

July 2015

# West Santa Ana Branch Transit Corridor

## Technical Refinement Study



Metro



July 2015

# West Santa Ana Branch Transit Corridor

## Technical Refinement Study





# Acknowledgements

## **Agency Partners**

Metro

Eco-Rapid Transit

Southern California Association of Governments

Caltrans

## **Corridor Cities in Study Area**

City of Artesia

City of Bell

City of Bellflower

City of Bell Gardens

City of Cudahy

City of Downey

City of Huntington Park

City of Lakewood

City of Los Angeles

City of Maywood

City of Paramount

City of South Gate

City of Vernon

## **Prepared By**

Parsons Brinckerhoff

Cityworks Design

Anil Verma Associates, Inc.

Epic Land Solutions, Inc.

Lenax Construction Services, Inc.



# Table of Contents

---

## Executive Summary

Introduction	ES-2
SCAG Alternatives Analysis	ES-4
Purpose of the Technical Refinement Study	ES-6
Stakeholder Coordination	ES-8
Study Summation	ES-8
Summation of Alignment Studies	ES-8
Summation of Station Studies	ES-12
Ridership	ES-18
Preliminary Cost Estimates	ES-20
Study Findings	ES-21
Alignments	ES-21
Stations	ES-22
Key Issues to Resolve During the Next Phase	ES-24

## 1 Alignment Studies 1

1.1	Introduction	2
1.2	East Bank	6
	1.2.1 Alignment Description	6
	1.2.2 Overview of Alignment Challenges	6
1.3	West Bank 3	8
	1.3.1 Alignment Description	8
	1.3.2 Overview of Alignment Challenges	10
1.4	Pacific Boulevard Corridor Options	12
	1.4.1 Pacific/Alameda Option	12
	1.4.2 Pacific/Vignes Option	16
1.5	Metro Blue Line / Alameda Street Options	20
	1.5.1 Alameda Option	20
	1.5.2 Alameda/Vignes Option	24
1.6	Alignment Study Findings	26
1.7	Alignments Considered and Removed from Further Consideration	30
	1.7.1 Huntington Park Alignment Alternative	30
	1.7.2 Malabar Street Option	31
	1.7.3 Hewitt Street Option	32
	1.7.4 San Pedro Street Option	33

<b>2</b>	<b>Station Studies</b>	<b>35</b>
2.1	Northern Terminus - LA Union Station	36
	2.1.1 Current Context	36
	2.1.2 Site Constraints	38
	2.1.3 Station Study Findings	39
	2.1.4 Additional Analysis Needed	39
2.2	New Stations for Alignment Options	40
	2.2.1 Arts District Station	40
	2.2.2 Washington Station (at Blue Line)	42
	2.2.3 Vernon Station (at Blue Line)	42
	2.2.4 Slauson Station (at Blue Line)	42
	2.2.5 Potential Station between Arts District and Pacific/ Randolph Station	42
2.3	Huntington Park Stations	44
	2.3.1 Randolph Street - Alternative Station Location	45
	2.3.2 Florence Avenue - Alternative Station Location	47
	2.3.3 Challenges	49
	2.3.4 City Input	50
	2.3.5 Station Study Findings	51
2.4	New Metro Green Line Station	52
	2.4.1 Station Context	52
	2.4.2 Station Concept	54
	2.4.3 Challenges	58
	2.4.4 Station Study Findings	61
2.5	Southern Terminus - Artesia	62
	2.5.1 Station Context	63
	3.5.2 Station Concept	64
	2.5.3 Challenges	66
	2.5.4 Station Study Findings	66
<b>3</b>	<b>Travel Forecast Results</b>	<b>69</b>
3.1	Key Performance Criteria	70
3.2	Assumptions	70
3.3	Daily New Transit Trips & Project Boardings	72

<b>4</b>	<b>Preliminary Cost Estimates</b>	<b>75</b>
4.1	Purpose and Methodology	76
4.2	Quantities	76
4.3	Escalation	76
4.4	Market Factors	77
4.5	Comparison of Alternatives	77
<b>5</b>	<b>Study Findings</b>	<b>79</b>
5.1	Recap of Study Areas	80
5.2	Alignment Findings	82
5.3	Station Findings	84
	5.3.1 LA Union Station - Northern Terminus Study Findings	84
	5.3.2 New Stations for Alignment Option Study Findings	84
	5.3.3 Huntington Park Stations Study Findings	85
	5.3.4 New Metro Green Line Station Study Findings	86
	5.3.5 Artesia - Southern Terminus Study Findings	87
5.4	Summary of Findings	88
5.5	Key Issues to Resolve During the Next Phase	90
<b>6</b>	<b>Sources &amp; Bibliography</b>	<b>93</b>
	Sources	94
	Bibliography	98



12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1

STATION



# Executive Summary

---

**Building upon the Southern California Association of Governments (SCAG) “Pacific Electric ROW / West Santa Ana Branch Corridor Alternatives Analysis Report”, the Los Angeles County Metropolitan Transportation Authority (Metro) commissioned the “West Santa Ana Branch Technical Refinement Study” to focus on five specific areas of concern. This section summarizes the five issues, analysis performed, and study findings for future light rail service between Artesia and Los Angeles Union Station.**

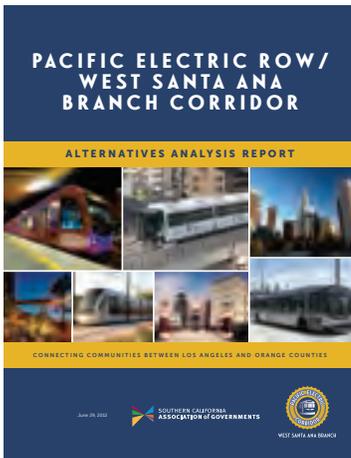
## Introduction

The West Santa Ana Branch (WSAB) Transit Corridor is one of twelve (12) transit projects funded by Measure R; a one-half cent sales tax approved by Los Angeles County voters in November 2008, and is contained in the Los Angeles County Metropolitan Transportation Authority's (Metro) 2009 Long Range Transportation Plan (LRTP) with a revenue service date of 2027. In March 2010, Southern California Association of Governments (SCAG) initiated the Pacific Electric Right-of-Way/West Santa Ana Branch (PEROW/WSAB) Alternative Analysis (AA) Study in coordination with the affected cities, Orangeline Development Authority (OLDA, now known as Eco-Rapid Transit), the Gateway Cities Council of Governments (COG), Metro, the Orange County Transportation Authority (OCTA), and the owners of the right-of-way (ROW). The AA Study evaluated a wide variety of transit connections and modes for the thirty-four (34) mile corridor from Union Station in Downtown Los Angeles to the City of Santa Ana in Orange County. The modes included low speed magnetic levitation (maglev), heavy rail (like the Metro Red and Purple Lines), light rail (like the Metro Blue and Green Lines), streetcar, and Bus Rapid Transit or BRT (like the Metro Orange Line).

During the SCAG AA Study, Metro provided comments to SCAG that would require resolution through additional studies at a future date. A general overview of the Metro comments included request for clarification of access into Union Station; clarification of determination for the grade crossing configurations; concern for impacts to the Metro Green and Blue Lines' capacity; and, verification of cost estimates and funding availability.

In February 2013, SCAG completed the PEROW/WSAB AA Study and recommended two light rail alternatives for further study; the West Bank Option 3 (West Bank 3) and the East Bank. Figure ES-1 shows the two SCAG AA recommended alternatives and the entire WSAB corridor Study area for Los Angeles County. The West Bank 3 alignment was recommended since it accessed a greater number of key cities and destinations that resulted in higher ridership along with good connections to the existing Metro rail system. The alignment also had stronger support from the cities and agencies. The East Bank was also recommended because it terminated at Union Station and while it had challenges, it had less issues than the other alternatives and was deemed a viable second alternative.

Metro decided to follow through with the SCAG AA recommendations by conducting a Technical Refinement Study (Study) of the WSAB corridor. This Study is not a revision to the PEROW/WSAB AA, but rather a focused study on key issues from the SCAG AA. These key issues involve alignment alternatives and station locations. The analysis and findings from this study are documented in the technical reports listed in the Bibliography and summarized in this report. Coordination and technical meetings with the various affected stakeholders (i.e., Eco-Rapid Transit, corridor cities, and Caltrans) were conducted throughout the Study process. Meeting minutes and presentations from these meetings can be found in the technical reports. Public participation was not included as part of this Study as it was a focused technical analysis. The public will be given opportunity to participate in the process and provide input during the next phase.



SCAG's Alternatives Analysis Report provided a basis for Metro's Technical Refinement Study

**Los Angeles County Metropolitan Transportation Authority (Metro)** is the transportation agency that serves as transportation planner and coordinator, designer, builder and operator for one of the country's largest, most populous counties. More than 9.6 million people – nearly one-third of California's residents – live, work, and play within its 1,433-square-mile service area.

OPPOSITE  
Figure ES-1: WSAB Corridor Study Area as defined by SCAG AA



## SCAG Alternatives Analysis

In March 2010, SCAG initiated the PEROW/WSAB AA Study in coordination with the affected cities, Eco-Rapid Transit, the COGs, Metro, OCTA, and the owners of the ROW. The AA Study evaluated a wide variety of transit connections and modes for the thirty-four (34) mile corridor from Union Station in Downtown Los Angeles to the City of Santa Ana in Orange County. The modes included low speed magnetic levitation (maglev), heavy rail (like the Metro Red and Purple Lines), light rail (like the Metro Blue and Green Lines), streetcar, and Bus Rapid Transit or BRT (like the Metro Orange Line).

During the SCAG AA Study, Metro provided comments to SCAG that would require resolution through additional studies at a future date. A general overview of the Metro comments included request for more details about the configuration of the alignment options; clarification of access into Union Station and its vehicle capacity; the need for coordination with other railroads; operational concerns; clarification of determination for the grade crossing configurations; concern for impacts to the Metro Green and Blue Lines' capacity; verification of cost estimates and funding availability, and concern for impacts to the Metro Green Line and I-105 freeway.



Figure ES-2: SCAG AA's East Bank alignment option

SCAG recommended two options (both utilizing light rail technology) to carry forward for further consideration by Metro and OCTA. These two options were the East Bank (Figure ES-2) and West Bank 3 alignments (Figure ES-3). The term East Bank refers to the alignment proposed within a ROW east of the Los Angeles River, and West Bank refers to the alignment proposed west of the Los Angeles River. Both alignments converge in the City of Huntington Park and continue south within existing rail ROW until the City of Artesia (Figure ES-4). Note that the SCAG AA Study included the Los Angeles County southern terminus in the City of Cerritos at the Bloomfield Station; additional information can be found in Section 2.5. The West Bank 3 alignment was recommended since it accessed a greater number of key cities and destinations that resulted in higher ridership along with good connections to the existing Metro rail system. The alignment also had stronger support from the cities and agencies. The East Bank was also recommended because it terminated at Union Station and while it had challenges, it had less issues than the other alternatives and was deemed a viable second alternative.



Figure ES-3: SCAG AA's West Bank 3 alignment option

## Purpose of the Technical Refinement Study

This Study is not a revision to the PEROW/WSAB AA, but rather a focused study on key issues from the SCAG AA. The analysis and findings from this Study are documented in the technical reports listed in the Bibliography and summarized in this report. Coordination and technical meetings with the various affected stakeholders (i.e., Eco-Rapid Transit, corridor cities, and Caltrans) were conducted throughout the Study process. Meeting minutes and presentations from these meetings can be found in the technical reports. This Study was more of a focused technical analysis so public participation will be included during the scoping for the environmental phase.

The key issues from the SCAG AA analyzed in this report involve alignment alternatives and station locations along with the development of travel forecast and preliminary cost estimates of the alternatives. The key issues concern five specific areas shown in Figure ES-4 and are listed below. Metro will use these results to help decide which alternative(s) and stations to carry forward into the next phase.

### 1. Los Angeles Union Station – Northern Terminus

Access and enter the northern terminal station, Los Angeles Union Station.

### 2. Northern Alignment Options

Develop options for the northern alignment segment between City of Huntington Park and Union Station.

### 3. Huntington Park Alignment & Stations

Study the City of Huntington Park's request for potential relocation and modification of the planned stations and alignment.

### 4. New Green Line Station

Feasibility of adding a new Metro Green Line Station east of the I-105/I-710 freeway interchange.

### 5. Southern Terminus

Study the potential change to the southern terminal station from the City of Cerritos to the City of Artesia.

An overview of the analysis and findings for each of these key issues is documented in this report and presented in four study areas; alignments, stations, travel forecast, and preliminary cost estimate. The alignment and station analysis include existing site context and factors considered in the study followed by a discussion of the findings, including options, challenges, and issues that will need further analysis in the next phase of the project. The travel forecast and preliminary cost estimate provide pertinent information to assist with the decision-making process of the alignment and station alternatives. For additional information beyond what is presented in this report, there are separate technical reports for each key issue; see the Bibliography for references to these reports.

OPPOSITE

Figure ES-4: Five Key Issues  
addressed in this study

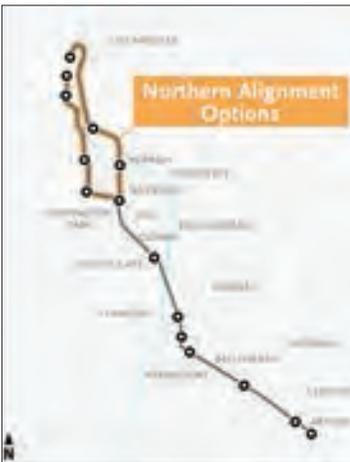


## Stakeholder Coordination

During the Study process, Metro and the consulting team met regularly with the Eco-Rapid Transit Executive Director, Caltrans, and cities directly affected by the five key issues, which included the Cities of Los Angeles, Vernon, Huntington Park, South Gate, Paramount, Cerritos, and Artesia. Each city's input was critical to validating the results of the Study as the team's findings were measured alongside their local knowledge of planned projects, insights on the team's assumptions, and general feasibility of design options considered. Gathering input from Caltrans and each city will continue to be an important part of the project in subsequent phases.

Coordination typically consisted of technical meetings with Caltrans, city staff (City Manager, Planning, Public Works and/or Transportation) to review preliminary findings, provide feedback, discuss design options, and review draft and final reports. Meetings were held with Caltrans, the Cities of Los Angeles, Vernon, Huntington Park, South Gate, Paramount, Artesia and Cerritos.

Other meetings included coordination with Metro personnel to discuss projects that may affect WSAB, such as the Union Station Master Plan (USMP), Southern California Regional Interconnector Project (SCRIP) and California High Speed Rail (CAHSR). Meetings were held with various Metro departments, such as Operations, Engineering, Estimating, and Real Estate, to discuss and confirm assumptions as well as give them WSAB project updates.



Key plan showing location of alignment study conducted for the northern portion of WSAB study area

## Study Summation

### Summation of Alignment Studies

The SCAG AA recommended two alignments (both utilizing light rail technology) for the WSAB project be carried forward for further analysis by Metro or OCTA; the East Bank and West Bank 3 alignments (Figure ES-1). The term East Bank refers to the alignment proposed within a ROW east of the Los Angeles River, and West Bank refers to the alignment proposed west of the Los Angeles River. Both alignments converge in the City of Huntington Park and continue south within existing rail ROW to the City of Artesia (Figure ES-4). Note that initially both alignments had a station within the City of Cerritos, called the Bloomfield Station, which was the last station within Los Angeles County. The City of Cerritos requested the elimination of this station during the SCAG AA development and by default the Pioneer Station in the city of Artesia became the last station. The West Bank 3 alignment was recommended since it accessed a greater number of key cities and destinations that resulted in higher ridership along with good connections to the existing Metro rail system. The alignment also had stronger support from the cities and agencies. The East Bank was also recommended because it terminated at Union Station and while it had challenges, it had less issues than the other alternatives and was deemed a viable second alternative.

The alignment studies included both SCAG AA alignments and new alignment options (Figure ES-5). Study findings based on 5% level of design are in the Section 1.0, Alignment Options.

The analysis considered the following factors:

- Current context
- Metro Rail Design Criteria, Standard & Directive Drawings
- In process projects for Metro, corridor cities, and private developers
- Site and corridor constraints
- Input from stakeholders
- Construction feasibility



OPPOSITE  
Figure ES-5 Six alignment options for the northern segment of the WSAB Corridor

**Six alignment options for the WSAB Alignment were studied.** Two of the alignment options were carried over from the SCAG AA and the other four were new options. The new alignment options consist of two corridors: the Pacific Boulevard Corridor and the Metro Blue Line/Alameda Street Corridor. The Pacific Boulevard Corridor uses Pacific Boulevard in the Cities of Vernon and Huntington Park for the light rail tracks within the street, while the Metro Blue Line/Alameda Street Corridor utilizes the existing Metro Blue Line ROW for separate light rail tracks. The six options (Figure ES-6) are:

## SCAG AA Options

### East Bank

- This alignment starts at Union Station and continues south on the eastern side of the Los Angeles River within existing Metro ROW. It then continues further south within existing railroad ROW owned by others starting at approximately Soto station until the southern terminus in the City of Artesia.

### West Bank 3

- This alignment starts south of Union Station within the Little Tokyo district and continues south above or within existing streets, under private property, and within Metro ROW until the center of the City of Huntington Park. From here it transitions to existing railroad ROW owned by others to the southern terminus in the City of Artesia.

## Pacific Boulevard Corridor Options

### West Bank - Pacific/Alameda (New)

- This alignment starts at Union Station and continues south along various streets (mostly within Alameda Street, 4th Street, Santa Fe Avenue, and Pacific Boulevard) until the center of the City of Huntington Park. From here it transitions to existing railroad ROW owned by others until the southern terminus in the City of Artesia.

### West Bank - Pacific/Vignes (New)

- This alignment starts at Union Station and continues south along various streets (mostly within Vignes Avenue, Santa Fe Avenue, and Pacific Boulevard) until the center of the City of Huntington Park. From here it transitions to existing railroad ROW owned by others until the southern terminus in the City of Artesia.

## Metro Blue Line/Alameda Street Corridor Options

### West Bank - Alameda (New)

- This alignment starts at Union Station and continues south along Alameda Street until the I-10 freeway where it transitions into the Metro Blue Line ROW until the west side of the City of Huntington Park. From here it transitions to existing railroad ROW until owned by others the southern terminus in the City of Artesia.

### West Bank - Alameda/Vignes (New)

- This alignment starts at Union Station and continues south along various streets (mostly within Vignes Street, Santa Fe Avenue, and Alameda Street) until the I-10 freeway where it transitions into the Metro Blue Line ROW until the west side of the City of Huntington Park. From here it transitions to existing railroad ROW owned by others until the southern terminus in the City of Artesia.

Table ES-1 provides some key alignment characteristics for comparison of the options, which include the total number of stations, total length of the alignment, and land use characteristics. The study findings for each alignment alternative can be found in the subsequent Section 1.6.

Figure ES-6: Enlarged map of six alignment options



**Table ES-1: Key Alignment Characteristics**

Alternative	Number of Stations	Length (miles)	Land Use
East Bank	11	18.5	Institutional Industrial Manufacturing
West Bank 3	12	17.8	Commercial Multi-family residential Industrial Single-family residential
West Bank - Pacific/Alameda	13	18.3	Institutional Commercial Multi-family residential Industrial Live-work
West Bank - Pacific/Vignes	12	18.1	Industrial Live-work Multi-family residential Commercial Single-family residential
West Bank - Alameda	15	19.0	Institutional Commercial Multi-family residential Industrial Single-family residential
West Bank - Alameda/Vignes	15	19.1	Industrial Live-work Single-family residential Multi-family residential

### Summation of Station Studies

The SCAG AA recommended station locations along the East Bank and West Bank 3 alignment alternatives. Additional alignment alternatives were developed, as described in the previous section, along with new station locations. This section summarizes the additional analysis completed for specific station locations due to potential challenges, stakeholder recommendations to adjust station locations, and new location(s) not studied within the SCAG AA. The study findings for each station are expanded upon in Section 2.0, Station Studies.

## Los Angeles Union Station - Northern Terminus

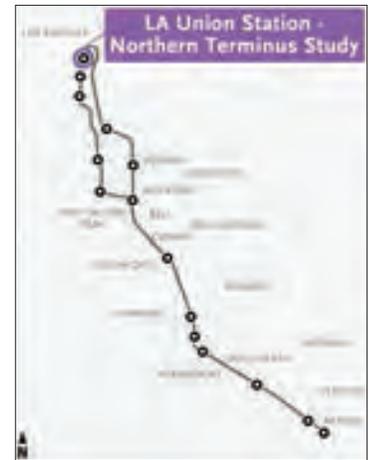
This study considered where a new light rail platform could be added to serve as the north terminus of the WSAB project within Los Angeles Union Station. Analysis based on 5% level of design, urban design considerations, and meetings with the USMP and SCRIP teams resulted in the identification of potential station locations. Study findings are expanded upon in Section 2.1.

The analysis considered the following factors:

- Current context
- Metro Rail Design Criteria, Standard & Directive Drawings, “Kit of Parts” approach
- In process projects, such as USMP, SCRIP, and CAHSR
- Site constraints

Two potential zones for a new WSAB Terminus Station light rail platform were identified. Both locations are centralized and provide close proximity to Amtrak and Metrolink platforms, Metro Red/Purple Lines and Gold Line Stations, and the USMP recommended relocated bus plaza as shown in Figure ES-7:

- **Over the USMP recommended relocated bus plaza.** An aerial station could be built one-level above the relocated bus plaza and share some vertical circulation elements (elevators, escalators, stairs). This location is also a future development pad per the USMP (identified as an Office Building). It is unknown when a building could be financed and developed in this location.
- **Over the Metro Gold Line Platform.** An aerial station could be built one-level above the existing station platform and share some vertical circulation elements (elevators, escalators, stairs). This location does not coincide with any development pads and does not conflict with SCRIP or CAHSR.



Key plan showing location of Los Angeles Union Station Northern Terminus



Metro's Station Design Review Report includes a “Kit of Parts” standardized approach which was the basis for each station study

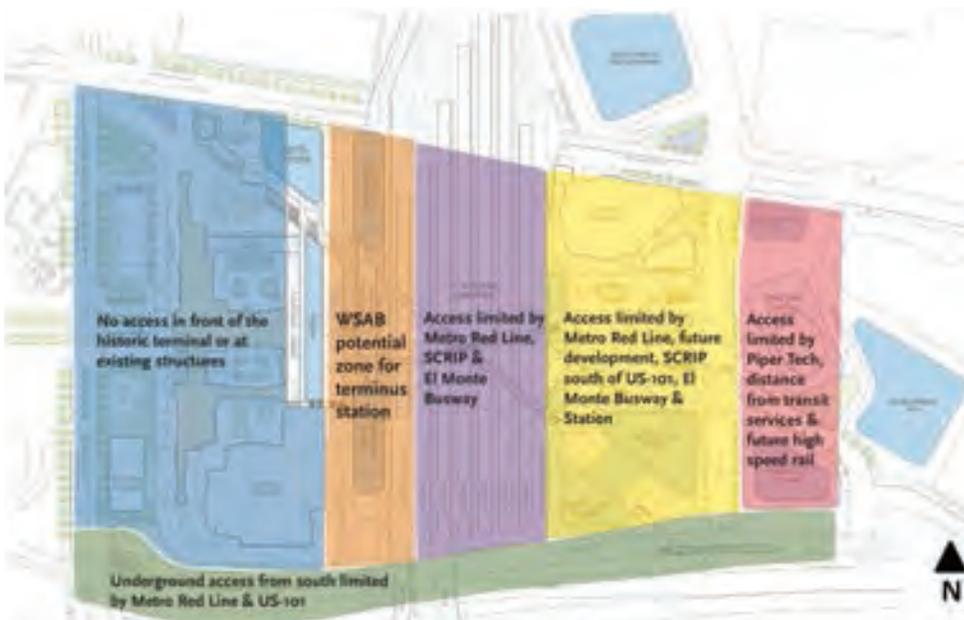
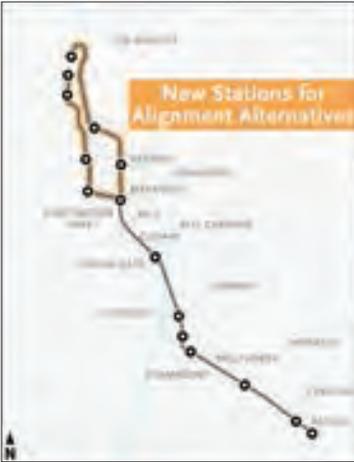


Figure ES-7: Los Angeles Union Station will undergo changes due to implementation of the Master Plan, SCRIP and a future CAHSR Station. The orange area (shown over the USMP) contains two potential sites for a WSAB terminus station.



Key plan showing study area for new stations that arose during the refinement of alignment alternatives

### New Stations for New Alignment Alternatives

During the refinement of alignment alternatives, new station locations were identified that were not previously included in the SCAG AA and should be considered in the next phase of analysis. The new stations that arose while developing the West Bank alternatives include:

- Arts District Station (3 potential locations: One Santa Fe, 3rd or 4th Streets)
- Washington Station (at Metro Blue Line)
- Vernon Station (at Metro Blue Line)
- Slauson Station (at Metro Blue Line)
- Potential Station between Arts District Station and Pacific/Vernon Station (3 potential locations: 6th Street, Santa Fe and Olympic, or Washington Boulevard) on the two alignment options “West Bank – Pacific/Alameda”, and “West Bank – Pacific/Vignes”

Study findings are expanded upon in Section 2.2. For the analysis of Florence Station in Huntington Park, and the new Green Line Station in Paramount, see the following sections.



Figure ES-8: Map showing the new stations that arose during the Technical Refinement Study not previously considered in the SCAG AA.

### City of Huntington Park Stations

This study analyzed the feasibility, potential challenges, and solutions for two stations in City of Huntington Park proposed by the City in alternative locations from what was shown in the SCAG AA.

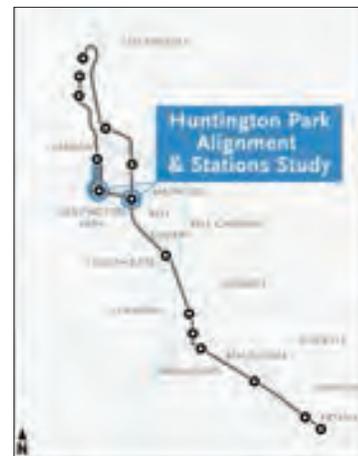
1. In lieu of a Pacific/Randolph Station (in the center of Pacific Boulevard north of Randolph Street) the City asked Metro to study a station on Randolph Street east of Pacific Boulevard. See Figure ES-9 for concept plan.
2. In lieu of a Gage Station (north of Gage Avenue along Salt Lake Avenue in the rail ROW) the City asked Metro to study a station south of Florence Avenue in the center of Salt Lake Avenue. See Figure ES-9 for concept plan.

Study findings based on 5% level of design and urban design considerations are expanded upon in Section 2.3.

The analysis considered the following factors:

- Cities of Huntington Park and Vernon letters and meeting input
- Metro Rail Design Criteria, Standard & Directive Drawings, “Kit of Parts” approach
- Randolph Street ROW
- Salt Lake Avenue ROW

The alternative station locations on Randolph Street (east of Pacific Boulevard) and Salt Lake Avenue (south of Florence Avenue) were deemed feasible.



Key plan showing location of Huntington Park Alignment and Station studies (above) and the City of Huntington Park’s 2012 map with proposed modifications to two stations (shown in black below).



Figure ES-9: Concept plans for Pacific/Randolph Station and Florence/Salt Lake Station in Huntington Park





Key plan showing location of new Metro Green Line Station study

### New Metro Green Line Station

This study focused on the feasibility and challenges associated with a new Metro Green Line Station within the median of the I-105 Freeway east of the I-105/I-710 interchange to provide a direct transfer between the new Green Line station and the new WSAB station, which is proposed immediately above it. The study addressed preliminary construction and operational impacts to both the existing I-105 Freeway and Metro Green Line and Blue Line operations as a result of building a new Metro Green Line station, and identified potential solutions for minimizing service disruptions. A conceptual cross-section drawing of the two new station platforms is shown in Figure ES-10.

Study findings based on 5% level of design and urban design considerations are expanded upon in the Section 2.4.

The analysis considered the following factors:

- WSAB Station over the I-105 Freeway per SCAG AA
- Metro Rail Design Criteria, Standard & Directive Drawings, “Kit of Parts” approach
- Metro Green Line Operations
- Station context
- Caltrans ROW
- UPRR bridge and ROW

Based on the conceptual plans, it was determined that a new Metro Green Line station connecting with the WSAB project can feasibly be built within the existing I-105 Freeway and ROW.

