Los Angeles County
Metropolitan Transportation Authority

West Santa Ana Branch Transit Corridor

Final EIS/EIR Appendix A: Alternatives Considered

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WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

Final EIS/EIR Appendix A: Alternatives Considered

March 2024

Final Environmental Impact Statement/ Environmental Impact Report

LEAD AGENCIES: Federal Transit Administration of the U.S. Department of Transportation; Los Angeles County Metropolitan Transportation Authority

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ACRONYMS AND ABBREVIATIONS

Acronyms	Definition
AA	Alternatives Analysis
BRT	bus rapid transit
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
DMU	diesel multiple unit
EIR	environmental impact report
EIS	environmental impact statement
EJ	environmental justice
FTA	Federal Transit Administration
HOV	high-occupancy vehicle
LRT	light rail transit
Metro	Los Angeles County Metropolitan Transportation Authority
MOS	minimum operable segment
O&M	operating and maintenance
OC/LA	Orange County/Los Angeles
OCTA	Orange County Transportation Authority
P3	public-private partnership
PEROW	Pacific Electric Right-of-Way
ROM	rough order of magnitude
ROW	right-of-way
SARTC	Santa Ana Regional Transportation Center
SCAG	Southern California Association of Governments
SP	Southern Pacific
TOC	transit-oriented communities
TOD	transit-oriented development
TRS	Technical Refinement Study
TSM/TDM	transportation systems management/transportation demand management
VMT	vehicle miles traveled
WSAB	West Santa Ana Branch

1 INTRODUCTION

This appendix, which is unchanged from the Draft EIS/EIR, summarizes the range of alternatives, including alignment and station locations, that were considered and eliminated during development of the West Santa Ana Branch Transit Corridor Project (Project). These alternatives were developed and evaluated in the following studies/planning efforts:

- Railroad Right-of-Way Evaluation Project (1989)
- Orange and Los Angeles Intercounty Transportation Study (2008)
- Pacific Electric Right-of-Way/West Santa Ana Branch Corridor Alternatives Analysis Report (2012)
- West Santa Ana Branch Transit Corridor Technical Refinement Study (2015)
- West Santa Ana Branch Transit Corridor Northern Alignment Options Screening Report (2017)
- West Santa Ana Branch Transit Corridor Northern Alignment Alternatives and Concepts Updated Screening Report (2018)
- Revised Final Evaluation of Minimum Operable Segment Report (2019)

This appendix also identifies the reasons alternatives were not carried forward.

A description of the studies, the alternatives evaluated, and findings for these efforts are summarized in Table 1.1. References to Metro rail lines reflect the line as it operated at the time of the study. Details on each study are presented in the subsequent sections.

Table 1.1. Summary of Prior Studies, Alternatives, and Findings

Study Name and Description	Alternatives Evaluated	Findings
SCAG Railroad Right-of-Way Evaluation Project (1989) Reviewed the Southern California regional rail network to identify potential corridors to provide frequent and/or all-day transit service. The study's conclusions help influence the current project definition.	**Potential transit routes** ▪ Metro-owned Pacific Electric Right-of-Way (PEROW) ▪ San Pedro Subdivision ▪ La Habra Branch ▪ Wilmington Branch **Potential transit modes** ▪ Rapid Transit ▪ At-grade Light Rail Transit (LRT) ▪ Busway/Guided Buses ▪ Monorails and Magnetic Levitation Systems	▪ Feasible to employ transit modes on former railroad rights-of-way. ▪ Commuter or regional rail could be operated without major modifications to tracks and systems. ▪ A WSAB transit route would serve both Los Angeles and Orange Counties. ▪ This route could extend/connect to Metro C (Green) and A (Blue) Lines.

Study Name and Description	Alternatives Evaluated	Findings
Orange and Los Angeles Intercounty Transportation Study (2008) Jointly managed by the Orange County Transportation Authority (OCTA) and Metro, this study identified potential projects for improving transportation infrastructure between the two jurisdictions.	▪ Transportation System Management (TSM)/ Transportation Demand Management (TDM) Concept ▪ Street-Rapid Bus Concept ▪ Freeway Concept ▪ Transit Concept ▪ Public-Private Partnership (P3) Concept	▪ The concepts should undergo detailed analysis and evaluation as part of future studies.
Pacific Electric Right-of-Way (PEROW)/West Santa Ana Branch Corridor Alternatives Analysis Report (2012) Developed by SCAG, this study established a purpose and need statement then identified and evaluated transit system alternatives within the PEROW/WSAB Corridor between Orange and Los Angeles Counties. The study conducted both an initial set and a refined set of alternatives evaluation.	**Initial Set of Conceptual Modes** ▪ Bus Rapid Transit (BRT) Street-Running ▪ Streetcar ▪ LRT ▪ Diesel Multiple Unit (DMU) ▪ Commuter Rail ▪ High-Speed System (Steel Wheel) ▪ High-Speed System (Maglev) **Refined Set of Modes** ▪ BRT ▪ Streetcar ▪ LRT ▪ Low Speed Maglev **Potential Alignments** ▪ East Bank – along east bank of the Los Angeles River (LA River) to Los Angeles Union Station ▪ West Bank 1 – along west bank of the LA River to Los Angeles Union Station ▪ West Bank 2 – along median of Randolph Street to Pacific Boulevard/Harbor Subdivision to west bank of LA River to Los Angeles Union Station ▪ West Bank 3 – along Harbor Subdivision to L (Gold) Line to Los Angeles Union Station	▪ BRT not recommended (insufficient capacity, low travel time savings) ▪ Streetcar not recommended (insufficient capacity, cannot interline with existing rail systems) ▪ LRT recommended (projected ridership and interlining ability) ▪ Low Speed Maglev not recommended (unproven technology, related cost and schedule impacts) ▪ West Bank Option 3 recommended (accessed greater number of destinations and connections) ▪ East Bank recommended (terminated at Los Angeles Union Station and less challenges/issues than other alignments)

Study Name and Description	Alternatives Evaluated	Findings
West Santa Ana Branch Transit Corridor Technical Refinement Study (2015) Developed by Metro and building on the earlier 2012 SCAG AA Study, the purpose of the study was to further refine the alternatives related to alignment, stations, ridership, and preliminary cost estimates within LA County.	**Potential Alignments** ▪ East Bank – along east bank of the Los Angeles River (LA River) to Los Angeles Union Station ▪ West Bank 3 – along Harbor Subdivision to L (Gold) Line to Los Angeles Union Station ▪ West Bank–Pacific/Alameda – along Pacific and Alameda Boulevards to Los Angeles Union Station ▪ West Bank–Pacific/Vignes – along Pacific Boulevard and Vignes Avenue to Los Angeles Union Station ▪ West Bank–Alameda – along the Metro A (Blue) Line right-of-way to Alameda Boulevard to Los Angeles Union Station ▪ West Bank–Alameda/Vignes – along the Metro A (Blue) right-of-way to Alameda Boulevard and Vignes Avenue to Los Angeles Union Station	▪ East Bank not recommended (right-of-way constraints from utilities and existing railroad operations) ▪ West Bank 3 not recommended (unable to have direct access to Los Angeles Union Station) ▪ West Bank alignments: Pacific/Alameda, Pacific Vignes, Alameda and Alameda/Vignes recommended (direct access to Los Angeles Union Station) ▪ Northern terminus at Los Angeles Union Station should be further studied. ▪ New stations should be further studied, including connection to the Metro C (Green) Line and a terminus at Pioneer Boulevard.
West Santa Ana Branch Transit Corridor Northern Alignment Options Screening Report (2017) Developed by Metro, this study refined vertical guideway configurations and station locations and evaluated/ screened northern alignment options based on project goals.	**Northern Alignment Concepts** ▪ East Bank ▪ West Bank 3 ▪ Pacific/Alameda ▪ Pacific/Vignes ▪ Alameda ▪ Alameda/Vignes	▪ East Bank not recommended (engineering challenges, constrained right-of-way due to utilities, infrastructure, and LA River) ▪ West Bank 3 not recommended (lower ridership, no direct access to Los Angeles Union Station) ▪ Pacific/Alameda recommended (moderate ridership potential with access to Arts District and Little Tokyo and relieves congestion on the Metro A (Blue) Line) ▪ Pacific/Vignes recommended (moderate ridership potential with access to Arts District and congestion relief near Metro A (Blue) Line) ▪ Alameda recommended (high ridership potentials

Study Name and Description	Alternatives Evaluated	Findings
		with access to Little Tokyo, Los Angeles Union Station, and relieves congestion on the Metro A (Blue) Line, and lower cost alternative) ▪ Alameda/Vignes recommended (moderate ridership potentials, new service to transit-dependent communities and direct connection to Los Angeles Union Station and relieves congestion on the Metro A (Blue) Line
West Santa Ana Branch Transit Corridor Northern Alignment Alternatives and Concepts Updated Screening Report (2018) This report was developed to refine alternatives in response to community comments received during the Project's public scoping period, as well as updates from Measure M's approval and advancement of projects.	**New Northern Alignment Concepts** ▪ Concept E: Alameda (underground) – along the Metro A (Blue) Line right-of-way to Alameda Street to Los Angeles Union Station ▪ Concept F: Alameda/Center – along the Metro A (Blue) Line right-of-way to Alameda Street then aerial approach to Los Angeles Union Station from the east ▪ Concept G: Downtown Transit Core – along the Metro A (Blue) Line right-of-way to Alameda Boulevard then underground approach to a terminus station near the Downtown Transit Core (7th/8th Streets) ▪ Concept H: Arts District/6th Street – along the Metro A (Blue) Line Blue right-of-way to then underground approach to a terminus station near the Metro Division 20 Rail Yard (Arts District/6th Street) **Earlier Northern Alignment Concepts** ▪ Concept A: Pacific/Alameda ▪ Concept B: Pacific/Vignes ▪ Concept C: Alameda ▪ Concept D: Alameda/Vignes	▪ Concept E: Alameda (underground) recommended (rated high on overall project goals) ▪ Concept G: Downtown Transit Core recommended (rated high on overall project goals) ▪ Concepts A, B, C, D, F and H eliminated from further study (insufficient interest/opposition from local jurisdictions, non-supportive surrounding land uses, urban design impacts, low ridership potentials, limited benefits to transit-dependent populations, and conflicting infrastructure). ▪ Additional refinements based on public scoping meetings and technical analysis performed included: – Washington, Vernon, and 183rd/Gridley Station removed from further study – Alignment to be aerial grade-separated over the I-10 Freeway – Additional aerial grade-separations added in the Southern Section – Pershing Square Station option removed from

Study Name and Description	Alternatives Evaluated	Findings
		further study given additional transfers needed to access regional rail services.
Revised Final Evaluation of Minimum Operable Segment Report (2019) The purpose of this report was to identify potential Minimal Operable Segment (MOS) concepts to incorporate into the EIS/EIR process. The MOS evaluation was conducted to determine a cost-effective solution that provided greatest benefits from the Project.	**MOS concepts considered** ▪ MOS 1: I-105/C (Green) Line Station to Pioneer Station ▪ MOS 2: Slauson Station to Bellflower Station ▪ MOS 3: Slauson Station to Pioneer Station ▪ MOS 4: Los Angeles Union Station to I-105/C (Green) Line Station ▪ MOS 5: Downtown Transit Core to I-105/C (Green) Line Station	▪ MOS 1: I-105/C (Green) Line Station to Pioneer Station recommended (cost effective, minimal environmental effects, and benefits providing new transit service to southern communities through Pioneer Station) ▪ MOS 3: Slauson Station to Pioneer Station recommended (benefits providing new transit service to southern communities through Pioneer Station) ▪ MOS 2, 4, and 5 not recommended (less cost effective, potential environmental impacts, modest ridership, would not connect to southern communities through Pioneer Station)

Source: TransLink 2020

2 RAILROAD RIGHT-OF-WAY EVALUATION PROJECT (1989)

2.1 Introduction

Developed in August 1989, the Railroad Right-of-Way Evaluation Project by the Southern California Association of Governments (SCAG) identified transportation corridors within the railroad network that could connect subregions, activity centers, and land use development. The Railroad Right-of-Way Evaluation Project (1989) conducted a historic review of the region's railroad right-of-way corridors, examined regional growth and traffic congestion trends, considered transit and joint development on rail right-of-way (ROW), and reviewed transit plans and priorities of Los Angeles and Orange Counties.

2.2 Alternatives Considered

This study examined Southern California's regional rail network to determine the most plausible railroad lines for future placement of major transit facilities. The report considered transit modes that could potentially provide frequent and/or all-day service, including busways, light rail transit (LRT), rapid transit, and unconventional fixed-guideway systems such as monorail or magnetic levitation (maglev). Several rail network segments within the West Santa Ana Branch (WSAB) Corridor were identified for future transit use, including:

- Southern Pacific (SP) West Santa Ana Branch from Lynwood in Los Angeles County southeast to the City of Santa Ana in Orange County
- Century Line (now C (Green) Line)
- LA-Long Beach Line (now Metro A (Blue) Line)
- Santa Ana Metro Rail Corridor

Figure 2-1 shows potential transit routes that were evaluated in the Railroad Right-of-Way Evaluation Project (1989). The potential transit routes identified were within the Pacific Electric Right-of-Way (PEROW), San Pedro Subdivision, La Habra Branch and Wilmington Branch within the WSAB Corridor.

