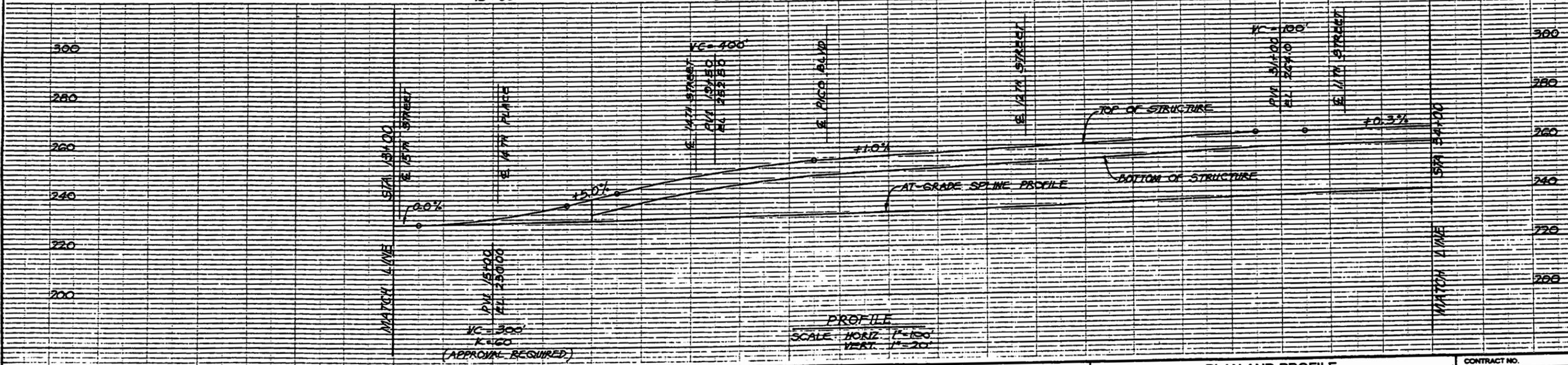
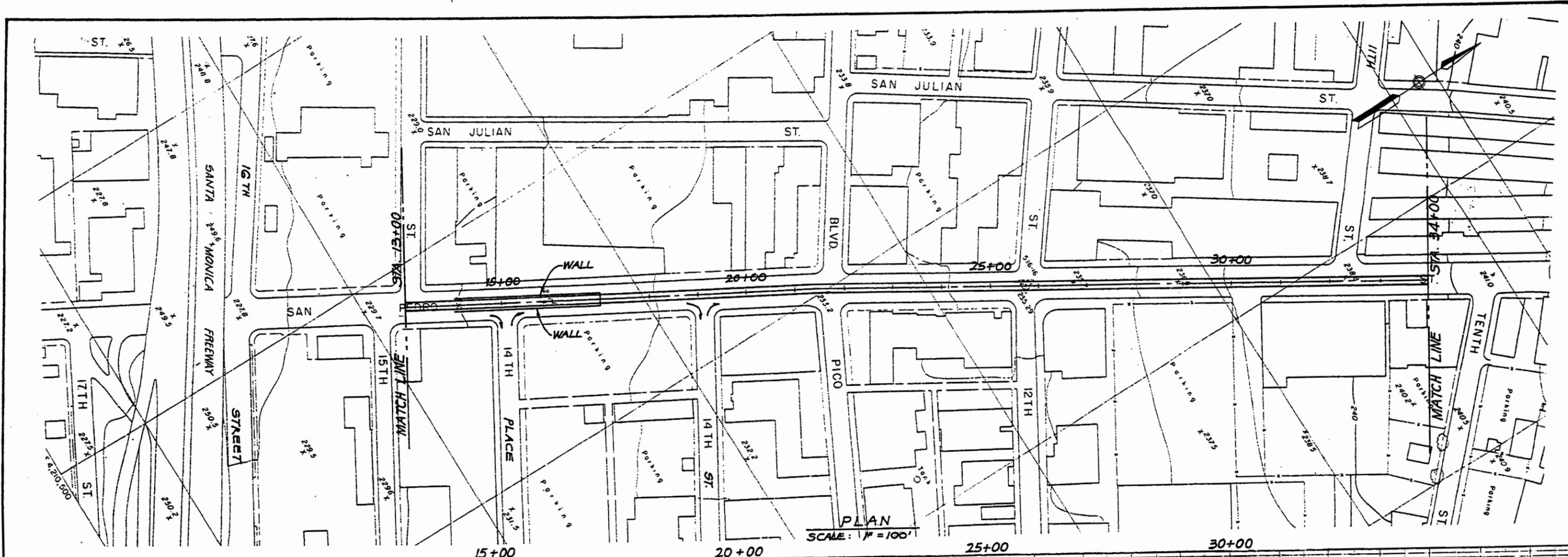
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDDES ASSOCIATES
SEVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-1
SCALE 1" = 100'
DATE 5/7/03
SHEET NUMBER