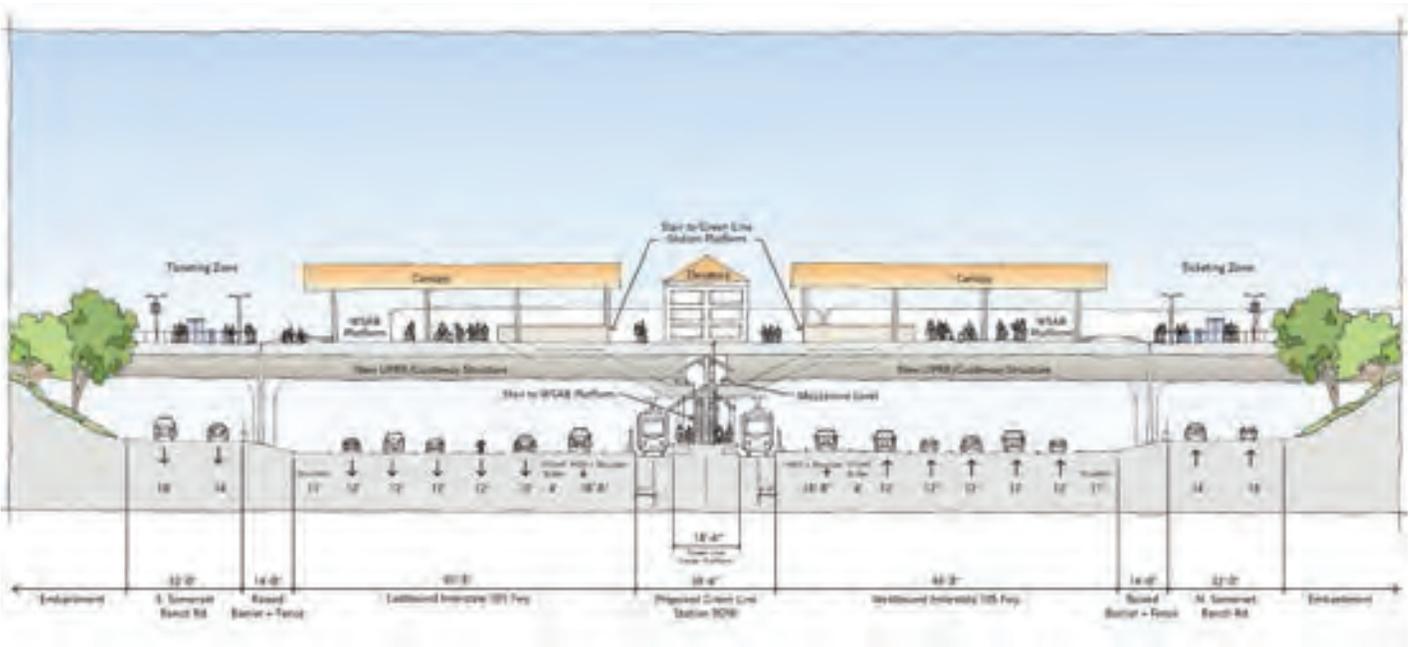


Figure ES-10: Conceptual cross-section drawing (looking west) for a new Metro Green Line Station below a new WSAB Station at Florine Ave. and Century Blvd. in the City of Paramount

### City of Artesia – New Southern Terminus

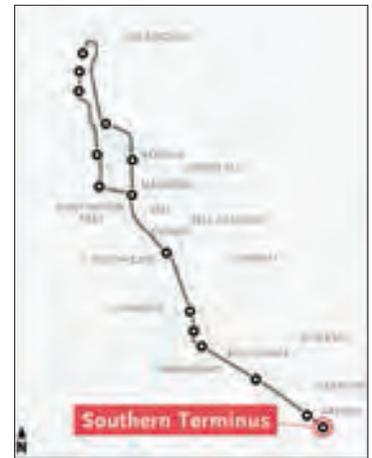
This study analyzed how the Pioneer Station would function as the new southern terminus for the WSAB project in lieu of the City of Cerritos Bloomfield Station. The SCAG AA included a Bloomfield Station in the City of Cerritos to serve as the southern terminus for Los Angeles County. Upon the City of Cerritos' request, the Bloomfield Station was removed from further consideration. The next station to the north is the Pioneer Station in the City of Artesia; assumed to function as a through-station by SCAG.

The Pioneer Station location (Figure ES-11) was analyzed for its feasibility to determine what kind of challenges may exist based on no more than 5% level of design. Study findings based on 5% level of design and urban design considerations are expanded upon in the Section 2.5.

The analysis considered the following factors:

- City of Artesia meeting input and planned project documents
- City of Cerritos meeting input
- Metro Rail Design Criteria, Standard & Directive Drawings, “Kit of Parts” approach
- Metro Operational needs for terminus station
- Urban design analysis
- ROW

Pioneer Station was deemed feasible as the new southern terminus for the WSAB project.



Key plan showing location of new Southern Terminus study in Artesia



Figure ES-11: Concept sketch of a potential transit-oriented development (TOD) at the Southern Terminus Station in Artesia, shows the City of Artesia's preferred station platform location between 187th St. and Pioneer Blvd.

## Ridership

The travel forecasting results for the six alternatives were developed using a horizon year of 2040 and presented as new transit trips and project boardings for each alternative.

Below are the assumptions per alternative used within the travel demand model; see Table ES-2. In the next phase, these assumptions will be revisited as they are dependent upon the types of guideway and stations (i.e., at-grade, aerial, and underground) assumed within this study.

**Table ES-2: Summary of Assumptions per Alternative**

Alternative	Number of Stations	Length (miles)	Travel Time (minutes)
East Bank	11	18.5	34.4
West Bank 3	12	17.8	32.4
West Bank - Pacific/Alameda	13	18.3	33.0
West Bank - Pacific/Vignes	12	18.1	33.2
West Bank - Alameda	15	19.0	33.2
West Bank - Alameda/Vignes	15	19.1	34.3

Another important assumption is station parking, which was analyzed starting with the SCAG AA recommended quantities and adjusted with input from the cities. The following Table ES-3 represents the station parking spaces used in the travel forecast process. The parking spaces in the table reflect the constrained amount, which refers to the amount that can be accommodated based upon existing conditions. The actual parking demand is higher. Note the 200 parking spaces listed for Union Station are existing while the remainder of the parking spaces are new and therefore will be constructed as part of this project.

**Table ES-3: Station Parking Spaces (Constrained)**

Station	Parking Spaces
Union Station	200 (existing)
Firestone	150
WSAB-Green Line (combined)	300
Paramount	200
Bellflower	270
Gridley	400
Pioneer	300
<b>TOTAL</b>	<b>1,820</b>

Therefore, during the next phase of the project, the amount of station parking spaces will be studied further to determine if additional spaces are feasible and how this will affect the travel forecast balanced with other factors, such as cost, ROW impacts, and traffic impacts.

## Daily New Transit Trips and Project Boardings

In order to evaluate the ridership for the six alternatives, several measurements were considered to understand the factors influencing why one alignment is anticipated to perform better than another. The first measurement is boardings. Boardings represent each time a person enters a transit vehicle; for example, one ride with a transfer to reach a destination equates to two boardings. New transit trips are another important measurement because they represent people who would likely opt to take a trip using the WSAB line rather than drive a car to reach their destination; for example, travel out to a destination and a return back represents two trips taken.

Based upon the travel forecast results, the alignment options that show higher boardings are the West Bank – Alameda and West Bank – Alameda/Vignes, which parallel the Metro Blue Line and share multiple station locations between Union Station and Slauson Station. The boardings are higher for these two options due to transfers from/ to the existing Metro Blue Line. For new transit trips, the highest alignments are the East Bank, West Bank – Pacific/Alameda and West Bank-Pacific/Vignes, which demonstrates that more people are shifting modes to take advantage of the new transportation option. Figure ES-12 shows the boardings and new transit trips per alignment option and illustrates how the two measurements relate. Below the figure is a discussion of the factors that affect these numbers.

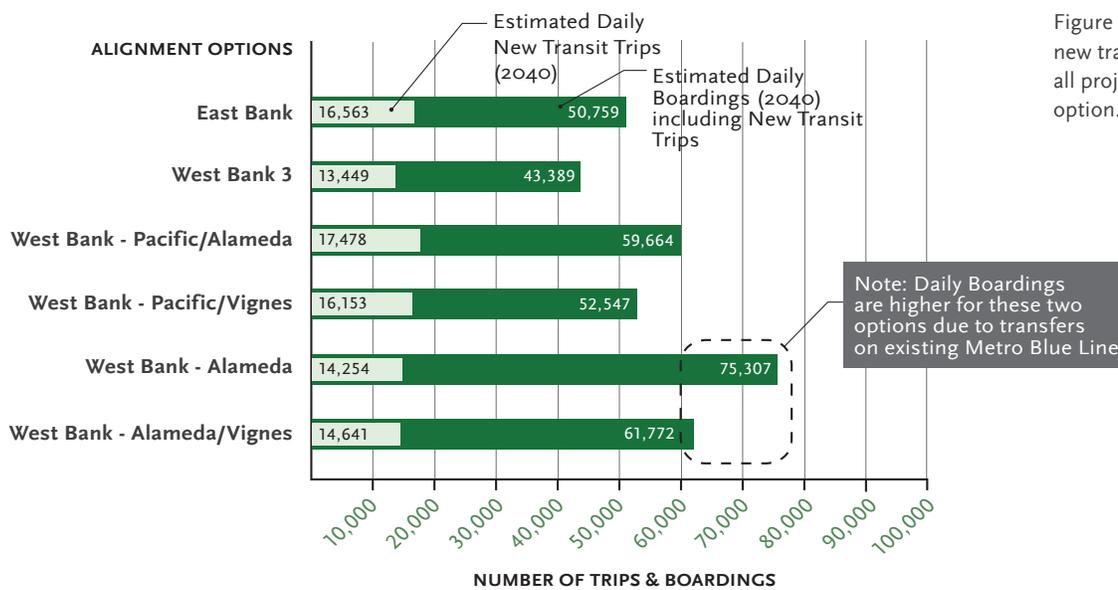


Figure ES-12: Graph showing daily new transit trips as a portion of all project boardings by alignment option.

Overall there are three factors that affect the number of “new transit trips” and “daily boardings” each alternative is capable of generating. The key issues that arose during this Study and that are the biggest differentiators between the six alternatives are:

### 1. Terminating in Union Station

The only alternative that didn’t terminate at Union Station at its northernmost point is the West Bank 3 and it resulted in the lowest total number of new transit trips and boardings. The ability for WSAB riders to access other Metro rail lines, Metro buses, other operator bus lines, Metrolink and Amtrak is a significant benefit that was revealed in the total number of forecasted new transit trips and boardings. New transit trips went up 20-30% for the other alternatives that assumed Union Station as the northernmost terminus. Therefore, the ability to reach Union Station is critical for maximizing ridership and the West Bank 3 alignment that terminates in Little Tokyo is not comparable because it requires a forced transfer.



Terminating WSAB at Union Station brings significant benefits to riders.



Alignments that included a station in Little Tokyo near 1st/Central, and stations alongside the Metro Blue Line reflected higher boardings.

**2. Capturing East-West Transfers in Little Tokyo**

Alternatives that included a station in Little Tokyo near 1st/Central and continuing into the Los Angeles Union Station generated more boardings because they allowed for transfers to the Metro Gold Line via the future Metro Regional Connector. These alternatives included West Bank – Pacific/Alameda and West Bank – Alameda. A WSAB station within Little Tokyo gives riders the opportunity to transfer to the Metro Gold Line to reach points further east (Boyle Heights, East Los Angeles, and Whittier when Metro Gold Line Eastside Phase II is realized) and west when the Regional Connector opens (Downtown Los Angeles, Mid-City and Santa Monica). Locating a station at 1st/Central can increase boardings by approximately 14% or increase new transit trips by 8% from what would otherwise be forecasted on a similar alternative that didn’t have a stop at 1st/Central and continued into the Los Angeles Union Station.

**3. Following the Metro Blue Line**

The alternatives proposed alongside the Metro Blue Line connecting Slauson Station and Union Station reflect a higher number of boardings due to “forced transfers”. These alternatives include the West Bank – Alameda and West Bank – Alameda/Vignes. Typically forced transfers are viewed negatively because transferring adds travel time and can be a deterrent if the delay is significant and the rider has other options. However, in this case the WSAB alternatives provide the Metro Blue Line riders a faster means to reach Union Station since the WSAB alternatives are more direct. For comparison, the travel time from Slauson Station to Union Station by Metro Blue Line is approximately 22 minutes; and by WSAB the travel time will only be approximately 9 minutes. The addition of WSAB between Slauson Station and Union Station can relieve demands on the Metro Blue Line which is currently operating at its full capacity.

**Preliminary Cost Estimates**

Table ES-4 presents the preliminary cost estimates associated with each of the alternatives in 2015 dollars. The preliminary cost estimates include cost contingency to cover unexpected cost increases, which is consistent with FTA recommendations for transit projects at the 5% level of design. The preliminary cost estimates will be further refined in the next phase.

**Table ES-4: Preliminary Cost Estimates**

Alternatives	Total Cost (in millions, 2015 dollars)
East Bank	\$3,796.3
West Bank 3	\$4,315.5
West Bank - Pacific/Alameda	\$4,420.5
West Bank - Pacific/Vignes	\$4,416.2
West Bank - Alameda	\$4,309.4
West Bank - Alameda/Vignes	\$4,621.3

The SCAG AA cost estimates for the East and West Bank alignments were lower than the updated preliminary cost estimates due to cost escalation between 2010, which is the base year for the SCAG AA, and 2015, the base year for WSAB. Additionally, the WSAB preliminary cost estimates include costs for parking facilities, route footage increases, additional sitework, train control, signaling and communications systems, land acquisition, professional services, related permits and other associated fees.

## Study Findings

Table ES-5 is a summary of the key characteristics for the six alternatives analyzed during this Study. The following sections expand upon the study findings for the alignments and stations (Figure ES-13) along with the key issues to be analyzed and resolved in the next phase of the project.

**Table ES-5: Key Characteristics for Six Alternatives**

	Number of Stations	Length (miles)	Travel Time (minutes)	Estimated Daily Boardings (2040)	Preliminary Cost Estimate (in millions, 2015 dollars)
East Bank	11	18.5	34.4	50,759	\$3,796.3
West Bank 3	12	17.8	32.4	43,389	\$4,315.5
West Bank - Pacific/Alameda	13	18.3	33.0	59,664	\$4,420.5
West Bank - Pacific/Vignes	12	18.1	33.2	52,547	\$4,416.2
West Bank - Alameda	15	19.0	33.2	75,307	\$4,309.4
West Bank - Alameda/Vignes	15	19.1	34.3	61,772	\$4,621.3

### Alignments

This section is an overview of the alignment study findings described in more detail in Section 5.2, Alignment Findings.

**East Bank:** Benefits include direct connection to Union Station. Challenges include ROW constraints of existing railroad usage and adjacent high-tension power lines to the west and commercial buildings to the east that make expansion of the ROW expensive and/or unattainable.

**West Bank 3:** Benefits include stations in key destinations. Challenges include northern terminus falling short of Union Station and therefore ridership is less due to the lack of direct access to other regional transit services available at Union Station.

**West Bank - Pacific/Alameda and West Bank – Pacific/Vignes:** Benefits include direct connection to Union Station and stations in key destinations. Challenge includes concern from the cities of Vernon and Huntington Park for impact to truck traffic along Pacific Boulevard.

**West Bank – Alameda and West Bank – Alameda/Vignes:** Benefits include direct connection to Union Station, stations in key destinations, and potential cost savings by utilizing the existing Metro Blue Line ROW. Challenges include potential impacts to private property and the widening of Metro ROW utilized by the Blue Line.

Based on the analysis, the East Bank alignment is not recommended to go forward due to right-of-way constraints from existing railroad usage. In addition, the adjacent high-tension power lines to the west and commercial buildings to the east make expansion of the right-of-way expensive and/or unattainable. The West Bank 3 alignment also is not recommended to go forward because its northern terminus falls short of Union Station and results in low-ridership due to the lack of direct access to other regional transit services available at Union Station. The newer Pacific and Alameda Corridor alternatives would proceed north to Union Station and are warranted for further study.

## Stations

This section is a synopsis of station study findings described in more detail in Section 5.3, Station Findings.

### Los Angeles Union Station - Northern Terminus

- Both station locations in Union Station are feasible to serve as WSAB's North Terminus:
  - Over the Relocated Bus Plaza, and
  - Over the Metro Gold Line platform
- Both options will require further coordination efforts with adjacent projects, such as USMP, CAHSR, and SCRIP.

### New Stations for Alignment Option

The next phase will study all new station locations (not previously identified in the SCAG AA) in greater detail, including those identified in the Arts District, Metro Blue Line transfer stations, and east-west transfer opportunities on Santa Fe/Pacific alignment options.

### Huntington Park Stations

- The alternative light rail station on Randolph Street will better serve Downtown Huntington Park and is initially preferred by the Cities of Huntington Park and Vernon over the proposed Pacific Boulevard location described in the SCAG AA.
- Metro understands Huntington Park's second light rail station location is preferred by the cities of Huntington Park, Bell, Cudahy, and Bell Gardens at Florence and Salt Lake Avenues due to the potential development and connections to other adjacent cities over the proposed Gage Avenue location described in the SCAG AA.

### New Metro Green Line Station

- Based on the conceptual plans, a new Metro Green Line station connecting with the WSAB project can feasibly be built within the existing I-105 Freeway and ROW.
- While the freeway ROW is sufficient to accommodate the new Metro Green Line station, further analysis is required if the I-105 ExpressLanes is also introduced in the freeway corridor.
- Based on initial travel forecast results, there does not appear to be any long-term systemwide operational impacts to either the Metro Green Line or the Metro Blue Line but may instead be positive in the sense of relieving the other lines by giving passengers other options.
- Pedestrian access to the station from the south should be studied further.

### Artesia - Southern Terminus

- Pioneer Station is feasible as a Southern Terminus and recommended for its platform west of Pioneer Boulevard.
- Station parking must be studied further based on demands.

OPPOSITE

Figure ES-13: Study findings for alignments and stations.



## Key Issues to Resolve During the Next Phase

The next phase will analyze the potential environmental impacts and mitigations for specific study areas. Also, the design will advance along with development of the operational and maintenance program. Based upon the 5% level of design, the following are key issues that will need to be analyzed during the next phase:

### 1. Traffic/Parking

All of the alignment options propose portions of the guideway within public streets. The guideway placement within the public streets will require reconfiguration of the traffic lanes, street parking, left turn pockets, etc. This will be done in conjunction with the traffic analysis in order to develop a solution that will not generate or minimize the potential impact to the traffic and parking.

### 2. Real Estate

There are specific areas where the guideway will be within the ROW owned by others that will require early coordination efforts due to the potential amount of time to reach an agreement on the design, compensation (if any), and coordination. This includes the following:

- The aerial guideway from Union Station over the 101 freeway that will require approval from Caltrans.
- The aerial or at-grade guideway within the existing railroad corridors will require early coordination, such as with UPRR, Southern California Regional Rail Authority (SCRRA) and Ports of Long Beach and Los Angeles.
- The various corridor cities will need to approve the guideway within (i.e., at-grade, aerial, or underground) their public streets.

### 3. Utilities

There are potential impacts to utilities for the alignment options and most will occur within the public streets where the guideway is proposed. Existing utilities will need to be located and mitigated, especially in areas with an aerial structure or underground guideway.

### 4. Soil Conditions

Investigation of the existing soil conditions is required for all underground structures, such as the foundations for aerial structures and underground guideway sections. In some areas, such as the alignments near the Los Angeles River, a higher water table may be encountered due to the proximity to the river.

### 5. Existing Underground Structures

For the alignment options proposed to be underground, the design will need to address existing structures that are within or adjacent to the proposed alignment. For example, for the West Bank – Pacific/Vignes alignment, when the guideway crosses under the 1st Street bridge, guideway design will be coordinated with the existing bridge piers. Also for the West Bank – Alameda/Vignes alignment when it transitions from the Vignes alley to 3rd Street, underpinning of adjacent buildings may be required.

**6. Coordination with California Public Utilities Commission (CPUC)**

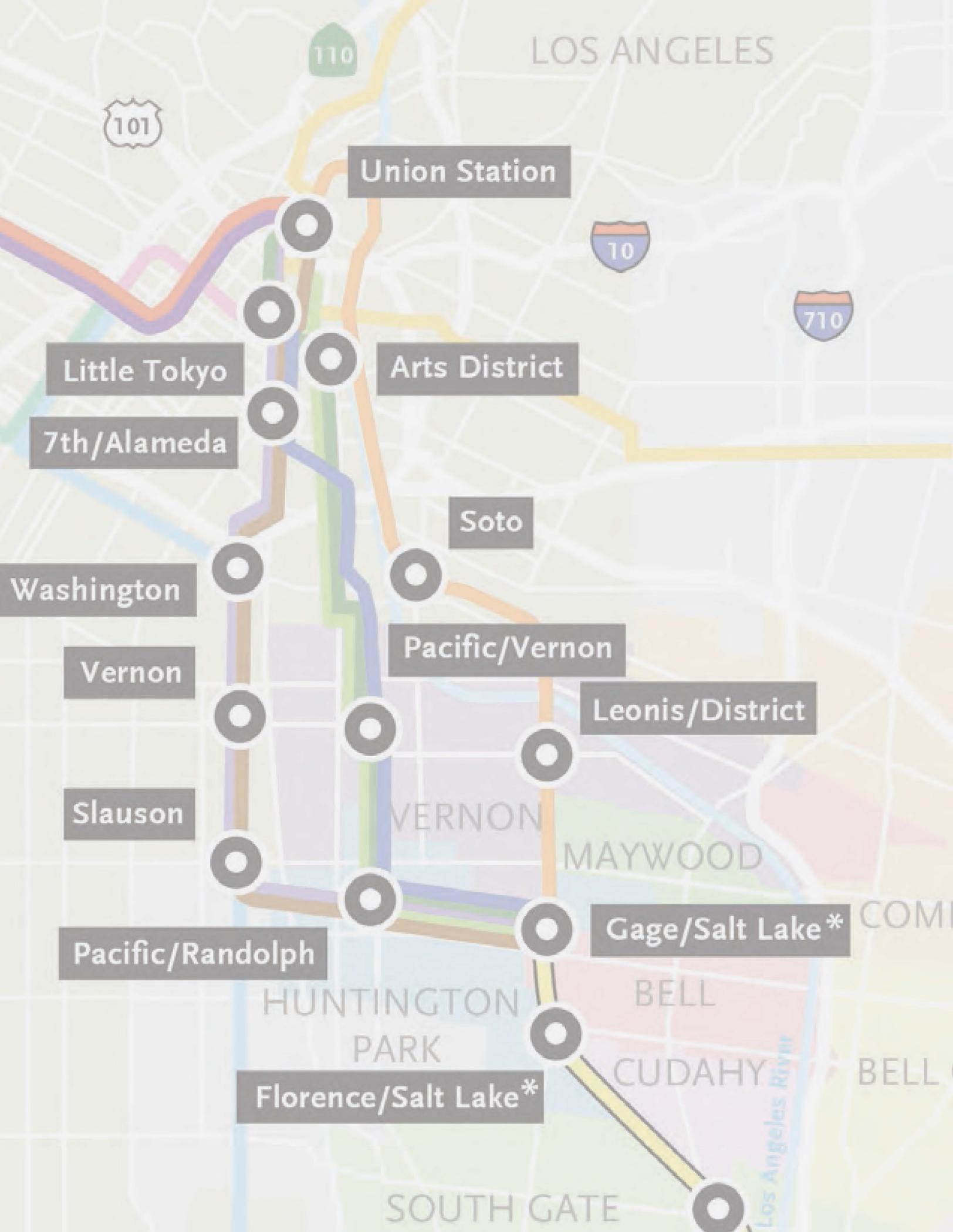
The CPUC is an important stakeholder as they will ultimately approve the project before it can be put into service. Therefore, it is critical to begin coordination early for information sharing and these types of meetings continue throughout the project development.

**7. Locate the Maintenance Facility**

The exact location, size, configuration, and functions will need to be decided for the maintenance facility. The SCAG AA identified some potential locations and these may be analyzed along with identification of new locations after the facility size and configuration is determined based upon the number of vehicles to be stored at the site and the facility functions.

**8. Resolve Station Parking Demand**

The station parking spaces used within the travel demand model are constrained and do not reflect the actual demand. Therefore, during the next phase of the project, the amount of station parking spaces will be studied further to determine if additional spaces are feasible and how this will affect the travel forecast balanced with other factors, such as cost, ROW impacts, and traffic impacts.



LOS ANGELES

101

110

Union Station

10

710

Little Tokyo

Arts District

7th/Alameda

Soto

Washington

Pacific/Vernon

Vernon

Leonis/District

Slauson

VERNON

MAYWOOD

Pacific/Randolph

Gage/Salt Lake\*

HUNTINGTON  
PARK

BELL

Florence/Salt Lake\*

CUDAHY

SOUTH GATE

Los Angeles River

# Alignment Studies

---

## 1

The SCAG AA identified two possible light rail alignments between Los Angeles Union Station and the Southern Terminus in Artesia. During the Technical Refinement Study both alignments were evaluated, design challenges cataloged, and new options identified north of Huntington Park as alternatives were deemed less feasible. Four alignments appear suitable for further evaluation in the next phase.



Key Plan showing location of Northern Alignment options study

# 1.1 Introduction

This section discusses the SCAG AA alignments and the new alignment options developed during the Study. Included below is a description and map of the alignment options along with an overview of the alignment challenges. The complete analysis, including all alignment challenges, can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

In the 2013 AA, SCAG recommended two options to carry forward for further consideration by the agency of jurisdiction. These two options were the East Bank and West Bank Option 3 (West Bank 3) alignments (Figure 1-1). The term East Bank refers to the alignment proposed within a ROW *east of the Los Angeles River*, and West Bank refers to the alignment proposed *west of the Los Angeles River*. Both alignments converge in the City of Huntington Park and continue south within existing rail ROW until the City of Artesia.

The West Bank 3 alignment was recommended since it accessed a greater number of key cities and destinations that resulted in higher ridership along with good connections to the existing Metro rail system and had stronger support from the cities and agencies. The East Bank was also recommended because it terminated at Union Station and while it had challenges, it had less issues than the other alternatives and was deemed a viable second alternative.

OPPOSITE  
 Figure 1-1 SCAG AA's East Bank & West Bank alignment options (north of Gage Station in Huntington Park). This study did not propose or analyze alternative alignments between between Gage and Artesia Stations.



The West Bank 3 showed the most potential and therefore a variety of modified potential alignments were developed from this alignment. During the process, alignments evolved with the input of the cities, Eco-Rapid Transit, and Metro. For example, the City of Huntington Park asked SCAG to consider the Santa Fe Corridor as an alternative to the Pacific Corridor. Subsequently, based on those findings, Metro and the cities supported exploring an alignment that paralleled the Metro Blue Line Corridor in lieu of the Santa Fe Corridor. A total of four alignment variations plus the two developed by SCAG gave a total of six options that may potentially continue into the next phase of the project (Figure 1-2). All six options were brought to an approximately 5% level of design, which include assumptions for the guideway selection, and are titled:

- **East Bank** Per SCAG AA
- **West Bank 3** Per SCAG AA
- **West Bank - Pacific/Alameda** New
- **West Bank - Pacific/Vignes** New
- **West Bank - Alameda** New
- **West Bank - Alameda/Vignes** New

For the alignment options that terminate at Union Station, which include all options except for the West Bank 3 option, the location of the WSAB station at Union Station is contingent upon other projects that include the Union Station Master Plan (USMP), Southern California Regional Interconnector Project (SCRIP), City of Los Angeles Park 101 (Phase 3) project, and California High Speed Rail (CAHSR). Therefore the access and location of the WSAB station will be finalized after the other project designs are further developed. The other projects may affect the placement of the WSAB columns, aerial station, and circulation elements (i.e., stairs, elevators) as the other projects include rearrangement of the existing tracks (in both the horizontal and vertical directions) along with the potential for new structures and access to Union Station. Based upon the information to date from these other projects, the ideal location for the WSAB station is in an aerial configuration directly above the Metro Gold Line station or to the west of the station above the relocated bus plaza. Additional information and details can be found in the WSAB Union Station Access Memorandum, Final Rev. 1. The following section provides a description and figures of the six alignment alternatives along with an overview of the challenges associated with the alternative. For additional information, refer to WSAB Northern Alignment Challenges Report, Final Rev. 2. The alignment alternative descriptions below are limited to the section between the northern-most terminus (downtown Los Angeles) to the City of Huntington Park’s Gage station as the remainder of the alignment alternatives are the same, which ends at the southern-most terminus in the City of Artesia.

**OPPOSITE**

Figure 1-2: Four new alignment options (north of Gage Station) arose during this study for terminating the WSAB Corridor at Union Station. The map shows the two original SCAG AA options plus four new ones for a total of six that were analyzed.