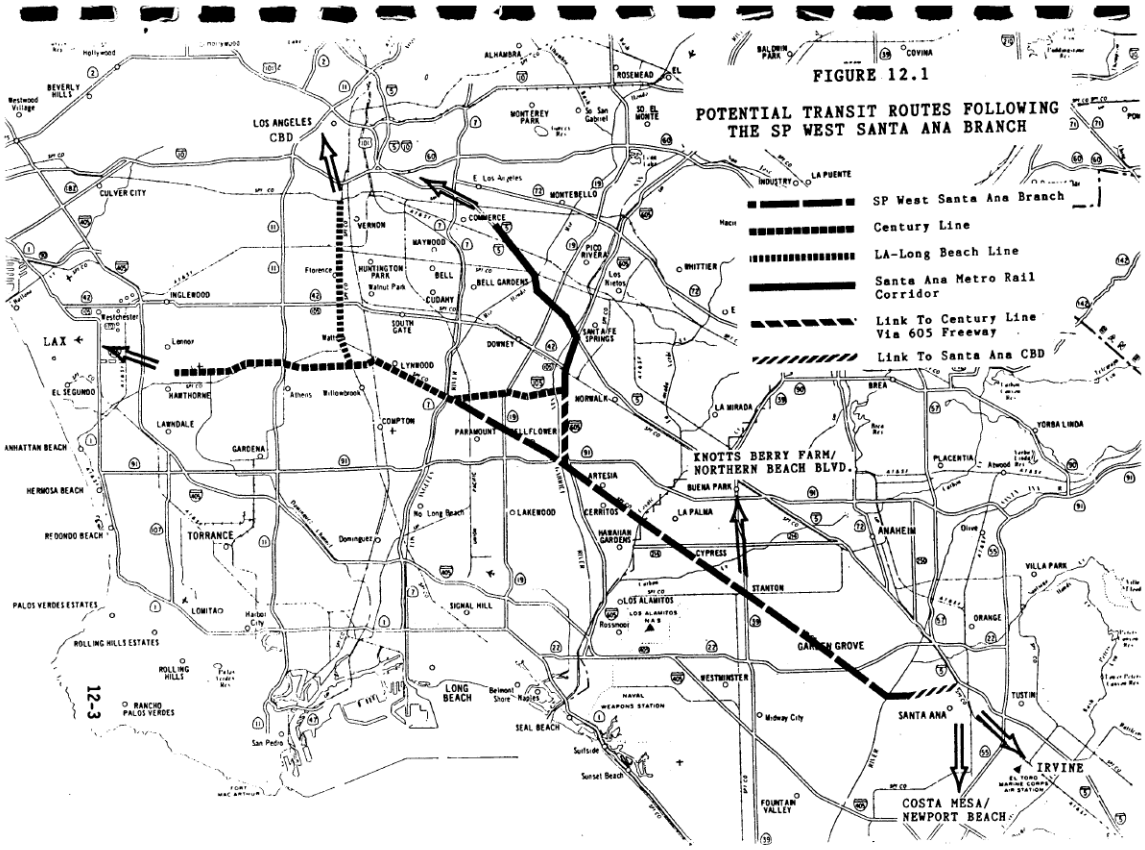
2.3 Findings

The Railroad Right-of-Way Evaluation Project (1989) concluded that it is feasible to employ any of the following transit modes within railroad ROW: rapid transit, at-grade LRT, busways, guided buses, and various new technologies such as monorails and magnetic levitation systems. In addition, it was determined that commuter or regional rail could be operated on existing routes of the general railroad system without major modifications to tracks and systems.

For the potential transit route identified as the SP West Santa Ana Branch, the study had the following conclusions that have influenced the current project:

- Formally the PEROW, SP West Santa Ana Branch was of particular interest as a diagonal route paralleling the heavily congested I-5 and I-405 Freeways.
- A WSAB transit route would serve several commercial, employment, educational, and residential nodes in Los Angeles and Orange Counties, including within the Cities of Bellflower, Cerritos, Cypress, Garden Grove, and Santa Ana.

Figure 2-1. Potential Transit Routes (1989)



Source: Railroad ROW Evaluation Project, Figure 12.1, SCAG (August, 1989)

- This route could extend to the Los Angeles International Airport area by way of the Los Angeles County Transportation Commission's[1] Century Freeway rail transit line (now Metro C (Green) Line) and to the City of Los Angeles' Central Business District via transfer to the Los Angeles-Long Beach light rail line (now Metro A (Blue) Line.

[1] Metro is the result of the 1993 merger of two previous LA County transportation agencies: Southern California Rapid Transit District and the Los Angeles County Transportation Commission.

3 ORANGE AND LOS ANGELES INTERCOUNTY TRANSPORTATION STUDY (2008)

3.1 Introduction

Finalized in July 2008, the Orange and Los Angeles (OC/LA) Intercounty Transportation Study explored alternatives for improving transportation infrastructure and services across the border between Orange and Los Angeles Counties. Jointly funded and managed by the Orange County Transportation Authority (OCTA) and Metro, the objectives of the study were to identify transportation needs and issues within the study area and to develop conceptual transportation improvements and strategies to address these needs.

The study included extensive coordination with the cities[2], technical staff, and elected officials as well as a public involvement process to identify transportation needs and development of potential improvements. The study was considered an initial/idea generation study to identify a wide range of potential projects. The projects were not subjected to an evaluation and screening process, but rather served as a baseline for the development of formal alternatives to be evaluated in future phases of study.

3.2 Alternatives Considered

Five conceptual alternatives and strategies were developed to address the mobility problems and needs identified as part of the study. The study area, along with the major transportation corridors are shown on Figure 3-1. The key strategies are summarized as follows:

- **Transportation System Management (TSM)/Transportation Demand Management (TDM) Concept** – Proposed projects included traffic signal coordination, park-and-ride facilities, bikeway improvements, and increased traffic monitoring.
- **Street-Rapid Bus Concept** – Proposed projects included arterial street widening, new rapid bus services, improved bus feeder services to Metrolink stations, and a grade-separated Bus Rapid Transit (BRT) service in the Metro-owned PEROW.
- **Freeway Concept** – Proposals included adding a lane in each direction to SR-91 and the I-405 and I-5 freeways either across or near the OC/LA county line.
- **Transit Concept** – Proposals included new BRT services and a fully elevated transit service in the Metro-owned PEROW. The new BRT routes would operate in exclusive travel lanes. A fully elevated transit service could either be BRT or LRT within the Metro-owned PEROW. The service would connect to the Metro C (Green) Line (see Figure 3-2).
- **Public-Private Partnership (P3) Concept** – Concepts included high-occupancy toll lanes in freeway corridors and high-speed transit service in the Metro-owned PEROW.

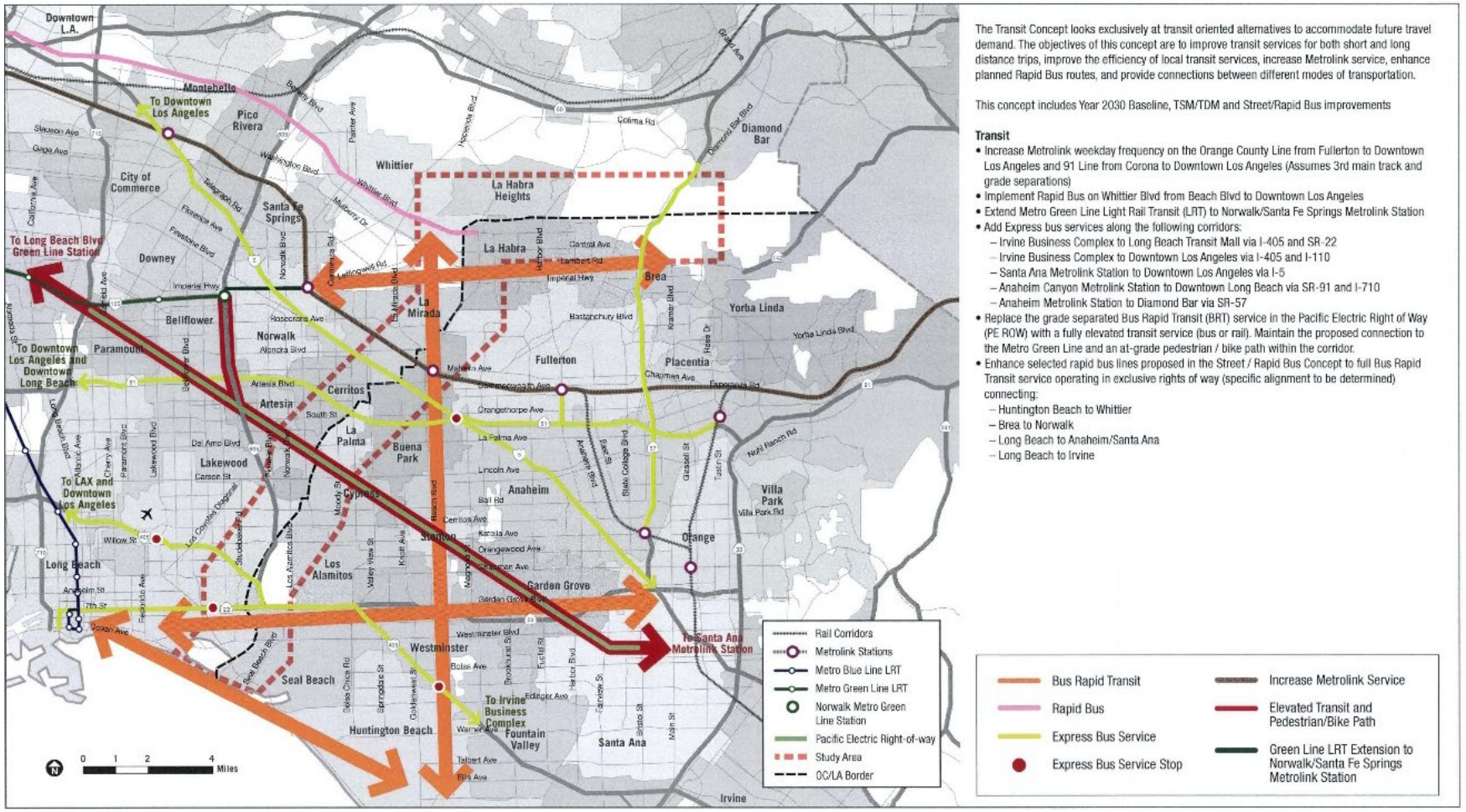
The conceptual alternatives and strategies were intended to provide Metro and OCTA with a starting point for the identification of improvements that would later undergo detailed analysis and evaluation as part of future studies, by each respective agency.

[2] Cities located near the county line in Orange County and Los Angeles County participated in this effort, as well as the California Department of Transportation (Caltrans) Districts 7 and 12, and the Gateway Cities Council of Governments.

Figure 3-1. Orange County/Los Angeles Intercounty Study Area (2008)

Source: OC/LA Intercounty Transportation Study, Exhibit 1-1, OCTA and Metro (July, 2008)

Figure 3-2. Orange County/Los Angeles Transit Concepts (2008)



Source: OC/LA Intercounty Transportation Study, Exhibit 3-6, OCTA and Metro (July, 2008)

3.3 Findings

Based on the public involvement/agency input, there were several hot spots/future transportation challenges identified. This study recommended future project development efforts, including the evaluation and screening of projects identified in the conceptual alternatives. Detailed studies to quantify performance, impacts, benefits, and costs of the proposed projects were recommended to determine the highest level of benefit and improvement to the transportation network.

4 PACIFIC ELECTRIC RIGHT-OF-WAY/WEST SANTA ANA BRANCH CORRIDOR ALTERNATIVES ANALYSIS REPORT (2012)

4.1 Introduction

Initiated in February 2010 and finalized in 2012, the Pacific Electric Right-of-Way/West Santa Ana Branch Corridor (PEROW/WSAB Corridor) Alternatives Analysis (AA) Report was developed by SCAG, in coordination with Metro and the OCTA. The purpose of this effort was to explore opportunities for connecting Los Angeles County and Orange County through the reuse of the PEROW/WSAB Corridor from Los Angeles Union Station in the north to the Santa Ana Regional Transportation Center (SARTC) in the south.

The study identified and evaluated a range of possible transit system alternatives and provided the public and decision-makers with technical information on the future PEROW/WSAB Corridor travel needs, plus the benefits and impacts of each of the proposed transit alternatives. The study process included three phases of evaluation to screen the possible alternatives down to the most viable alternative(s) that best met the identified purpose and need and project goals.

4.2 Alternatives Considered

4.2.1 Initial Set of Alternatives

Building on prior studies and reports, an initial set of eight concept modes/alternatives were developed and assessed based on high level technical and environment benefits/impacts. These alternatives are as follows:

- BRT Street-Running
- BRT High-Occupancy Vehicle (HOV) Lane-Running
- Streetcar
- LRT
- Diesel Multiple Unit (DMU)
- Commuter Rail
- Conventional Steel Wheel High-Speed Rail
- Magnetic Levitation (Maglev)

Through the first screening phase, the alternatives were evaluated on a "meet/does not meet" assessment of technical viability, purpose/policy fit, and public support (Table 4.1). For the first screening phase, BRT Street-Running and HOV Lane-Running concepts were combined; and the Commuter Rail, Conventional Street Wheel High-Speed Rail, and Maglev were combined as a "High-Speed Service" Concept Alternative.

Table 4.1. Summary of Initial Set of Conceptual Alternatives First Screening Results (2012)

Criteria	Conceptual Alternatives					
	BRT	STCR	LRT	DMU	CR	HSS
Community/stakeholder support and/or interest	●	✓	✓	✓	●	✓
Serves community and regional trips	✓	●	✓	✓	●	●
Provides fast travel service	■	■	✓	✓	✓	✓
Station spacing supports local economic development/revitalization goals	✓	✓	✓	✓	●	●
Accommodates peak and non-peak service needs	✓	✓	✓	✓	●	●
Compatible with current transit systems/plans	✓	■	✓	●	✓	■/●[1]
Compatible with freight rail operations	●	■	■	■	✓	■

Source: PEROW/WSAB Alternative Analysis Final Report, Table 2.1, SCAG (June 29, 2012)
Notes: BRT=bus rapid transit; STCR=streetcar; LRT=light rail transit; DMU= Diesel Multiple Unit; CR=commuter rail; HSS=high-speed service options, Conventional Steel Wheel High-Speed Rail Alternative and Magnetic Levitation High-Speed Alternative.
✓ Yes; ●No; ■Dependent on station spacing, vehicle selected, and operational decisions.
[1] The first symbol (■) represents the finding for the Conventional Steel Wheel High-Speed Rail Alternative; the second symbol (●) is for the Magnetic Levitation High-Speed Service Alternative

Concepts were defined at a planning level that included horizontal and vertical alignments and conceptual station locations in order to provide a comparative evaluation among alternatives. A comparative analysis was conducted and the initial level of assessment was presented for stakeholder and public input through a series of briefings, meetings, and work sessions in 2010 (Table 4.2). During advisory committee meetings held in March and April 2011, the Technical Advisory Committee recommended removal of three alternatives from further study: Urban Rail – DMU Option, High-Speed Service – Steel Wheel, and High-Speed Service – Maglev.