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DRAWN:
N.B.T.
DESIGNED:
J.A.S.
APPROVED:

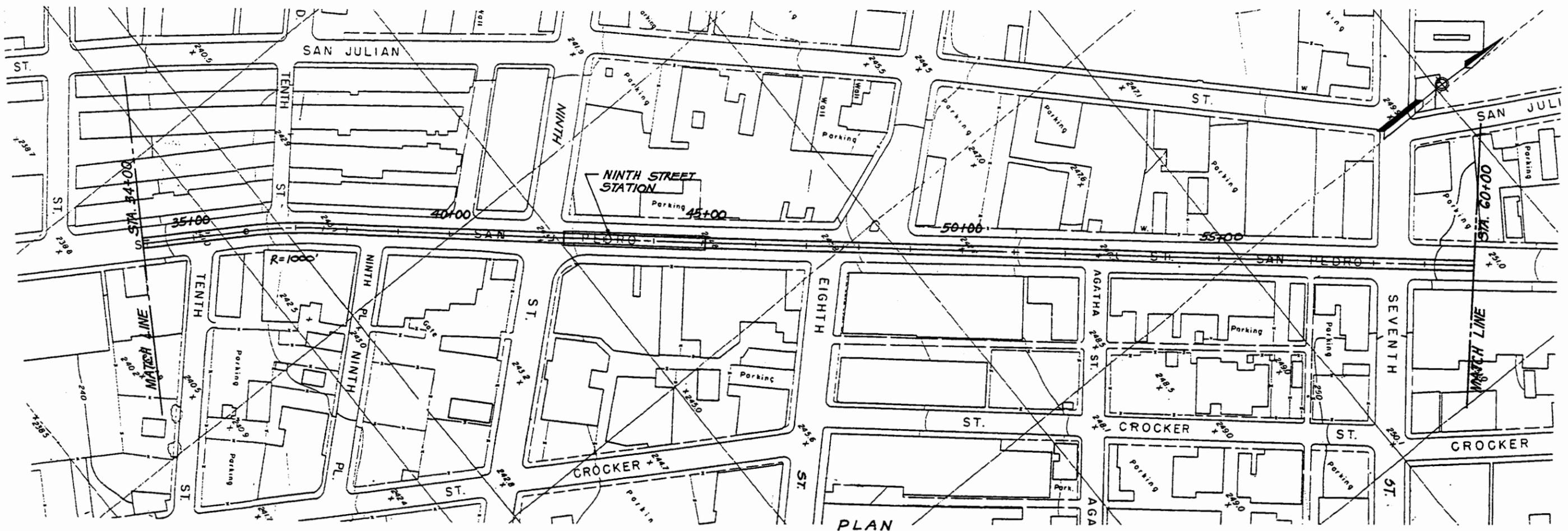
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHANNES ASSOCIATES
SVERDRUP CORPORATION

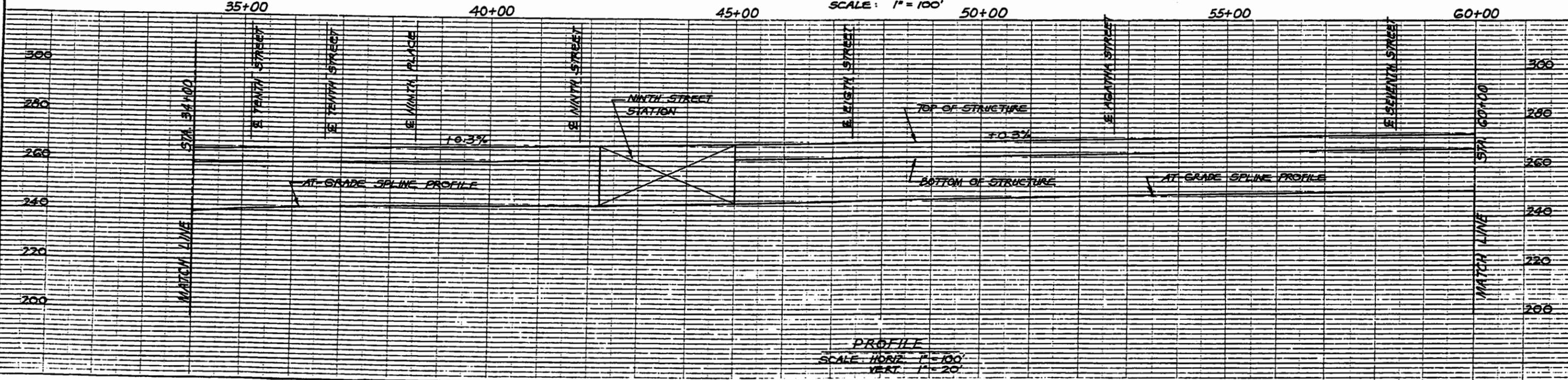
PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-2
SCALE: 1" = 100' DATE 5/27/03
SHEET NUMBER