## 1.2 East Bank

### 1.2.1 Alignment Description

The East Bank Option alignment alternative (shown in orange in Figure 1-3) was carried forward from the SCAG AA and was not modified so that the previous analysis could be used for comparison within this study. The guideway for this alternative begins at Los Angeles Union Station (Union Station) either above or adjacent to the existing Metro Gold Line station. From Union Station, the alignment travels north, at-grade to aerial, over the existing tracks, then east over the Los Angeles River. The alignment then continues south at-grade on the east bank and transitions to an aerial configuration just south of Olympic Boulevard. The aerial alignment then curves southeast, running directly above the Union Pacific Railroad (UPRR) ROW to an aerial Soto Street Station. East of the Soto Station, the alignment continues in an aerial configuration above the UPRR ROW, where it descends to grade along the Southern California Electric (SCE) ROW. South of Washington Boulevard in the northern edge of the City of Vernon, the alignment goes into an aerial configuration to avoid the BNSF ROW continuing south along Downey Boulevard to the San Pedro Subdivision in Huntington Park.

### 1.2.2 Overview of Alignment Challenges

Below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

The WSAB station is proposed to be an aerial station over the existing Metro Gold Line station or to the west of the station above the relocated bus plaza as proposed in the USMP. The exact WSAB station location is still under study and will be finalized after the design is advanced for other projects within the vicinity, which include USMP, SCRIP, City of Los Angeles Park 101 (Phase 3) project and CAHSR. For more information, please refer to Union Station Access Memorandum, Final Rev. 1.

Overall, the East Bank option has challenges due to ROW constraints of existing railroad usage and adjacent high-tension power lines to the west (see Figure 1-4) and commercial buildings to the east (see Figure 1-5) that make expansion of the ROW expensive and/or unattainable.

OPPOSITE

Figure 1-3: SCAG's East Bank alignment option from the SCAG AA

Figure 1-4 (L): High-tension power lines in ROW of potential alignment along the LA River.

Figure 1-5 (R): Aerial view of commercial property that requires acquisition





## 1.3 West Bank 3

---

### 1.3.1 Alignment Description

The West Bank 3 Option alternative alignment (shown in blue in Figure 1-6) was carried forward from the SCAG AA and was not modified so that the previous analysis could be used for comparison within this study. The guideway for this alternative begins near the existing Metro Gold Line Little Tokyo/Arts District Station at 1st and Alameda Streets; note that the existing Little Tokyo/Arts District station will be relocated by Metro's Regional Connector. The alignment continues south at-grade in the median of Alameda Street until it enters a tunnel configuration just north of Alameda and 2nd Streets. The alignment continues southbound below-grade to the 7th/Alameda Station, which is an underground station.

From the 7th/Alameda Station, the alignment curves southeast at a 45 degree angle and then surfaces at Santa Fe Avenue, just north of Olympic Boulevard. As soon as the alignment daylights, it begins its ascent into an aerial alignment and continues south on Santa Fe Avenue, crossing over Olympic Boulevard, under the I-10 Freeway and then over Washington Boulevard. Just north of 15th Street, the route curves east along 15th Street and then turns south on Minerva Street, where it merges onto the Harbor Subdivision. The alignment continues south in an aerial configuration above the Harbor Subdivision. Just north of Vernon Avenue, the alignment descends to an at-grade configuration and continues to the proposed Pacific/Vernon Station. From the Pacific/Vernon Station, the alignment curves southeast, merging onto Pacific Boulevard and running at-grade on the Pacific Boulevard median. The alignment curves southbound just east of the Harbor Subdivision, until just north of Randolph Street, where it curves southeast into the La Habra Branch. The alignment continues eastbound before ascending into an aerial configuration just west of the San Pedro Branch Subdivision. The aerial alignment curves southeast from the La Habra Branch, running southbound and directly above the San Pedro Branch Subdivision. The alignment then descends and continues on to Gage Station.

Note both the Cities of Huntington Park and Vernon expressed concern for potential impacts to truck traffic from the region due to the proposed at-grade alignment on Pacific Boulevard, which was studied in the SCAG AA. These concerns were discussed at meetings with both cities and documented in letters from the cities to Metro. Meeting minutes and city letters are documented in Proposed Alternate Station Location and Realignment Report, Final. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground).

#### OPPOSITE

Figure 1-6: SCAG's West Bank 3 alignment option from the AA



### 1.3.2 Overview of Alignment Challenges

Below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

The West Bank 3 option has challenges but most significantly is its northern terminus falling short of Union Station and therefore ridership is less due to the lack of direct access to other regional transit services available at Union Station (see Figure 1-7). Also, the at-grade crossing at 1st/Alameda Streets will be analyzed with the other grade crossings during the next phase of the project. This crossing may be more of a challenge than the others due to the existing volume of traffic.

The proposed bored tunnel from Alameda and 2nd Streets south to Santa Fe Avenue and the I-10 Freeway may encounter a high water table during construction due to the proximity to the Los Angeles River and pockets of contaminated soil (see Figure 1-8 for context photo). Additional precautions will be required during construction to address these issues.

The proposed alignment will crossover existing railroad tracks and through private properties, which will require easements from the railroad and an easement or acquisition for the property. For example, between 15th Street/Santa Fe Avenue, and 25th Street/Minerva Avenue, the path of the light rail alignment turns easterly on 15th Street, crosses over existing railroad tracks and through private property to eventually line up with Minerva Avenue (see Figure 1-9).



Figure 1-7: Aerial view of WSAB and Gold Line transfer point



Figure 1-8: Light Rail Underground Alignment (Alameda and 7th Street)

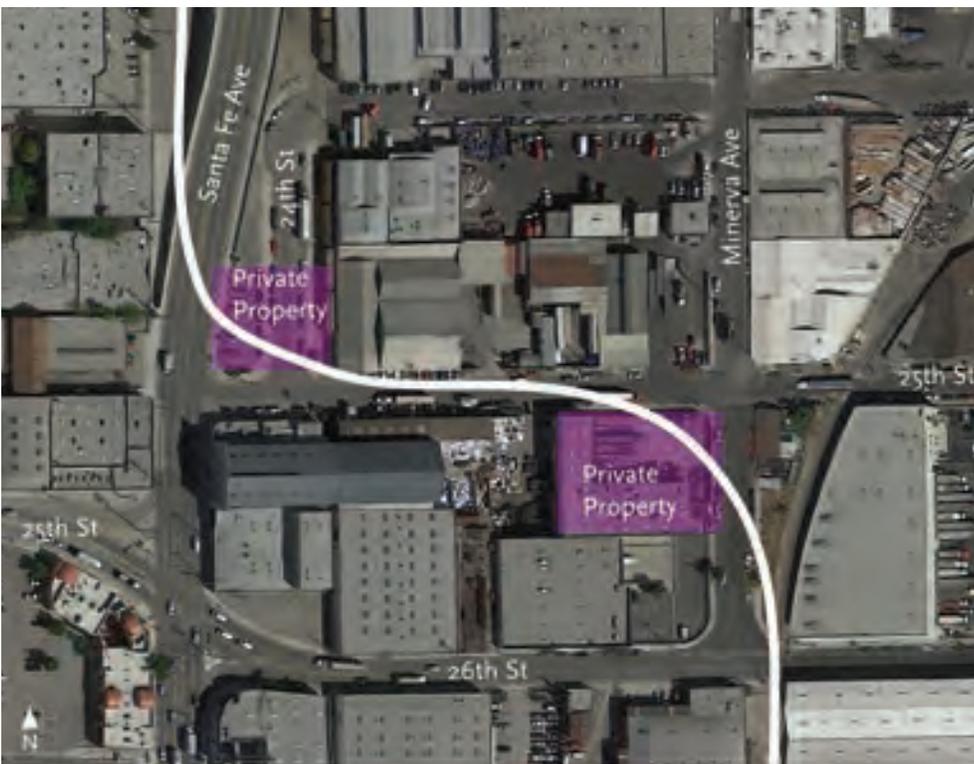


Figure 1-9: Aerial of Alignment (Between Minerva Street and Santa Fe Avenue)

## 1.4 Pacific Boulevard Corridor Options

Based upon the West Bank 3 option, two additional alternatives were developed that utilize Pacific Boulevard in the Cities of Vernon and Huntington Park. As both options discussed below share the alignment along Pacific Boulevard, only the first alignment option (Pacific/Alameda) describe the challenges with Pacific Boulevard and to avoid duplication, these common challenges are not repeated in the second alignment (Pacific/Vignes). For additional information, refer to the refer to WSAB Northern Alignment Challenges Report, Final Rev. 2 and Proposed Alternate Station Location and Realignment Report, Final.

### 1.4.1 Pacific/Alameda Option

#### Alignment Description

The West Bank – Pacific/Alameda Option (Figure 1-10 shown in green) was designed in response to increased interest in providing rail transit access to the burgeoning Arts District, located just east of Downtown Los Angeles and adjacent to the Los Angeles River. This option connects Union Station and the Arts District with the remainder of the alignment.

This option begins at Union Station, with an aerial station adjacent to or above the existing Metro Gold Line station. The route runs southbound in an aerial configuration, crossing over the US-101 Freeway and the existing Metro Gold Line aerial structure via Alameda Street. The route continues southbound aerial on Alameda Street before reaching 4th Place. The route curves east onto 4th Place and descends into a cut and cover tunnel just east of the intersection of 4th Place and Alameda Street. An open air Arts District station is proposed just west of 4th Street and Santa Fe Avenue, adjacent to the Southern California Institute of Architecture (SCI-Arc).

The alignment would then run southbound along Santa Fe Avenue (in two bored tunnels) until the intersection of 8th Street and Santa Fe Avenue, where it surfaces and ascends into an aerial alignment. The alignment continues south on Santa Fe Avenue until 25th Street and then turns east onto 25th Street until Minerva Street. At this point, the route turns south and then follows the same alignment as West Bank 3 Option.

Note, there were discussions with Metro on a potential connection with the existing Metro Gold Line guideway from approximately the existing Little Tokyo station to Union Station thus allowing the WSAB trains to utilize the same guideway as the Metro Gold Line and therefore making a separate WSAB structure not necessary (this type of connection and operation is referred to as interlining). However, Metro did not support interlining due to concern for safely and effectively maintaining schedule at this critical junction, which includes the Pasadena, Eastside, and Regional Connector Gold Lines. A fourth alignment, which would be the WSAB, into this junction did not seem feasible to Metro. These discussions are documented in the Progress Meeting minutes.

Also, both the Cities of Huntington Park and Vernon expressed concern for potential impacts to truck traffic from the region due to the at-grade alignment on Pacific Boulevard, which was studied in the SCAG AA. The concern was discussed at meetings with both cities and documented in letters from the cities to Metro. Meeting minutes and city letters are documented in the WSAB Proposed Alternate Station Location and Realignment Report, Final. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground).

#### OPPOSITE

Figure 1-10: West Bank - Pacific/Alameda is a new alignment option that reaches Union Station via Little Tokyo



## Overview of Alignment Challenges

Below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

A tangent alignment from Union Station going south towards Little Tokyo will pass over the US-101 freeway and requires coordination with Caltrans and the City of Los Angeles Park 101 (Phase 3) project. The WSAB structure will be similar to the existing Metro Gold Line structure but taller due to the potential height of the WSAB station at Union Station (see Figure 1-11). The height may pose engineering and environmental challenges that will need to be analyzed in the next phase.

The new WSAB Little Tokyo aerial station serving Little Tokyo/Arts District will require the widening of Alameda Street (see Figure 1-12). Also, the surrounding Little Tokyo community supports a station within their neighborhood, as seen in their support letter documented in the SCAG AA, but may not support an aerial station.

Support columns on Alameda Street from the new WSAB Little Tokyo Station to 4th Place Street may require the elimination of left turn movements on Alameda Street (see Figure 1-13).

The alignment is proposed to utilize the center of Pacific Boulevard within the Cities of Huntington Park and Vernon. Although this street is wide, the Cities are concerned about potential traffic impacts, especially to their truck traffic north of Randolph Boulevard (see Figure 1-14).



Figure 1-11: Metro Gold Line's tangent alignment over the US-101 (looking west)

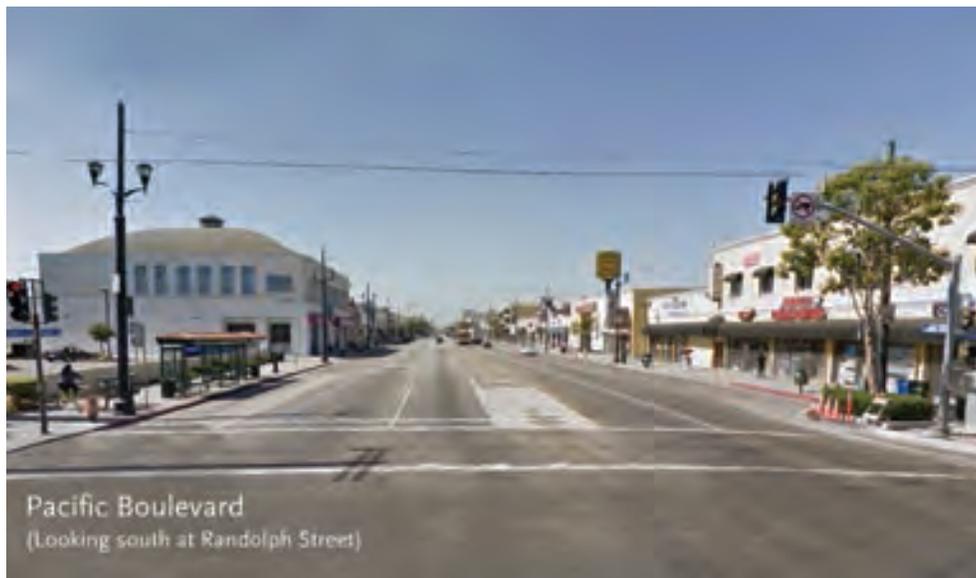


Figure 1-12: Proposed Little Tokyo/Arts District Station location at 1st/Alameda (looking north)



Alameda Street  
(Looking south at 4th Street)

Figure 1-13: Proposed Little Tokyo Station to 4th Place alignment segment (proposed columns for aerial structure would be in street)



Pacific Boulevard  
(Looking south at Randolph Street)

Figure 1-14: Proposed Pacific Boulevard alignment (Cities of Huntington Park and Vernon)

## 1.4.2 Pacific/Vignes Option

### Alignment Description

The West Bank – Pacific/Vignes Option (shown in light green in Figure 1-15) was designed as an alternative to Alameda Street that could serve the evolving Arts District by locating a station on Santa Fe Avenue; a street that functions as an important north-south connector within the Arts District and beyond. This option connects Union Station and the Arts District with the remainder of the alignment by using the Santa Fe Avenue to Pacific Boulevard route.

This option begins at Union Station with an aerial station adjacent to or above the existing Metro Gold Line station. The route runs southbound in an aerial configuration, crossing over the US-101 Freeway alongside the proposed SCRIP alignment, and turning east in an aerial alignment over Commercial Street. The aerial structure then turns south on Vignes Street and transitions down to grade just north of Temple Street.

South of Temple Street, the alignment will transition to a tunnel segment as it turns east under Banning Street. The alignment will then turn south under Santa Fe Avenue and cross under the 1st Street Bridge. The Arts District would be served by an underground station on Santa Fe Avenue near 3rd Street. This location provides convenient access to SCI-Arc, One Santa Fe, and the Arts District hub at 3rd Street and Traction Avenue.

The alignment remains underground on Santa Fe Avenue, crossing under the 4th Street Bridge and heading southbound (in two bored tunnels) until the intersection of 8th Street and Santa Fe Avenue, where it surfaces north of the I-10 Freeway and then ascends into an aerial alignment south of the I-10 Freeway. South of this area, the route then follows the same alignment as the West Bank 3 Option.

A variation was explored that would utilize a street running guideway from Temple Street to 4th Street. It would transition to underground south of the 4th Street Bridge and then follow the same alignment under Santa Fe Avenue as described above. This variation will require additional investigation during the next phase of the project in order to determine its feasibility.

Note both the Cities of Huntington Park and Vernon expressed concern for potential impacts to truck traffic from the region due to the proposed at-grade alignment on Pacific Boulevard, which was studied in the SCAG AA. These concerns were discussed at meetings with both cities and documented in letters from the cities to Metro. Meeting minutes and city letters are documented in the WSAB Proposed Alternate Station Location and Realignment Report, Final. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground).

#### OPPOSITE

Figure 1-15: West Bank – Pacific/Vignes is a new alignment option that reaches Union Station via the Arts District



## Overview of Alignment Challenges

In addition to the challenges on Pacific Boulevard as stated in Section 1.4.1, below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

As part of the alignment, an aerial structure will be placed in the center of Vignes Street, which has limited ROW (see Figure 1-16). The transition from aerial to underground between Commercial Street and Temple Street will permanently close Ducommun and Jackson Streets to traffic between Garey Street and Center Street. Traffic will divert to Commercial Street (north of Ducommun Street) and Temple Avenue (south of Jackson Street), which will be kept as is. At least two driveways would permanently close and a travel lane and street parking would be affected on Vignes Street.

From Vignes Street to Santa Fe Avenue, the alignment will be underground via dual bored tunnels. Once on Santa Fe Avenue, the tunnels will need to avoid 1st Street Bridge piers (see Figure 1-17).

Along Santa Fe Avenue, there is limited public ROW (see Figure 1-18). There will be impacts to adjacent properties when constructing the underground station near 3rd Street (i.e., SCI-Arc, One Santa Fe have no setbacks in some places). The station location will be studied further in the next phase of the project and will include public input. Also, there is limited space for station access points.

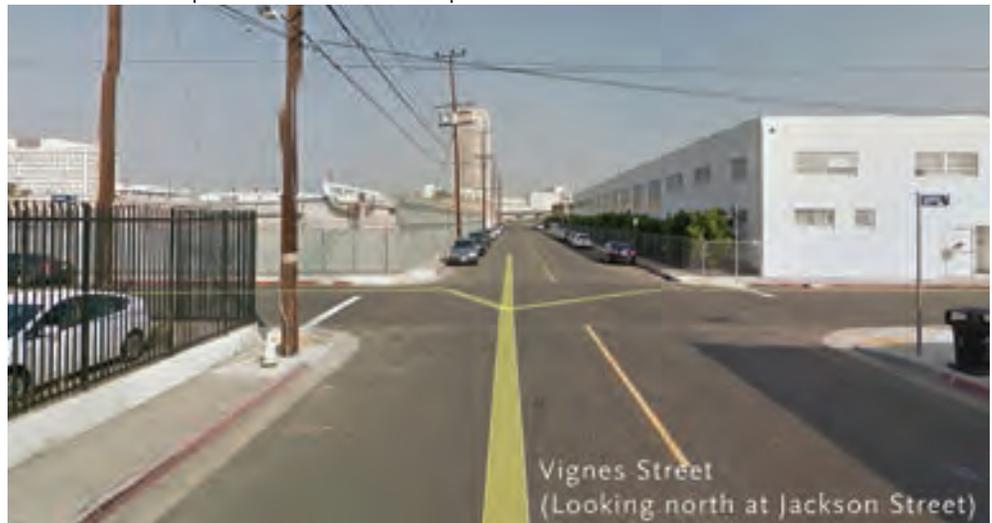


Figure 1-16: Proposed Vignes Street Alignment



Figure 1-17: Proposed Vignets to Santa Fe Alignment (Underground Tunnels)

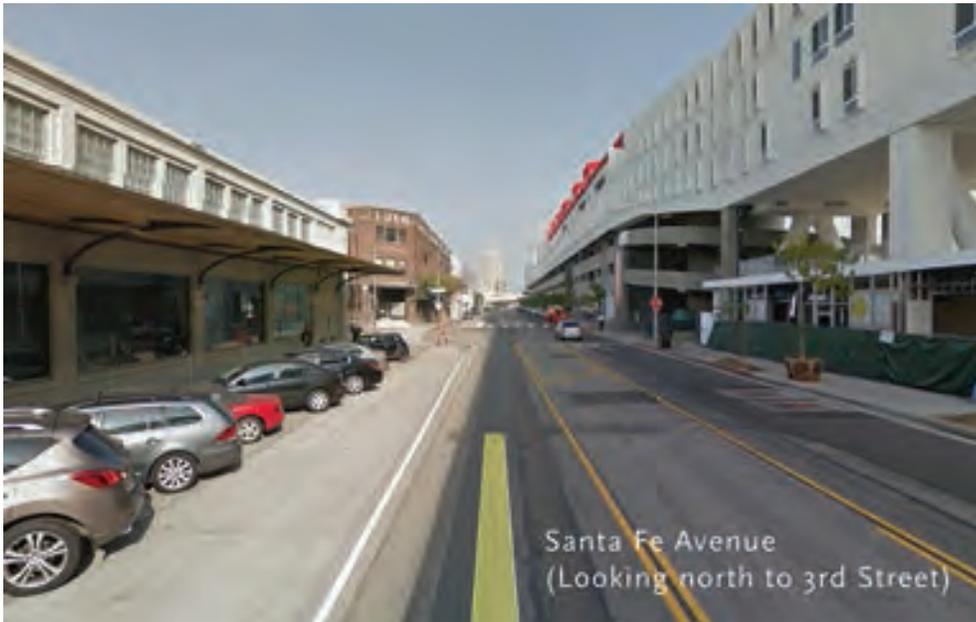


Figure 1-18: Proposed Santa Fe Alignment (Arts District)

## 1.5 Metro Blue Line / Alameda Street Options

Another variation of the West Bank 3 option was to utilize the Metro Blue Line ROW with an aerial guideway adjacent to the existing Metro Blue Line, which is mostly at-grade in this segment. There are two proposed alignments that share the Metro Blue Line ROW; both are described below. Since both options discussed below share the Metro Blue Line ROW, only the first alignment option (Alameda) describes the challenges with sharing the Metro Blue Line ROW and to avoid duplication, these common challenges are not repeated in the second alignment option (Alameda/Vignes). For additional information, refer to WSAB Northern Alignment Challenges Report, Final Rev. 2.

### 1.5.1 Alameda Option

#### Alignment Description

The West Bank – Alameda Option (Figure 1-19 in purple) runs in a predominantly all-aerial configuration between Union Station and the City of Huntington Park. This option was developed in response to some of the design and operational challenges present with the alternatives in the SCAG Alternatives Analysis (AA) Report (East Bank and West Bank 3). Both the Cities of Huntington Park and Vernon expressed concerns for a potential at-grade alignment on either Pacific Boulevard or Santa Fe Avenue, which were studied in the SCAG AA and this Technical Refinement Study, respectively. These concerns were discussed at meetings with both cities and documented in letters from the cities to Metro. Meeting minutes and city letters are documented in the WSAB Proposed Alternate Station Location and Realignment Report, Final. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground). The West Bank – Alameda Option removes the at-grade alignment from both streets thus eliminating the cities' concerns; see WSAB Proposed Alternate Station Location and Realignment Report for additional information including letter of support from City of Vernon for additional study of this alignment and a letter from City of Huntington Park with the City Council resolution of support.

This option begins at Union Station, with an aerial station adjacent to or above the existing Metro Gold Line station. The route follows the same alignment options as West Bank – Pacific/Alameda until the intersection of Alameda Street and 4th Place, where it continues in an aerial alignment above the Alameda Street median. Continuing southbound on Alameda Street, the route curves westbound just south of 14th Street and descends to at-grade along the north side of the I-10 Freeway. The route then curves south and onto Long Beach Avenue, crossing under the I-10 Freeway on the former Pacific Electric ROW, currently owned by Metro. The route crosses 17th Street at-grade before ascending into an aerial structure north of Washington Boulevard. The route continues aurally and south on Long Beach Avenue, adjacent to the existing Metro Blue Line, until Slauson Avenue, where the route curves southeast and merges with the La Habra Branch median. For the WSAB stations that are adjacent to the existing Metro Blue Line stations, a connection between the three stations will be studied in the next phase. The route continues aurally and east on the La Habra Branch until the Pacific/Randolph Station, after which the route follows the original West Bank 3 alignment.

#### OPPOSITE

Figure 1-19: West Bank - Alameda is a new alignment option that reaches Union Station via Little Tokyo and runs beside the Metro Blue Line



Note, there were discussions with Metro on a potential connection with the existing Metro Gold Line guideway from approximately the existing Little Tokyo station to Union Station thus allowing the WSAB trains to utilize the same guideway as the Metro Gold Line and therefore making a separate WSAB structure not necessary (this type of connection and operation is referred to as interlining). However, Metro did not support interlining due to concern for safely and effectively maintaining schedule at this critical junction, which includes the Pasadena, Eastside, and Regional Connector Gold Lines. A fourth alignment, which would be the WSAB, into this junction did not seem feasible to Metro. These discussions are documented in the Progress Meeting minutes.

### Overview of Alignment Challenges

Below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

Potential for construction on private properties between Alameda Street and Long Beach Avenue, adjacent to the I-10 Freeway ramp on Newton Street, which would require ROW acquisition or easement (see Figure 1-20).

The Metro ROW currently accommodates a total of three to five tracks for the Metro Blue Line and freight between the existing Slauson Station and just south of 24th Street. In order to accommodate the columns for the proposed aerial alignment adjacent to the Metro Blue Line, a reduction in the existing street width on the northbound side of Long Beach Avenue between Washington Station and Slauson Station may be required (see Figure 1-21). This will allow sufficient space for the WSAB columns. The WSAB alignment will cross over the Alameda Corridor trench structure via an aerial structure and therefore will not compromise this structure (see Figure 1-22).



Figure 1-20: Proposed alignment between Alameda Street and Long Beach Avenue

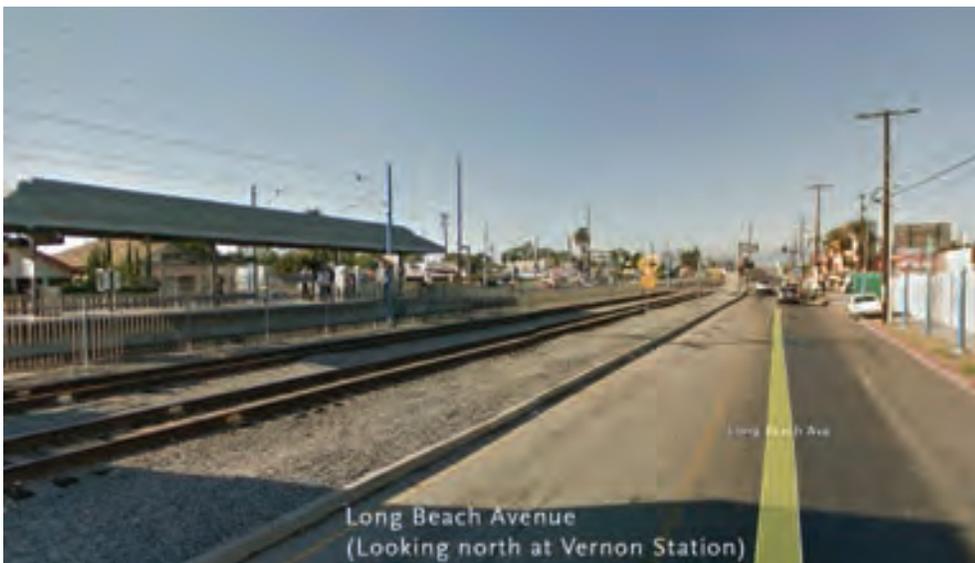


Figure 1-21: Proposed Vernon Station and Long Beach Boulevard Alignment



Figure 1-22: Proposed Alignment between Alameda Street and Long Beach Boulevard

## 1.5.2 Alameda/Vignes Option

### Alignment Description

The West Bank - Alameda/Vignes Option (shown in brown in Figure 1-23) was designed as an alternative to the West Bank – Alameda Option that could serve the evolving Arts District and Little Tokyo by locating a station on 3rd Street at Traction Avenue. The West Bank – Alameda/Vignes Option was developed in response to some of the design and operational challenges present with the alternatives in the SCAG Alternatives Analysis (AA) Report (East Bank and West Bank, Option 3). This includes addressing both the Cities of Huntington Park and Vernon concern for potential impacts to truck traffic from the region due to the proposed at-grade alignment on either Pacific Boulevard or Santa Fe Avenue, which were studied in the SCAG AA and this Technical Refinement Study, respectively. These concerns were discussed at meetings with both cities and documented in letters from the cities to Metro. Meeting minutes and city letters are documented in the WSAB Proposed Alternate Station Location and Realignment Report, Final. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground). This option connects Union Station, the Arts District and Little Tokyo with the remainder of the alignment using Alameda Street as described in the West Bank - Alameda Option.

This option begins at Union Station with an aerial station adjacent to or above the existing Metro Gold Line station. The route runs southbound in an aerial configuration, crossing over the US-101 Freeway alongside the proposed SCRIP alignment, and turning east in an aerial alignment over Commercial Street. The aerial structure then turns south on Vignes Street and transitions down to grade just north of Temple Street. South of Temple Street, the alignment transitions to a cut-and-cover segment and then continues under Vignes Street. The alignment crosses under the 1st Street Bridge and continues south of 2nd Street then turns west under 3rd Street towards Alameda Street.