Table 4.2. Summary of Initial Set of Conceptual Alternatives Screening Results (2012)

Criteria		BRT	STCR	LRT	DMU	HSS	
						Steel Wheel	Maglev
Serves (trips):	**Local**	Yes	Yes	Yes	Yes	No	No
	Regional	Yes	No	Yes	Yes	Yes	Yes
Provides support for local plans		*	Yes	Yes	*	*	*
Requires minimal property acquisition		Less than 10	Less than 10	10-25	10-25	More than 125	More than 125
Has air quality benefits		Yes	Yes	Yes	No**	Yes	Yes
Fits with local transit system plans		Yes	Yes	Yes	No	No	No
Has State and Federally approved vehicles and U.S. operating system	**State**	Yes	No	Yes	Yes	Yes	Not yet
	Federal	Yes	Yes	Yes	Yes	Yes	Not yet
Range of conceptual daily ridership		19,200-32,400	26,000-39,000	26,000-57,600	26,000-57,600	2,400-4,800	2,400-4,800
Conceptual cost to build ($2010, billions)		$0.6-2.2[1]	$1.3-4.0[1]	$1.6-4.2[1]	$1.2-4.1[1]	$4.9	$5.9
Conceptual annual cost per rider		$20-50	$10-40	$10-50	$10-50	$460-920	$580-1,150

Source: PEROW/WSAB Alternative Analysis Final Report, Table 2.3, SCAG (June 29, 2012)
Notes: *Proven nationally and/or internationally
** Some regional benefits
BRT=bus rapid transit; STCR=streetcar; LRT=light rail transit; DMU= Diesel Multiple Unit; HSS=high-speed service options
[1] A range of construction costs was identified reflecting at-grade operations at the low end and grade-separated (subway) at the high end; aerial operations would fall mid-range. A single cost is provided for the HSS alternatives as Maglev operations require and Steel Wheel systems work best with grade-separated operations.

4.2.2 Final Set of Alternatives

The remaining set of alternatives were then evaluated through conceptual-level engineering and station design, and related technical and environmental efforts. The technical results were discussed in community and stakeholder outreach meetings to identify a refined set of alternatives in May 2012. The refined set of alternatives approved by the Project Steering Committee in June 2012 for further study included the following:

- **No Build** – Completion of transit, highway, and other transportation projects that have (at the time of the study) approved local, regional, state, and federal funding.
- **Transportation Systems Management (TSM)** – Maximize the use and effectiveness of the existing transportation system through a set of proposed transit, highway, bicycle, and pedestrian projects.
- **BRT** – High capacity, high-speed bus service primarily operating in dedicated lanes similar to the Metro G (Orange) Line in Los Angeles County.

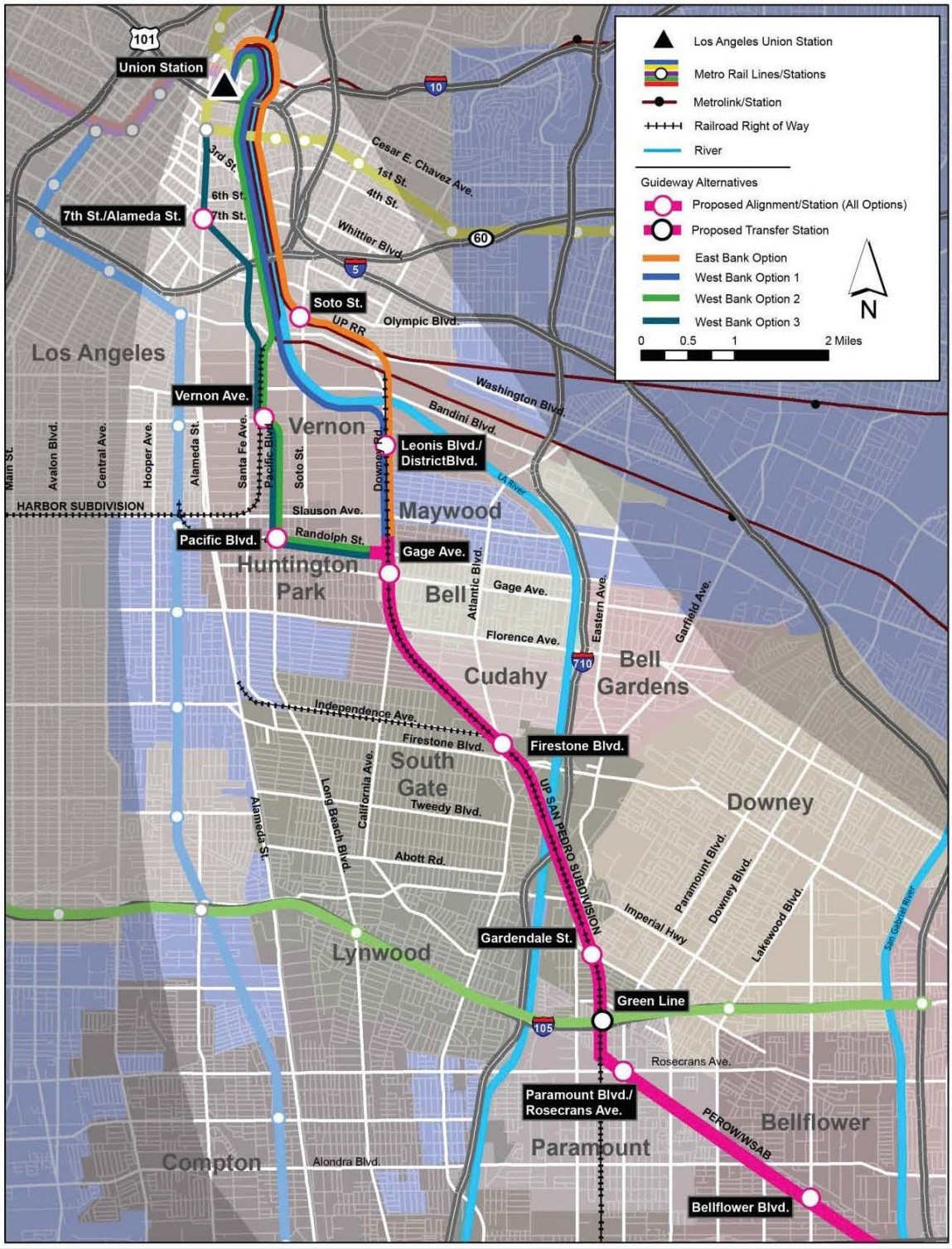
- **Streetcar** – Community-oriented rail system similar to what is now being implemented by the City of Santa Ana.
- **LRT** – Rail system similar to the L (Gold) Line and A (Blue) Line operated by Metro in Los Angeles.
- **Low Speed Maglev** – Service similar to the Linimo System operating in Nagoya, Japan.

In addition to the type of technology, there were four guideway route alternatives connecting north from the PEROW/WSAB Corridor right-of-way to Los Angeles Union Station and two options connecting south to the SARTC (Figure 4-1 and Figure 4-2). All guideway route options would use the San Pedro Subdivision between the City of Paramount to Randolph Street in the City of Huntington Park.

The four guideway route alternatives connecting north to Los Angeles Union Station are as follows:

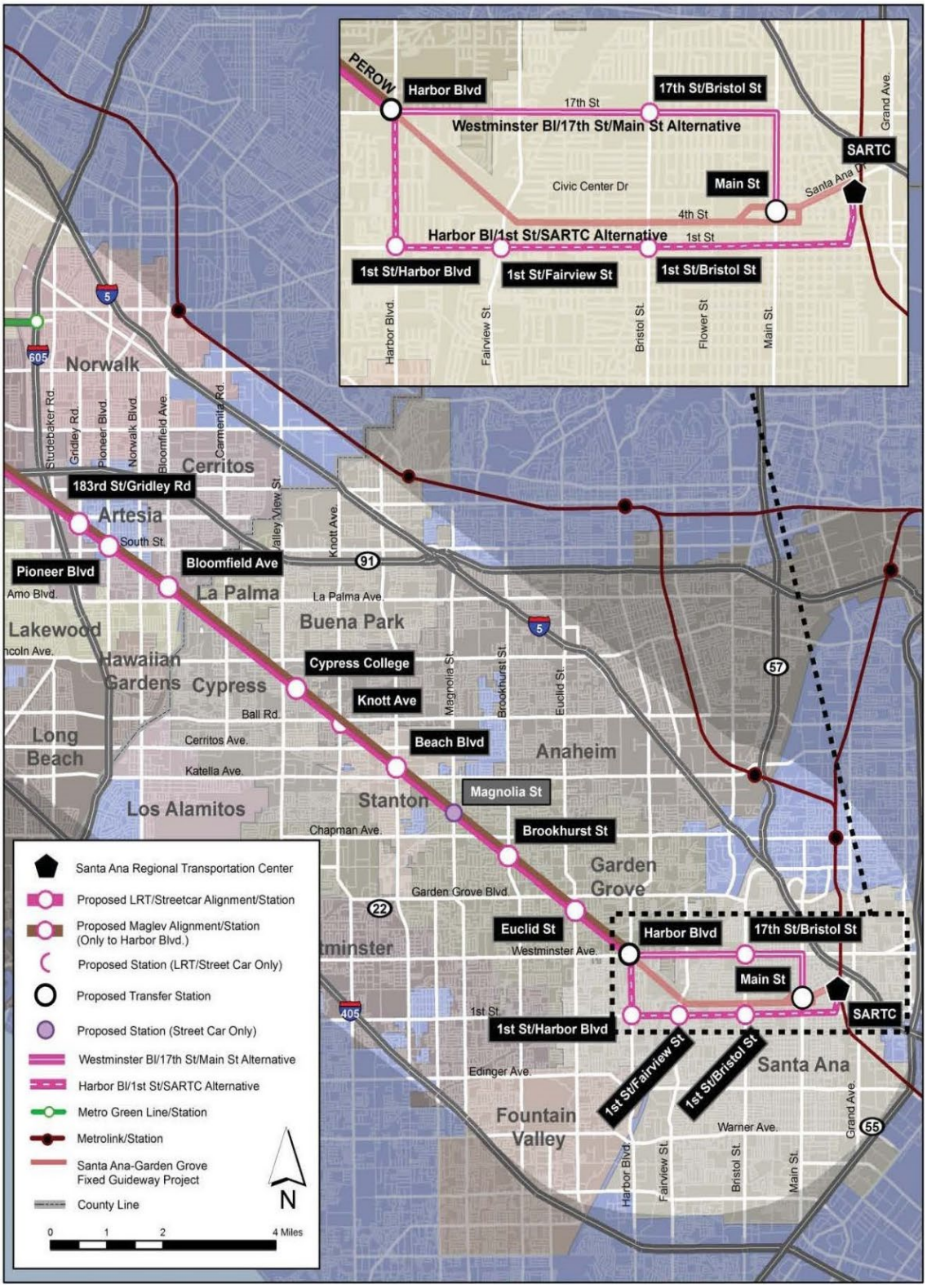
- The **East Bank Alternative** would operate north along the San Pedro Subdivision, cross a corner of the Hobart Intermodal Yard to intersect with a Union Pacific-owned right-of-way. This route option would share the Union Pacific right-of-way for a short distance, and then turn north to run along the east bank of the Los Angeles River in right-of-way owned by Metro and operated by Metrolink. It would cross the river to end at Los Angeles Union Station.
- The **West Bank Alternative** would operate north along the San Pedro Subdivision to either operate along the west bank of the Los Angeles River north to reach Los Angeles Union Station, or turn west to operate in the former railroad right-of-way in the median of Randolph Street, and then north along several street and railroad ROW alignment options to Los Angeles Union Station. The West Bank Alternative has three sub-options:
  - The **West Bank 1** option would operate along the west bank of the river to just beyond the Redondo Junction where it would share the Metro-owned PEROW to Los Angeles Union Station.
  - The **West Bank 2** option would turn west from the San Pedro Subdivision to run in the median of Randolph Street through Huntington Park, and then north to operate in the median of Pacific Boulevard, a former streetcar right-of-way to the Metro-owned Harbor Subdivision. It would use the Harbor Subdivision right-of-way under the Redondo Junction, and operate north similar to West Bank 1 option.
  - The **West Bank 3** alternative would have the same initial route as West Bank 2, but would continue north along the Harbor Subdivision, city streets, and private property in a combination of aerial and underground configurations to daylight south of the Metro L (Gold) Line Little Tokyo Station where it would use the existing at-grade Gold Line tracks to reach Los Angeles Union Station.

Figure 4-1. Northern Connection Area Alignment Alternatives (2012)



Source: PEROW/WSAB Alternative Analysis Final Report, Figure 2.9, SCAG (June 29, 2012)

Figure 4-2. Southern Connection Area Alignment Alternatives (2012)



Source: PEROW/WSAB Alternative Analysis Final Report, Figure 2.10, SCAG (June 29, 2012)

The two guideway options connecting south to SARTC in Orange County are as follows:

- **Westminster Boulevard/17th Street/Main Street** – From the Harbor Boulevard Station, the alignment would travel east on Westminster Boulevard/17th Street to Main Street where it would turn south to interface with the Main Street Station. Passengers would transfer to the streetcar system to reach the SARTC.
- **Harbor Boulevard/1st Street/SARTC** – From the Harbor Boulevard Station, this alignment would travel south on Harbor Boulevard, turn east on 1st Street, and north on a realigned Santiago Street to the SARTC where passengers could transfer to streetcar, Metrolink, and Amtrak services, along with OCTA and international bus services.

More detailed definition information on the set of technology and alignment alternatives can be found in Chapter 2.0 of the PEROW/WSAB AA Final Report (2012).

4.3 Stakeholder/Community Input

Community and agency input were integral in shaping the PEROW/WSAB AA process. Comments were received and documented over the course of the 27-month study at meetings and work sessions with elected officials, stakeholders, advisory committee members, and the public. The following major project themes were identified during the outreach efforts:

- The No Build Alternative was preferred by some northern Orange County residents living along the PEROW/WSAB Corridor right-of-way. Residents expressed significant concerns about implementing a transit system adjacent to their residences, which they felt could negatively impact their quality of life and property values. The key concerns expressed were related to noise, vibration, and traffic impacts.
- BRT was seen as a pragmatic and sensible option, but with significant obstacles to successful implementation. In particular, BRT was viewed possibly as a good solution due to its relatively low cost to build and operate, and perceived shorter construction time. However, BRT received lackluster support because many people expressed doubts that the negative public perception of buses could be overcome. Community members doubted its efficiency without dedicated lanes beyond the PEROW/WSAB Corridor right-of-way.
- Although not widely considered a right fit for the PEROW/WSAB Corridor, streetcar service was viewed favorably. Participants liked the streetcar vehicle, and its slow travel speed was viewed as possibly having less community and environmental impacts than the other alternatives. However, a majority of the community members did not see it as a right fit for this corridor. The slow travel speed and frequent stops were perceived as meeting local transit needs, but not as addressing regional transportation needs viewed as essential for connecting the PEROW/WSAB Corridor communities.
- Strong support was expressed for LRT based on its potential for serving all of the community's transportation needs. Community members indicated the strongest preference for the LRT option. Many considered it to be an efficient system that would provide the right balance between local and regional service for communities along the PEROW/WSAB Corridor. Participants felt the station spacing would support community economic development and revitalization needs. LRT was viewed as a familiar technology that has been proven successful locally.

- A High-Speed Maglev Alternative was presented, with many participants expressing that it was an unreasonable solution, but others suggesting a lower speed option that could meet community needs. Participants were not generally supportive of high-speed maglev service, and some people proposed a low-speed maglev system option that would have more station stops. Those participants felt that it was more of a cutting-edge approach and would provide cleaner and quieter service. Others expressed concerns that the technology was unproven in the U.S. and would be incompatible with existing system.