PLAN

SCALE: 1" = 100'



PROFILE

SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

DRAWN:
E.V.E.
DESIGNED:
J.A.S.
APPROVED:

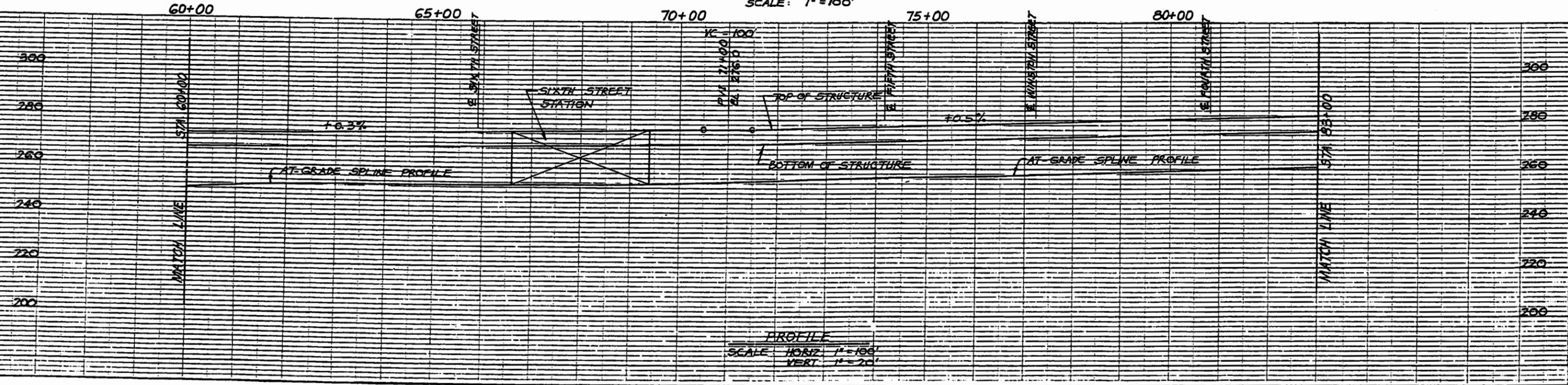
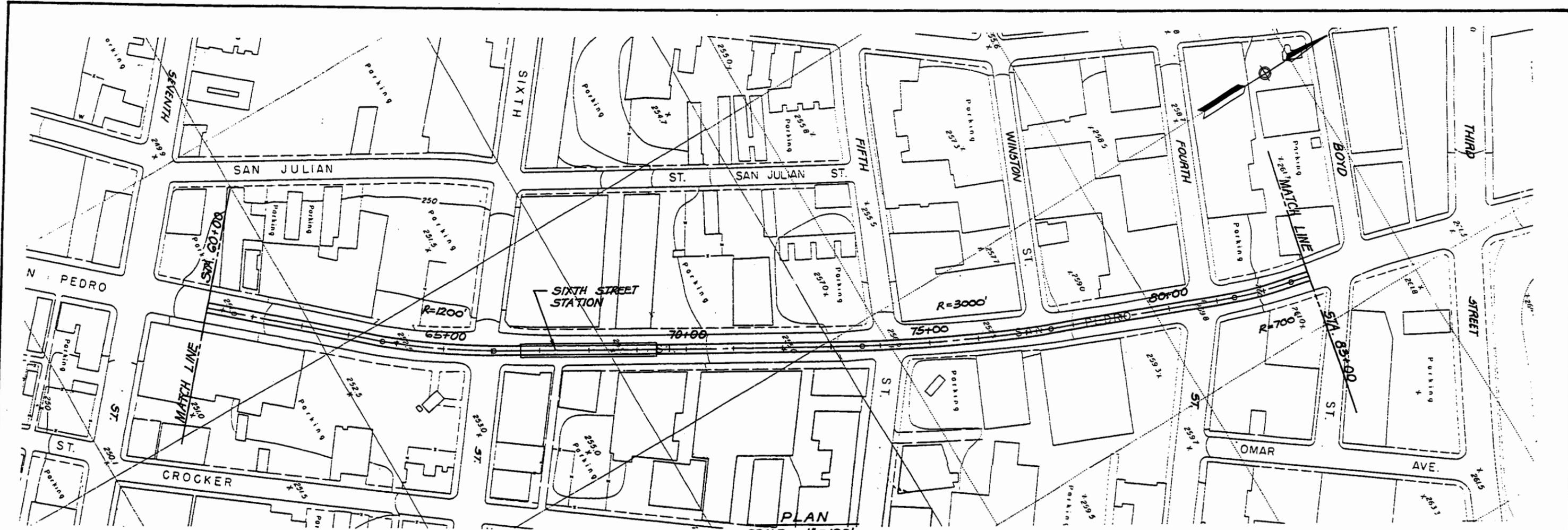
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-3
SCALE 1" = 100' DATE 5/7/93
SHEET NUMBER



NOTE: It is necessary to stress the significance of plans and profiles developed for this and all other alternatives. The drawings were produced to verify engineering feasibility. By no means would these designs be construed as a commitment to a specific geometric arrangement. In all cases, geometric variations are possible and more refined designs to be undertaken for any selected alternative in the future would involve a more detailed evaluation of pertinent issues. Revised alignment characteristics may be suggested and would be encouraged to improve the overall performance and acceptability of the alignment. For this study, the designs available should be viewed as conceptual only, subject to change, and tools for discussion purposes.