Figure 1-24: Cut and cover construction would be necessary along 3rd Street in the Arts District

The Arts District would be served by an underground station on 3rd Street near Traction Avenue, a crossing which serves as a neighborhood hub. This station would provide access to the Arts District, Little Tokyo and the 1st Street/Central Regional Connector Station a few blocks away. The cut and cover segment then turns from 3rd Street onto Alameda, heading south past 4th Street. After 4th Street, the alignment surfaces and ascends into an aerial alignment (see Figure 1-24). South of this area, the route then follows the same alignment as West Bank – Alameda Option.

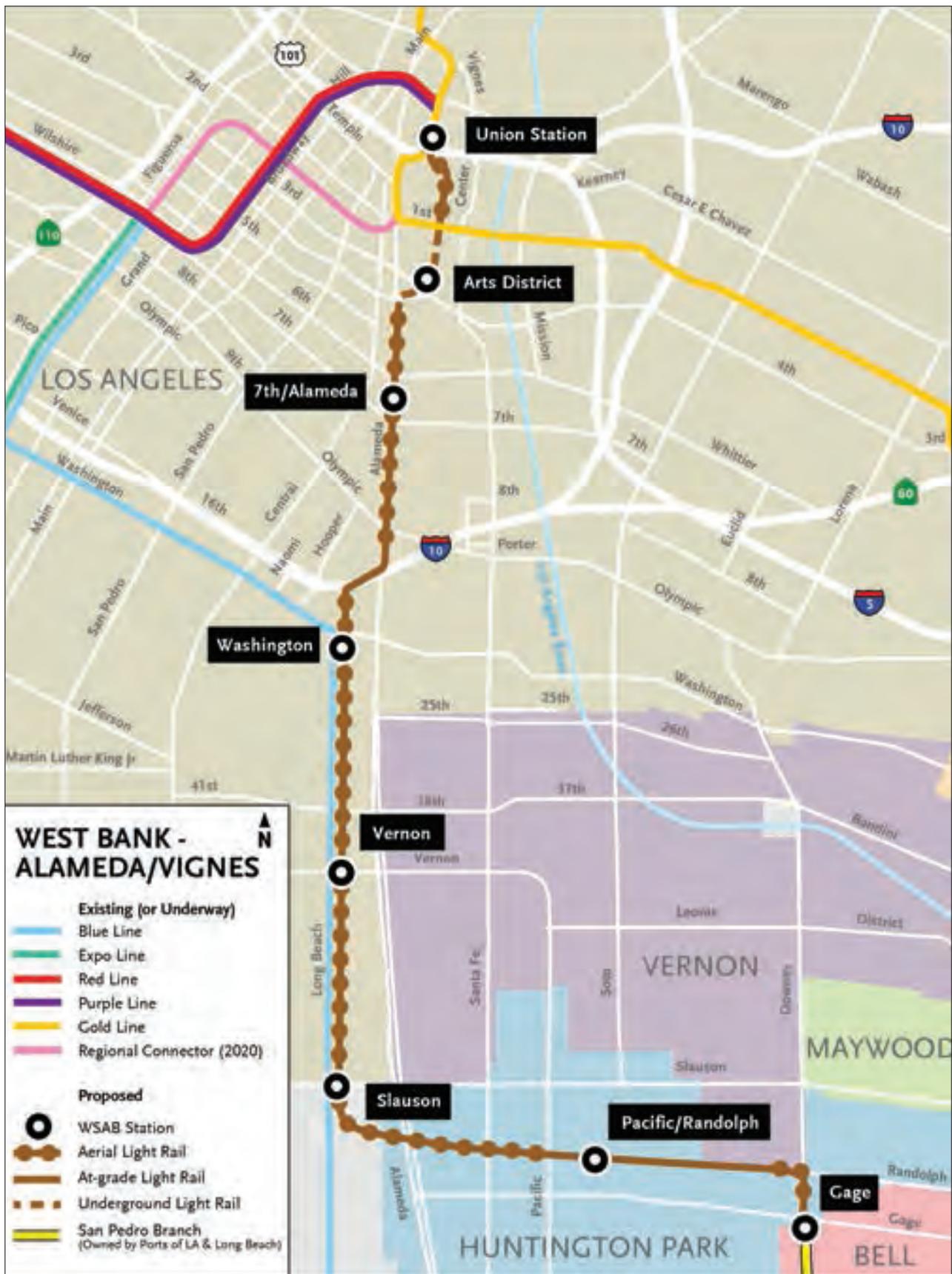
### Overview of Alignment Challenges

In addition to the challenges along the Metro Blue Line ROW as stated in Section 1.5.1, below is an overview of the critical alignment challenges. The complete list can be found in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

It is anticipated that cut-and-cover construction can be done between Vignes Street/ Temple Street and Alameda Street/4th Street. Underpinning may be needed where the alignment curves under the existing building between 2nd Street and 3rd Street. The challenge would be maintaining access to the neighborhood-serving commercial businesses and local access on 3rd Street.

#### OPPOSITE

Figure 1-25: West Bank – Alameda/Vignes is a new alignment option that reaches Union Station via the Arts District and runs beside the Metro Blue Line



## 1.6 Alignment Study Findings

---

Based on the analysis, the East Bank alignment is not recommended to go forward due to right-of-way constraints from existing railroad usage. In addition, the adjacent high-tension power lines to the west and commercial buildings to the east make expansion of the right-of-way expensive and/or unattainable. The West Bank 3 alignment also is not recommended to go forward because its northern terminus falls short of Union Station and results in low-ridership due to the lack of direct access to other regional transit services available at Union Station. However, the West Bank 3 alignment served as a foundation for four more viable West Bank alignments that arose during the refinement process: West Bank - Pacific/Alameda, West Bank - Pacific/Vignes, West Bank - Alameda, and West Bank - Alameda/Vignes. The first two alignments turn west from Union Station's southern property edge and provide a Little Tokyo Station. The other two alignments turn east out of Union Station's southern property edge and provide an Arts District Station. Therefore, the Pacific and Alameda Corridor alternatives warrant further study.

Table 1-1 and Figure 1-25 provide a comparison of the key features of the alignments. See Figure 1-26 for a map of the four new alignment options.

Table 1-1: Alignment Comparison Matrix

Alternative	Differentiating Feature	Land Use	Key Challenges
<b>East Bank</b>	<ul style="list-style-type: none"> <li>• Access to Union Station from north via east bank of L.A. River</li> </ul>	Institutional Industrial Manufacturing	<ul style="list-style-type: none"> <li>• Circuitous route into Union Station from north and to be determined station location</li> <li>• Issues of shared ROW (UPRR) &amp; high-tension power lines</li> </ul>
<b>West Bank 3</b>	<ul style="list-style-type: none"> <li>• Access to Little Tokyo via Pacific Boulevard to 7th Street, then Alameda Street to 1st/Central</li> </ul>	Commercial Multi-family residential Industrial Single-family residential	<ul style="list-style-type: none"> <li>• Transfer required to reach Union Station</li> <li>• Tunneling in area with potential for high water table</li> <li>• Crossover and under private property</li> </ul>
<b>West Bank - Pacific/Alameda</b>	<ul style="list-style-type: none"> <li>• Access to Union Station via Pacific Boulevard, 4th Street, then Alameda Street</li> </ul>	Institutional Commercial Multi-family residential Industrial Live-work	<ul style="list-style-type: none"> <li>• Potential impacts of aerial structure in Little Tokyo</li> <li>• Support columns in Alameda Street may require elimination of left turns</li> <li>• City concerns about affecting truck traffic on Pacific Boulevard</li> </ul>
<b>West Bank - Pacific/Vignes</b>	<ul style="list-style-type: none"> <li>• Access to Union Station through the Arts District</li> </ul>	Industrial Live-work Multi-family residential Commercial Single-family residential	<ul style="list-style-type: none"> <li>• Street closures north of 1st Street</li> <li>• Tunnel/station under Santa Fe</li> <li>• City concerns about affecting truck traffic on Pacific Boulevard</li> </ul>
<b>West Bank - Alameda</b>	<ul style="list-style-type: none"> <li>• Access to Union Station</li> <li>• Direct connection with Metro Blue Line at 3 shared Metro stations</li> </ul>	Institutional Commercial Multi-family residential Industrial Single-family residential	<ul style="list-style-type: none"> <li>• Potential impacts of aerial structure in Little Tokyo</li> <li>• Construction within private properties from Alameda Street to Long Beach Avenue connection</li> <li>• Increase in Metro ROW for Blue Line and WSAB</li> </ul>
<b>West Bank - Alameda/Vignes</b>	<ul style="list-style-type: none"> <li>• Access to Union Station via Blue Line and Arts District</li> <li>• Direct connection with Metro Blue Line at 3 shared Metro stations</li> </ul>	Industrial Live-work Single-family residential Multi-family residential	<ul style="list-style-type: none"> <li>• Cut and cover impacts in Arts District</li> <li>• Construction within private properties from Alameda Street to Long Beach Avenue connection</li> <li>• Increase in Metro ROW for Blue Line and WSAB</li> </ul>

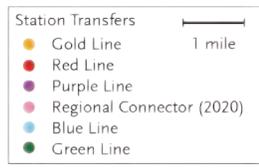
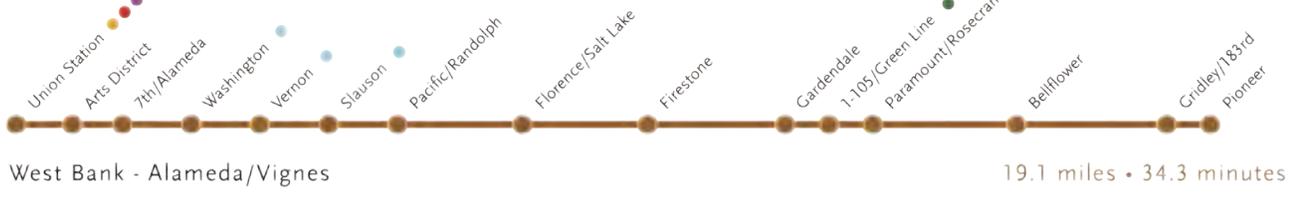
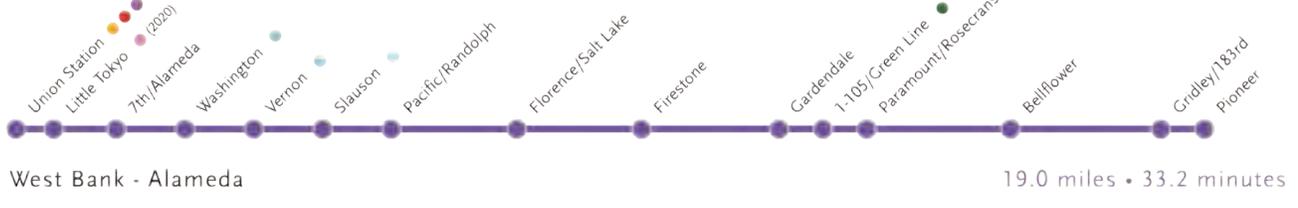
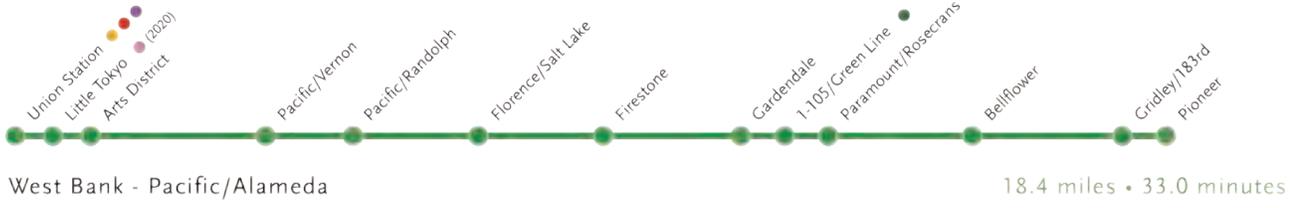
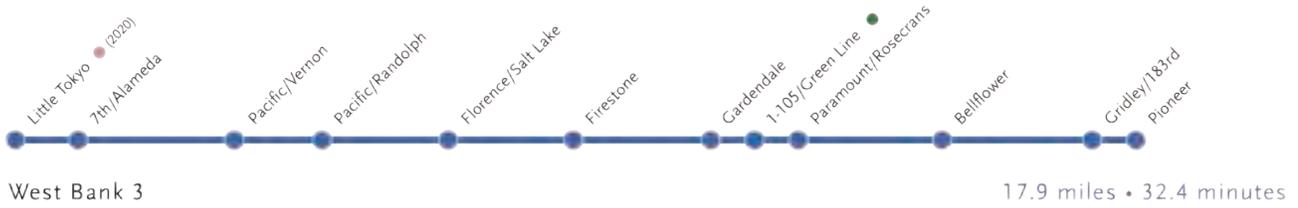
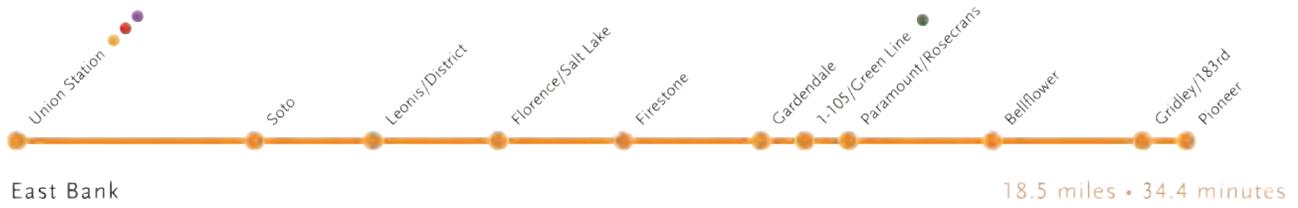




Figure 1-26: Map showing composite of the four new options that arose during this study using the SCAG AA West Bank 3 as a foundation

OPPOSITE  
 Figure 1-25: Comparative line diagrams of the six alignment options showing stations, Metro Rail interface, length and travel time

## 1.7 Alignments Considered and Removed from Further Consideration

The following alignment options were investigated, but found to have more challenges than benefits that led to a decision to not further consider them.

### 1.7.1 Huntington Park Alignment Alternative

In May 2012, the City of Huntington Park wrote a letter to SCAG providing them with their preferred alignment, the West Bank 3 alternative, along with a request to modify the alternative in an effort to optimize the local benefits. The City recommended eliminating the northerly segment on Pacific Boulevard by continuing the alignment west along Randolph Street to Santa Fe Avenue and then connect to the Harbor Subdivision in order to continue north to Union Station (see Figure 1-27).

The Santa Fe Avenue alignment would be a street-running mode of operation (i.e., the train would obey the same traffic signals as the automobiles) and would require the removal of at least two traffic lanes. Operations within the guideway along Santa Fe Avenue are dedicated to light rail trains only; i.e., no automobiles would share the same lanes as the light rail trains. The guideway would be separated from adjacent parallel vehicles by a curb on either side. The street-running mode does not require gates for automobiles or pedestrians and would have with limited or no left-turns for automobiles parallel to the train. The light rail train speed would be no faster than the adjacent automobile traffic and would obey the traffic signals.

After meeting with both the Cities of Vernon and Huntington Park, the Cities shared their concern for potential truck traffic from the region and decided that another alignment alternative should be determined. See WSAB Proposed Alternate Station Location and Realignment Report for additional information. During the next phase of this project, all of the grade crossings will be studied further, including the type of grade crossing (i.e., at-grade, aerial, or underground).



Figure 1-27: City of Huntington Park proposed modifications

## 1.7.2 Malabar Street Option

In meeting with the City of Huntington Park, there was a suggestion to analyze the potential use of Malabar Street as the connection between Randolph Street and the Harbor Subdivision. Malabar Street is a direct connection with less traffic on it than Santa Fe Avenue, however there are challenges. The street is only two lanes wide (one in each direction) and has parking on both sides, which is not ideal for a light rail train, even in street-running mode, due to the disruption from removing parking and limiting access (see Figure 1-28). Also, land use surrounding this street is multi- and single family residential close to Randolph Street and then transitions to industrial/commercial closer to the Harbor Subdivision. In order to transition from Randolph Street to Malabar Street, existing residential and commercial buildings would need to be acquired and removed. With more challenges than benefits, this alignment was removed.



Figure 1-28: Malabar Street view

### 1.7.3 Hewitt Street Option

A variation of the West Bank - Pacific/Alameda and Alameda Options was explored utilizing Hewitt Street instead of Alameda Street to connect Union Station to Little Tokyo (shown in solid black line in Figure 1-29). However, the City of Los Angeles Department of Transportation (LADOT) is moving forward with a bus maintenance facility, which includes a multi-story building that would be in direct conflict with the proposed WSAB aerial structure from Union Station to Alameda Street. The status of the facility's design and construction was confirmed with LADOT at a meeting on January 29, 2015. This variation was dropped from further consideration.

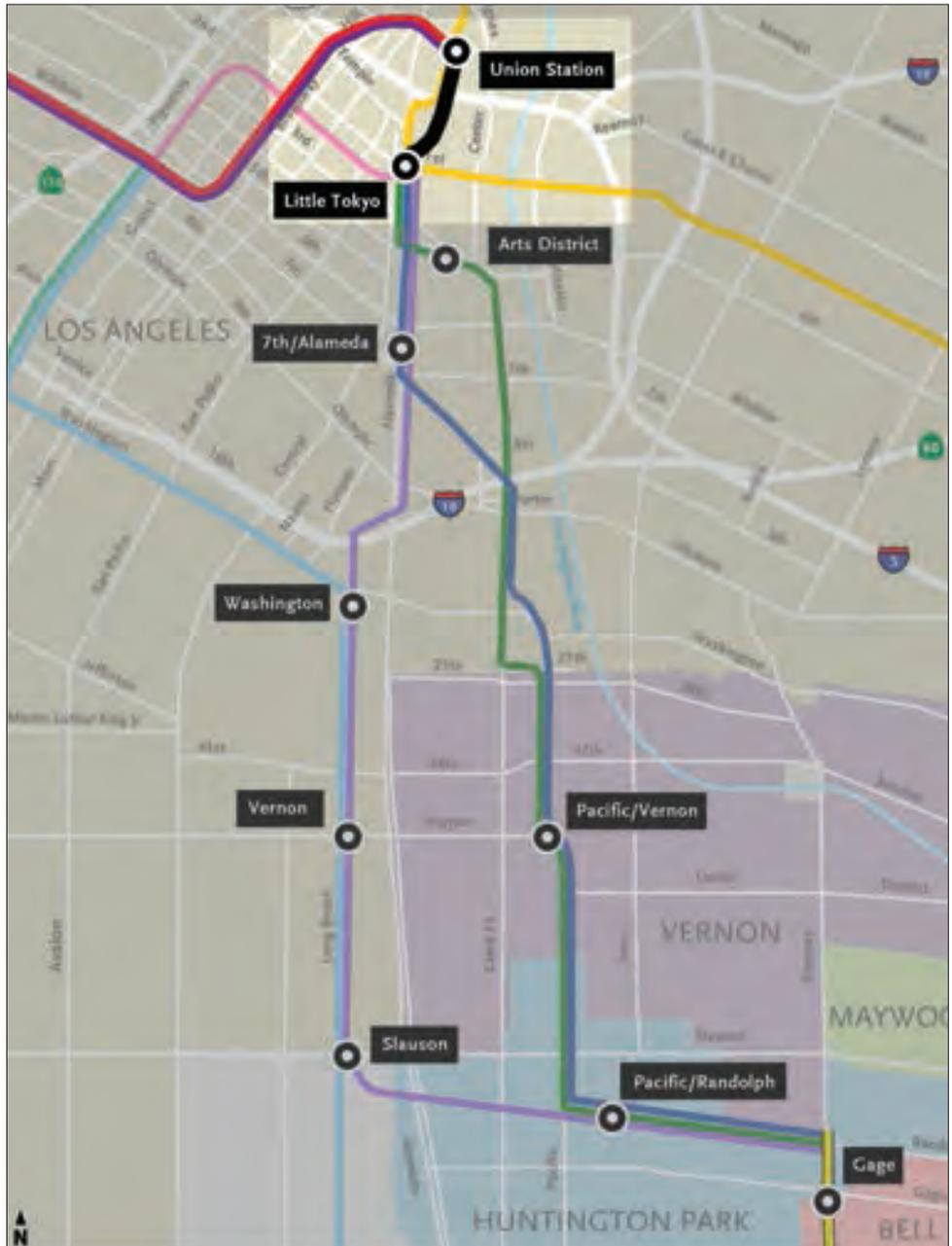


Figure 1-29: Hewitt Street Option shown in highlighted area just south of Union Station

### 1.7.4 San Pedro Street Option

The San Pedro Street Option (shown in teal in Figure 1-30) runs between Union Station and the City of Huntington Park, utilizing public streets and the Metro Blue Line ROW. This option was developed in response to the City of Los Angeles Planning Department's request to explore an alignment along San Pedro Street between Union Station and the portion of West Bank – Alameda Option that runs adjacent to the existing Metro Blue Line on Long Beach Avenue. Per the City's Land Use Plan, San Pedro Street is identified as a transit corridor for light rail. After initial analysis, this option was deemed to have too many challenges, such as a narrow public ROW that will require the guideway to be aerial and require the removal of some traffic lanes and/or parking, along with scarce opportunities for generating patrons to justify placement of stations. This option was dropped from further consideration.



Figure 1-30: San Pedro Street Option



↙ Southbound  
to East Los Angeles

Southbound ↘  
to Pasadena

Station 4th/3rd St

Orange Line

STATION



# Station Studies

---

## 2

**This section summarizes the feasibility of introducing a new light rail station within Los Angeles Union Station, at several locations near Downtown Los Angeles, in Huntington Park on Randolph Street, in Paramount along the Metro Green Line, and in Artesia as a Southern Terminus.**



Key plan showing location of Los Angeles Union Station

## 2.1 Northern Terminus - LA Union Station

This Study considered where a new light rail platform could be added within Los Angeles Union Station to serve as the North Terminus of the WSAB corridor (Figure 2-1). Study findings based on engineering analysis (to 5% level of design) and urban design considerations are summarized in the WSAB Union Station Access Memorandum, Final Rev. 1. Metro Rail Design Criteria and Standard Directive Drawings were referenced to when developing the station concepts to be consistent with Metro’s standardized “Kit of Parts” station design approach.

### 2.1.1 Current Context

Union Station is the primary transit hub of Los Angeles County, connecting more than 9.6 million people – nearly one-third of California’s residents – who live, work, and play within Metro’s 1,433-square-mile service area. Transit services provided at Union Station include Metro and municipal buses, LAX Flyaway, Megabus, Metro Rail (Red, Purple and Gold Lines), Metrolink and Amtrak. The station attracts the highest ridership of any Amtrak station on the West Coast, and ranks 5th in Amtrak ridership nationally (Source: Metro.net).

Ridership at Union Station is expected to more than double over the next 25 years from approximately 110,000 trips per day (2012) to 221,000 trips per day (2040), including future high speed rail service. The availability of taxis, a planned bike hub and proximity to El Pueblo, Chinatown, Little Tokyo, Civic Center and Boyle Heights make Union Station an important gateway to the heart of Los Angeles and a logical terminus for the WSAB corridor.



Figure 2-1: Union Station is located at the north edge of Downtown Los Angeles and is bounded by US-101 Freeway, Alameda Street, Cesar E. Chavez Avenue and Vignes Street (view looking northeast)

### Union Station Master Plan (USMP)

Metro purchased the 47-acre Union Station property from Catellus in 2011 and in 2012 began a master planning process to determine how to accommodate growth in transit trips and provide transit-supporting uses that would benefit riders, and contribute to a more sustainable transit system and city. In October 2014 the Metro Board adopted recommendations to move the USMP from planning to implementation (Figure 2-2).



Figure 2-2: The Master Plan vision of Union Station in 2050 looking southeast towards the L.A. River

### Southern California Regional Interconnector Project (SCRIP)

Metro’s Southern California Regional Interconnector Project or SCRIP, will extend several of the yard tracks to ‘run through’ Union Station, exiting the south end, crossing over the US-101 Freeway, and ultimately joining the railroad ROW along the west bank of the Los Angeles River (see Figure 2-3). This track configuration will increase capacity by 40% to 50% and provide greater operational flexibility in scheduling trains, as well as increase passenger loading with longer trains. SCRIP is being designed now, and will be a major factor informing how new WSAB light rail tracks enter Union Station.

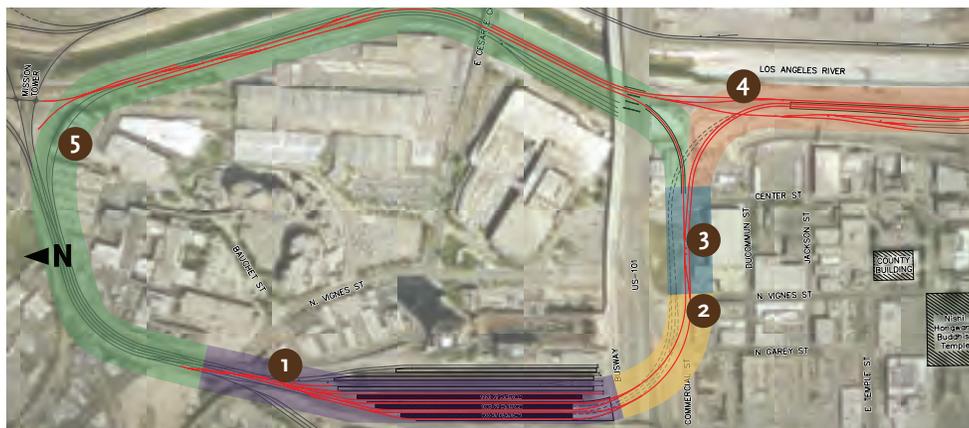


Figure 2-3: Aerial View of SCRIP Improvements: 1) Union Station Improvements/El Monte Busway, 2) US-101 Crossing/CALTRANS, 3) Commercial/Ducommun St. 4) Rail Yard, 5) The Loop

## Future High Speed Rail

The USMP identifies Metro's preferred location for a California High Speed Rail (CAHSR) station being underground east of Vignes Street, where Piper Technical Center is currently located. A new CAHSR portal would align with the new east entrance of Union Station and be connected at the passenger concourse level (Figure 2-4). It is possible that other CAHSR station sites can be accommodated and concur with the Master Plan but the other locations will also depend upon SCRIP, which may restrict CAHSR at or above the current Union Station yard.



Figure 2-4: Union Station Master Plan showing Metro's preferred location for a future CAHSR Station east of Vignes Street. Note: CAHSR as shown may not represent California High Speed Rail Authority's final design location

### 2.1.2 Site Constraints

The Study includes analysis of two SCAG AA Northern Alignment options (between Union Station and Huntington Park) to understand if both options are feasible. During the analysis, four new route options were identified that reach Union Station and do not possess fatal flaws. The four new route options all enter Union Station from the south. Study findings based on engineering analysis (to 5% level of design) and urban design considerations are summarized in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

The Northern Terminus analysis identified several site constraints that limit the potential placement of a WSAB station given existing development, existing rail infrastructure, and planned projects (described in the previous section). Constraints include:

- US-101 Freeway - Precludes all but an aerial approach from the south
- Metro Red Line - Underground station/trackway bifurcates Union Station site
- Union Station - Historic ticketing hall, waiting room and courtyards are sensitive
- Relocated Bus Plaza and future development sites as part of USMP
- Planned SCRIP and CAHSR projects

### 2.1.3 Station Study Findings

A potential zone for a new light rail platform is identified behind the historic Union Station terminal building, east of the Municipal Water District Headquarters and west of SCRIP per Figure 2-5. This area could accommodate a new WSAB station: 1) over the Relocated Bus Plaza, or 2) over the Metro Gold Line Station. Both locations are centralized and provide close proximity to Amtrak and Metrolink platforms, Metro Red and Gold Line Stations, and the Relocated Bus Plaza.

#### Over the Relocated Bus Plaza

An aerial station could be built one-level above the Relocated Bus Plaza and share some vertical circulation elements (elevators, escalators, stairs) to access Union Station. This location is also a future development pad per the USMP (identified as an Office Building). It is unknown when a building would be needed, financed and developed in this location.

#### Over the Metro Gold Line Platform

An aerial station could be built one-level above the existing Metro Gold Line station platform and share some vertical circulation elements (elevators, escalators, and stairs) to access Union Station. This location does not coincide with any development pads and cannot conflict with SCRIP or CAHSR.

### 2.1.4 Additional Analysis Needed

Confirmation as to which location is more advantageous (fewer impacts and/or more supportive of the USMP objectives), and how the Northern Alignment options would introduce new trackway into Union Station both require further analysis. Assumptions made during the Study may be affected if future development at Union Station differs from what is shown in the USMP. Additionally, because SCRIP and CAHSR designs are still in development, these projects may affect the WSAB access into Union Station and terminus station location.