4.4 Comparative Analysis

Utilizing the corridor-specific goals, evaluation criteria and performance measures were identified in conjunction with elected officials, stakeholders, and the public. The criteria were intended to reflect the broad range of benefits and impacts that would be realized by the implementation of each of the alternatives. The criteria and performance measures were presented in categories that corresponded to the Federal Transit Administration (FTA) New Starts project evaluation categories (Table 4.3). The categories included:

- **Public and Stakeholder Support** – The level of community, stakeholder, and jurisdictional support for the project.
- **Mobility Improvements** – Improve local and regional mobility and accessibility as measured by: provide another travel option; connect to the regional transit system; serve both community and regional trips; increase access to and from corridor destinations and activity centers; provide a fast travel speed; provide related pedestrian and bicycle facilities.
- **Cost-Effectiveness/Sustainability** – Provide a cost-effective solution where project costs are balanced with expected benefits, and the project funding needs fit within available funding resources.
- **Land Use/Economic Plans** – Implement a project that supports local and regional land use and development plans and policies. Provide station location and spacing that supports local economic development and revitalization plans and goals.
- **Project Feasibility** – Assess the fit with current local transit system operations or plans, has state and federally approved vehicles, and is operational in the U.S.
- **Environmental and Community Impacts** – The extent to which the project provides additional travel capacity while minimizing environmental and community impacts, balancing distribution of benefits, impacts, and costs by mode, household income, and race/ethnicity.

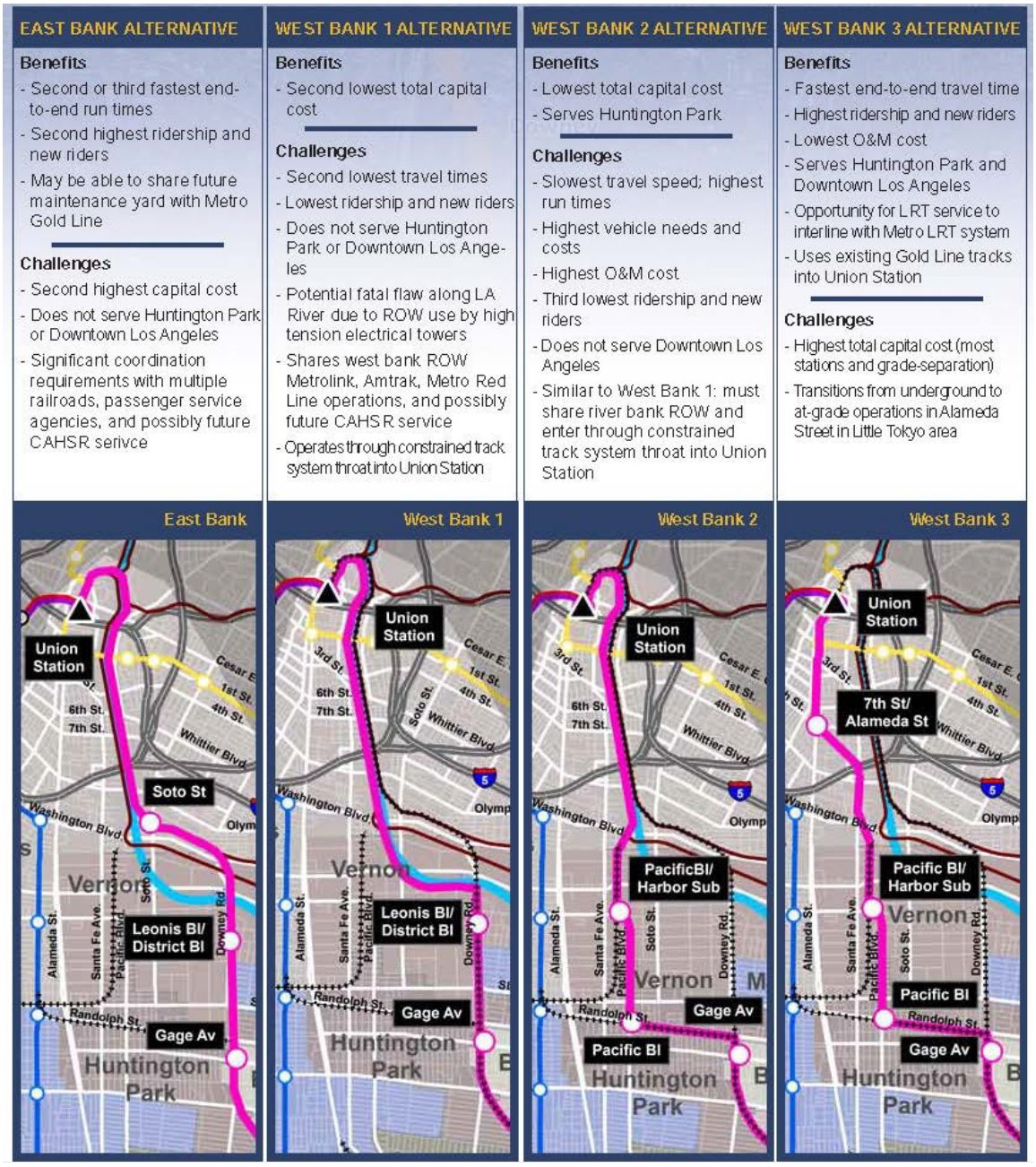
Table 4.3. Final Screening Evaluation Criteria (2012)

Criteria	Performance Measures
1. Public and Stakeholder Support	▪ Provide a desirable solution to the community and stakeholders. ▪ Have city/jurisdictional support.
2. Mobility Improvements	▪ Improve travel speeds and reduce travel times. ▪ Provide connections to the regional rail system. ▪ Increase range of transportation options. ▪ Serve current and future travel growth and patterns. ▪ Serve both community and regional trips. ▪ Make transit a viable alternative as measured by resulting ridership and new riders. ▪ Increase access to and from Corridor activity centers and destinations. ▪ Increase service for transit-dependent Corridor residents. ▪ Provide improved cross-county line transit service. ▪ Provide an integrated pedestrian and bicycle system.
3. Cost Effectiveness/ Sustainability	▪ Balance project costs with expected benefits – resulting construction and operating costs are balanced by strong ridership (cost effectiveness). ▪ Identify transportation alternatives that are financially sustainable with identified resources.
4. Land Use/Economic Plans	▪ Provide station spacing that supports local economic development and revitalization plans and job strategies. ▪ Serve areas with transit-supportive land use policies.
5. Project Feasibility	▪ Fit with current local transit system operations or plans. ▪ Has state and federally approved vehicles, and is operational in the U.S.
6. Environmental Benefits and Impacts	▪ Minimize environmental/community impacts. ▪ Improve air quality by reducing tailpipe and Greenhouse Gas emissions. ▪ Minimize the number of properties to be acquired. ▪ Assess environmental justice impacts.

Source: PEROW/WSAB Alternative Analysis Final Report, Table 7.1, SCAG (June 29, 2012)

A comparative analysis was then conducted for each of the proposed transit alternatives. The alternatives were defined by technology and guideway alignments route option on an AA-level with conceptual (e.g., 5 percent) engineering and operating design and station location. Below is a summary of the benefits and challenges described by alignment alternative (Figure 4-3) and then a more detailed summary of technology results by alignment alternative (Table 4.4).

Figure 4-3. Benefits and Challenges by Alignment Alternative (2012)



Source: PEROW/WSAB Alternative Analysis Report, Initial Executive Summary, SCAG (March 16, 2012)

Table 4.4. Summary of Final Screening Results (2012)

Criteria	TSM	BRT		Streetcar		LRT		Maglev	
		Street	HOV	East Bank	West Bank 3	East Bank	West Bank 3	East Bank	West Bank 3
Alignment Length (miles)	206	38.2	39.0	35.2	34.5	35.2	34.5	29.7	29.2
Number of Stations	Varies	27	22	23	24	22	23	17	18
End-to-End Run Time[1]	Varies	1:21:11	1:18:30	1:09:55	1:07:15	1:02:09	1:00:12	43:06[2]	43:00[2]
Average Speed (mph)	Varies	32.4	32.6	30.7	31.1	35.2	34.5	40.2	40.2
Daily Boardings	85.580	57.340	67,210	77,545	79,600	84,900	87,150	74,020	75,990
New Riders	35,820	18,120	26,640	28,900	28,950	32,730	32,780	28,430	28,430
Cost to Rider ($2011)	Varies[3]	$1.50	$2.45[4] - $3,00[5]	$1.50	$1.50	$1.50	$1.50	$1.50 - $8.75[6]	$1.50 - $8.75[6]
Corridor Boardings	100,670	126,000	133,680	133,035	140,180	144,670	147,340	142,360	146,150
Cost to Build ($2010, millions)	$249	$1,075	$1,082	$2,575	$2,918	$2,969	$3,216	$6,620	$7,476
Annual Operating Cost ($2011, millions)	$56.9	$41.6	$53.1	$217.9	$217.5	$216.0	$204.0	$152.3	$151.9
Cost-Effectiveness Index	$8.15	$20.47	$16.60		$51.44	$48.26	$48.23		$89.90
Acquisition	Minor	0-10	0-15	15-20	15-20	15-20	15-20	50-70	50-70
Noise and Vibration	Minor	Minor	Minor	Medium	Medium	Major	Major	Minor	Minor
Visual and Privacy	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Major	Major
AQ and Climate Change Benefits	Minor	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Impacts	Major	Major	Major	Major	Major	Major	Major	Minor	Minor
Other Impacts[7]	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Major	Major

Criteria	TSM	BRT		Streetcar		LRT		Maglev	
		Street	HOV	East Bank	West Bank 3	East Bank	West Bank 3	East Bank	West Bank 3
Transfers - Union Station	1	1	1	1	1	0	0	1	1
Transfers - SARTC	1	1	1	1	1	1	1	2	2

Source: PEROW/WSAB Alternative Analysis Final Report, Table 7.16, SCAG (June 29, 2012)
Notes: BRT=bus rapid transit; HOV=high-occupancy vehicle; LRT=light rail transit; mph=miles per hour; TSM=transportation systems management
[1] Union Station – SARTC
[2] Union Station – Santa Ana Streetcar Harbor Boulevard Station.
[3] TSM Alternative includes local, limited stop, and intercounty express service.
[4] Metro Silver Line fare.
[5] OCTA Intercounty Express Route fare.
[6] Private Operator fare.
[7] Other impacts include: Land Use, Economic Development, Cultural Resources, Parks and Recreation Resources, Energy, Safety and Security, and Environmental Justice and Equity

4.5 Findings

Based on the technical evaluation results and community and stakeholder input, recommendations on technology, alternative descriptions, and phasing were developed in collaboration with advisory committees. The following recommendations were approved by the SCAG Transportation Committee and Regional Council in February 2013:

- **No Build Alternative was required** to move forward to provide a baseline comparison in future environmental evaluation study efforts.
- At the time of the final report, the **TSM Alternative was required** to move forward to provide a baseline comparison in future environmental evaluation study efforts.
- **BRT Alternative was not recommended for further study** as this alternative was found to not provide sufficient capacity to accommodate future corridor ridership. Although this alternative had the lowest initial capital cost, vehicle replacement costs would be needed every 12 to 15 years. The alternative was also found to have low travel time savings and would not support city economic development and revitalization needs and efforts. In particular, the cities were not supportive of BRT due to three key reasons: they did not support any transit system use of the right-of-way; they felt BRT services would work better and integrate more closely with local bus services on city streets; or they wanted the right-of-way preserved for future use by a high-capacity guideway system.
- **Streetcar Alternative was not recommended for further study** primarily because the community-based alternative would not serve regional corridor trip purpose and length. It would not provide sufficient capacity to accommodate future ridership demand due to required single car operations. This alternative could not interline with the existing Metro rail system and facilities due to the low-floor design and different catenary requirements, and would require all new facilities. The capital cost would also be similar to the LRT Alternative, but would not provide the same capacity needed to serve forecasted ridership.
- **LRT Alternative was recommended for further study** based on projected ridership and ability to provide sufficient capacity. The LRT would allow for interlining with the Metro rail system and use of existing facilities and operational experience. It was the most cost-effective of the guideway alternatives, and had the highest community and stakeholder support among all of the alternatives. Although noise and vibration and traffic impacts would likely need to be addressed, this may be offset with the anticipated mobility benefits to the region.
- **Low Speed Magnetic Levitation Alternative was not recommended for further study** primarily due to the cost and uncertainty of using an unproven technology. This new type of technology in the U.S. would need to meet federal and state regulation which would have related cost and schedule impacts. The alternative also scored lowest on cost-effectiveness based on projected cost and ridership forecasts. The alignment would need to be completely grade-separated, therefore constraining local development plans. Visual impacts would likely be significant, particularly near environmental justice communities along the San Pedro Subdivision, north of the Metro C (Green) Line. This alternative would require the acquisition of a large number of residential properties to accommodate system requirements. In some cases, the required height of the system to cross over freeways may preclude some stations. Additionally, OCTA indicated that this alternative will not be considered or approved based on its adopted principles on transit technologies in its 2010 Long-Range Transportation Plan.

Finalized in February 2013, this study recommended the No Build, TSM, and two LRT alignments for further study: West Bank Option 3 (West Bank 3) and East Bank. 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 alignment was also recommended because it terminated at Los Angeles Union Station. Although the East Bank had some challenges, it had less issues than the other alignments and was deemed a viable second alternative.

5 WEST SANTA ANA BRANCH TRANSIT CORRIDOR TECHNICAL REFINEMENT STUDY (2015)

5.1 Introduction

Finalized in July 2015, the WSAB Corridor Technical Refinement Study (WSAB TRS) was a focused study to further refine key technical concerns on alternatives identified in the PEROW/WSAB AA Final Report (2012) within Los Angeles County. Developed by Metro, the WSAB TRS was conducted in coordination with affected stakeholders including Eco-Rapid Transit[3], corridor cities, and Caltrans.

The purpose of the study was to refine the definition of alternatives related to alignments and station locations as well as further analyze travel forecasts and preliminary cost estimates. The WSAB TRS also considered the feasibility of additional alignments connecting the PEROW to downtown Los Angeles given constraints and opportunities within the northern segment. Metro used the results of this study to advance alternatives to the next phase of evaluation.

5.2 Stakeholder Coordination

Throughout the study process, Metro met regularly with the key stakeholders in the corridor, including Eco-Rapid Transit, Caltrans, and city staff from Los Angeles, Vernon, Huntington Park, South Gate, Paramount, Cerritos, and Artesia. The stakeholder input was critical to validating results of the study, incorporating local knowledge of planned projects, and general feasibility of design options considered. Additional coordination was conducted with Metro staff to discuss ongoing projects in the corridor, including the Los Angeles Union Station Master Plan, Southern California Regional Interconnector Project, and California High-Speed Rail.