DRAWN:
N.B.T.
DESIGNED:
J.A.S.
APPROVED:

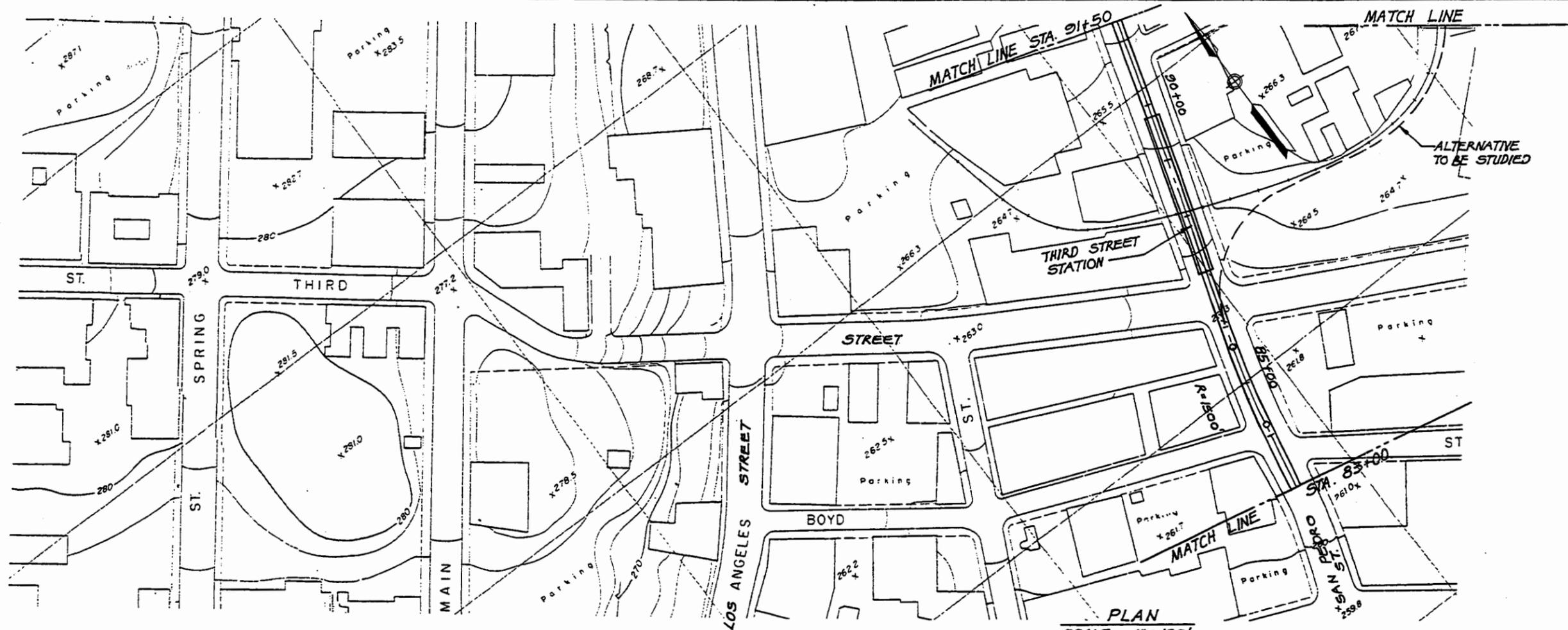
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

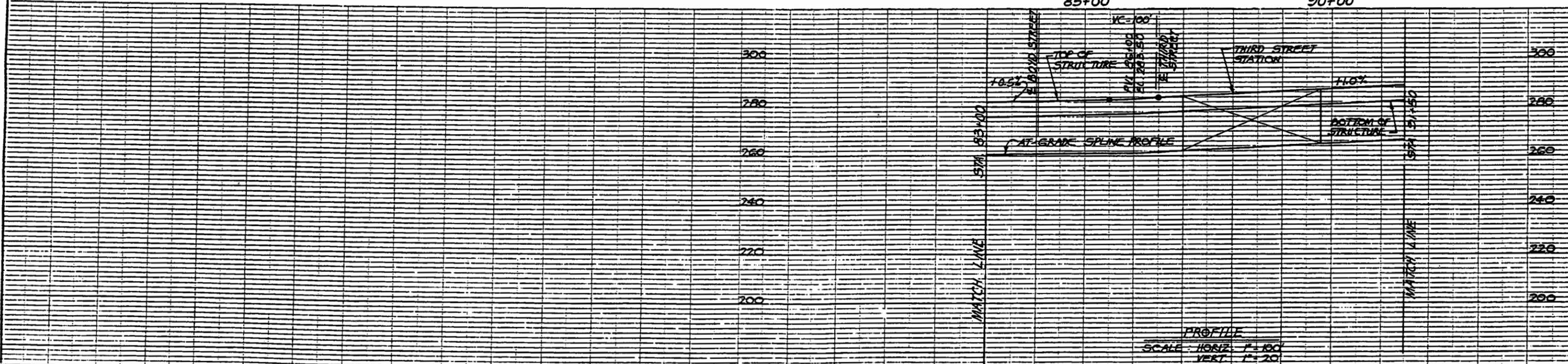
IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDIS ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. **4-4**
SCALE **1"=100'** DATE **5/7/93**
SHEET NUMBER