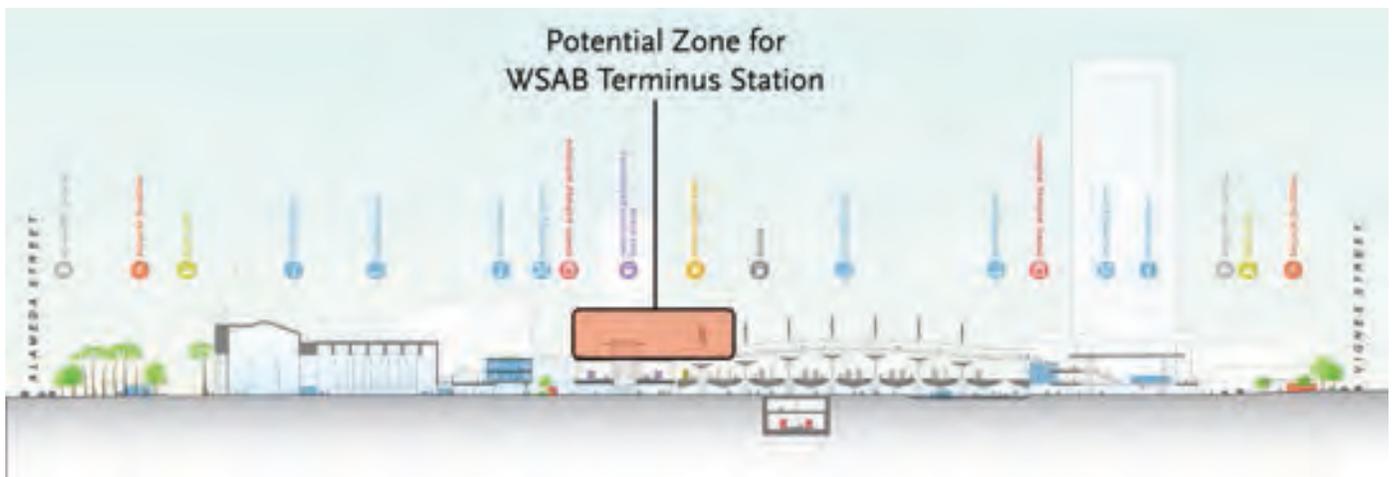
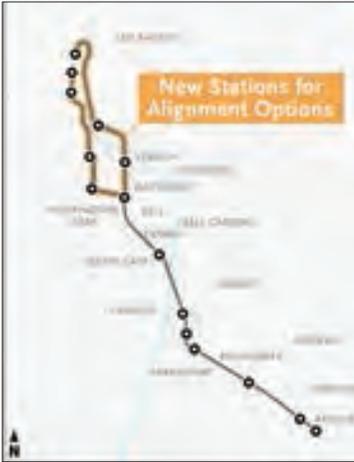


Figure 2-5: Union Station Master Plan cross-section (Gruen + Grimshaw Architects) looking north and showing a potential zone for a new WSAB Terminus Station



Key plan showing location of new stations for alignment options

## 2.2 New Stations for Alignment Options

During the refinement of alignment options, new station locations were identified that were not previously included in the SCAG AA, as shown in Figure 2-6. Five new stations arose while developing the West Bank alternatives in particular:

- Arts District Station (3 possible locations)
- Washington Station (at Metro Blue Line)
- Vernon Station (at Metro Blue Line)
- Slauson Station (at Metro Blue Line)
- Potential Station between Arts District Station and Pacific/Randolph Station

Due to the close proximity of the WSAB and Metro Blue Line stations, riders are able to easily transfer from one line to another and therefore have a choice on how to get to their destination, such as Union Station in downtown Los Angeles. The WSAB has a potential to relieve the Metro Blue Line of riders as it will reach Union Station faster due to its more direct route and the travel forecast supports this conclusion; see Section 3 for more information.

All five station locations were identified after the WSAB Compatibility with Surrounding Land Uses Report, Final Rev. 1 was finalized, so a brief description of each was included in the WSAB Northern Alignment Challenges Report, Final Rev. 2.

### 2.2.1 Arts District Station

The Arts District Station would be an underground station in the City of Los Angeles under Santa Fe Avenue or 3rd Street or 4th Street (see Figure 2-7), depending on the northern alignment option. These locations provide access to this emerging urban neighborhood comprised of remnant light industrial uses, live-work lofts, new urban residences, galleries, restaurants and pop-up boutiques at the eastern edge of Downtown Los Angeles. The Southern California Institute of Architecture (SCI-Arc), One Santa Fe (recently constructed apartment complex) and Metro Division 20 (Red Line rail yard) are also nearby. An Arts District Station would also provide access to Little Tokyo and Boyle Heights.

Figure 2-7: Three potential Arts District Station sites were identified during the study of alignment options



OPPOSITE  
Figure 2-6: Locations for potential new stations that arose during this study



### 2.2.2 Washington Station (at Blue Line)

The WSAB Washington Station would be a new aerial station separate from, but adjacent to, the existing at-grade Metro Blue Line Station on Long Beach Boulevard just south of Washington Boulevard in the City of Los Angeles (Figure 2-8). The station area is primarily industrial with residential to the southwest and commercial uses along the major arterial streets. Nevin Elementary, Twentieth Street Elementary and Thomas Jefferson High School are nearby. In addition to Metro Blue Line, there is access to Montebello Bus Line service.

### 2.2.3 Vernon Station (at Blue Line)

The WSAB Vernon Station would be a new at-grade station separate from, but adjacent to, the existing aerial Metro Blue Line Station just south of Vernon Avenue on Long Beach Boulevard in the City of Los Angeles (Figure 2-9). The station is west of the City of Vernon. The surrounding area is comprised of industrial and residential uses with some commercial use along Vernon Avenue. Thomas Jefferson High School, Fred Roberts Park, Ross Snyder Recreation Center and the Alameda Swap Meet are nearby. In addition to Metro Blue Line, there is access to Metro local, Metro Rapid and DASH services.

### 2.2.4 Slauson Station (at Blue Line)

The WSAB Slauson Station would be a new aerial station separate from, but adjacent to, the existing aerial Metro Blue Line Station just south of Slauson Avenue and west of Randolph Street in the City of Los Angeles (Figure 2-10). The station is just west of the City of Huntington Park. The surrounding area is comprised of industrial and residential uses with some commercial use along Slauson Avenue. Augustus F. Hawkins Nature Park, Slauson Multipurpose Center, Raul R. Perez Memorial Park, Lillian Elementary and Linda Esperanza Marquez High School are nearby. In addition to Metro Blue Line, there is access to Metro local and DASH services.



Figure 2-8: Washington Station at the Metro Blue Line



Figure 2-9: Vernon Station at the Metro Blue Line

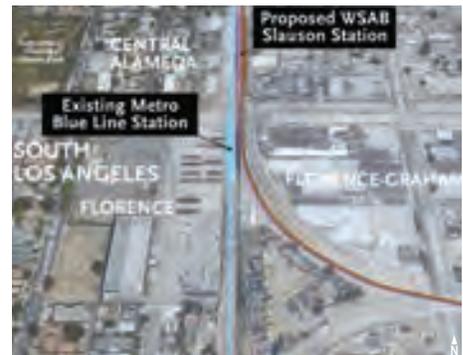


Figure 2-10: Slauson Station at the Metro Blue Line

### 2.2.5 Potential Station between Arts District and Pacific/Randolph Station

The distance between the Arts District Station in Downtown Los Angeles and the Pacific/Vernon Station in City of Vernon (utilized by the West Bank – Pacific/Alameda, and West Bank – Pacific/Vignes alignments) followed by the 7th/Alameda station in Downtown Los Angeles and the Pacific/Vernon Station in City of Vernon (utilized by the West Bank 3 alignment) have the longest distance between stations. The predominant land use between the stations is industrial and therefore is not likely to generate enough ridership to support a station. However, there are a couple locations between these stations that would allow train to bus transfer for an east or west connection to reach other neighborhoods (Figure 2-11).

**6th Street**

A station could be located at the southern end of the Arts District at 6th Street where five Metro local lines and Metro Rapid 720 would provide connections to East Los Angeles and East LA Civic Center, Downtown Los Angeles and points much further west. Additionally, the proposed 6th Street Viaduct pedestrian and bicycle linkages to Boyle Heights would provide good active transportation connections at 6th Street and Santa Fe Avenue. These potential station locations will need to be studied further in the next phase of the project pending decision on which alignments will proceed further.

**Santa Fe and Olympic Boulevard**

There is a potential station location located approximately halfway between the stations at the intersection of Santa Fe Avenue and Olympic Boulevard. This location could provide a transfer to Metro Line 66 and would access to East Los Angeles, Fashion District and Koreatown via local service.

**Washington Boulevard**

Another option is at Washington Boulevard where the Montebello Bus Line 50 would provide access to Montebello, Pico Rivera, Whittier, Metro Blue Line Washington Station and Downtown Los Angeles via local service.



Figure 2-11: Potential east-west bus transfers points along Santa Fe between the Arts District and Pacific/Vernon Stations



Key plan showing location of Huntington Park Alignment and Stations Study

## 2.3 Huntington Park Stations

This Study analyzed the feasibility, potential challenges, and solutions for two stations in the City of Huntington Park proposed by the City (per Figure 2-12) as alternative locations from what was shown in the SCAG AA:

1. In lieu of a Pacific/Randolph Boulevard Station (in the center of Pacific Blvd. north of Randolph Street) the City asked Metro to study a station on Randolph Street east of Pacific Boulevard
2. In lieu of Gage Avenue Station (north of Gage Avenue along Salt Lake Avenue in the rail ROW) the City asked Metro to study a station south of Florence Avenue in center of Salt Lake Avenue.

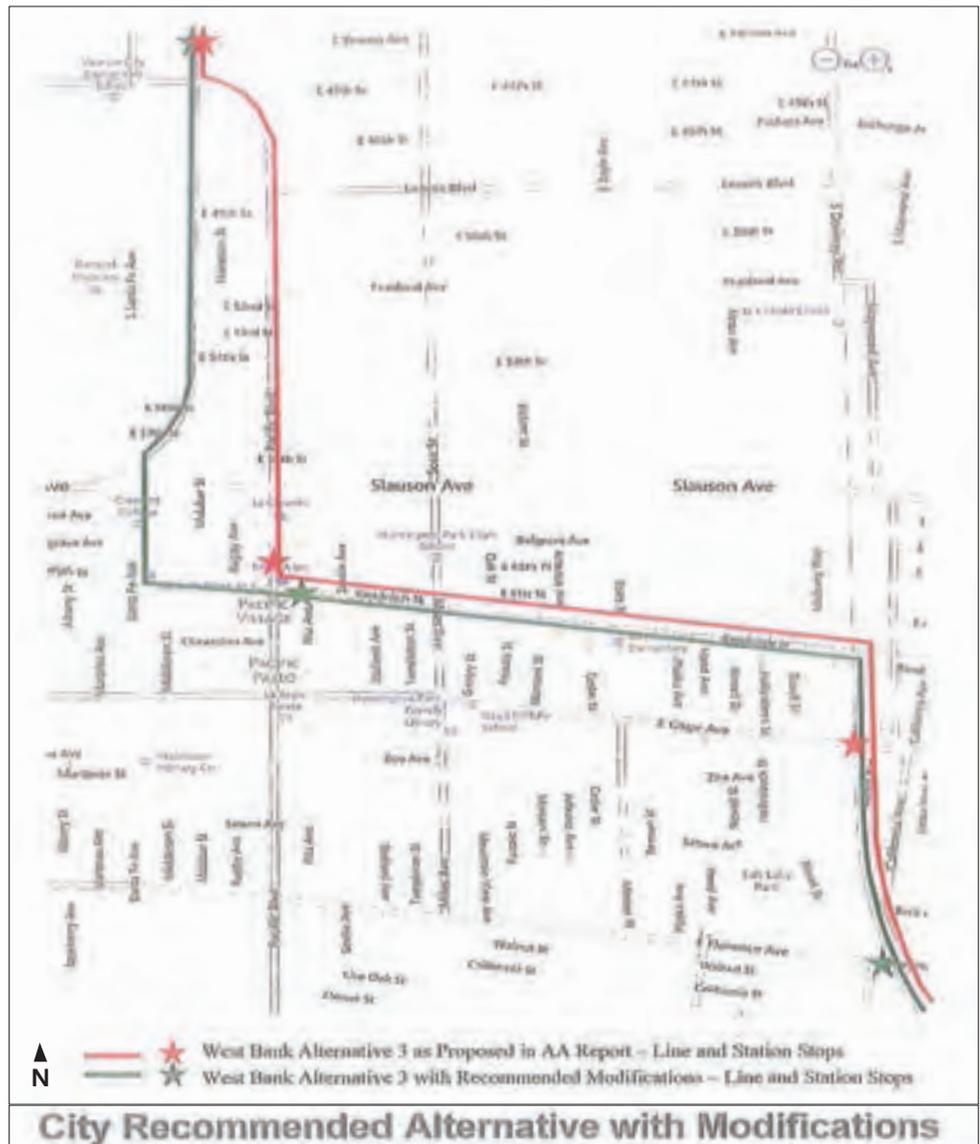


Figure 2-12: The City of Huntington Park requested modifications in 2012 to two station locations (shown in black) that differ from what was presented in the SCAG AA (shown in red)

### 2.3.1 Randolph Street - Alternative Station Location

The Pacific/Randolph Station as proposed in the SCAG AA is located at a crossroads near Huntington Park's main commercial district. The station could be classified as a neighborhood-serving station understanding that this destination caters to regional shoppers who come specifically to Pacific Boulevard for its unique experience (Figure 2-13). The alternative location on Randolph Street would remain at this crossroad and provide similar access to Downtown Huntington Park.



Figure 2-13 Photos of Pacific Boulevard looking north at Randolph Street (top) and Randolph Street alternative station location looking west at Pacific Boulevard (bottom)

The alternative location is comprised of a center platform in the middle of Randolph Street within the existing UPRR ROW just east of Pacific Boulevard (see Figure 2-14). A center platform was deemed more appropriate than two side platforms or two split platforms on opposing sides of the intersection given the available ROW and how Randolph Street currently functions. The station would have entrances at Pacific Boulevard and Seville Avenue.

The station platform would be located closest to Pacific Boulevard since most arriving transit patrons are assumed to be traveling to the Downtown Huntington Park commercial corridor. The existing UPRR track would be relocated immediately south of the station (see Figures 2-15 and 2-16).



Figure 2-14: Conceptual plan for a center platform station on Randolph Street in Huntington Park

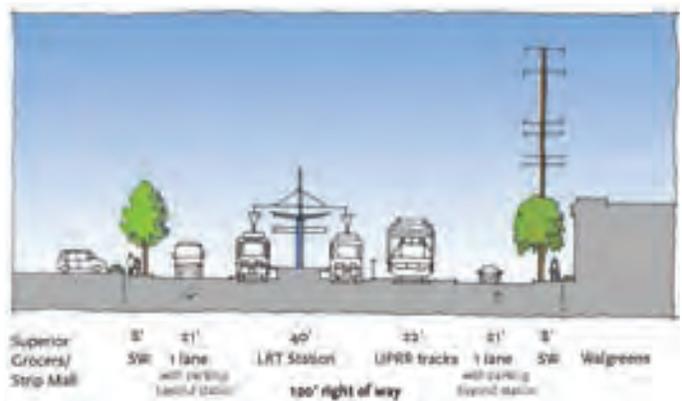
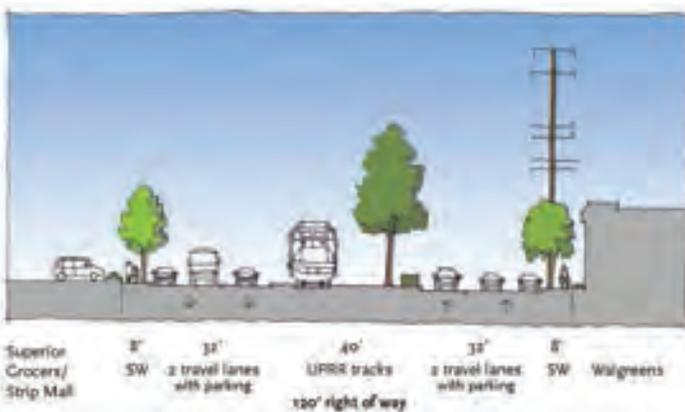


Figure 2-15 (L) Existing cross-section of Randolph Street (looking east) Figure 2-16 (R): Conceptual cross-section for a center platform station on Randolph Street (looking east)

### 2.3.2 Florence Avenue - Alternative Station Location

The Florence/Salt Lake Station alternative is at the nexus of Huntington Park, Bell, Bell Gardens, and Cudahy city boundaries. The section of Florence Avenue nearest to the proposed station provides a mix of uses that includes neighborhood-serving commercial, industrial and auto-related businesses, and Huntington Park's Salt Lake Park and Recreation Center (Figure 2-17). The City of Huntington Park uses this park to host community events, including farmer's markets, holiday celebrations as well as carnivals and fairs. This station location has a municipal water tower that serves as a visible landmark when approaching from either direction on Florence Avenue.

The adjacent residential neighborhoods are mostly comprised of single-family dwellings behind the Florence Avenue commercial corridor. Although this location is not currently a major destination, it provides access to other destinations found within Huntington Park, Bell, Cudahy and Bell Gardens along with other transit options such as Metro Blue Line and Metro bus system. The station could be classified as "neighborhood serving", understanding that land use development along Florence Avenue could enhance its ability to serve as a destination in the future.



Figure 2-17: Photos of Florence Station location looking southeast at Florence and Salt Lake Avenues (top) and looking west at Florence Avenue across ROW (bottom)

The Florence/Salt Lake Station alternative is comprised of a center platform, south of Florence Avenue between both Salt Lake Avenues, within the Port of Los Angeles and Long Beach ROW, currently used by UPRR (Figure 2-18). The center platform station was deemed most appropriate given the available ROW, patron convenience and cost effectiveness. The station would have entrances at Florence Avenue and Walnut Street. Depending upon the ridership demand, there may be a need to integrate an additional entrance at the south end of the station.

The station platform would be located closest to Florence Avenue since most arriving transit patrons are assumed to be traveling to the commercial corridor and bus stops on Florence Avenue. The existing UPRR tracks would be relocated immediately west of the station (Figures 2-19 and 2-20). No major street modifications to each branch of Salt Lake Avenue is anticipated, but existing sidewalks that are not ADA compliant leading up to the station would need to be made compliant.



Figure 2-18: Conceptual plan for a center platform station at Florence Avenue in Huntington Park

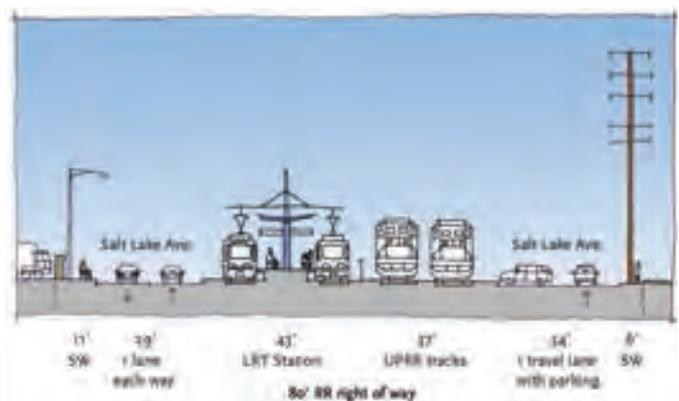
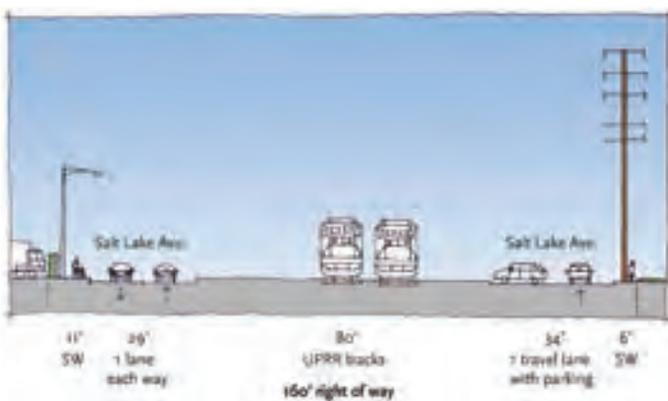


Figure 2-19 (L) Existing cross-section of Salt Lake Avenue looking south (near Florence Avenue) Figure 2-20 (R) A conceptual cross-section for a center platform station on Salt Lake Avenue looking south (near Florence Ave.)

### 2.3.3 Challenges

This section identified potential challenges in Huntington Park if the alternative station location request is implemented. For each challenge, there will be more detailed design, impact analysis, and cost estimating required during the next phase. This study identified three types of challenges:

- Traffic
- Parking
- Access/Circulation

#### Traffic

The Randolph Street alternative station location falls within the median of Randolph Street, which is the UPRR ROW. The existing railroad ROW will need to be widened to accommodate the freight, light rail tracks and station. By removing one lane of traffic and the parking in the eastbound and westbound directions along Randolph Street, the existing railroad ROW can be widened. The capacity decrease resulting from removing travel lanes on Randolph Street is anticipated to have minimal effect, and left turn movements from eastbound and westbound Randolph Street to the adjacent north-south Pacific Boulevard and Seville Avenue will be prohibited. The placement of the Pacific/Randolph Station just east of Pacific Boulevard will require the closure of Rita Avenue which is recommended for further evaluation during the next phase.

The Florence/Salt Lake alternative station location and proposed freight/light rail at-grade crossing presents a significant challenge due to the existing Florence Avenue street configuration. There is a potential for vehicles to queue onto the tracks while waiting to proceed eastbound, westbound and in the left turn pockets. Advancement of the design and traffic analysis is necessary in order to refine the street configuration and to determine if mitigations are required.

#### Parking

Removal of on-street parking is needed in order to accommodate the Pacific/Randolph Station and maintain the existing street width. It is understood that street parking in commercial districts and high-density neighborhoods is valued. The limits of removal would be from Rugby Avenue to Seville Avenue. The estimated number of on-street parking spaces affected is approximately 40. A study of the existing on-street parking demand should be conducted during the next phase to determine if parking does need to be replaced. Replacement spaces could be accomplished on adjacent north-south streets, such as Rugby Avenue and Seville Avenue. Street widening to replace lost curbside parking would have significant impact on adjacent properties so is not typically recommended, but could be analyzed further during the next phase.

#### Access/Circulation

Left turn movements from eastbound and westbound Randolph Street to Pacific Boulevard, and Seville Avenue will be prohibited. A traffic study will need to be conducted to determine the challenges based on traffic volume, potential street closures and traffic diversion similar to what was discussed in “Traffic” section above.

As a result of these three potential challenges, the surrounding community may need to find alternate routes in order to continue accessing residential areas and businesses. It is recommended to engage and educate the community of recirculation options during the next phase.

### 2.3.4 City Input

The Huntington Park analysis was developed in response to the initial letter from the City of Huntington Park and through a variety of meetings with the City Manager and key staff. The analysis responded to input from the City of Huntington Park and to cities surrounding the station area, including the Cities of Bell, Cudahy, Bell Gardens, and Vernon. Regional connectivity, such as access to the Metro Blue Line, bus routes, and activity centers, were also considered during the analysis.

Following completion of the Proposed Alternate Station Location and Realignment Report, Final in September 2014, the Cities of Huntington Park and Vernon responded respectively with letters and a City Council resolution:

- City of Vernon, Letter from Mayor Michael McCormick to Art Leahy, Metro (December 23, 2014)
- City of Huntington Park, Resolution No. 2014-69 (January 5, 2015)

The City of Vernon stated that the aerial alignment option that parallels the Metro Blue Line west of Vernon alleviated their concerns that arose with alignment options on Pacific Boulevard and Santa Fe Avenue due to public safety response times, freight rail service, truck access, traffic and ROW impacts. The City of Huntington Park expressed preference for the alignment option on Randolph Street to the Metro Blue Line and requested an additional station at Randolph and Alameda be studied in the next phase.

### 2.3.5 Station Study Findings

**The alternative light rail station on Randolph Street will serve Downtown Huntington Park.** The alternative Randolph Street location is feasible and will serve the City's vibrant commercial corridor, providing access to local residents and regional visitors coming to the City's Downtown. The final station location will ultimately be influenced by which Northern Alignment option is selected (between Huntington Park and Union Station) since most of the alignment options provide access to Downtown Huntington Park from either 1) a Randolph Street alignment, or 2) a Pacific-Randolph alignment. The former precludes a station platform on Pacific Boulevard; the latter allows a station to be located on either street pending factors such as:

- Trackway geometry and turning radii (developed during next phase)
- Street ROW, driveway access and parking (further traffic analysis required)
- Pedestrian and bicycle access to station

Given the fact that both the cities of Huntington Park and Vernon expressed an initial preference for the Randolph Street/Metro Blue Line alignment option, the Randolph Street Station would appear to have more benefits and require further study in the next phase.

**Huntington Park's second light rail station location at Florence and Salt Lake Avenues would provide convenient access to the regional rail transit system, as well as to other destinations within Huntington Park, Bell, Bell Gardens and Cudahy.** The station would be neighborhood-serving, and is anticipated to function as a "commuter station". Furthermore, given the City of Huntington Park's future plans for redevelopment, the area around the station could become a destination, with Salt Lake Park serving as a recreational and civic landmark. The Study analysis concluded that:

- Land uses adjacent to the Florence/Salt Lake Station are more supportive of transit than those surrounding the Gage/Salt Lake Station.
- Florence Avenue is an important east-west connection to the neighboring communities of Cudahy and Bell.
- Florence/Salt Lake Station area has a higher population density, slightly lower employment density, which together would yield almost 200 more station boardings each day than the Gage/Salt Lake Station.
- Shifting the station south from Gage Avenue to Florence Avenue would have no effects to overall end to end travel time as both stations are located within the existing ROW.

For these reasons the study finding is a station at Florence/Salt Lake Avenue appears to have more benefits than at Gage Avenue.



Key plan showing location of the New Green Line Station Study

## 2.4 New Metro Green Line Station

This Study analyzes the feasibility and challenges associated with a new Metro Green Line Station within the median of the I-105 Freeway east of the I-105/I-710 interchange to provide a direct transfer to the WSAB corridor aerial station proposed immediately above it. The study addressed preliminary construction and operational impacts to both the existing I-105 Freeway and Metro Green and Blue Lines' operations as a result of building a new Metro Green Line Station, and identified potential solutions for minimizing service disruptions.

### 2.4.1 Station Context

Per the SCAG AA, the new WSAB/Green Line Station is proposed in the City of Paramount as an aerial platform over the I-105 Freeway and Metro Green Line. The station's location is south of the proposed Gardendale Station in the City of Downey, and north of the proposed Paramount/Rosecrans Station in the City of Paramount. Along the Metro Green Line, the new at-freeway grade station would be located 2.8 miles east of the existing Long Beach Boulevard Station, and 1.4 miles west of the existing Lakewood Station and immediately below the WSAB/Green Line Station platform (see Figure 2-21).



Figure 2-21: Aerial showing location of proposed Metro Green Line Station at the I-105 Freeway adjacent to the proposed WSAB/Green Line Station

In contrast to other stations along the WSAB corridor, the proposed WSAB/Green Line Station's primary function is to allow passengers to transfer to and from the Metro Green Line and WSAB corridor. Ridership forecasts indicate that transfers may constitute up to 75 percent of all trips made to/from the station. Although it is feasible to make the new Metro Green Line Station "transfer only" and eliminate access to/from the surrounding neighborhoods, this is not recommended because it would preclude the benefit of a new Metro Green Line station to the community and to the number of non-transferring passengers, which is considered to be significant.

The new Metro Green Line Station will be located between two residential neighborhoods that flank the I-105 Freeway (see Figure 2-22). There are industrial uses along both sides of the UPRR ROW, north of the I-105 Freeway. Due to 1) the existing block/street network, 2) the I-105 Freeway being a barrier to walkability, and 3) the fact that development turns its back on the UPRR ROW, access to both WSAB and Green Line Stations will be challenging from the surrounding neighborhoods. Today there are only two access points over the I-105 Freeway in the vicinity: Grove Street (vehicular) and a pedestrian bridge (currently closed) between Denver Street and Century Boulevard. Local access of any kind is prohibited on the UPRR ROW. Therefore, station access will be part of the station design. Access is proposed from the north (Figure 2-24) due to the ease of access for pedestrian vehicular drop-off and transit services. This northern access was discussed with both cities, who have initially agreed to the north due to narrow streets and no apparent station parking to the south. Transit services consists of two bus routes that operate with limited frequency on Garfield Avenue and Paramount Boulevard ¼-mile to the west and east of the station.



Figure 2-22: Aerial showing neighborhood context of Metro Green Line Station at the I-105 Freeway adjacent to the proposed WSAB/Green Line Station (looking west)

While the focus of this study was the feasibility of the new Metro Green Line Station, it was assumed that the UPRR track will be shifted and remain operational in order to accommodate the WSAB/Green Line Station above.