The alignments evolved based on input received during stakeholder meetings, particularly for the West Bank 3 alignment. This input included requesting consideration of options within the Santa Fe Corridor and alignments that would run parallel to the Metro A (Blue) Line Corridor.

As a result, a total of six alignment options were studied in the WSAB TRS, including West Bank 3, East Bank, and four alignment variations of the West Bank (Figure 5-1).

[3] Eco-Rapid Transit, formerly known as the Orangeline Development Authority, is a joint powers authority (JPA) created to pursue development of a transit system between Burbank/Glendale and Artesia.

Figure 5-1. Six Alignment Options (2015)

Source: WSAB TRS, Figure 1-2, Metro (July 2015)

5.3 Alignment Studies

The six alignment options (two carried over from the PEROW/WSAB AA Final Report (2012), and four new West Bank options) analyzed are described as follows:

- **East Bank** – This alignment starts at Los Angeles Union Station and continues south on the eastern side of the Los Angeles River within existing Metro right-of-way. It then continues farther south within existing railroad right-of-way owned by others starting at approximately the Metro Soto station until the southern terminus in the City of Artesia.
- **West Bank 3** – This alignment starts south of Los Angeles Union Station within the Little Tokyo district and continues south above or within existing streets, under private property, and within Metro right-of-way until the center of the City of Huntington Park. From there, it transitions to existing railroad right-of-way owned by others to the southern terminus in the City of Artesia.
- **West Bank–Pacific/Alameda (New)** – This alignment starts at Los Angeles 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 there, it transitions to existing railroad right-of-way owned by others until the southern terminus in the City of Artesia.
- **West Bank–Pacific/Vignes (New)** – This alignment starts at Los Angeles 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 there, it transitions to existing railroad right-of-way owned by others until the southern terminus in the City of Artesia.
- **West Bank–Alameda (New)** – This alignment starts at Los Angeles Union Station and continues south along Alameda Street until the I-10 Freeway where it transitions into the Metro A (Blue) Line right-of-way until the west side of the City of Huntington Park. From there, it transitions to existing railroad right-of-way owned by others until the southern terminus in the City of Artesia.
- **West Bank–Alameda/Vignes (New)** – This alignment starts at Los Angeles 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 A (Blue) Line right-of-way until the west side of the City of Huntington Park. From there, it transitions to existing railroad right-of-way owned by others until the southern terminus in the City of Artesia.

All six alignments were evaluated in terms of differentiating features, surrounding land uses, and key challenges. Table 5.1 shows the initial evaluation conducted on the alignment options.

Table 5.1. Initial Evaluation of Alignment Options (2015)

Alternative	Differentiating Feature	Land Use	Key Challenges
East Bank	▪ Access to Union Station from north via east bank of LA River	▪ Institutional ▪ Industrial ▪ Manufacturing	▪ Circuitous route into Union Station from north and to be determined station location ▪ Issues of shared ROW (UPRR) and high-tension power lines
West Bank 3	▪ Access to Little Tokyo via Pacific Blvd to 7th St., then Alameda St. to 1st/Central	▪ Commercial ▪ Multi-family residential ▪ Industrial ▪ Single-family residential	▪ Transfer required to reach Union Station ▪ Tunneling in area with potential for high water table ▪ Crossover and under private property
West Bank – Pacific/Alameda	▪ Access to Union Station via Pacific Blvd, 4th St., then Alameda St.	▪ Institutional ▪ Commercial ▪ Multi-family residential ▪ Industrial ▪ Live-work	▪ Potential impacts of aerial structure in Little Tokyo ▪ Support columns in Alameda St. may require elimination of left turns ▪ City concerns about affecting truck traffic on Pacific Blvd.
West Bank – Pacific/Vignes	▪ Access to Union Station through the Arts District	▪ Industrial ▪ Live-work ▪ Multi-family residential ▪ Commercial ▪ Single-family residential	▪ Street closures north of 1st St. ▪ Tunnel/station under Santa Fe ▪ City concerns about affecting truck traffic on Pacific Blvd.
West Bank – Alameda	▪ Access to Union Station ▪ Direct connection with Metro A (Blue) Line at 3 shared Metro stations	▪ Institutional ▪ Commercial ▪ Multi-family residential ▪ Industrial ▪ Single-family residential	▪ Potential impacts of aerial structure in Little Tokyo ▪ Construction within private properties from Alameda St. to Long Beach Ave. connection ▪ Increase in Metro ROW for Metro A (Blue) Line and WSAB
West Bank – Alameda/Vignes	▪ Access to Union Station via Metro A (Blue) Line and Arts District ▪ Direct connection with Metro A (Blue) Line at 3 shared Metro stations	▪ Industrial ▪ Live-work ▪ Multi-family residential ▪ Single-family residential	▪ Cut and cover impacts in Arts District ▪ Construction within private properties from Alameda St. to Long Bank Ave. connection ▪ Increase in Metro ROW for Metro A (Blue) Line and WSAB

Source: WSAB TRS, Table 1-1, Metro (July 2015)
Notes: LA=Los Angeles; ROW=right-of-way; UPRR=Union Pacific Railroad; WSAB=West Santa Ana Branch

Note that additional alignment segments were considered along several of the alternatives, but were found to have more challenges than benefits. Stakeholders provided the following input and recommendations:

- The City of Huntington Park and City of Vernon were concerned with at-grade crossings affecting truck/goods movement traffic on the northern segment on Pacific Boulevard. As such, **a new modified alignment west was considered along Randolph Street to Santa Fe Avenue**, then to the Harbor Subdivision to Los Angeles Union Station (West Bank–Alameda, and West Bank–Alameda/Vignes).
- Based on suggestions from the City of Huntington Park, the potential use of Malabar Street between Randolph Street and the Harbor Subdivision was evaluated. However, with right-of-way constraints and surrounding conflicts with land uses, existing parcels would need to be acquired and removed. As such, **this alignment segment was eliminated from further consideration.**
- A variation of the West Bank (Pacific/Alameda and Alameda Options) was explored utilizing Hewitt Street instead of Alameda Street to connect Los Angeles Union Station to Little Tokyo. However, due to right-of-way conflicts with the aerial structure's proximity to multi-story buildings and a bus maintenance facility, **the variation was eliminated from further consideration**.
- In response to the City of Los Angeles request, an alignment along San Pedro Street between Los Angeles Union Station and the West Bank (Alameda Option) in Huntington Park was considered. After analysis, this option was deemed to have significant challenges, including removal of travel lanes and a narrow public right-of-way. As such, **this alignment segment was eliminated from further consideration**.

Following technical analysis of the alignment alternatives and input from the affected stakeholders, the new West Bank alignment alternatives were recommended for further study. Table 5.2 presents the key findings from the analysis conducted on the alignment options.

Table 5.2. Key Findings of Alignment Options (2015)

Alternative	Number of Stations	Length (miles)	Travel Time (minutes)	Estimated Daily New Trips (2040)	Estimated Daily Boardings (2040)	Preliminary Cost Estimate ($2015 millions)
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

Source: WSAB TRS, Table 5-2, Metro (July 2015)

5.4 Station Studies

Building on initial stations identified in the PEROW/WSAB AA Report (2012), the WSAB TRS analyzed the feasibility of a northern terminus station within Los Angeles Union Station and new LRT stations near downtown Los Angeles, Huntington Park (along Randolph Street), Paramount (along Metro C (Green) Line, and a southern terminus station in Artesia. The following summarizes the analysis conducted with respect to the stations:

- **Los Angeles Union Station Northern Terminus:** Analysis was conducted to determine where within Los Angeles Union Station a new light rail platform could be added to serve as the northern terminus for the WSAB project. In coordination with Metro's Los Angeles Union Station Master Plan and Rail Planning staff, two potential zones for a new WSAB Terminus Station LRT platform were identified: above a relocated bus plaza[4], or above the Metro L (Gold) Line Station Platform.
- **New Stations for Alignment Options:** With the four new alignment options, several new station locations were identified: Arts District station (three possible locations), Washington station, Vernon station, and Slauson station (near Metro A (Blue) Line), and a potential station between Arts District and Pacific/Randolph station. The City of Huntington Park proposed alternate station locations on Randolph Street east of Pacific Boulevard and a station south of Florence Avenue in the center of Salt Lake Avenue (Figure 5-2).
- **New Metro C (Green) Line Station:** Analysis was conducted to determine the feasibility and challenges associated with a new Metro C (Green) Line Station within the median of the I-105 freeway east of the I-105/I-710 interchange. This station would provide a direct transfer to the WSAB Transit Corridor aerial station proposed immediately above it.
- **New Southern Terminus Station in the City of Artesia:** The PEROW/WSAB Corridor AA Report originally included a station in the City of Cerritos at Bloomfield Avenue to serve as the southern terminus of the WSAB Transit Corridor. At the request of the City of Cerritos, Metro removed this station and recommended the City of Artesia as the line's southern terminus (with a final station at Pioneer Boulevard). Additional study was conducted to determine how the Pioneer Station, originally conceived as a through-station, would function as a terminus station.

[4] Relocated bus plaza based on plans described in the Los Angeles Union Station Master Plan. Metro, 2014. Available: https://media.metro.net/projects_studies/union_station/images/20141023rbmitem19.pdf

Figure 5-2. New Stations for Alignment Options (2015)

Source: WSAB TRS, Figure 2-6, Metro (July 2015)

5.5 Findings

Based on the technical evaluation results and input from the affected stakeholders, the following key findings were a result of the study:

- **East Bank alignment was not recommended to move forward** due to right-of-way constraints from existing railroad usage, adjacent high-tension power lines, and adjacent commercial buildings that would make expansion of the right-of-way expensive and/or unattainable.
- **West Bank 3 alignment was not recommended to move forward** as its northern terminus would be unable to have direct access to Los Angeles Union Station resulting in low ridership.
- **West Bank–Pacific/Alameda, West Bank–Pacific/Vignes, West Bank–Alameda, and West Bank–Alameda/Vignes warranted further study** as these alignments have the ability to connect to Los Angeles Union Station and the Arts District based on initial analysis conducted for stations, length, travel time, cost, and estimated boardings.
- **Two platform locations were both recommended to be carried forward for the Los Angeles Union Station.** Due to site constraints, a northern terminus at Los Angeles Union Station would need to be located behind the historic Los Angeles Union Station terminal building (east of the Municipal Water District building or above the Metro L (Gold) Line Station Platform).
- **New stations for the West Bank alignment options were recommended to be further studied** including: Arts District station (three possible locations), Metro A (Blue) Line transfer stations (three possible locations), a potential station between Arts District and Pacific/Randolph station (three possible locations), and a potential station at Florence and Salt Lake Avenues.
- **A new Metro C (Green) Line Station was recommended to be further advanced.** The new C (Green) Line Station was based on conceptual plans that would connect the WSAB corridor to the C (Green) Line and will require more detailed planning and design evaluations with Caltrans.
- **Pioneer Station was recommended to be further studied** as the 5 percent level of conceptual design deemed the station as a feasible southern terminus.

6 WEST SANTA ANA BRANCH TRANSIT CORRIDOR NORTHERN ALIGNMENT OPTIONS SCREENING REPORT (2017)

6.1 Introduction

The purpose of the West Santa Ana Branch Transit Corridor Northern Alignment Options Screening Report (Northern Alignment Screening Report) (2017) was to refine vertical guideway configurations and to evaluate and screen the northern alignment options identified in the WSAB TRS (2015) under a similar alternative analysis screening process conducted during the WSAB AA Study (2012). This work was conducted in preparation of scoping an environmental study of the WSAB Transit Corridor. Since the northern alignments (between downtown Los Angeles and the City of Huntington Park) identified in the WSAB TRS had shown several possible station locations, this study was also meant to further screen station locations and confirm the findings of the WSAB TRS through the alternative analysis process.

6.2 Northern Alignment Concepts Considered

Building on the concepts identified in the WSAB TRS (2015), six alignment options were under consideration in the northern portion of the alignment (Figure 6-1), as follows:

- **East Bank** – Extended approximately 7.7 miles between Los Angeles Union Station to the Florence/Salt Lake Station along the east side of the LA River. This alignment option would provide three stations north of Florence/Salt Lake: Los Angeles Union Station, Soto, and Leonis/District. The East Bank alignment option was originally developed as part of the WSAB AA Report (2012).
- **West Bank 3** – Extended approximately 6.9 miles between the Little Tokyo Station and the Florence/Salt Lake Station. This alignment option would provide four stations north of Florence/Salt Lake: Little Tokyo, 7th/Alameda, Pacific/Vernon, and Pacific/Randolph. The West Bank 3 alignment option was originally developed as part of the WSAB AA Report (2012).
- **Pacific/Alameda** – Extended approximately 7.4 miles between Los Angeles Union Station and Florence/Salt Lake Station. This alignment option utilized Alameda Street to connect with Los Angeles Union Station and would provide five stations north of Florence/Salt Lake: Los Angeles Union Station, Little Tokyo, Arts District, Pacific/Vernon, and Pacific/Randolph. The Pacific/Alameda alignment option was developed during the WSAB TRS (2015) as a variation of the West Bank 3 alignment option, but with a direct connection to Los Angeles Union Station.
- **Pacific/Vignes** – Extended approximately 7.2 miles between Los Angeles Union Station and the Florence/Salt Lake Station. This alignment option utilized Vignes Street to connect with Los Angeles Union Station and would provide four stations north of Florence/Salt Lake: Los Angeles Union Station, Arts District, Pacific/Vernon, and Pacific/Randolph. The Pacific/Vignes alignment option was developed during the WSAB TRS (2015) as a variation of the West Bank 3 alignment option, but with a direct connection to Los Angeles Union Station.

Figure 6-1. Northern Alignment Options (2015)

Source: WSAB Northern Alignment Screening Report, Figure 4-3, Metro (April 2017)

- **Alameda** – Extended approximately 8.0 miles between Los Angeles Union Station and the Florence/Salt Lake Station along Alameda Street and Metro A (Blue) Line. This alignment option utilized Alameda Street to connect with Los Angeles Union Station and would provide seven stations north of Florence/Salt Lake: Los Angeles Union Station, Little Tokyo, 7th/Alameda, Washington, Vernon, Slauson, and Pacific/Randolph. This alignment option was developed during the WSAB TRS (2015).
- **Alameda/Vignes** – Extended approximately 8.1 miles between Los Angeles Union Station and the Florence/Salt Lake Station along Alameda Street and Metro A (Blue) Line. This alignment option utilized Vignes Street to connect with Los Angeles Union Station and would provide seven stations north of the Florence/Salt Lake Station: Los Angeles Union Station, Arts District, 7th/Alameda, Washington, Vernon, Slauson, and Pacific/Randolph. This alignment option was developed during the WSAB TRS (2015).