PLAN
SCALE: 1"=100'



PROFILE
SCALE: HORIZ. 1"=100'
VERT. 1"=20'

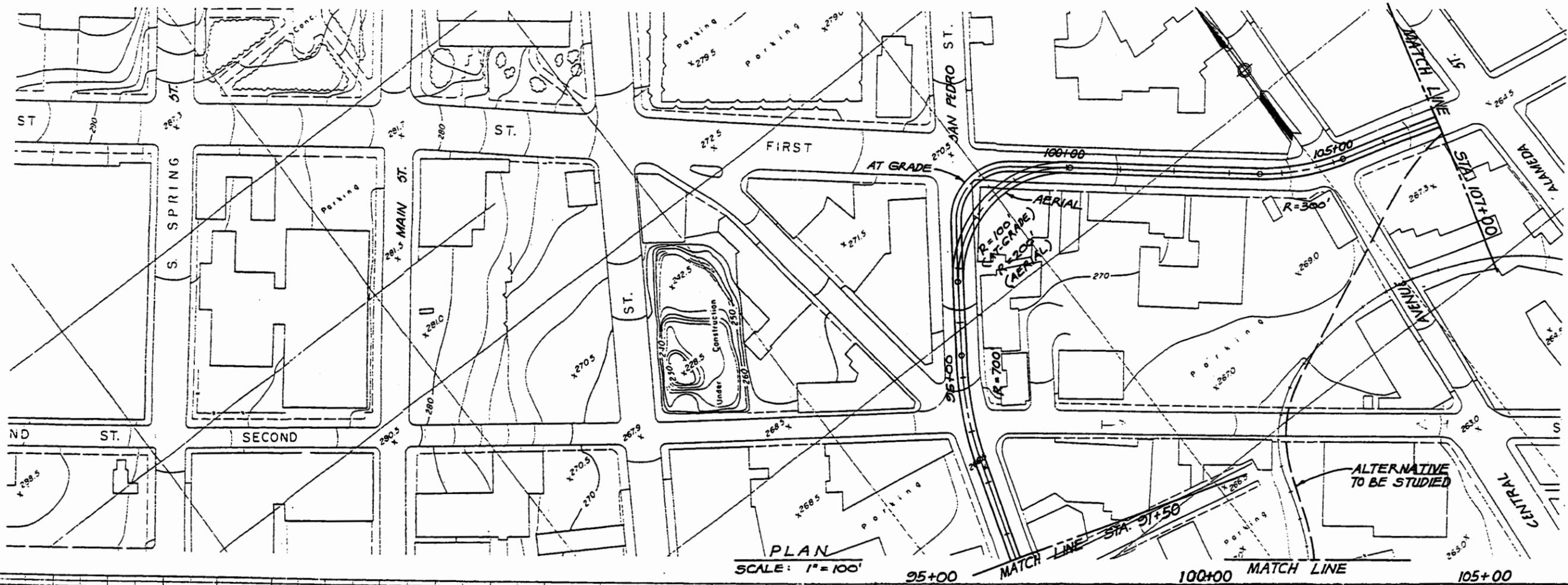
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APPROVED:

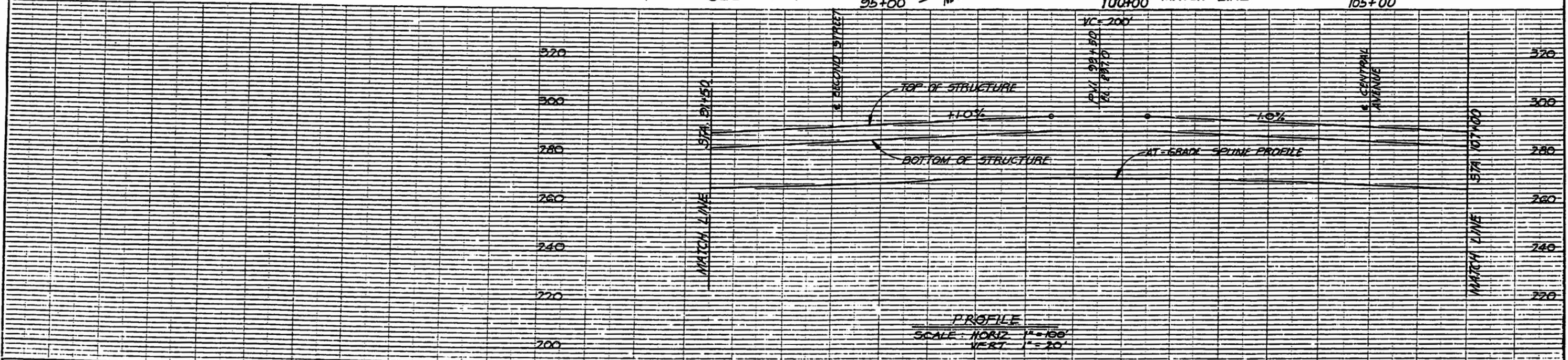
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY
TRANSMETRICS, INC.
IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOCHADES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-5
SCALE 1"=100' DATE 5/7/93
SHEET NUMBER



PLAN
SCALE: 1" = 100'



PROFILE
SCALE: HORIZ 1" = 100'
VERT 1" = 10'

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DRAWN:
E.V.E.
DESIGNED:
J.A.S.
APPROVED:



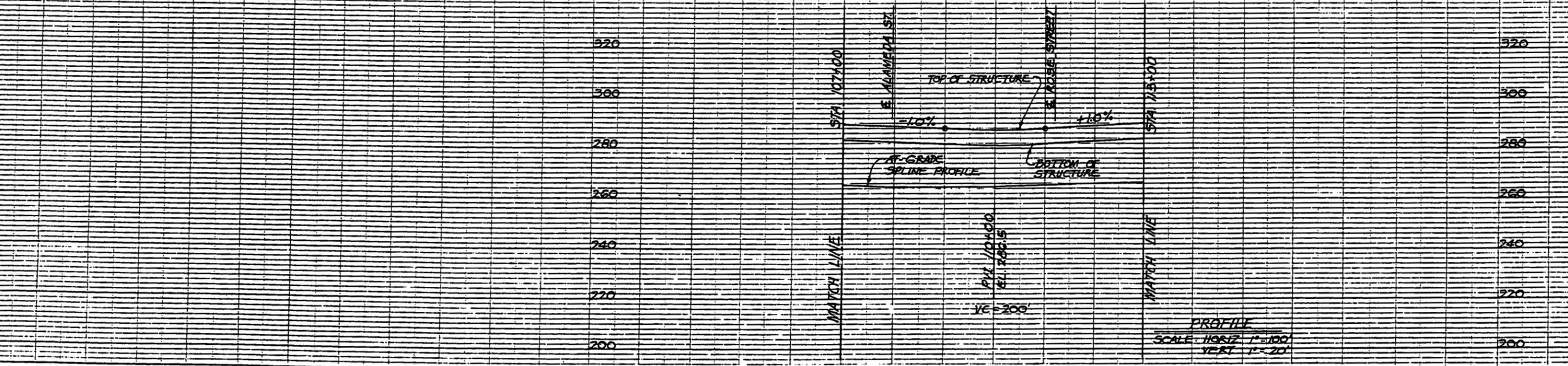
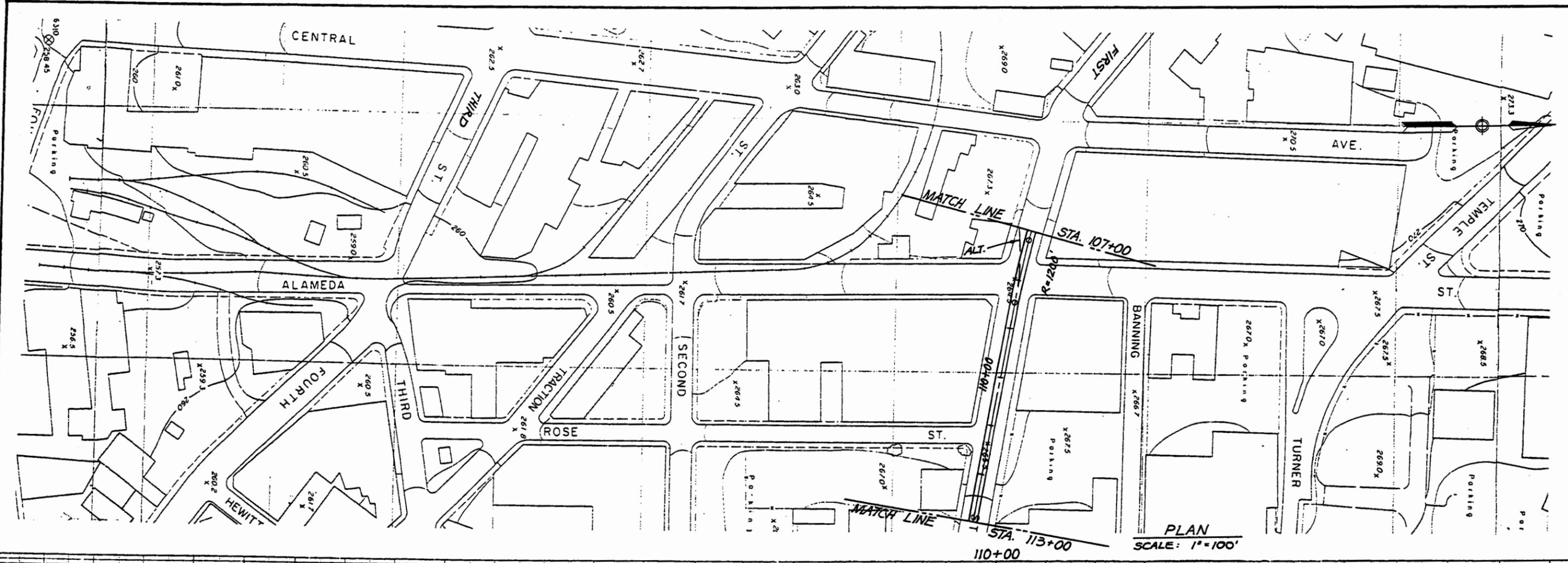
LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADES ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-G
SCALE 1" = 100' DATE 5/7/93
SHEET NUMBER