## 2.4.2 Station Concept

The new Metro Green Line station would be retrofitted into the Metro Green Line system which currently carries about 42,000 passengers a day between Norwalk, LAX and Redondo Beach. It would add a stop between the Long Beach Boulevard Station 2.8 miles to the west, and the Lakewood Boulevard Station 1.4 miles to the east. The new station would be built at-freeway grade in the median of the I-105 Freeway to connect with the above-freeway WSAB/Green Line Station and alignment, creating a transfer point for passengers traveling to and from Downtown Los Angeles and the densely-populated Gateway Cities sub-region, as well as El Segundo/LAX to the west or Downey/Norwalk/Santa Fe Springs to the east (Figure 2-24).



Rendering of standardized station concept (kit of parts) from Metro Station Design Review Report, April 2012 (Johnson-Fain team)

The station concept was developed using Metro Rail Design Criteria and Standard Directive Drawings and assumed standardized station elements. Base maps and station drawings (plans and cross-sections) were developed using Google Earth imagery as neither surveys or CAD drawings of existing conditions were available. For conceptual design see Figures 2-25 through 2-28.

The Metro Green Line rail ROW is bounded by Caltrans' ROW. This stretch of the I-105 Freeway has an inside shoulder, one HOV lane and buffer, three mixed-flow lanes, two auxiliary lanes, an outside shoulder, and two-lane frontage road; all built to full-standards in both directions of the freeway. Crossing above the freeway at this location are the Grove Street overcrossing, a UPRR bridge/Century Boulevard Underpass, and the Arthur Avenue pedestrian overcrossing (Figure 2-23). The UPRR bridge is part of the San Pedro Branch, which is owned by the Ports of Los Angeles and Long Beach and used by UPRR on a limited basis. The UPRR crosses over the I-105 Freeway in this stretch and is proposed to be shared with the WSAB corridor.

Figure 2-23 (Top L) Existing view looking west from freeway of I-105 project segment and UPRR bridge support columns (Top R) Existing view of UPRR Bridge looking south (Lower L) Existing view looking south of Arthur Avenue Pedestrian Overcrossing above I-105 Freeway





As part of the conceptual station design work, the project team provided information to Metro that showed that if the UPRR bridge was kept at its current location to avoid impacting the current freight tracks, then there would be significant property impacts to the east of the UPRR ROW, because approximately 40-feet of widening would be required in order to accommodate the new WSAB center platform and light rail tracks. This would result in significant impacts to multi-family residential properties south of the I-105 and industrial properties north of the I-105.

The alternative is to hold the east UPRR ROW line where it currently sits, but this would require re-constructing the UPRR bridge and relocation of the existing freight tracks to the west. However, this option would require up to 20 feet of widening to the west and would mostly impact the back yards of single-family homes. The tradeoffs associated with both WSAB bridge/alignment options were discussed with the Metro project management team and it was agreed that this issue would be further studied as part of the next phase, and consideration would need to be given to the ROW needs for the additional WSAB tracks in this area. However, for purposes of the new Metro Green Line station analysis, the assumption is that the UPRR bridge would remain at its current location. The potential challenges associated with the new Metro Green Line station itself would remain the same, even if the WSAB station and track placement were shifted west and the UPRR bridge was re-built to minimize property impacts.

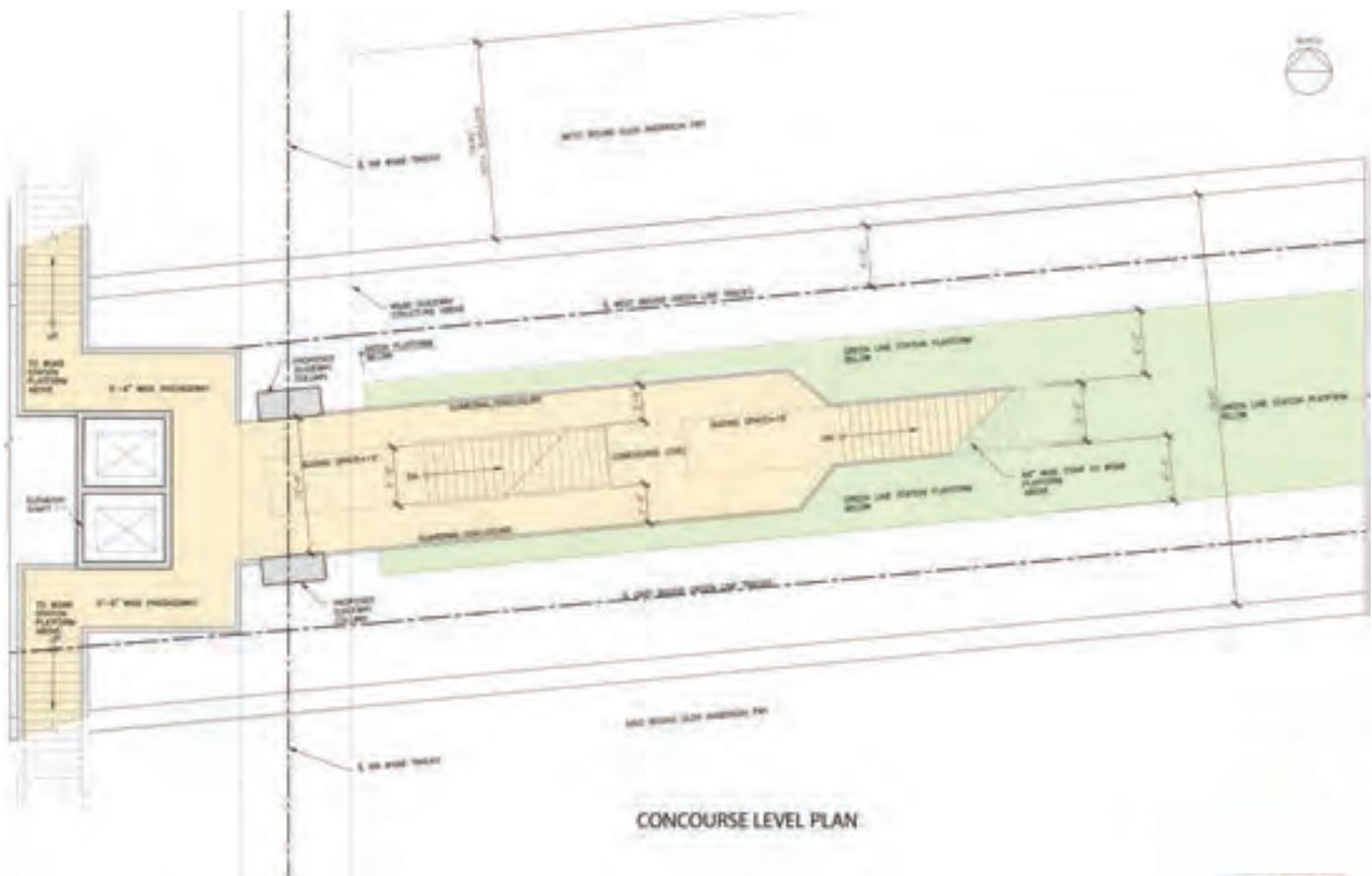


Figure 2-26: Station concept plan for new Metro Green Line Station and vertical circulation up to new WSAB/Green Line Station



## 2.4.3 Challenges

### Transportation and Circulation

Four challenges identified during the study are:

- Grade crossing safety and CPUC required measures
- Cut-through traffic that may be generated
- Spill-over parking for both stations
- Pedestrian access

While not a direct challenge resulting from the new Metro Green Line station, the existing at-grade railroad crossing at Century Boulevard and the UPRR/San Pedro Subdivision will need to be improved because of the new rail service in this corridor. In addition, the CPUC requires various vehicular, pedestrian and bike safety measures at grade crossings to mitigate potential impacts. Florine Avenue will provide station access and vehicular drop-off. It is projected that a total of 300 parking spaces will be needed to meet the park-and-ride demand for both stations; so two potential sites were identified north of the I-105 Freeway. Pedestrian access will be at street-level to the WSAB/Green Line Station, but the new Metro Green Line Station will require taking an elevator/escalator/stair from street-level down to freeway level.

### Right-of-Way

#### **New Metro Green Line Station**

The widening of the Metro Green Line ROW will require a permanent encroachment onto the I-105 Freeway by approximately 3 feet in each direction in order to accommodate the new center platform station, the relocation of Metro Green Line tracks and OCS poles/wires, and vertical circulation systems and equipment, thus resulting in a geometric challenge to the freeway. One possibility for absorbing the 3 foot loss of space is for Metro to request a non-standard shoulder design from Caltrans, which reduces the existing inside freeway width from the existing 9.5 feet to 6.6 feet over a distance of approximately 1,300 linear feet including taper lengths (Figures 2-29 and 2-30).

During a technical meeting with Caltrans held in July 2014, Metro presented the proposed plan of reducing the inside freeway shoulder width and its implications. The concept was favorably received. It is understood that during the next phase, all non-standard design features and additional exceptions pursuant to Caltrans Exceptions will be developed for Caltrans review and approval. Furthermore, it is recommended that a structural analysis and geotechnical investigation for the bridge columns and placement locations supporting the upper WSAB/Green Line station platform be completed and that any geotechnical recommendations are incorporated into the design.



Figure 2-29: Potential freeway lane configuration (non-standard) for new Metro Green Line Station and WSAB/Green Line Station

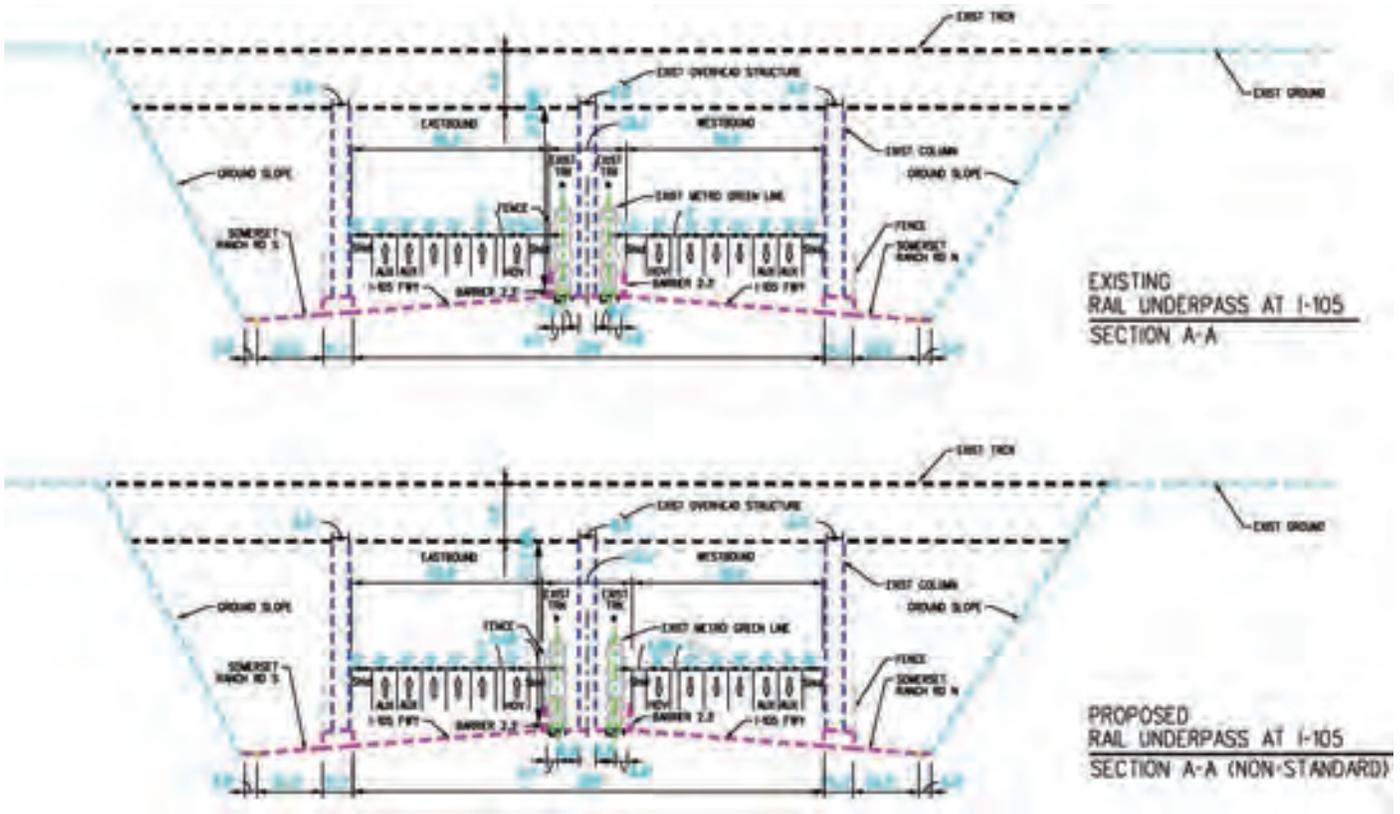


Figure 2-30: Existing and potential freeway lane configuration (non-standard) for new Metro Green Line Station and WSAB/Green Line Station

### **New WSAB/Green Line station**

The SCAG AA assumed that the existing UPRR bridge above the I-105/Metro Green Line would remain in place beside the new WSAB/Green Line station to minimize disruptions to freight operations. During the course of this Study it was discovered that the UPRR bridge may need to be re-built in order to minimize ROW acquisition associated with the new WSAB/Green Line station and track placement. However, it was determined that the construction challenges associated with the new Metro Green Line station itself would remain generally the same, regardless of the exact location of the WSAB/Green Line station and track placement.

### **Construction**

Temporary construction challenges associated with the new Metro Green Line Station were also considered. The analysis focused on the lower station platform in the I-105 Freeway/Metro Green Line ROW since the upper WSAB/Green Line platform was evaluated during the SCAG AA including construction challenges associated with the platform and the UPRR bridge. This study identified two construction issues related to:

- Freeway Operations
- Metro Green Line and Blue Line Operations

The construction of the new Metro Green Line Station and the columns to support the WSAB/Green Line Station platform will require temporary closures of at least the inside HOV lanes and shoulder in both directions of the I-105 Freeway. During the next phase, the engineering plans will be advanced to confirm the extent of impacts and to establish greater detail as to the options available for minimizing construction impacts to the I-105 Freeway. Final construction documents and specifications shall specify the construction staging requirements and work windows for the contractor.

### **Metro Green Line and Blue Line Long-term Operations**

Current Metro Green Line operations will be temporarily affected by the construction of the new Metro Green Line Station and the placement of the columns for the new WSAB bridge. Although the station platform construction can be done at night, the Metro Green Line's 20 hour schedule means that some single-tracking will likely be necessary during the hours of operation.

Alternatively, Metro could run a bus bridge between the Long Beach Boulevard and Lakewood Boulevard Stations during the construction period. This would facilitate the complete closure of the Metro Green Line in this segment, but could reduce the construction period.

There do not appear to be any long term challenges to either the Metro Green Line or the Metro Blue Line that would require new rolling stock or station expansions. Initial forecasts confirm that this new Metro Green Line station would mainly serve as a transfer station. Depending on the alternative selected, approximately 75 percent of total passengers per day are expected to transfer to/from the Metro Green Line to the WSAB/Metro Green Line station.

Initial travel demand forecasts also indicate that riders would primarily shift from other stations and lines along the system. With some variation across alternatives, ridership will increase at some stations and decrease at others but minimal system-wide challenges exist. Among the East Bank alternatives, initial travel demand forecasts indicate that ridership would shift to the WSAB line primarily from the Metro Blue Line, the Expo Line, and, to a lesser extent from the Crenshaw Line. Among West Bank alternatives, ridership would shift primarily from the Metro Blue Line, the Metro Green Line, and the Crenshaw Line. Further details on station boardings/alightings and systemwide ridership changes can be found in WSAB Travel Forecasting Results Report, Final.

## 2.4.4 Station Study Findings

**Based on the conceptual plans (5% level of design), a new Metro Green Line station connecting with the WSAB corridor can feasibly be built within the existing I-105 Freeway ROW.** To accommodate this new station, the existing Metro Green Line ROW will need to be widened by approximately 3 feet in each direction in order to accommodate the new station, the relocation of Metro Green Line tracks and OCS poles/wires, and requisite vertical circulation systems and equipment. The additional 3 feet will encroach into the existing 9.5-foot wide inside freeway shoulder next to the HOV lane in both directions. This will require a design exception from Caltrans to allow for a permanent reduction in the inside shoulder width from 9.5 feet to approximately 6.6 feet for a distance of approximately 1,300 feet.

**It is recommended that this concept be further advanced, so that design exceptions and fact sheets can be formally reviewed and approved by Caltrans.** Furthermore, it is recommended that a structural analysis of the bridge columns and placement locations supporting the upper WSAB/Green Line platform be completed, along with a geotechnical investigation to confirm the existing soil conditions and that any geotechnical recommendations are incorporated into the design and project specifications are implemented during construction.

**While the freeway ROW is sufficient to accommodate the new Metro Green Line station, further analysis is required if the I-105 ExpressLanes is also introduced in the freeway corridor.** In July 2014, the Metro Board approved a motion to advance the I-105 ExpressLanes to the Project Approval/Environmental Document phase. Therefore, it is recommended that the design of these two projects be coordinated and the ultimate footprint of both projects be identified. Both projects will require Caltrans approval of design exceptions and fact sheets.

**Operational impacts are mainly due to temporary construction but strategies need to be developed to address Metro and Caltrans services and customer experience.** The operational challenges to the Metro Green Line are limited to temporary construction challenges, caused by the need to relocate existing tracks and OCS poles/wires. The service disruptions could be mitigated by single-tracking or bus bridging during the construction period. Construction staging will likely require the temporary closure of at least the shoulder and HOV lane in each direction. Therefore, a traffic management plan (TMP) that lays out a set of strategies for managing the work zone impacts and minimizing traffic and mobility impacts of the project should be prepared.

**Based on initial travel forecast results, there does not appear to be any long-term systemwide operational impacts to either the Metro Green Line or the Metro Blue Line.** New rolling stock or station expansions are not foreseen to be needed. Initial travel forecasts confirm that this new Metro Green Line station would mainly serve as a transfer station, and that riders are primarily shifting from other stations along the system.

**Pedestrian access to the station from the south should be studied further.** The City of Paramount preferred that the Arthur Avenue pedestrian bridge be used for emergency egress only based on vandalism and unauthorized use complaints. The addition of two new light rail stations in this location will increase pedestrian activity and “eyes on the street”. Further studies should be performed during the next phase to assure convenient, safe and ADA-compliant pedestrian access is provided.



Key plan showing location of the Southern Terminus Study

## 2.5 Southern Terminus - Artesia

The SCAG AA included a Bloomfield Station in the City of Cerritos to serve as the Southern Terminus of the WSAB corridor in Los Angeles County (Figure 2-31). Upon a request by the City of Cerritos, the Bloomfield Station was removed from further consideration. The next station to the north was the Pioneer Station in the City of Artesia; assumed to function as a through-station. This Study analyzed how the Pioneer Station would function as a Southern Terminus for the WSAB corridor in lieu of the Bloomfield Station.

The Pioneer Station/Southern Terminus location was analyzed for its feasibility and to determine what kind of challenges may exist based on no more than 5% level of design. The study findings were based on meetings with the Cities of Artesia and Cerritos, applying Metro station design criteria and operational requirements, and an urban design analysis of the station area.



Figure 2-31: The City of Cerritos requested the SCAG AA Bloomfield Station be dropped from further consideration, resulting in a need to analyze Pioneer Station as the WSAB corridor's Southern Terminus within Los Angeles County

### 2.5.1 Station Context

The Pioneer Station could serve as an anchor for the local neighborhood to continue growing as both a local and regional destination. The station’s location next to the Pioneer Boulevard retail and restaurant commercial corridor known as “Little India”, and its proximity to predominantly residential neighborhoods and the City’s Historic District (Historical Museum and Fire House) could provide significant economic, social and cultural benefits to the City of Artesia (Figure 2-32 and 2-33). The station could be classified as both neighborhood-serving and a regional terminus, understanding that this destination can cater to regional visitors who come specifically to the vibrant commercial corridor for its unique cultural offerings.

The City of Artesia is in the process of modifying its existing land uses around the proposed Pioneer Station location so future development is more conducive to transit. Presently, the station area contains low-density commercial parcels along Pioneer Boulevard surrounded by mostly low-density and some higher-density residential buildings. The City adopted policies to improve pedestrian and bicycle access along Pioneer Boulevard and to support mixed-use development. With the transit connections along South Street, and the potential for specific development around the proposed Pioneer Station, the City is well-positioned to support transit oriented development (TOD) making a new Southern Terminus at Pioneer Boulevard compatible with City objectives and feasible.



Figure 2-32 (Top) The Pioneer Station site in a broad ROW (Bottom) This terminus station can be catalyst for transit-oriented development and provides direct access to Artesia’s “Little India” on Pioneer Boulevard

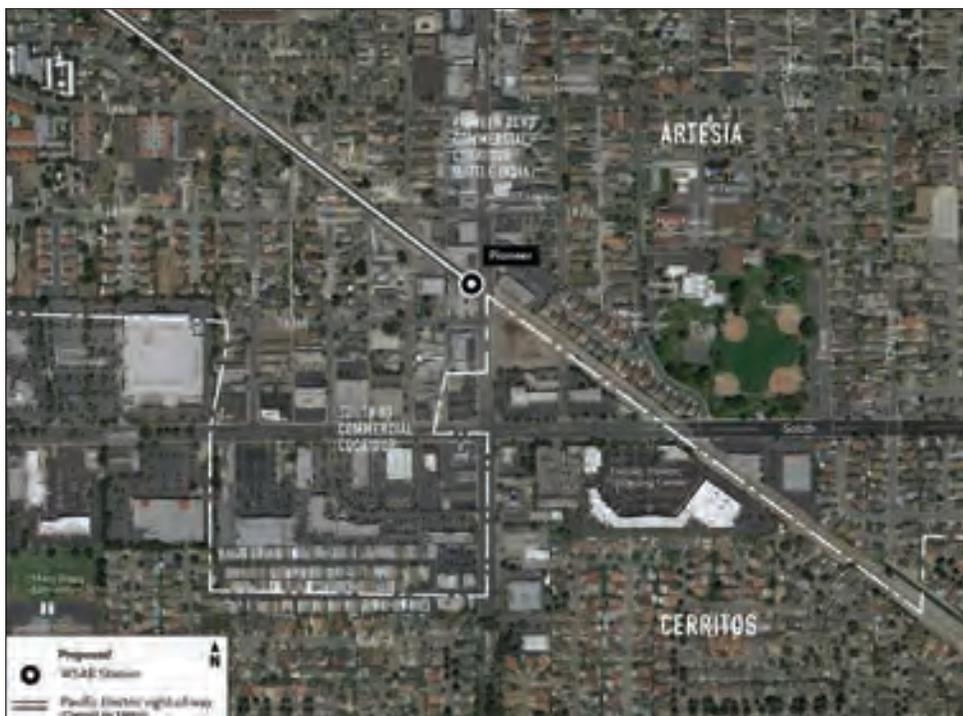


Figure 2-33: Pioneer Station area

### 3.5.2 Station Concept

The SCAG AA located the Pioneer Station on the west side of Pioneer Boulevard, within the existing Metro-owned Pacific Electric ROW, southeast of the 183rd Street/Gridley Road Station. To serve as the Southern Terminus, the station design concept was advanced (no more than 5% level of design level) to accommodate:

- Communication & Signal Building (C&S)
- Traction Power Substation (TPSS)
- Train Operators Supervisor's Booth & Toilet Facility (TOS)
- Tail track for train storage and crossover movements
- Parking and/or parking structure

Metro Rail Design Criteria and Standard Directive Drawings were referenced when developing several terminus station concepts consistent with Metro's "Kit of Parts" standardized station design approach, and input from Metro Operations was provided. Alternative design concepts located the terminus station platform either east of Pioneer Boulevard (Figure 2-34) or west of Pioneer Boulevard (Figure 2-35) or in various configurations. Evaluation of both concepts took into account the existing ROW dimensions, pedestrian/bike access, visibility for transit users, adjacent land uses and the station site's potential for TOD (Figure 2-36).

While both design concepts are feasible, the Cities of Artesia and Cerritos preferred placing the Southern Terminus station west of Pioneer Boulevard in the City of Artesia, and the tail tracks and crossover east of Pioneer Boulevard in the City of Cerritos.



Figure 2-34: One of two options developed accommodates the Southern Terminus station platform east of Pioneer Boulevard but was not preferred by the Cities of Artesia or Cerritos



Figure 2-35: The preferred plan accommodates the Southern Terminus station platform between 187th Street and Pioneer Boulevard

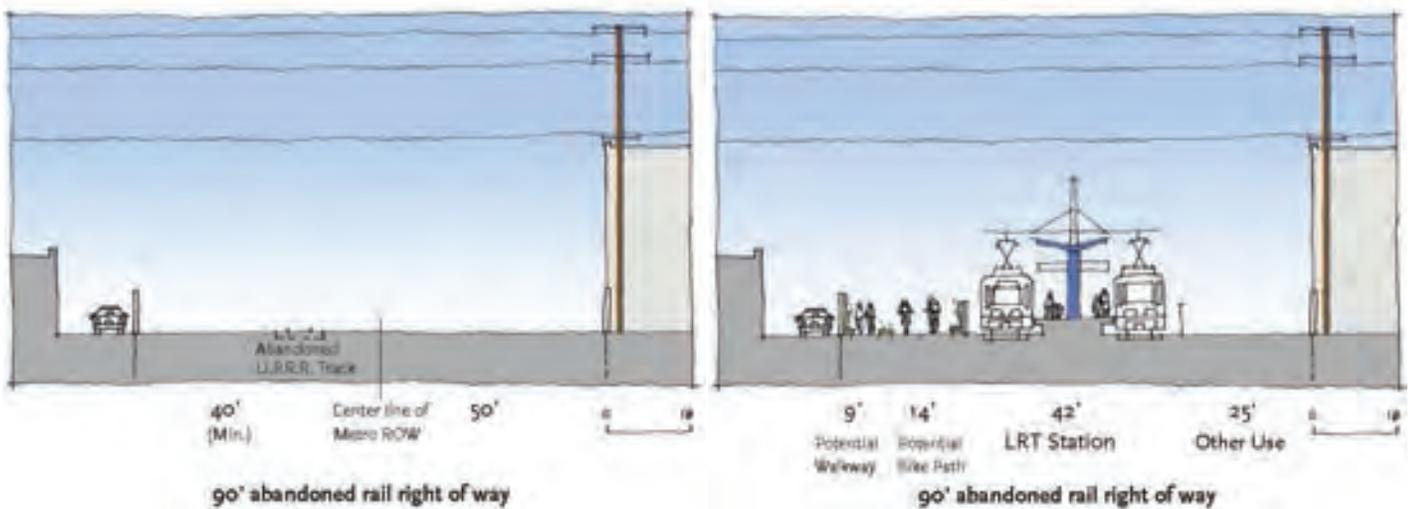


Figure 2-36: Existing and proposed cross sections of Southern Terminus station (looking southeast towards Pioneer Boulevard)

### 2.5.3 Challenges

#### Parking

Parking for Option A could accommodate approximately 44 parking spaces between Pioneer Boulevard and 187th Street with approximately 152 additional parking spaces to the east of Pioneer Boulevard. Option B could accommodate approximately 45 parking spaces to the west and approximately 96 parking spaces to the east of Pioneer Boulevard. These layouts require further refinement to meet the necessary Metro Rail Design Criteria, which includes ADA parking space, landscape, and lighting requirements that will reduce the final number of parking spaces. Neither Option A nor B meets the projected demand for parking at the Southern Terminus.

#### Traffic

The at-grade crossings at 187th Street and Pioneer Boulevard will require further analysis. Gated rail crossings and new traffic signals are anticipated. During the next phase it is recommended to verify the delay.

### 2.5.4 Station Study Findings

**Pioneer Station is feasible as a Southern Terminus for the WSAB corridor and preferred by the cities with its platform west of Pioneer Boulevard in the City of Artesia, and the tail tracks and crossover east of Pioneer Boulevard in the City of Cerritos.** Based on 5% level of design, this configuration has better potential for TOD and structured parking in the area bounded by 187th Street, 188th Street, Pioneer Boulevard to the alley west of Corby Avenue (see Figure 2-37). This station location is also compatible with Artesia's plans to make Pioneer Boulevard more pedestrian-oriented, has potential for integrating a walk-bike path from Artesia Park to the historic sites Artesia Historic District northwest of the station, and was the preferred configuration of Metro Operations.

**Parking must be studied further based on demands at the Southern Terminus.** Parking demands at the Pioneer Station require more analysis beyond the 5% level of design level of this study and further discussions between Metro and the Cities of Artesia and Cerritos. The evaluation of transit parking demands should be in conjunction with understanding the existing parking supply and demand for the neighborhood and commercial district. Options for meeting the parking demands of WSAB transit patrons and visitors to Artesia may include structured parking (below-grade or above-grade), shared-use with the nearby Pioneer Boulevard commercial district, and/or joint-development of parking facilities with future TOD.