As part of this study, the northern alignment options were also further defined in terms of proposed vertical guideway configurations and station sites based on infrastructure constraints (at a 5 percent level of design). Table 6.1 shows the assumed alignment option characteristics.

Table 6.1. Northern Alignment Options Characteristics (2017)

Alignment Option	Length (Northern Terminus to Florence/ Salt Lake Station)	Preliminary Proposed Configuration	# of Proposed Stations (Northern Terminus to Florence/Salt Lake Station)
East Bank	7.7 miles	3.7 miles aerial 4.0 miles at-grade	3
West Bank 3	6.9 miles	1.9 miles aerial 3.3 miles at-grade 1.7 miles underground	4
Pacific/ Alameda	7.4 miles	2.7 miles aerial 3.3 miles at-grade 1.4 miles underground	5
Pacific/ Vignes	7.2 miles	2.4 miles aerial 3.2 miles at-grade 1.6 miles underground	4
Alameda	8.0 miles	6.0 miles aerial 2.0 miles at-grade	7
Alameda/ Vignes	8.1 miles	5.5 miles aerial 1.9 miles at-grade 0.7 miles underground	7

Source: WSAB Northern Alignment Screening Report, Table 4-2, Metro (April 2017)

6.3 Screening Analysis

Based on the purpose and need, as well as extensive stakeholder and agency outreach, the set of goals and objectives were established for the WSAB Transit Corridor (consistent with the WSAB AA Report (2012)). The five goals are as follows:

- Goal 1: Provide Mobility Improvements
- Goal 2: Support Local and Regional Land Use Plans and Policies
- Goal 3: Minimize Environmental Impacts
- Goal 4: Ensure Cost Effectiveness and Financial Feasibility
- Goal 5: Ensure Equity

For each goal, objectives and corresponding evaluation criteria were developed to assess how well each of the northern alignment options performed. The criteria also incorporated Metro and FTA's standards for other similar LRT projects. Table 6.2 shows the goals, objectives, and criteria used to evaluate the alignment alternatives.

Alignment options were assessed against each evaluation criterion on their potential performance in qualitative and quantitative measures. A "high," "medium," or "low" rating was assigned based on the alignment option's ability to meet the project's goals and objective.

Following results of the detailed analysis, each of the northern alignment options benefits were considered against their potential costs and challenges. Table 6.3 presents the results for each alignment option considered.

Table 6.2. Goals, Objectives and Screening Criteria (2017)

#	Goals	Objectives	Evaluation Criteria
1	Provide Mobility Improvements	▪ Improves travel speeds and reduces travel times	▪ Daily hours of user benefits
		▪ Relieves high use (overcrowded) transit systems along the corridor	▪ Decrease in boardings on North-South Line (current Metro A (Blue) Line)
		▪ Connects with the transit network	▪ Number of connections to other Metro Rail Lines ▪ Provides direct access to regional rail
		▪ Provides an alternative to a congested freeway and arterial network. Serves local and regional trips	▪ Number of daily boardings ▪ Number of new transit trips
		▪ Supports active transportation and first/last mile connections	▪ Number of connections to bicycle facilities
2	Support Local and Regional Land Use Plans and Policies	▪ Serves major employment centers and high-density residential neighborhoods	▪ 2040 population density within ½ mile of stations ▪ 2040 employment density within ½ mile of stations
		▪ Supports local economic development, projects, plans, and jobs	▪ Plans and policies supporting Transit-Oriented Development around stations
		▪ Serves affordable housing developments	▪ Number of existing affordable housing units within ½ mile of stations
		▪ Supports and is consistent with local plans	▪ Supported by existing local plans and programs
3	Minimize Environmental Impacts	▪ Minimizes environmental and community impacts	▪ Reduction in regional vehicle miles traveled
		▪ Minimizes impacts to the transportation network	▪ Impacts to roadway lanes, parking, and truck movement ▪ Minimal disruption to existing railroad ROW
4	Ensure Cost Effectiveness and Financial Feasibility	▪ Costs are financially feasible	▪ Rough order of magnitude capital costs
		▪ Provides cost-effective project	▪ Cost/benefit (capital costs/boarding)
		▪ Minimizes risk of cost increase	▪ Engineering challenges ▪ Number of property acquisitions
5	Ensure Equity	▪ Provides benefits to transit-dependent and minority populations	▪ Percentage of transit-dependent persons within ½ mile of stations ▪ Percentage of station areas that qualify as environmental justice communities ▪ Provision of new reliable fixed service to underserved communities

Source: WSAB Northern Alignment Screening Report, Table 3-3, Metro (April 2017)

Table 6.3. Northern Alignment Options Summary of Results (2017)

Evaluation Criteria	Northern Alignment Options					
	East Bank	West Bank 3	Pacific/ Alameda	Pacific/ Vignes	Alameda	Alameda/ Vignes
Provide Mobility Improvements	Medium	Low	High	High	High	Medium
Support Local and Regional Land Use Compatibility	Low	Low	High	High	High	High
Minimize Environmental Impacts	Medium	Low	High	Medium	Low	Low
Ensure Cost Effectiveness and Financial Feasibility	Low	Medium	Medium	Medium	High	Medium
Ensure Equity	High	High	High	High	High	High
Overall Rankings	**Low**	**Low**	**High**	**High**	**High**	**Medium**

Source: WSAB Northern Alignment Screening Report, Table 6-1, Metro (April 2017)

6.4 Findings

Based on the evaluation results, the following recommendations were made:

- **East Bank was not recommended to move forward.** Because of its direct connection into Los Angeles Union Station, the East Bank alignment option provided substantial mobility benefits; however, the stations along this alignment would serve predominantly industrial areas with lower population and employment densities and limited opportunities for future transit-oriented development (TOD). Most importantly, this alignment option presented significant engineering challenges because of the constrained right-of-way from adjacent established properties and utilities, conflicts with existing infrastructure (such as LA River bridges) and would require securing third-party agreements with rail agencies. Combined, these factors were likely to result in higher costs.
- **West Bank 3 was not recommended to move forward.** This alignment option provided limited mobility benefits because its northern terminus was in Little Tokyo instead of Los Angeles Union Station. The lack of connection to Los Angeles Union Station also limited TOD opportunities and connections to major population and employment centers. Furthermore, while the benefits of West Bank 3 were substantially lower than the other northern alignment options, the associated costs and engineering challenges were not significantly lower and thus did not offset the lack of connection into Los Angeles Union Station.
- **Pacific/Alameda was recommended to move forward.** By serving both an Arts District and a Little Tokyo Station, this alignment option provided significant mobility benefits, presented numerous TOD opportunities, and met the needs of the local communities and stakeholders. By serving Pacific Boulevard, this alignment option introduced new transit service to a currently underserved area while also providing congestion relief along the Metro A (Blue) Line (North-South Line). However, by

serving Santa Fe Avenue and Pacific Boulevard, this alignment option provided service to a primarily industrial area rather than enhancing transit service along the Metro A (Blue) Line, which is heavily residential and presents promising TOD opportunities in the future.

- **Pacific/Vignes was recommended to move forward.** This alignment option provided many of the same benefits as the Pacific/Alameda alignment option. However, by not connecting to the Little Tokyo Station, this alignment option missed a key connection to the future Regional Connector (East-West Line). Overall, this option would provide mobility benefits with TOD opportunities.
- **Alameda was recommended to move forward.** The Alameda alignment option provided connections to Los Angeles Union Station, Little Tokyo, and Metro A (Blue) Line (North-South Line), resulting in significant mobility benefits. By following the Metro A (Blue) Line, this alignment option served low-income and densely populated areas that would benefit from additional transit service and would help address overcrowding on the Metro A (Blue) Line. By avoiding tunneling, this alignment option was also estimated to be one of the lower cost options. However, this alignment option did not minimize environmental impacts as effectively as other alignment options because of a moderate reduction in vehicle miles traveled (VMT) and an exclusively aerial alignment, which could result in conflicts with existing roadway or rail (Metro A (Blue) Line and freight) networks.
- **Alameda/Vignes was recommended to move forward.** As with the Alameda alignment option, this alignment option provided new transit service to a transit-dependent community along the Metro A (Blue) Line (North-South Line) and resulted in substantial mobility benefits. While this alignment option provided a station in the Arts District with significant potential for future growth, it did not include a station at Little Tokyo, limiting the connection to the future Regional Connector (East-West Line). This alignment option was also estimated to be the most expensive because of the required tunneling.

By providing a direct connection into Los Angeles Union Station, the Pacific/Alameda, Pacific/Vignes, Alameda, and Alameda/Vignes alignment options provided a reliable transit service that connected southeastern LA County to the regional transportation network. The Pacific/Alameda, Pacific/Vignes, Alameda, and Alameda/Vignes alignment options increased mobility and connectivity for historically underserved transit-dependent and environmental justice (EJ) communities; reduced travel times on local and regional transportation networks; and accommodated substantial future population and employment growth. Therefore, it was recommended that the Pacific/Alameda, Pacific/Vignes, Alameda, and Alameda/Vignes alignment options be carried into scoping for the environmental analysis.

7 WEST SANTA ANA BRANCH TRANSIT CORRIDOR NORTHERN ALIGNMENT ALTERNATIVES AND CONCEPTS UPDATED SCREENING REPORT (2018)

7.1 Introduction

Between June and August 2017, one agency meeting and five public scoping meetings took place in the Cities of Bellflower, Los Angeles, South Gate, and Huntington Park. The meetings provided project updates and information to stakeholders with the intent to receive comments and questions on the environmental process. During the public scoping period, 1,122 comments were received.

With respect to the northern alignment options (as identified during the Northern Alignment Screening Report (2017)), the highest levels of concerns were related to the potential impacts to the Little Tokyo community[5]. Other comments received from agencies such as the Federal Railroad Administration, Metrolink, and the California High-Speed Rail Authority stated preference for alignments that did not limit existing or planned capacity at Los Angeles Union Station.

In response to the issues raised during the public scoping period, new northern alignment options were developed and evaluated as part of the WSAB Northern Alignment and Concepts Updated Screening Report (2018). This 2018 report also incorporated several updates and refinement to the project definition, including the following:

- Model updates and assumptions due to the passing of Measure M (approved in November 2016) and Metro's Long-Range Transportation Plan.
- Planning initiatives for TOD/transit-oriented communities (TOC) occurring in stakeholder cities.
- Advancement of projects that would affect the Northern Alignment Alternatives, including Metro A (Blue) Line upgrades, BRT initiatives, Division 20 Portal and Turnback Facility, and regional rail station plans at Los Angeles Union Station.
- Exploring a public-private-partnership (P3) that would change schedule considerations and best practices as part of the evaluation process.

Given the factors above, additional concepts and planning analyses were initiated per direction from the Metro Board in March 2018.

5 Approximately 400 comments were received by Little Tokyo stakeholders.

7.2 Northern Alignment Alternatives and Concepts Considered

Several new alignment and station concepts were considered based on variations of the original alternatives, as well as new concepts to connect to other downtown Los Angeles termini. The concepts were further refined and shared with stakeholders in a series of public meetings in March 2018. The four new concepts that emerged from the public meetings in 2017 were as follows:

- **Concept E: Alameda (underground)** – Extended approximately 8.1 miles between Los Angeles Union Station and Florence/Salt Lake Station along the Metro A (Blue) Line corridor and Alameda Street. This concept provided seven stations north of Florence/Salt Lake: Los Angeles Union Station, Little Tokyo, Arts District South, Washington, Vernon, Slauson, and Pacific/Randolph. The Little Tokyo Station was an optional underground station. The alignment was underground from Los Angeles Union Station, then transitioned at-grade at 15th Street, beneath the I-10 Freeway, to the PEROW. Concept E would then rise to an aerial structure before crossing Washington Boulevard.
- **Concept F: Alameda/Center** – Extended approximately 8.2 miles between Los Angeles Union Station and Florence/Salt Lake Station along the Metro A (Blue) Line corridor and Alameda Street. Concept F provided seven stations north of the Florence/Salt Lake Station: Los Angeles Union Station, Arts District North, Arts District South, Washington, Vernon, Slauson, and Pacific/Randolph. From Los Angeles Union Station, Concept F was aerial or at-grade then transitioned to underground after crossing Garey Street toward Alameda Street. Concept F then transitioned to at-grade at 15th Street, beneath the I-10 Freeway, to the PEROW. Concept F would then rise to an aerial structure before crossing Washington Boulevard.
- **Concept G: Downtown Transit Core** – Extended approximately 8.1 miles between Los Angeles' Downtown Transit Core area and Florence/Salt Lake Station. The northern portion of Concept G provided seven stations north of the Florence/Salt Lake Station: Downtown Transit Core, South Park/Fashion District, Arts District South, Washington, Vernon, Slauson, and Pacific/Randolph. Within the Downtown Transit Core area, there were two possible station location options: an underground station near 8th and Flower Streets with an underground pedestrian connection to the existing 7th Street/Metro Center Station; and an underground station near Broadway between 4th and 5th Streets with an underground pedestrian connection to the existing Pershing Square Station. Concept G continued underground transiting to at-grade just north of 15th Street to the PEROW. Concept G would then rise to an aerial structure before crossing Washington Boulevard. The alignment crossed at-grade beneath the I-10 Freeway.

- **Concept H: Arts District/6th Street** – Extended approximately 7.6 miles between a new northern terminus near 6th and Mesquite Streets and Florence/Salt Lake Station. Concept H provided four stations north of the Florence/Salt Lake Station: Arts District/6th Street, Vernon, Slauson, and Pacific/Randolph[6]. Concept H terminated at an underground Arts District/6th Street station near 6th and Mesquite Streets. Passengers would transfer to a proposed Metro B (Red) and D (Purple) Line station near the Metro Division 20 Rail Yard. Concept H would then continue underground beneath the I-10 Freeway toward the Redondo Junction transition to an aerial configuration before entering the Metro A (Blue) Line corridor.