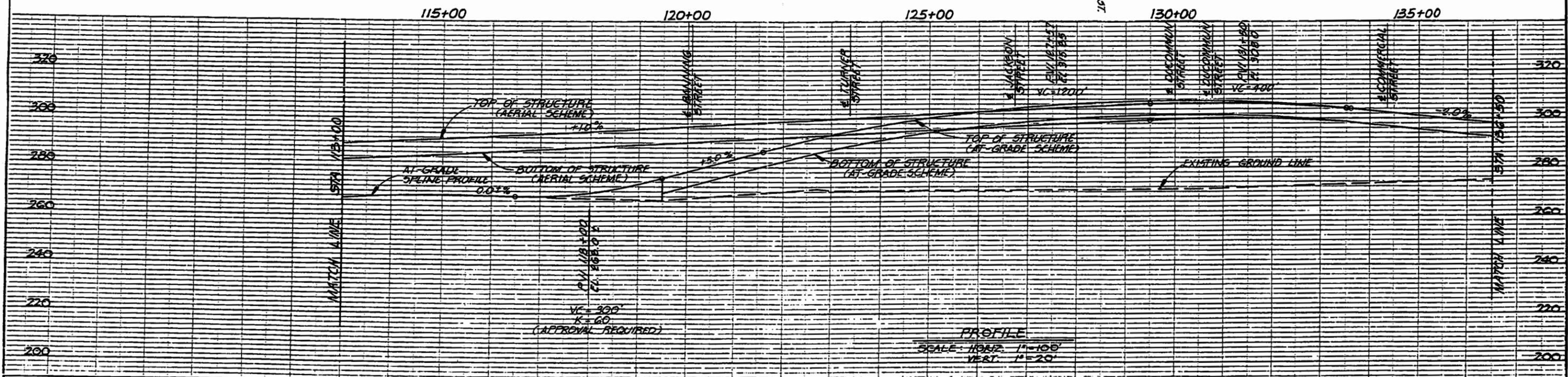
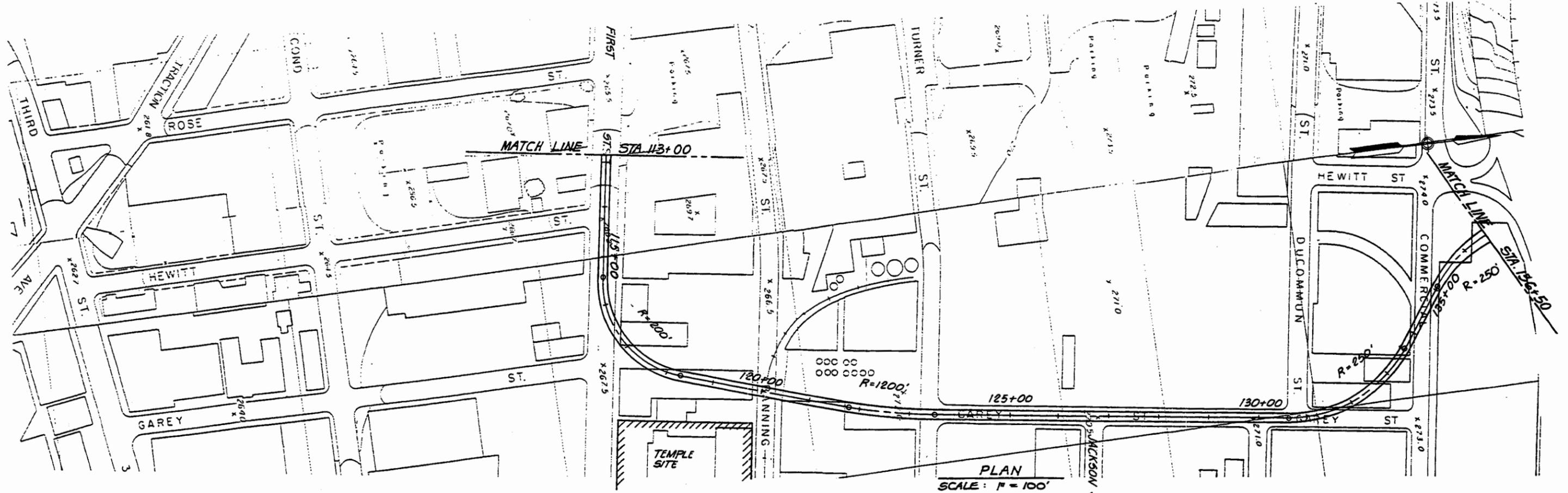