**During the next phase, verify the traffic delay by analyzing the level of service at the identified intersections along Pioneer Boulevard.** The future traffic study will also analyze potential impacts caused by additional traffic on local streets created by transit users accessing Pioneer Station. If the City of Artesia implements their traffic calming plan (reduction in lanes from two in each direction to one) along Pioneer Boulevard, development of this plan will need to be considered.

**Advance station design and engineering.** It will be necessary to obtain a current survey of the station site, perform geotechnical and structural evaluations, and further develop the Southern Terminus station program and design drawings. This will be done in a manner compatible with the Cities of Artesia's and Cerritos' vision, and in order to best serve their residents, visitors and long term objectives.

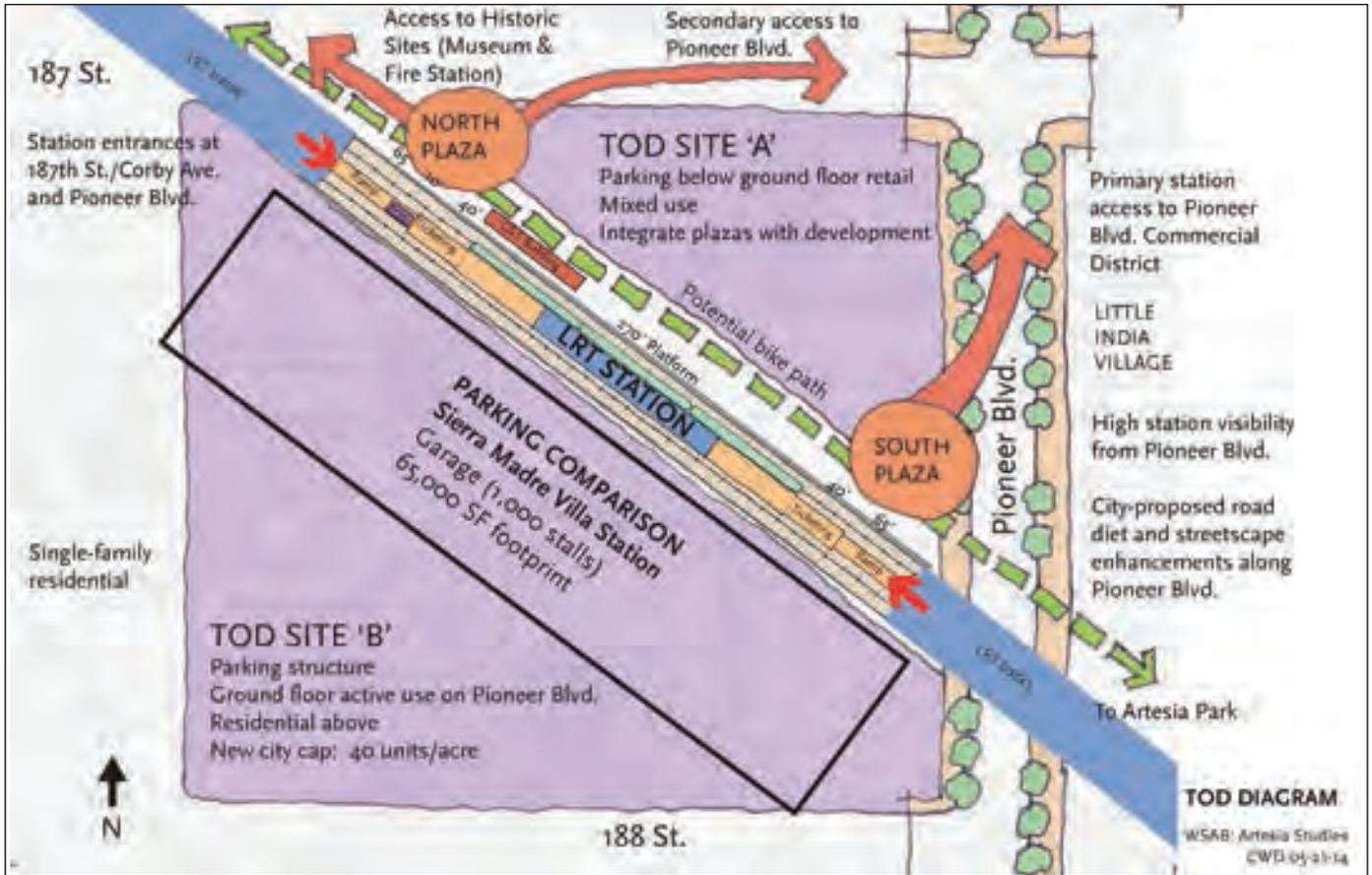


Figure 2-37: Concept sketch of a potential transit-oriented development (TOD) at the Southern Terminus Station in Artesia, shows the preferred station platform location between 187th Street and Pioneer Blvd

Patsaouras Plaza  
MTA Regional, City Buses  
Metro Red Line (Subway)

Tracks  
**7 & 8**  
Platform B

Amtrak Thruway Bus  
Metro Gold Line  
Taxis

7





# Travel Forecast Results

---

## 3

A travel forecast to horizon year 2040 was performed on two alignments identified in the SCAG AA, and on four alignments that arose during the Technical Refinement Study. Forecast indicators such as new transit trips, daily boardings, benefits to existing Metro Rail lines, and uncertainties are captured in this section.

### 3.1 Key Performance Criteria

---

A travel forecast of future demand was completed for each of the six WSAB alternatives using Metro’s travel forecasting model, “Corridor-Based Model 2009 (CBM09)”. The model can project outcomes of transit activity (measured in quantities, human behavior, time) to help understand how people might use a future transit system given specific assumptions. The horizon year used for the travel forecast was 2040. The results are presented in the following key performance criteria: new transit trips and project boardings. Note for all of the alternatives, the City of Huntington Park proposed new station locations for Pacific/Randolph and for Florence/Salt Lake were incorporated.

### 3.2 Assumptions

---

Below are the assumptions per alternative used within the travel demand model; see Table 3-1. In the next phase, these assumptions will be revisited as they are dependent upon the types of guideway and stations (i.e., at-grade, aerial, and underground) assumed within this study.

**Table 3-1: Summary of Alternative Assumptions for Travel Demand Model**

Alternative	Number of Stations	Length (miles)	Travel Time (minutes)
East Bank	11	18.7	34.4
West Bank 3	12	17.9	32.4
West Bank - Pacific/Alameda	13	18.4	33.0
West Bank - Pacific/Vignes	12	18.2	33.2
West Bank - Alameda	15	19.0	33.2
West Bank - Alameda/Vignes	15	19.1	34.3

Another important assumption is the station parking, which was analyzed starting with the SCAG AA recommended quantities and adjusted with input from the cities. The following Table 3-2 represents the parking spaces used in the travel forecast process. The parking spaces in the table reflect the constrained amount, which refers to the amount that can be accommodated based upon existing condition, rather than the actual demand. A test scenario was done with the parking demand unconstrained, which shows the maximum parking demand that the WSAB would attract. This test scenario was done for the East Bank alignment and resulted in approximately 7,200 parking demand. When compared to the above table, it is apparent that the actual parking demand is only to some extent realized with the proposed station parking. Therefore, during the next phase of the project, the amount of station parking spaces will be studied further to determine if additional spaces are feasible and how this will affect the travel forecast balanced with other factors, such as cost, ROW impacts, and traffic impacts. Note the 200 parking spaces listed for Union Station are existing while the remainder of the parking spaces are new and therefore will be constructed as part of this project.

**Table 3-2: Station Parking Spaces (Constrained)**

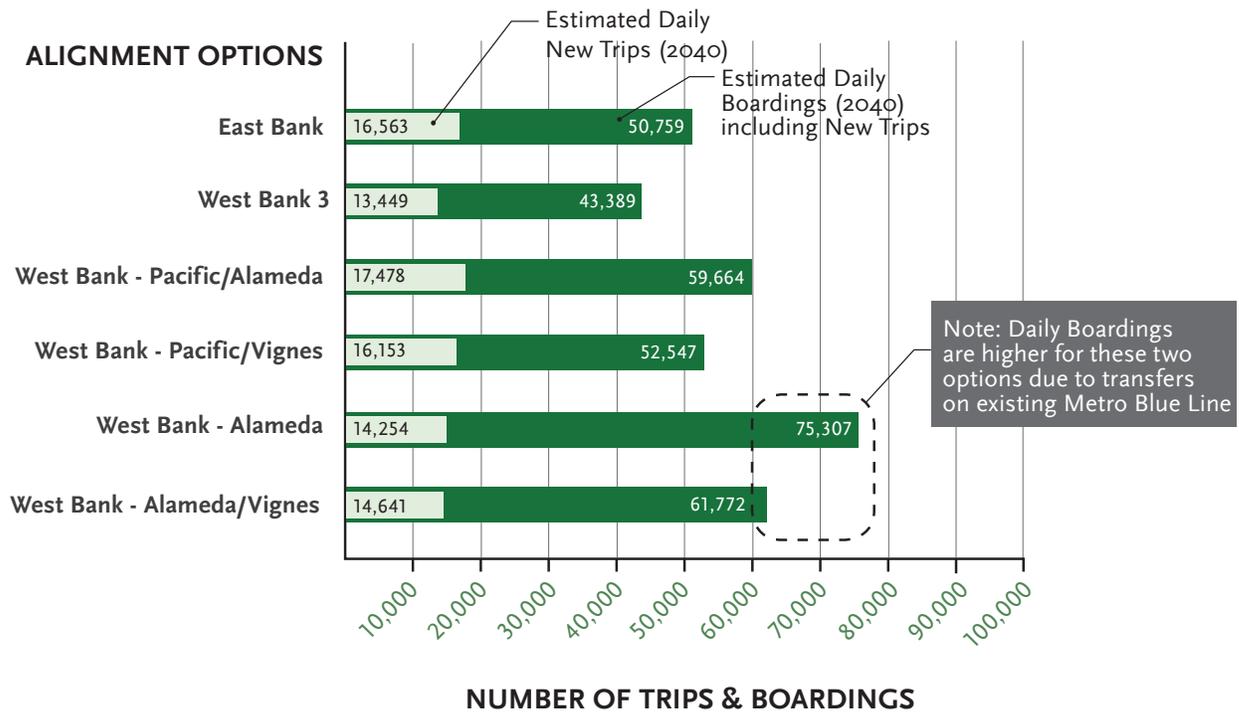
Station	Parking Spaces
Union Station	200
Firestone	150
WSAB-Green Line (Combined stations)	300
Paramount	200
Bellflower	270
Gridley	400
Pioneer	300
Total	1,820

### 3.3 Daily New Transit Trips & Project Boardings

In order to evaluate the ridership for the six alternatives, several measurements were considered in order to understand the factors influencing why one alignment is anticipated to perform better than another. New transit trips are an important measurement because they represent people who would likely opt to take a trip using the WSAB line rather than drive a car to reach their destination (travel out to a destination and a return back represents two trips taken). Another meaningful gage is daily boardings that represent each time a person enters a transit vehicle (a ride with one transfer to reach a destination equates to two boardings).

Higher boardings are particularly evident for the alignment options that parallel the Metro Blue Line and share multiple station locations between Union Station and Slauson Station, which is due to the ridership of that existing line. So there is value in focusing on the new transit trips generated as a portion of the overall daily boardings (Figure 3-1).

Figure 3-1: Graph showing daily new transit trips as a portion of all project boardings by alignment option



Overall there are three factors that affect the number of “new transit trips” and “daily boardings” each alternative is capable of generating. The key issues that arose during this Study and that are the biggest differentiators between the six alternatives are:

### 1. Terminating in Union Station

The only alternative that doesn’t terminate at Union Station at its northernmost point is the West Bank 3 and it performed the least in the total number of new transit trips and daily boardings. The ability for WSAB riders to access other Metro rail lines, Metro buses, other operator bus lines, Metrolink and Amtrak is a significant benefit that was revealed in the total number of forecasted new transit trips and daily boardings. New transit trips went up 20-30% for the other alternatives that assumed Union Station as the northernmost terminus.

### 2. Capturing East-West Transfers in Little Tokyo

Alternatives that included a station in Little Tokyo near 1st/Central continued into the Los Angeles Union Station generated more daily boardings because they allowed for transfers to the Metro Gold Line via the future Metro Regional Connector. These alternatives included West Bank – Pacific/Alameda and West Bank – Alameda. A WSAB station within Little Tokyo gives riders the opportunity to transfer to the Metro Gold Line to reach points further east (Boyle Heights, East Los Angeles, and Whittier when Metro Gold Line Eastside Phase II is realized) and west when the Regional Connector opens (Downtown Los Angeles, Mid-City and Santa Monica). Locating a station at 1st/Central can increase daily boardings by approximately 14% or increase new transit trips by 8% from what would otherwise be forecasted on a similar alternative that didn’t have a stop at 1st/Central and continued into the Los Angeles Union Station.

### 3. Following the Metro Blue Line

The alternatives proposed alongside the Metro Blue Line connecting Slauson Station and Union Station reflect a higher number of daily boardings due to “forced transfers”. These alternatives include the West Bank – Alameda and West Bank – Alameda/Vignes. Typically forced transfers are viewed negatively because transferring adds travel time and can be a deterrent if the delay is significant and the rider has other options. However, in this case the WSAB alternatives provide the Metro Blue Line riders a faster means to reach Union Station since the WSAB alternatives are more direct. For comparison, the travel time from Slauson Station to Union Station by Metro Blue Line is approximately 22 minutes; and by WSAB the travel time will only be approximately 9 minutes. The addition of WSAB line between Slauson Station and Union Station can relieve demands on the Metro Blue Line, which is currently operating at its full capacity, and other Metro lines by shifting rail riders away from existing Metro lines to the WSAB line. In addition to the WSAB line providing some relief to the existing Metro rail system, the WSAB line also attracts new riders. Because of the abundance of rail lines in downtown, riders have a variety of travel routes to choose from depending on their destination.



Terminating WSAB at Union Station brings significant benefits to riders (top). Alignments that included a station in Little Tokyo near 1st/Central (middle), and stations alongside the Metro Blue Line (bottom) reflected higher boardings.





# Preliminary Cost Estimates

---

## 4

This section provides an overview of cost methodology, cost categories, market factors and compares the total cost of each alignment option.

## 4.1 Purpose and Methodology

---

The preliminary cost estimates have been developed for the individual study alternatives in accordance with FTA guidelines, using the latest revision of FTA's Standard Cost Categories (SCC), which summarize budget baselines in a consistent framework. These estimates were prepared in a standard estimating format, appropriate for this stage (5% level of design) of project development. The preliminary cost estimates will be further refined in the next phase.

### Standard Cost Categories (SCC)

The FTA guidelines require cost estimates to be prepared and reported using the latest version of the SCC. Cost categories form the basis for the format and structure that is used for the capital cost detail and summary sheets developed for each alternative alignment. The cost categories consist of the following:

- Guideway: At-Grade, Aerial, Tunnel, Cut and Cover
- Stations: At-Grade, Aerial, and Underground
- Support Facilities
- Sitework and Special Conditions
- Systems
- ROW, Land, Existing Improvements
- Vehicles
- Professional Services
- Contingency
- Finance Charges

## 4.2 Quantities

---

In the areas where the level of design did not support quantity measurements, parametric estimating techniques were utilized.

### Unit Price, Mark-Ups, Contingency

All prices have been developed by using parametric historical project data that was escalated to 2015. The prices are based on Expo Phases 1 and 2 and Crenshaw/LAX light rail projects. The unit costs received were adjusted to reflect current market value pricing in the South California area.

The unit costs shown in the preliminary cost estimate include all direct cost, associated project mark-ups, including subcontractor overhead & profit, general contractor overhead and profit, taxes, insurances, and bond.

## 4.3 Escalation

---

Escalation was not included. Escalation will be added in the next phase when the preliminary cost estimates will be updated. Depending upon the projected year and market values, escalation will most likely increase the cost.

## 4.4 Market Factors

The preliminary cost estimates do not include any adjustments for an overly competitive or overly uncompetitive market conditions. The estimates are considered a fair value estimate under “stable” market conditions for a complete and responsible bid with a fair profit.

## 4.5 Comparison of Alternatives

Table 4-1 presents and compares the preliminary cost estimates associated with each of the alternatives in 2015 dollars. The preliminary cost estimates include cost contingency to cover unexpected cost increases, which is consistent with FTA recommendations for transit projects at the 5% level of design.

**Table 4-1: Preliminary Cost Comparison by Alternative**

Cost Categories	WEST SANTA ANA BRANCH TRANSIT CORRIDOR - ALTERNATIVES (In millions, 2015 dollars)					
	Total East Bank	Total West Bank 3	Total West Bank – Pacific / Alameda	Total West Bank – Pacific / Vignes	Total West Bank – Alameda	Total West Bank – Alameda / Vignes
Guideway and track elements	\$839.6	\$1,088.5	\$1,096.6	\$1,132.4	\$1,090.8	\$1,165.3
Stations, stops, terminals, intermodal	\$238.0	\$382.9	\$411.5	\$391.7	\$288.9	\$440.0
Support facilities—yards, shops, administration buildings	\$250.7	\$250.7	\$250.7	\$250.7	\$250.7	\$250.7
Sitework and special conditions	\$262.8	\$246.1	\$253.6	\$251.0	\$268.6	\$252.1
Systems	\$610.1	\$596.9	\$618.8	\$604.2	\$648.4	\$650.8
ROW, land, existing improvements	\$229.4	\$217.6	\$225.0	\$222.9	\$235.7	\$237.8
Vehicles	\$294.0	\$294.0	\$294.0	\$294.0	\$294.0	\$294.0
Professional services	\$726.5	\$846.5	\$868.4	\$867.8	\$840.5	\$910.5
Unallocated contingency	\$345.2	\$392.3	\$401.9	\$401.5	\$391.8	\$420.1
Finance charges	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total Cost (2015 dollars)</b>	<b>\$3,796.3</b>	<b>\$4,315.5</b>	<b>\$4,420.5</b>	<b>\$4,416.2</b>	<b>\$4,309.4</b>	<b>\$4,621.3</b>
<b>Total Distance in Miles</b>	<b>18.53</b>	<b>17.78</b>	<b>18.25</b>	<b>18.12</b>	<b>18.93</b>	<b>19.06</b>
<b>Total Cost per Mile</b>	<b>\$204.9</b>	<b>\$242.7</b>	<b>\$242.2</b>	<b>\$243.7</b>	<b>\$227.6</b>	<b>\$242.5</b>

# Two LA Union Station Northern Terminus Options

Union Station

LOS ANGELES

## Four Northern Alignment Options

Little Tokyo

Arts District

7th/Alameda

- West Bank - Pacific/Alameda
- West Bank - Pacific/Vignes
- West Bank - Alameda
- West Bank - Alameda/Vignes

Washington

Vernon

Pacific/Vernon

VERNON

Slauson

MAYWOOD

COMMERCE

Pacific/Randolph

Florence/Salt Lake

HUNTINGTON PARK

BELL

Replace Gage with Florence Station

CUDAHY

BELL GARDENS

SOUTH GATE

Firestone

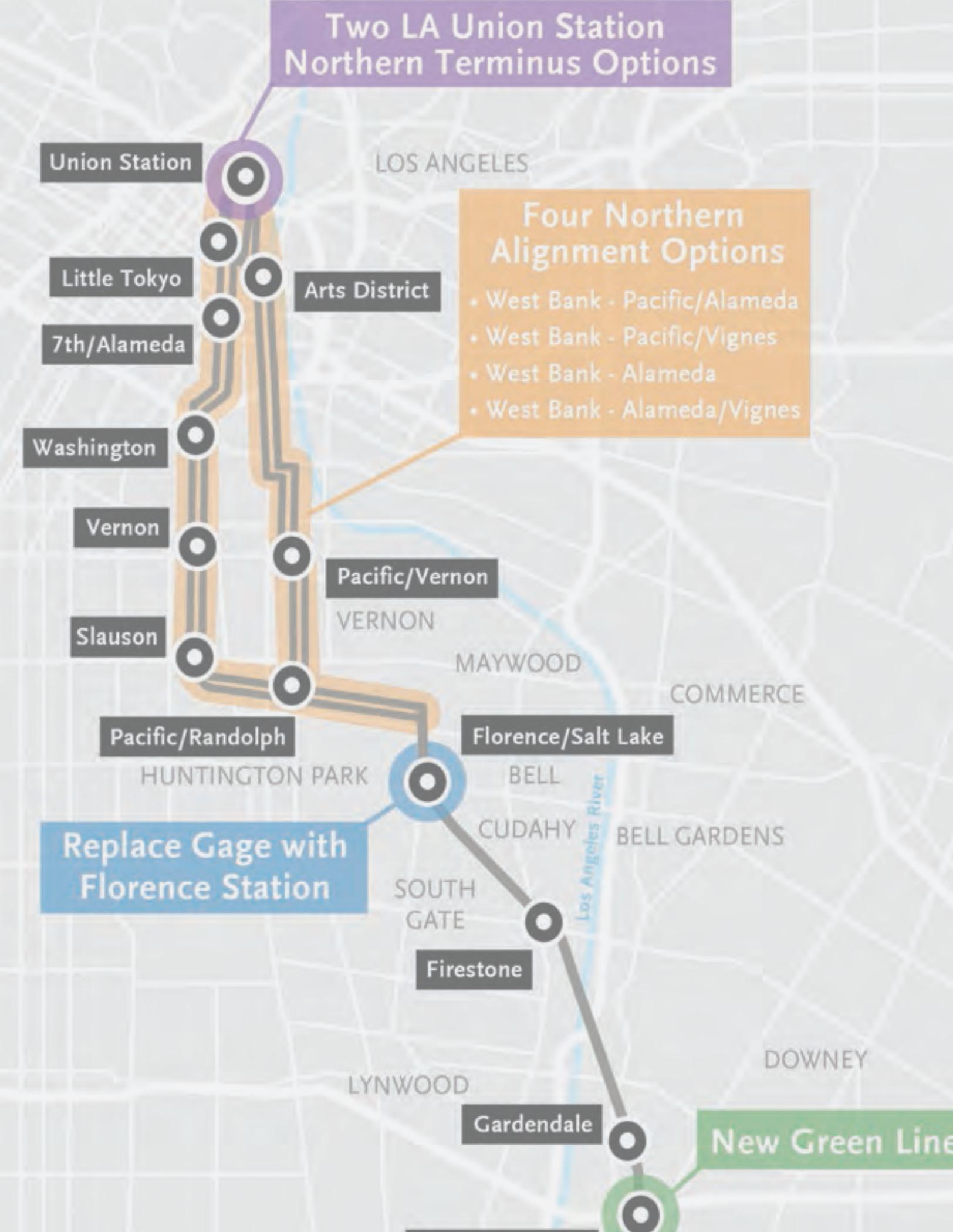
Los Angeles River

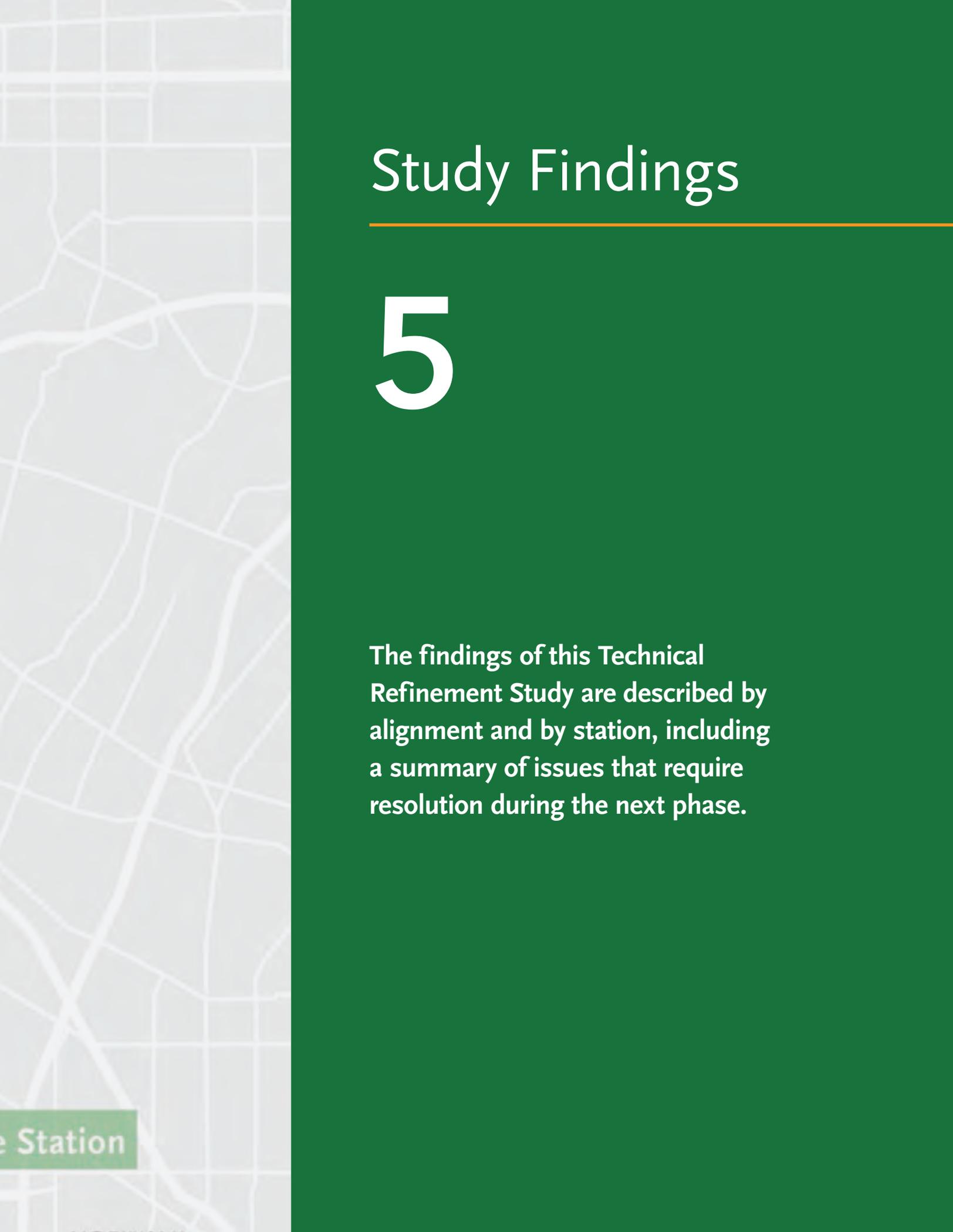
LYNWOOD

DOWNEY

Gardendale

New Green Line





# Study Findings

---

## 5

The findings of this Technical Refinement Study are described by alignment and by station, including a summary of issues that require resolution during the next phase.

## 5.1 Recap of Study Areas

---

The Study covered five specific areas shown in Figure 5-1 and listed below. Metro will use these results to help decide which alternative(s) and stations to carry forward into the next phase. The findings from this Study are documented in the technical reports listed in the Bibliography and summarized in this section.

### 1. Los Angeles Unions Station – Northern Terminus

Access and enter the northern terminal station, Los Angeles Union Station.

### 2. Northern Alignment Options

Develop options for the northern alignment segment between City of Huntington Park and Union Station.

### 3. Huntington Park Alignment & Stations

Study the City of Huntington Park's request for potential relocation and modification of the planned stations and alignment.

### 4. New Green Line Station

Feasibility of adding a new Metro Green Line Station east of the I-105/I-710 freeway interchange.

### 5. Southern Terminus

Study the potential change to the southern terminal station from the City of Cerritos to the City of Artesia.