For the purpose of providing a comparative assessment of both the Northern Alignment and new concepts, the earlier alternatives were renamed as the following:

- **Concept A: Pacific/Alameda** – Extended approximately 7.7 miles between Los Angeles Union Station and Florence/Salt Lake Station. This alignment option utilized Alameda Street to connect with Los Angeles Union Station and provided five stations north of Florence/Salt Lake: Los Angeles Union Station, Little Tokyo, Arts District, Pacific/Vernon, and Pacific/Randolph. The Pacific/Alameda alignment option was developed during the WSAB TRS (2015).
- **Concept B: Pacific/Vignes** – Extended approximately 7.5 miles between Los Angeles Union Station and the Florence/Salt Lake Station. This alignment option utilized Vignes Street to connect with Los Angeles Union Station and provided four stations north of Florence/Salt Lake: Los Angeles Union Station, Arts District, Pacific/Vernon, and Pacific/Randolph. The Pacific/Vignes alignment option was developed during the WSAB TRS (2015).
- **Concept C: Alameda (aerial)** – Extended approximately 8.3 miles between Los Angeles Union Station and the Florence/Salt Lake Station along Alameda Street and Metro A (Blue) Line). This alignment option utilized Alameda Street to connect with Los Angeles Union Station and provided seven stations north of Florence/Salt Lake: Los Angeles Union Station, Little Tokyo, 7th/Alameda, Washington, Vernon, Slauson, and Pacific/Randolph. This alignment option was developed during the WSAB TRS (2015).
- **Concept D: Alameda/Vignes** – Extended approximately 8.3 miles between Los Angeles Union Station and the Florence/Salt Lake Station along Alameda Street and Metro A (Blue) Line. This alignment option utilized Vignes Street to connect with Los Angeles Union Station and provided seven stations north of the Florence/Salt Lake Station: Los Angeles Union Station, Arts District, 7th/Alameda, Washington, Vernon, Slauson, and Pacific/Randolph. This alignment option was developed during the WSAB TRS (2015).

Concepts A through D were all initially developed as part of the WSAB TRS (2015) and presented in 2017 public scoping meeting. Figure 7-1 and Figure 7-2 shows the WSAB alignment and potential station locations, and Table 7.1 shows the characteristics of each alternative/concept.

[6] Note that the proposed Red/Purple Line station would be constructed as a part of Concept H south of the existing Metro Division 20 Rail Yard.

Figure 7-1. Transit Corridor Northern Alignment Alternatives A through D (2018)

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Figure 4-1, Metro (May 2018)

Figure 7-2. Transit Corridor Northern Alignment Concepts E through H (2018)

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Figure 4-2, Metro (May 2018)

Table 7.1. Northern Alignment Alternatives and Concepts Characteristics (2018)

Northern Alignment Alternatives	Length[1]	Preliminary Proposed Configuration[1]	# of Proposed Stations[1]
A. Pacific/ Alameda	7.7 miles	3.6 miles aerial; 2.9 miles at-grade; 1.2 miles underground	5 stations: 3 aerial; 1 at-grade; 1 underground
B. Pacific/ Vignes	7.5 miles	3.0 miles aerial; 2.9 miles at-grade; 1.6 miles underground	4 stations: 2 aerial; 1 at-grade; 1 underground
C. Alameda (aerial)	8.3 miles	5.8 miles aerial; 2.5 miles at-grade	7 stations: 6 aerial; 1 at-grade
D. Alameda/ Vignes	8.3 miles	5.0 miles aerial; 2.5 miles at-grade; 0.8 miles underground	7 stations: 5 aerial; 1 at-grade; 1 underground
E. Alameda (underground)	8.1 miles	3.2 miles aerial; 2.5 miles at-grade; 2.4 miles underground	7 stations: 3 aerial; 1 at-grade; 3 underground
F. Alameda/ Center	8.2 miles	3.6 miles aerial; 2.4 miles at-grade; 2.2 miles underground	7 stations: 4 aerial; 1 at-grade; 2 underground
G. Downtown Transit Core	8.1 miles	2.8 miles aerial; 3.2 miles at-grade; 2.1 miles underground	7 stations: 3 aerial; 1 at-grade; 3 underground
H. Arts District/6th Street	7.6 miles	2.6 miles aerial; 2.4 miles at-grade; 2.6 miles underground	4 stations: 2 aerial; 1 at-grade; 1 underground

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 4-1, Metro (May 2018)
Note: [1] Description is provided between the Northern Terminus station and the Florence/Salt Lake Station.

7.3 Screening Analysis

Building on updated purpose and need information and the set of goals and objectives that were established for the WSAB Transit Corridor (consistent with previous reports), a screening evaluation was conducted to determine how well each of the Northern Alignment Alternatives and Concepts met the goals and objectives of the Project. The five goals are as follows:

- Goal 1: Provide Mobility Improvements
- Goal 2: Support Local and Regional Land Use Plans and Policies
- Goal 3: Minimize Environmental Impacts
- Goal 4: Ensure Cost Effectiveness and Financial Feasibility
- Goal 5: Ensure Equity

For each goal and objective, corresponding evaluation criteria were developed based on previous assessment methods as well as updated Metro policies, initiatives, and stakeholder input received during the public scoping meetings held in 2017.

The Northern Alignment Alternatives and Concepts were assessed on their potential performance in qualitative and quantitative measures with a “high,” “medium,” or “low” rating assigned. Table 7.2 shows the goals, objectives, and criteria used to evaluate the alternatives and concepts.

Table 7.2. Goals, Objectives, and Evaluation Criteria (2018)

Goals	Objectives	Evaluation Criteria
1. Provide Mobility Improvements	1.1 Improves travel speeds and reduces travel times	▪ Daily hours of user benefits ▪ Minutes of travel time from southern to northern termini
	1.2 Supports other transit systems along the corridor	▪ Effects to other Metro Lines ▪ Streamlines/improves customer experiences (number of daily one-seat rides)
	1.3 Connects with the greater transit network	▪ Connections to other Metro Rail Lines ▪ Direct access to regional rail (commuter rail) ▪ Potential for future extensions
	1.4 Provides an alternative to a congested freeway and arterial network. Serves local and regional trips	▪ Number of daily boardings ▪ Number of new transit trips ▪ Peak load points versus operational limits
	1.5 Supports active transportation and first/last mile connections	▪ Quality of the pedestrian environment and public realm near station areas ▪ Potential connections to bicycle facilities
2. Support Local and Regional Land Use Plans and Policies	2.1 Serves major employment centers and high-density residential neighborhoods	▪ 2042 population density within ½ mile of stations ▪ 2042 employment density within ½ mile of stations
	2.2 Encourages local economic development, projects, plans, and jobs	▪ Consistent with Plans and Metro's policies supporting Transit-Oriented Communities ▪ Supports land values and real estate market trends ▪ Potential Joint Use/Joint Development Opportunities within ¼ mile of stations
	2.3 Serves affordable housing developments	▪ Number of existing affordable housing units within ½ mile of stations
	2.4 Supports and is consistent with local plans	▪ Consistent with development patterns and land uses (scale/intensity of development) ▪ Consistent with ongoing planning efforts that update zoning/development standards
3. Minimize Environmental Impacts	3.1 Minimizes environmental and community impacts	▪ Reduction in regional vehicle miles traveled ▪ Level of effects to sensitive uses (e.g., historical properties)
	3.2 Minimizes impacts to the transportation network	▪ Impacts to roadway travel lanes, parking, and truck movements ▪ Disruption to existing rail right-of-way
	3.3 Minimizes other environmental impacts	▪ Impacts to visual, noise, hazards, and other environmental considerations

Goals	Objectives	Evaluation Criteria
4. Ensure Cost Effectiveness and Financial Feasibility	4.1 Costs are financially feasible	▪ Rough order of magnitude capital costs
	4.2 Provide a cost-effective project	▪ Capital cost compared to number of new riders per year
	4.3 Minimizes risk of cost increase	▪ Intensity of engineering challenges ▪ Amount of property acquisition
5. Ensure Equity	5.1 Provides benefits to transit-dependent and minority populations	▪ Percentage of transit-dependent persons within ½ mile of stations
	5.2 Minimizes adverse effects to an EJ community	▪ Potential adverse effects to EJ communities
	5.3 Provision of new reliable fixed service to underserved communities	▪ New reliable fixed service to transit-dependent persons around station areas
	5.4 Serves low-income riders	▪ Estimated number of low-income riders

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 3-1, Metro (May 2018)

Detailed evaluation was conducted for each of the alignment alternatives and concepts. Table 7.3 through Table 7.7 summarize the evaluation results for each of the five goals.

Each of the alternatives and concepts provided a set of benefits that was considered against the potential costs and challenges. Table 7.8 presents a summary of the evaluation results.

Based on these evaluations, the WSAB Northern Alignment and Concepts Updated Screening Report recommended three concepts be carried forward for further analysis and refinement: Concept E, F, and G.

Table 7.3. Summary of Northern Alignment Alternatives and Concepts Evaluation Results—Goal 1 (2018)

Evaluation Criteria	Northern Alignment Alternatives and Concepts							
	Alternative A Pacific/ Alameda	Alternative B Pacific/Vignes	Alternative C Alameda (aerial)	Alternative D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/6th Street
1.1 Improves travel speeds and reduces travel times (daily hours of user benefits)	22,200 hours	22,500 hours	24,000 hours	23,500 hours	25,000 hours	24,100 hours	24,100 hours	18,500 hours
1.1 Improves travel speeds and reduces travel times (minutes of travel time)	36.6 minutes	34.5 minutes	35.5 minutes	35.5 minutes	33.5 minutes	34.0 minutes	33.6 minutes	37.5 minutes
1.2 Supports other transit systems (effects to other Metro Lines)	Medium	Medium	Medium	Medium	Medium	Medium	High	Medium
1.2 Supports other transit systems (daily one-seat ride)	36,900 daily one-seat rides	36,300 daily one-seat rides	45,600 daily one-seat rides	43,800 daily one-seat rides	47,800 daily one-seat rides	45,500 daily one-seat rides	46,500 daily one-seat rides	30,300 daily one-seat rides
1.3 Connects with the greater transit network (connections to Metro Lines, regional rail and future extensions)	Medium	Low	High	Medium	High	Medium	Medium	Low
1.4 Provides an alternative to freeway and arterial network. Serves local and regional trips. (Daily boardings; new transit trips, peak operational limits)	58,000 Boardings (24,500 new riders)	56,000 Boardings (25,000 new riders)	75,500 Boardings (26,000 new riders)	69,500 Boardings (25,500 new riders)	81,500 Boardings (27,000 new riders)	74,500 Boardings (26,000 new riders)	78,500 Boardings (25,000 new riders)	46,500 Boardings (19,500 new riders)
1.5 Supports active transportation and first/last mile connections (bicycle and pedestrian connections)	Medium	Medium	Medium	Medium	Medium	Medium	High	Low
Goal 1 Ratings	◑	◑	●	●	●	●	●	○

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 5-18, Metro (May 2018)
Note: Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments.
○ = Low; ◑ = Medium; ● = High

Table 7.4. Summary of Northern Alignment Alternatives and Concepts Evaluation Results—Goal 2 (2018)

Evaluation Criteria	Northern Alignment Alternatives and Concepts							
	Alternative A Pacific/ Alameda	Alternative B Pacific/Vignes	Alternative C Alameda (aerial)	Alternative D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/6th Street
2.1 Serves major employment centers and high-density residential (2042 Population Density)	27,880 persons/ square mile	17,670 persons/ square mile	16,180 persons/ square mile	10,350 persons/ square mile	16,040 persons/ square mile	16,740 persons/ square mile	24,160 persons/ square mile	1,980 persons/ square mile
2.1 Serves major employment centers and high-density residential (2042 Employment Density)	15,130 jobs/ square mile	10,100 jobs/ square mile	15,520 jobs/ square mile	11,200 jobs/ square mile	14,520 jobs/ square mile	13,510 jobs/ square mile	44,260 jobs/ square mile	11,210 jobs/ square mile
2.2 Encourages local economic development (TOC policies; supports land values; potential joint development opportunities)	Medium	Medium	Medium	Medium	Medium	Medium	High	Low
2.3 Serves affordable housing developments (number affordable housing units near stations)	3,750 affordable housing units	1,270 affordable housing units	4,590 affordable housing units	3,960 affordable housing units	5,600 affordable housing units	5,040 affordable housing units	20,980 affordable housing units	550 affordable housing units
2.4 Supports and is consistent with local plans (development patterns; character of public realm; development standards)	Medium	Medium	Medium	Medium	Medium	Medium	High	Low
Goal 2 Ratings	◑	◑	◑	◑	◑	◑	●	○

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 5-27, Metro (May 2018)
Note: Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments.
○= Low; ◑ = Medium; ● = High

Table 7.5. Summary of Northern Alignment Alternatives and Concepts Evaluation Results—Goal 3 (2018)

Evaluation Criteria	Northern Alignment Alternatives and Concepts							
	Alternative A Pacific/ Alameda	Alternative B Pacific/ Vignes	Alternative C Alameda (aerial)	Alternative D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/ 6th Street
3.1 Minimizes environmental and community impacts (Reduction in VMT)	624,400 VMT reduction	645,500 VMT reduction	621,100 VMT reduction	611,500 VMT reduction	648,800 VMT reduction	629,100 VMT reduction	458,300 VMT reduction	327,300 VMT reduction
3.1 Minimizes environmental and community impacts (Effects to sensitive uses)	Low	Medium	Low	Medium	High	Medium	Low	Medium
3.2 Minimizes impacts to the transportation network (Impacts to travel lanes, parking and truck movements; disruption to existing rail ROW)	Medium	Medium	Low	Low	High	Medium	High	Medium
3.3 Minimizes other potential environmental impacts (Impacts to visual, noise, hazards, and other environmental topics.)	Low	Medium	Low	Low	High	Medium	Low	Medium
Goal 3 Ratings	○	◑	○	○	●	◑	○	◑

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 5-35, Metro (May 2018)
Note: Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments
○= Low; ◑ = Medium; ● = High

Table 7.6. Summary of Northern Alignment Alternatives and Concepts Evaluation Results—Goal 4 (2018)

Evaluation Criteria	Northern Alignment Alternatives and Concepts							
	Alternative A Pacific/ Alameda	Alternative B Pacific/ Vignes	Alternative C Alameda (aerial)	Alternative D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/ 6th Street
4.1 Costs are financially feasible (*ROM capital costs in $Billions)	$4.7 Billion (2017$)	$4.7 Billion (2017$)	$4.6 Billion (2017$)	$5.0 Billion (2017$)	$5.8 Billion (2017$)	$5.4 Billion (2017$)	$5.8 Billion (2017$)	$4.5 Billion (2017$)
4.2 Provide a cost-effective project (capital cost / new riders per year)	$607	$596	$557	$620	$679	$655	$729	$740
4.3 Minimizes risk of cost increase (engineering challenges)	Higher risks with tunneling	Higher risks with tunneling	Less risk with aerial or at-grade	Risks with short tunneling in Arts District	Higher risks with tunneling	Higher risks with tunneling	Higher risks with tunneling	Higher risks with tunneling
4.3 Minimizes risk of cost increase (property acquisition)	Medium risks due to property impacts	Medium risks due to property impacts	Higher risks due to more property impacts	Higher risks due to more property impacts	Lower risk due to reduced property impacts	Medium risks due to property impacts	Lower risk due to reduced property impacts	Lower risk due to reduced property impacts
Goal 4 Ratings	◑	◑	◑	◑	○	○	○	○