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DRAWN: N.B.T. DESIGNED: J.A.S. APPROVED:	 LOS ANGELES COUNTY TRANSPORTATION COMMISSION DOWNTOWN BLUE LINE CONNECTION STUDY TRANSMETRICS, INC.	IN ASSOCIATION WITH: CORDOBA CORPORATION GRUEN ASSOCIATES MANUEL PADRON ASSOCIATES MEYER WIKHAIDES ASSOCIATES SVENDRUP CORPORATION
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PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.	
DRAWING NO.	4-7
SCALE	1" = 100'
DATE	5/7/93
SHEET NUMBER	



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DRAWN:
C.S.D.
DESIGNED:
J.A.S.
APPROVED:



LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHADDDES ASSOCIATES
SVERDRUP CORPORATION

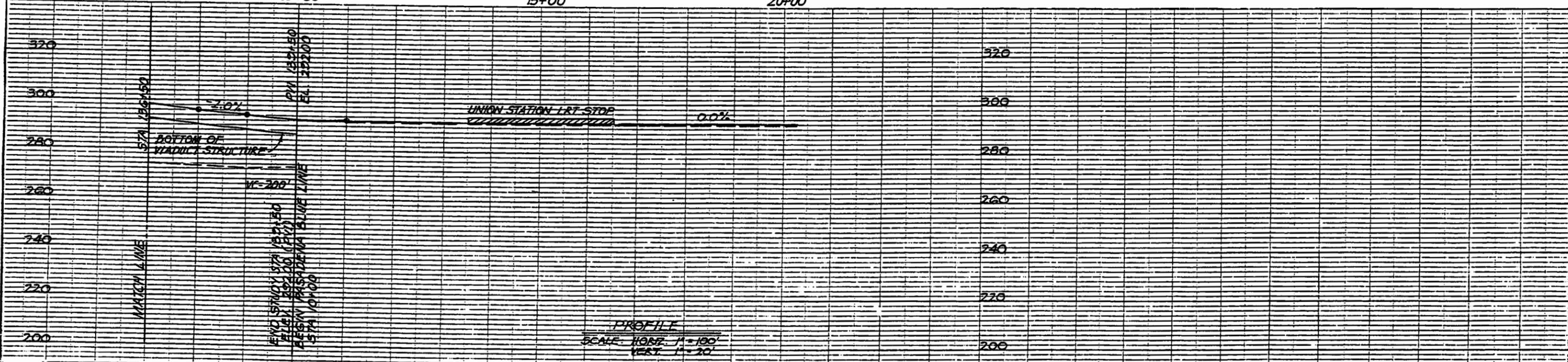
PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-8
SCALE 1" = 100' DATE 5/7/93
SHEET NUMBER



NOTE:
VERTICAL GEOMETRICS
OVER FREEWAY MUST BE
VERIFIED WITH REGARDS
TO CLEARANCES, ANTICIPATED
STRUCTURE DEPTH, ETC.

PLAN
SCALE: 1" = 100'



PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 20'

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DRAWN:
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DESIGNED:
J.A.S.
APPROVED:



LOS ANGELES COUNTY TRANSPORTATION COMMISSION
DOWNTOWN BLUE LINE CONNECTION STUDY

TRANSMETRICS, INC.

IN ASSOCIATION WITH:
CORDOBA CORPORATION
GRUEN ASSOCIATES
MANUEL PADRON ASSOCIATES
MEYER MOHAMED ASSOCIATES
SVERDRUP CORPORATION

PLAN AND PROFILE
DOWNTOWN CONNECTION
SCHEMATIC DESIGN
SAN PEDRO ALTERNATIVE D
(AERIAL & AT-GRADE)

CONTRACT NO.
DRAWING NO. 4-9
SCALE 1" = 100' DATE 5/7/93
SHEET NUMBER

**PLAN AND PROFILE
ALTERNATIVE E - ALAMEDA STREET**