OPPOSITE

Figure 5-1: Five Key Issues



OPPOSITE

Figure 5-2: Comparative line diagrams of the six alignment options showing stations, Metro Rail connections, length and travel time

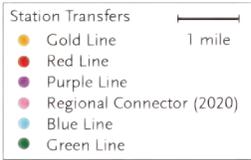
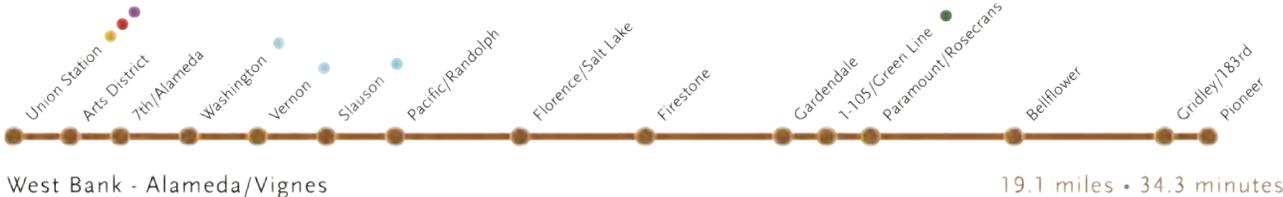
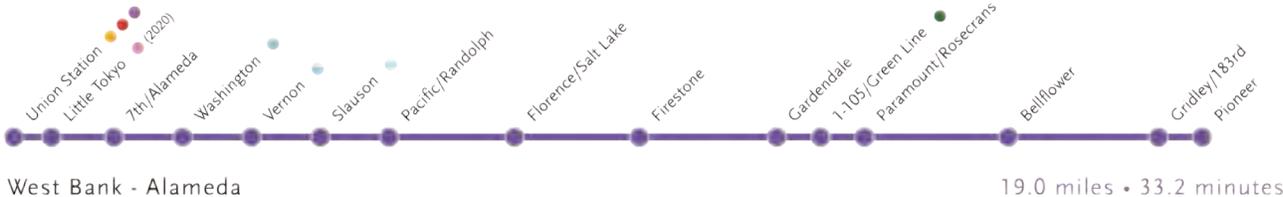
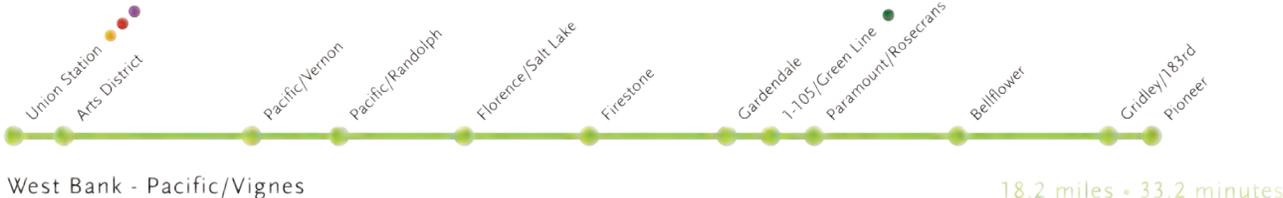
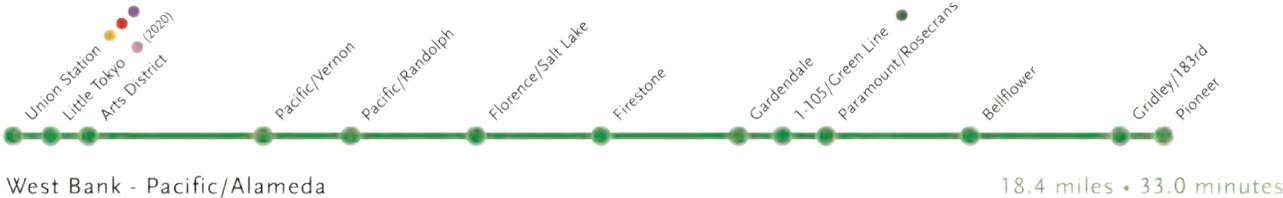
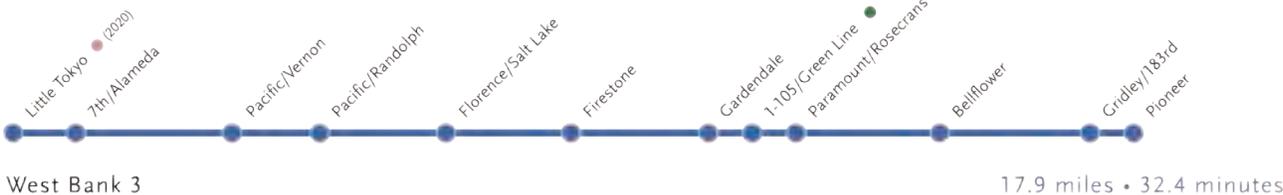
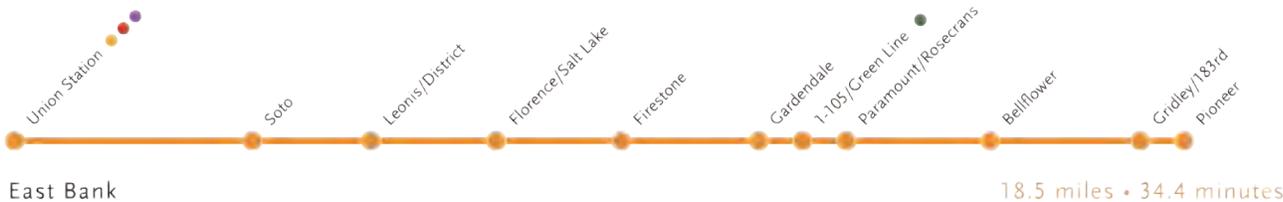
## 5.2 Alignment Findings

Based on the analysis, the East Bank alignment is not recommended to go forward due to right-of-way constraints from existing railroad usage. In addition, the adjacent high-tension power lines to the west and commercial buildings to the east make expansion of the right-of-way expensive and/or unattainable. The West Bank 3 alignment also is not recommended to go forward because its northern terminus falls short of Union Station and results in low-ridership due to the lack of direct access to other regional transit services available at Union Station. However, the West Bank 3 alignment served as a foundation for four more viable West Bank alignments that arose during the refinement process: West Bank - Pacific/Alameda, West Bank - Pacific/Vignes, West Bank - Alameda, and West Bank - Alameda/Vignes. The first two alignments turn west from Union Station’s southern property edge and provide a Little Tokyo Station. The other two alignments turn east out of Union Station’s southern property edge and provide an Arts District Station. Therefore, the Pacific and Alameda Corridor alternatives warrant further study.

A summary of the alignment options is captured in Table 5-1 by differentiating features, land uses and key challenges. Figure 5-2 portrays key differences by Station, Metro Rail connections, travel length and travel time.

**Table 5-1: Alignment Comparison Matrix**

Alternative	Differentiating Features	Land Uses	Key Challenges
East Bank	<ul style="list-style-type: none"> <li>Access to Union Station from north via east bank of L.A. River</li> </ul>	Institutional Industrial Manufacturing	<ul style="list-style-type: none"> <li>Circuitous route into Union Station from north and to be determined station location</li> <li>Issues of shared ROW (UPRR) &amp; high-tension power lines</li> </ul>
West Bank 3	<ul style="list-style-type: none"> <li>Access to Little Tokyo via Pacific Boulevard to 7th Street, then Alameda Street to 1st/Central</li> </ul>	Commercial Multi-family residential Industrial Single-family residential	<ul style="list-style-type: none"> <li>Transfer required to reach Union Station</li> <li>Tunneling in area with potential for high water table</li> <li>Crossover and under private property</li> </ul>
West Bank - Pacific/Alameda	<ul style="list-style-type: none"> <li>Access to Union Station via Pacific Boulevard, 4th, then Alameda Street</li> </ul>	Institutional Commercial Multi-family residential Industrial Live-work	<ul style="list-style-type: none"> <li>Potential impacts of aerial structure in Little Tokyo</li> <li>Support columns in Alameda Street may require elimination of left turns</li> <li>City concerns about affecting truck traffic on Pacific Boulevard</li> </ul>
West Bank - Pacific/Vignes	<ul style="list-style-type: none"> <li>Access to Union Station through the Arts District</li> </ul>	Industrial Live-work Multi-family residential Commercial Single-family residential	<ul style="list-style-type: none"> <li>Street closures north of 1st Street</li> <li>Tunnel/station under Santa Fe</li> <li>City concerns about affecting truck traffic on Pacific Boulevard</li> </ul>
West Bank - Alameda	<ul style="list-style-type: none"> <li>Access to Union Station</li> <li>Direct connection with Metro Blue Line at 3 shared Metro stations</li> </ul>	Institutional Commercial Multi-family residential Industrial Single-family residential	<ul style="list-style-type: none"> <li>Potential impacts of aerial structure in Little Tokyo</li> <li>Construction within private properties from Alameda Street to Long Beach Avenue connection</li> <li>Increase in Metro ROW for Blue Line and WSAB</li> </ul>
West Bank - Alameda/Vignes	<ul style="list-style-type: none"> <li>Access to Union Station via Blue Line and Arts District</li> <li>Direct connection with Metro Blue Line at 3 shared Metro stations</li> </ul>	Industrial Live-work Single-family residential Multi-family residential	<ul style="list-style-type: none"> <li>Cut and cover impacts in Arts District</li> <li>Construction within private properties from Alameda Street to Long Beach Avenue connection</li> <li>Increase in Metro ROW for Blue Line and WSAB</li> </ul>



## 5.3 Station Findings

---

### 5.3.1 Los Angeles Union Station - Northern Terminus Study Findings

Two potential zones for a new WSAB Terminus Station were identified. Both locations are centralized and provide close proximity to Amtrak and Metrolink platforms, Metro Red and Gold Line Stations, and the Relocated Bus Plaza:

- **Over the Relocated Bus Plaza** An aerial station could be built one-level above the Relocated Bus Plaza and share some vertical circulation elements (elevators, escalators, stairs) to access Union Station. This location is also a future development pad per the USMP (identified as an Office Building). It is unknown when a building would be needed, financed and developed in this location.
- **Over the Metro Gold Line Platform** An aerial station could be built one-level above the existing Metro Gold Line station platform and share some vertical circulation elements (elevators, escalators, and stairs) to access Union Station. This location does not coincide with any development pads but cannot conflict with SCRIP.

#### Study findings

- **Analyze Both Locations Further** Confirmation as to which location is more advantageous (fewer impacts and/or more supportive of the USMP objectives), and how the Northern Alignment options would introduce new trackway into Union Station both require further analysis. Assumptions made during the Study may be affected if future development at Union Station differs from what is shown in the USMP. Additionally, because SCRIP and CAHSR designs are still in development, these projects may affect the WSAB access into Union Station and terminus station location.

### 5.3.2 New Stations for Alignment Option Study Findings

**Study all new station locations further during the next phase.** It will be important to confirm that each station area can support a new station and WSAB patronage based on:

- Transit-supportive land uses
- Planned or permitted projects nearby
- New or updated community plans or visions
- Access to other transit services
- Pedestrian-bicycle access
- Ridership estimates
- Travel time
- Operations and maintenance
- Cost benefit analysis
- Community support

Additional analysis should be performed at the following WSAB station locations:

### Arts District Station

- Santa Fe Avenue Station
- 3rd Street Station
- 4th Street Station

### Metro Blue Line Transfer Stations

- Washington Station
- Vernon Station
- Slauson Station

### Potential Station Between Arts District and Pacific/Randolph Station

- 6th Street
- Santa Fe and Olympic Boulevard
- Washington Boulevard

## 5.3.3 Huntington Park Stations Study Findings

**The alternative light rail station on Randolph Street will serve Downtown Huntington Park.** The alternative Randolph Street location is feasible and will serve the City's vibrant commercial corridor, providing access to local residents and regional visitors coming to the City's Downtown. The final station location will ultimately be influenced by which Northern Alignment option is selected (between Huntington Park and Union Station) since the most of the alignment options provide access to Downtown Huntington Park from either 1) a Randolph Street alignment, or 2) a Pacific-Randolph alignment. The former precludes a station platform on Pacific Boulevard; the latter allows a station to be located on either street.

Given the fact that both the cities of Huntington Park and Vernon expressed an initial preference for the Randolph Street/Metro Blue Line alignment option, the Randolph Street Station would appear to have more benefits and require further study in the next phase.

**Huntington Park's second light rail station location at Florence and Salt Lake Avenues would provide convenient access to the regional rail transit system, as well as to other destinations within Huntington Park, Bell, Bell Gardens and Cudahy.** The station would be neighborhood-serving, and is anticipated to function as a "commuter station". Furthermore, given the City of Huntington Park's future plans for redevelopment, the area around the station could become a destination, with Salt Lake Park serving as a recreational and civic landmark. For these reasons the study finding is a station at Florence/Salt Lake Avenue appears to have more benefits than at Gage Avenue.

### 5.3.4 New Metro Green Line Station Study Findings

**Based on the conceptual plans (5% level of design), a new Metro Green Line station connecting with the WSAB corridor can feasibly be built within the existing I-105 Freeway ROW.** To accommodate this new station, the existing Metro Green Line ROW will need to be widened by approximately 3 feet in each direction in order to accommodate the new station, the relocation of Metro Green Line tracks and OCS poles/wires, and requisite vertical circulation systems and equipment. The additional 3 feet will encroach into the existing 9.5-foot wide inside freeway shoulder next to the HOV lane in both directions. This will require a design exception from Caltrans to allow for a permanent reduction in the inside shoulder width from 9.5 feet to approximately 6.55 feet for a distance of approximately 1,300 feet.

**It is recommended that this concept be further advanced, so that design exceptions and fact sheets can be formally reviewed and approved by Caltrans.** Furthermore, it is recommended that a structural analysis of the bridge columns and placement locations supporting the upper WSAB/Green Line platform be completed, along with a geotechnical investigation to confirm the existing soil conditions and that any geotechnical recommendations are incorporated into the design and project specifications are implemented during construction.

**While the freeway ROW is sufficient to accommodate the new Metro Green Line station, further analysis is required if the I-105 ExpressLanes is also introduced in the freeway corridor.** In July 2014, the Metro Board approved a motion to advance the I-105 ExpressLanes to the Project Approval/Environmental Document phase. Therefore, it is recommended that the design of these two projects be coordinated and the ultimate footprint of both projects be identified. Both projects will require Caltrans approval of design exceptions and fact sheets.

**Operational impacts are mainly due to temporary construction but strategies need to be developed to address Metro and Caltrans services and customer experience.** The operational challenges to the Metro Green Line are limited to temporary construction challenges, caused by the need to relocate existing tracks and OCS poles/wires. The service disruptions could be mitigated by single-tracking or bus bridging during the construction period. Construction staging will likely require the temporary closure of at least the shoulder and HOV lane in each direction. Therefore, a traffic management plan (TMP) that lays out a set of strategies for managing the work zone impacts and minimizing traffic and mobility impacts of the project should be prepared.

**Based on initial travel forecast results, there does not appear to be any long-term systemwide operational impacts to either the Metro Green Line or the Metro Blue Line.** New rolling stock or station expansions are not foreseen to be needed. Initial travel forecasts confirm that this new Metro Green Line station would mainly serve as a transfer station, and that riders are primarily shifting from other stations along the system.

**Pedestrian access to the station from the south should be studied further.** The City of Paramount preferred that the Arthur Avenue pedestrian bridge be used for emergency egress only based on vandalism and unauthorized use complaints. The addition of two new light rail stations in this location will increase pedestrian activity and “eyes on the street”. Further studies should be performed during the next phase to assure convenient, safe and ADA-compliant pedestrian access is provided.

### 5.3.5 Artesia - Southern Terminus Study Findings

**Pioneer Station is feasible as a Southern Terminus for the WSAB Corridor, and preferred by the cities with its platform west of Pioneer Boulevard in the City of Artesia, and the tail tracks and crossover east of Pioneer Boulevard in the City of Cerritos.** Based on 5% level of design, this configuration has better potential for TOD and structured parking in the area bounded by 187th Street, 188th Street, Pioneer Boulevard to the alley west of Corby Avenue. This station location is also compatible with Artesia's plans to make Pioneer Boulevard more pedestrian-oriented, has potential for integrating a walk-bike path from Artesia Park to the Artesia Historic District northwest of the station, and was the preferred configuration of Metro Operations.

**Parking must be studied further based on demands at the Southern Terminus.** Parking demands at the Pioneer Station require more analysis beyond the 5% level of design level of this study and further discussions between Metro and the Cities of Artesia and Cerritos. The evaluation of transit parking demands should be in conjunction with understanding the existing parking supply and demand for the neighborhood and commercial district. Options for meeting the parking demands of WSAB transit patrons and visitors to Artesia may include structured parking (below-grade or above-grade), shared-use with the nearby Pioneer Boulevard commercial district, and/or joint-development of parking facilities with future TOD.

**During the next phase, verify the traffic delay by analyzing the level of service at the identified intersections along Pioneer Boulevard.** The future traffic study will also analyze potential impacts caused by additional traffic on local streets created by transit users accessing Pioneer Station. If the City of Artesia implements their traffic calming plan (reduction in lanes from two in each direction to one) along Pioneer Boulevard, development of this plan will need to be considered.

**Advance station design and engineering.** It will be necessary to obtain a current survey of the station site, perform geotechnical and structural evaluations, and further develop the Southern Terminus station program and design drawings. This will be done in a manner compatible with the Cities of Artesia's and Cerritos' vision, and to best serve their residents, visitors and long term objectives.

## 5.4 Summary of Findings

Based on the analysis, the East Bank alignment is not recommended to go forward due to right-of-way constraints from existing railroad usage. In addition, the adjacent high-tension power lines to the west and commercial buildings to the east make expansion of the right-of-way expensive and/or unattainable. The West Bank 3 alignment also is not recommended to go forward because its northern terminus falls short of Union Station and results in low-ridership due to the lack of direct access to other regional transit services available at Union Station. The newer Pacific and Alameda Corridor alternatives would proceed north to Union Station and are warranted for further study. The results from this Study are most concisely summarized in Figure 5-3 along with the key findings shown in Table 5-2.

**Table 5-2: Key Findings**

Alternative	Number of Stations	Length (miles)	Travel Time (minutes)	Estimated Daily New Trips (2040)	Estimated Daily Boardings (2040)	Preliminary Cost Estimate (in millions, 2015 dollars)
East Bank	11	18.5	34.4	16,563	50,759	\$3,796.3
West Bank 3	12	17.8	32.4	13,449	43,389	\$4,315.5
West Bank - Pacific/Alameda	13	18.3	33.0	17,478	59,664	\$4,420.5
West Bank - Pacific/Vignes	12	18.1	33.2	16,153	52,547	\$4,416.2
West Bank - Alameda	15	19.0	33.2	14,641	75,803	\$4,309.4
West Bank - Alameda/Vignes	15	19.1	34.3	14,254	61,772	\$4,621.3

OPPOSITE

Figure 5-3: Study Findings



## 5.5 Key Issues to Resolve During the Next Phase

---

The next phase for this project will analyze the potential environmental impacts and mitigations for specific study areas. Also, the design will advance along with development of the operational and maintenance program. Based upon the 5% level of design, the following are key issues that will need to be analyzed during the next phase:

The following are key issues will need to be analyzed during the next phase:

### 1. Traffic/Parking

All of the alignment options propose portions of the guideway within public streets. The guideway placement within the public streets will require reconfiguration of the traffic lanes, street parking, left turn pockets, etc. This will be done in conjunction with the traffic analysis in order to develop a solution that will not generate or minimize the potential impact to the traffic and parking.

### 2. Real Estate

There are specific areas where the guideway will be within the ROW owned by others that will require early coordination efforts due to the potential amount of time to reach an agreement on the design, compensation (if any), and coordination. This includes the following:

- The aerial guideway from Union Station over the 101 freeway that will require approval from Caltrans.
- The aerial or at-grade guideway within the existing railroad corridors will require early coordination, such as with UPRR, Southern California Regional Rail Authority (SCRRA) and Ports of Long Beach and Los Angeles.
- The various corridor cities will need to approve the guideway within (i.e., at-grade, aerial, or underground) their public streets.

### 3. Utilities

There are potential impacts to utilities for the alignment options and most will occur within the public streets where the guideway is proposed. Existing utilities will need to be located and mitigated, especially in areas with an aerial structure or underground guideway.

### 4. Soil Conditions

Investigation of the existing soil conditions is required for all underground structures, such as the foundations for aerial structures and underground guideway sections. In some areas, such as the alignments near the Los Angeles River, a higher water table may be encountered due to the proximity to the river.

### **5. Existing Underground Structures**

For the alignment options proposed to be underground, the design will need to address existing structures that are within or adjacent to the proposed alignment. For example, for the West Bank – Pacific/Vignes alignment, when the guideway crosses under the 1st Street bridge, guideway design will be coordinated with the existing bridge piers. Also for the West Bank – Alameda/Vignes alignment when it transitions from the Vignes alley to 3rd Street, underpinning of adjacent buildings may be required.

### **6. Coordination with California Public Utilities Commission (CPUC)**

The CPUC is an important stakeholder as they will ultimately approve the project before it can be put into service. Therefore, it is critical to begin coordination early for information sharing and these types of meetings continue throughout the project development.

### **7. Locate the Maintenance Facility**

The exact location, size, configuration, and functions will need to be decided for the maintenance facility. The SCAG AA identified some potential locations and these may be analyzed along with identification of new locations after the facility size and configuration is determined based upon the number of vehicles to be stored at the site and the facility functions.

### **8. Resolve Station Parking Demand**

The station parking spaces used within the travel demand model are constrained and do not reflect the actual demand. Therefore, during the next phase of the project, the amount of station parking spaces will be studied further to determine if additional spaces are feasible and how this will affect the travel forecast balanced with other factors, such as cost, ROW impacts, and traffic impacts.

# Metro Station Design Review

Final Report  
April 2012



**Metro**  
Los Angeles County  
Metropolitan Transportation Authority

Mead



WEST SANTA ANA BRANCH  
CORRIDOR PROJECT  
TECHNICAL REFINEMENT STUDY  
Project No. PS43703116  
New Southern Terminus Station  
Station Challenges Report (Final)  
Task No. 4.2

Prepared for:



**Metro**  
Los Angeles County  
Metropolitan Transportation Authority

Prepared by:

**PARSONS  
BRINCKERHOFF**  
444 South Flower Street  
Suite 800  
Los Angeles, CA 90071

	Review Copy
Originator	Date
Checker	10/16/14
Back checker (for Final)	10/29/14
Approved by	10/30/14

October 30, 2014



CONNECTING COMMUNITIES BETWEEN LOS ANGELES AND ORANGE COUNTY  
February 7, 2013  
SOUTHERN CALIFORNIA  
ASSOCIATION OF GOVERNMENTS

# Sources & Bibliography

---

## 6

This section cites the source for all figures, tables, and photographs that appear in this report and includes a list of documents referenced during the Study.



## Sources

---

### Figures

### Source

All Key Plans	CWD
Cover Scope of WSAB Technical Refinement Study	CWD
ES-1 WSAB Corridor Study area	CWD, PB
ES-2 SCAG AA East Bank Alignment	CWD, PB
ES-3 SCAG AA West Bank 3 Alignment	CWD, PB
ES-4 Five Key Issues	CWD
ES-5 Six Alignment Options for northern segment	CWD
ES-6 Enlarged map of six alignments	CWD
ES-7 LA Union Station with potential WSAB zone	CWD
ES-8 New Stations that arose during study	CWD
ES-9 Concept plans for Huntington Park stations	AVA, CWD
ES-10 Cross-section of New Green Line Station	CWD
ES-11 Concept sketch of potential TOD in Artesia	CWD
ES-12 Graph of new transit trips & daily boardings by option	CWD
ES-13 Study findings	CWD
1-1 SCAG AA East Bank and West Bank 3 Alignments	CWD, PB
1-2 Northern Alignment and SCAG AA Alignment options	CWD, PB
1-3 SCAG AA East Bank Alignment	CWD, PB
1-4 High-tension power lines along LA River	GEP
1-5 Commercial property near Cesar E. Chavez	CWD, GEP
1-6 SCAG AA West Bank 3 Alignment	CWD, PB
1-7 WSAB and Gold Line transfer point	CWD, GEP
1-8 Alameda at 7th Street	GEP
1-9 Alignment between Minerva and Santa Fe	CWD, GEP
1-10 West Bank - Pacific/Alameda Alignment	CWD, PB
1-11 Gold Line over US-101	GEP
1-12 Little Tokyo/Arts District station location	GEP
1-13 Little Tokyo to 4th Street alignment	GEP
1-14 Pacific Blvd Alignment	GEP
1-15 West Bank - Pacific/Vignes Alignment	CWD, PB
1-16 Vignes Street alignment	GEP
1-17 Santa Fe at Banning alignment	GEP
1-18 Santa Fe alignment in Arts District	GEP
1-19 West Bank - Alameda Alignment	CWD, PB
1-20 Alameda at I-10	GEP
1-21 Vernon Station location and Long Beach Alignment	GEP
1-22 Alameda Corridor at Randolph Street	GEP

## Figures

Figures		Source
1-23	3rd Street cut and cover segment	GEP
1-24	West Bank - Alameda/Vignes Alignment	CWD
1-25	Comparative line diagrams of alignment options	CWD
1-26	Four new alignment options	CWD, PB
1-27	City of Huntington Park proposed modifications	CHP
1-28	Malabar Street	GEP
1-29	Hewitt Street option	CWD, PB
1-30	San Pedro Street option	CWD, PB
2-1	Union Station aerial	Metro
2-2	Union Station Master Plan rendering	G+G
2-3	SCRIP Improvements	Metro
2-4	Union Station Master Plan with CAHSR	G+G
2-5	Union Station Master Plan cross-section (for zone WSAB added)	G+G
2-6	New Stations studied	CWD
2-7	Aerial with potential Arts District Stations	GEP
2-8	Washington Station site	GEP
2-9	Vernon Station site	GEP
2-10	Slauson Station site	GEP
2-11	Potential east-west bus transfer points	CWD
2-12	City of Huntington Park proposed modifications	CHP
2-13	Photos of Pacific/Randolph station area	PB
2-14	Conceptual plan for Randolph Street station	CWD
2-15	Existing cross section at Randolph St.	CWD
2-16	Proposed cross section for Randolph St. station	CWD
2-17	Photos of Florence/Salt Lake station area	GEP
2-18	Conceptual plan for Florence/Salt Lake station	CWD
2-19	Existing cross section at Salt Lake Avenue	CWD
2-20	Proposed cross section for station at Salt Lake Avenue	CWD
2-21	Aerial of New Green Line station context	CWD, GEP
2-22	Aerial with station concept overlay	CWD, GEP
2-23	Photos of New Green Line station area	GEP, PB
2-24	Concept plan for new WSAB and Green Line Station	AVA
2-25	Conceptual rendering of new WSAB and Green Line Station	AVA
2-26	Concept plan for vertical circulation	AVA
2-27	Cross-section through new Green Line station	AVA, CWD
2-28	Cross-section through new WSAB station	AVA, CWD
2-29	Potential freeway lane configuration	PB
2-30	Existing/Potential free lane configuration	PB
2-31	Southern alignment with Bloomfield Station	CWD, PB

## Figures

## Source

2-32	Photos of Pioneer Station area	CWD
2-33	Aerial of Pioneer Station context	CWD, GEP
2-34	Southern Terminus east of Pioneer Blvd	CWD
2-35	Southern Terminus west of Pioneer Blvd	CWD
2-36	Existing/Proposed cross-sections at Southern Terminus	CWD
2-37	Potential TOD at Southern Terminus	CWD
3-1	Graph of new transit trips & daily boardings by option	CWD
5-1	Five Key Issues	CWD
5-2	Comparative line diagrams of options	CWD
5-3	Study Findings	CWD

### Source Abbreviations

AVA = Anil Verma Associates, Inc.

CHP = City of Huntington Park

CWD = Cityworks Design

GEP = Google Earth Pro or Bing Maps

G+G = Gruen Associates with Grimshaw Architects

Metro = Metro or The Source

PB = Parsons Brinckerhoff

## Tables

		Source
ES-1	Key Alignment Characteristics	PB
ES-2	Summary of Assumptions per Alternative	PB
ES-3	Station Parking Spaces (Constrained)	PB
ES-4	Preliminary Cost Estimates	PB
ES-5	Key Characteristics for Six Alternatives	PB
1-1	Alignment Comparison Matrix	PB
3-1	Summary Alternative Assumptions for Travel Demand Model	PB
3-2	Station Parking Spaces (Constrained)	PB
4-1	Preliminary Cost Comparison by Alternative	PB
5-1	Alignment Comparison Matrix	PB
5-2	Key Findings	CWD

## Photos

		Source
Page		
i	Light Rail Example (Metro Gold Line Pico-Aliso Station)	PB
ES-1	LA Union Station	Metro
ES-19	Gateway East Portal	CWD
ES-20	Little Tokyo-Arts District Station	Metro
ES-20	Slauson Blue Line Station	CWD
34	Eastside Station Metro Gold Line	CWD
68	Union Station Passageway	CWD
73	See ES-19 and ES-20 above	
74	Metro Expo Line construction	CWD
92	Source documents	CWD

### Source Abbreviations

AVA = Anil Verma Associates, Inc.  
 CHP = City of Huntington Park  
 CWD = Cityworks Design  
 GEP = Google Earth Pro or Bing Maps  
 G+G = Gruen Associates & Grimshaw Architects  
 Metro = Metro or The Source  
 PB = Parsons Brinckerhoff

## Bibliography

---

### Metro West Santa Ana Branch Technical Refinement Study Reports

Proposed Alternate Station Location and Realignment Report, Final Rev. 2 (9/8/15)  
Cost Comparison Analysis Report, Final Rev. 1 (8/19/15)  
Northern Alignment Challenges Report, Final Rev. 2 (7/16/15)  
Travel Forecasting Results Report, Final (6/25/15)  
Union Station Access Memorandum, Final Rev. 1 (2/16/15)  
New Metro Green Line Station Challenges Report, Final (10/30/14)  
New Southern Terminus Station - Artesia, CA, Station Challenges Report, Final (10/30/14)  
WSAB Compatibility with Surrounding Land Uses Report, Final Rev. 1 (8/28/14)

### Metro References

Metro Rail Design Criteria  
Metro Rail Standard and Directive Drawings  
Metro Station Design Review (includes Kit of Parts), April 2012

### SCAG Alternatives Analysis

Pacific Electric ROW/West Santa Branch Corridor Report (2/7/13)  
Urban Design Report (3/16/12)





**Metro**<sup>®</sup>