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 5-41, Metro (May 2018)
Notes: *ROM capital cost is based on early engineering assumptions and are provided to demonstrate general differentiators in costs.
Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments
○= Low; ◑ = Medium; ● = High

Table 7.7. Summary of Northern Alignment Alternatives and Concepts Evaluation Results—Goal 5 (2018)

Evaluation Criteria	Northern Alignment Alternative and Concepts							
	Alternative A Pacific/ Alameda	Alternative B Pacific/ Vignes	Alternative C Alameda (aerial)	Alternative D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/ 6th Street
5.1 Provides benefits to transit-dependent and minority populations (% transit-dependent persons within ½ mile of stations)	34.7% transit-dependent	21.6% transit-dependent	39.7% transit-dependent	35.8% transit-dependent	38.4% transit-dependent	38.8% transit-dependent	51.6% transit-dependent	24.1% transit-dependent
5.2 Minimizes adverse effects to an EJ community (potential adverse effects to EJ communities)	Low	Medium	Low	Medium	High	High	High	High
5.3 Provision of new reliable fixed service to underserved communities (new fixed service to transit-dependent persons around station areas)	Medium	Medium	Medium	Medium	Medium	Medium	High	Low
5.4 Serves low-income riders (estimated number of low-income riders)	22,100 low-income riders	21,300 low-income riders	29,600 low-income riders	26,800 low-income riders	31,700 low-income riders	28,400 low-income riders	32,400 low-income riders	19,000 low-income riders
Goal 5 Ratings	◑	○	◑	◑	●	●	●	○

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 5-47, Metro (May 2018)
Note: Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments.
○= Low; ◑ = Medium; ● = High

Table 7.8. Northern Alignment Alternatives and Concepts Summary of Results (2018)

Evaluation Criteria	Northern Alignment Alternative and Concepts							
	Alt A Pacific/ Alameda	Alt B Pacific/ Vignes	Alt C Alameda (aerial)	Alt D Alameda/ Vignes	Concept E Alameda (underground)	Concept F Alameda/ Center	Concept G Downtown Transit Core	Concept H Arts District/ 6th Street
1. Provide Mobility Improvements	◑	◑	●	●	●	●	●	○
2. Support Local and Regional Land Use Plans and Policies	◑	◑	◑	◑	◑	◑	●	○
3. Minimize Environmental Impacts	○	◑	○	○	●	◑	○	◑
4. Ensure Cost Effectiveness and Financial Feasibility	◑	◑	◑	◑	○	○	○	○
5. Ensure Equity	◑	○	◑	◑	●	●	●	○
Overall Ratings	Medium/ Low	Medium/ Low	Medium	Medium	High	Medium/ High	Medium/ High	Low

Source: WSAB Northern Alignment and Concepts Updated Screening Report, Table 7-1, Metro (May 2018)
Note: Since the proposed alignment for all Alternatives and Concepts is the same south of Florence/Salt Lake Station, evaluation results shown are attributed to differences in the Northern Alignments.
○= Low; ◑ = Medium; ● = High

7.4 Community and Stakeholder Outreach

To obtain community and stakeholder input on the new concepts and discuss the original alternatives, five public meetings were held in March 2018. With over 250 participants, 270 webcast views, and 85 written comments, key responses were related to the following:

- Preferred termini in Downtown Los Angeles (Downtown Transit Core, Los Angeles Union Station, or Arts District)
- Destinations beyond the WSAB Transit Corridor (first/last mile needs)
- Comments on the new alignment concepts

Comments received cited both Los Angeles Union Station and the Downtown Transit Core as the top preferences for beginning/ending trips, followed by the Arts District. Other destinations participants wanted to reach included Pasadena, Glendale, Burbank, Orange County, and Metrolink/Amtrak connections. Other comments were related to pedestrian connections, safety, first/last mile, parking supplies and impacts, traffic, property values, noise levels, budget, ridership, P3 potentials, and property acquisitions.

As part of this feedback, Concept G: Downtown Transit Core was most selected as a preferred alignment followed by Concept E: Alameda (underground).

It should be noted that additional public input was collected at the Metro Board meeting in May 2018 on the study results and recommendations. As a result of a large amount of public input received, Concept F was not recommended by the Metro Board to move forward for further study.

7.5 Findings

Based on the evaluation findings and public outreach input, the following key findings were a result of the study that were confirmed and approved by the Metro Board in May 2018:

- **A northern terminus at Los Angeles Union Station or Downtown Transit Core was recommended to move forward.** These station locations would provide the highest benefits which was confirmed at the public outreach meetings in March 2018.
- **Concept E Alameda (underground) was recommended to be carried forward).** Concept E aligned with the overall project goals for the Project by rating high for mobility, minimized environmental impacts, and ensured equity providing access to minority and low-income communities. Concept E was also supportive of land use plans and policies serving high population and employment densities. The significant underground section resulted in higher capital costs and risks; however, the opportunity to provide a direct connection to Los Angeles Union Station and the east-west and north-south regional rail systems offered benefits that best met the project goals and objectives.
- **Concept G: Downtown Transit Core (underground) was recommended to be carried forward**. Concept G aligned with the overall project goals by connecting to emerging TOCs and providing access to high population, employment, and transit-dependent communities. The significant underground section of the alignment would result in high capital costs and risks, but based on modeling results, transfers at the 7th Street/Metro Center terminus would attract more riders. Pershing Square Station option was not recommended for further study given the need for two transfers to access north-south and east-west regional rail services (Metro A (Blue) and E (Expo) Lines). Overall, this concept offered valuable benefits of mobility and supportive land uses.

- **Alternative A: Pacific/Alameda and Alternative B: Pacific/Vignes were not recommended to move forward**. Since both alignments would turn north via Pacific Avenue to Santa Fe, terminating at Los Angeles Union Station, land uses along these alignments were not supportive to transit. There was also insufficient interest from local jurisdictions to leverage transit with TOC.
- **Alternative C: Alameda (aerial) and Alternative D: Alameda/Vignes were not recommended to move forward.** Since both alignments would turn north via Alameda Street in an aerial configuration terminating at Los Angeles Union Station, there would be significant negative urban design impacts. There was also strong community opposition and potential cumulative construction impacts to the Little Tokyo community.
- **Concept H: Arts District/6th Street was not recommended to move forward.** This alignment would turn north parallel to the Los Angeles River in an underground configuration with a station at the Arts District/6th Street and extend either the Metro A (Red) or D (Purple) Line to this station for passenger service. This alignment would require a transfer for passengers wishing to travel to Los Angeles Union Station. This alignment was not recommended to move forward due to low compatibility with the project goals, including low ridership and limited benefits to transit-dependent and minority populations. Furthermore, all the three recommended options serve areas of the Arts District. The recommendation to not carry forward Concept H into the WSAB environmental process did not preclude a separate effort to study and/or environmentally clear an Arts District station.
- **Concept F: Alameda/Center was not recommended to move forward.** This alignment would be at at-grade or aerial through Little Tokyo. This alignment was not recommended to move forward due to concerns related to potential construction impacts to the Little Tokyo community.
- Various stakeholders in the northern portion of the project corridor expressed interest in potential new alignments, including shifting Concept G (Downtown Transit Core) or Concept H (Arts District/6th Street) to head west from the proposed 7th/Alameda Station or Arts District/6th Street station, respectively, and travel southwest to the existing Pico Station of the Metro A (Blue) and E (Expo) Lines. Although a potential alignment to the Pico Station may provide additional and direct connectivity to South Park/Fashion District and LA Live/Staples Center, this alignment would increase travel time and further reduce the number of new riders traveling between the southern portion of this alignment and northern destinations. Moreover, it results in a forced transfer to travel from the Pico Station to 7th/Metro Center for those whose destination is elsewhere. As previously noted, heavy rail transit was also suggested as a mode. A rough order of magnitude (ROM) cost for a 20-mile WSAB heavy rail alignment based on recent Metro projects was prepared and found the cost to range between $12.3B and $18.4B. It has also been determined, in consultation with the FTA, that the environmental process would need to be restarted, thereby impacting the project schedule. **These alignments and modes were not recommended to move forward.**

Subsequent to the Metro Board authorizing further study of Concepts E and G in the environmental process, a revised and recirculated notice of preparation was issued on July 11, 2018. This notice informed the public of the Metro Board decision to eliminate Alternatives A, B, C, D, and Concepts F and H from further study, and carry forward Northern Alignment Concepts E and G into the Draft EIS/EIR.

8 REVISED FINAL EVALUATION OF MINIMUM OPERABLE SEGMENT REPORT (2019)

8.1 Introduction

In order to accelerate delivery of the Project, as compared to what was assumed in the Measure M Expenditure Plan (while remaining consistent with FTA rules), various minimal operable segments (MOS) options were evaluated. Described as initial operating segments options in the September 2019 Metro Board Report, the options were developed based on physical infrastructure limits and barriers, major origins/destinations, market trends, and high activity areas.

The Revised Final Evaluation of Minimum Operable Segment Report was developed in February 2019, to identify potential MOS concepts. The MOS concepts are a segment and/or phase of segments of the Locally Preferred Alternative that may provide a cost-effective solution with the greatest benefits from the Project[7]. As described by FTA, the MOS must function as a stand-alone project and not be dependent on other segments or phases to be constructed.

8.2 MOS Concepts Considered

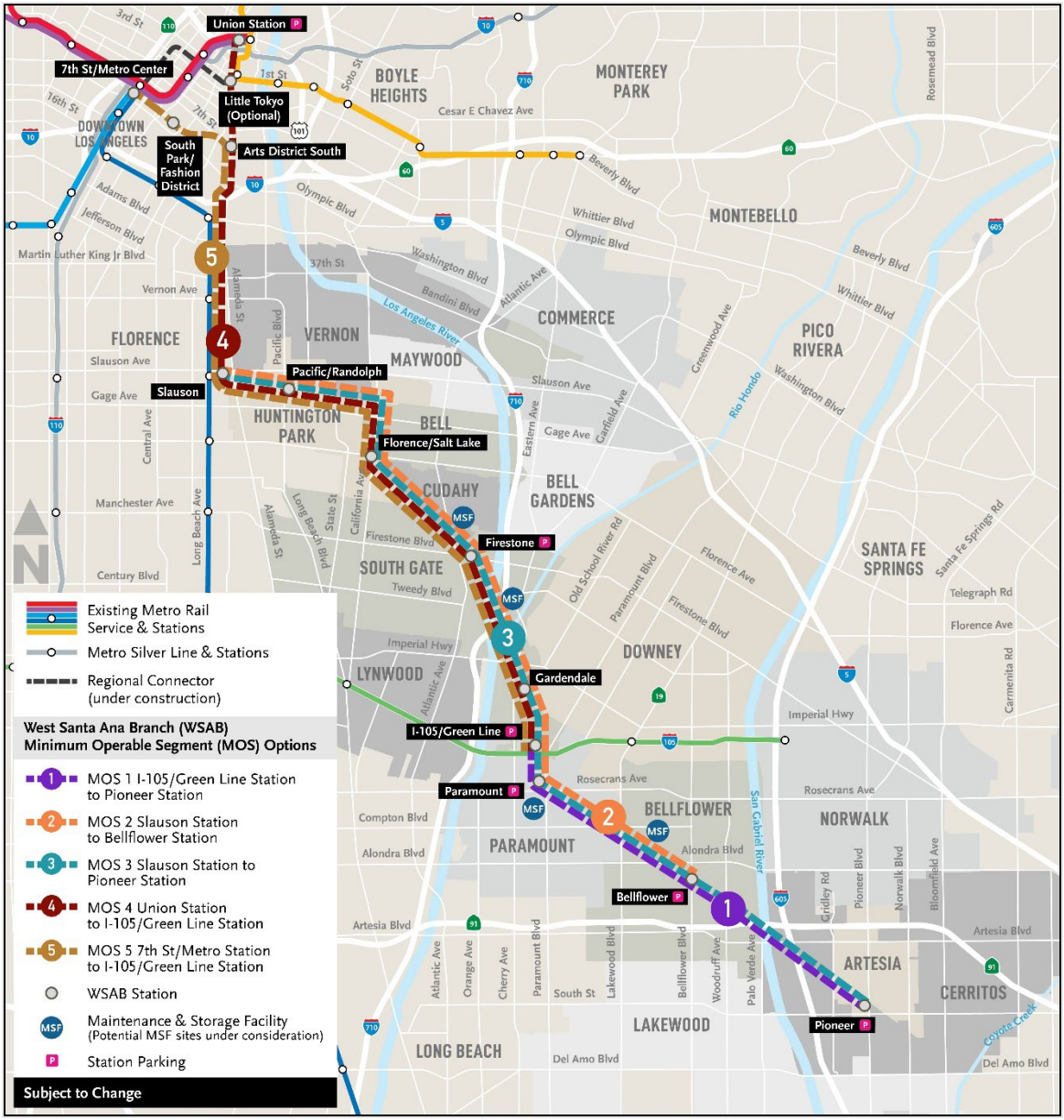
Several MOS concepts were considered based on potential alignment opportunities and constraints along the corridor, station areas that would serve major activity areas, operational feasibility, and locations for a maintenance and storage facility. Five MOS concepts were considered:

- MOS 1: I-105/C (Green) Line Station to Pioneer Station
- MOS 2: Slauson Station to Bellflower Station
- MOS 3: Slauson Station to Pioneer Station
- MOS 4: Los Angeles Union Station to I-105/C (Green) Line Station
- MOS 5: Downtown Transit Core to I-105/C (Green) Line Station

Figure 8-1 shows the MOS concepts alignment and potential station locations and Table 8.1 shows the characteristics of each concept.

[7] U.S. Department of Transportation, Federal Transit Administration (FTA) Circular 9300.1B - Capital Investment Program Guidance and Application Instruction. November 2008. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Final_C_9300_1_Bpub.pdf. Accessed 3/26/20

Figure 8-1. MOS Concepts (2019)



Source: WSAB Evaluation of MOS Report, Figure 3-1, Metro (February 2019)

Table 8.1. MOS Concepts Characteristics (2019)

MOS Concepts	Approximate Length (end to end)	# of Proposed Stations	Fleet Size (# of cars)	Run Time (in minutes)	Headways (weekday)	Span of Service
MOS 1 I-105/C (Green) Line Station to Pioneer Station	6.1 miles	4 stations	26 cars	9:23	5 minute peak, 10 minute midday, 10-20 minute evening headways	4:00 AM to 1:30 AM daily (Fri and Sat until 2:00 AM)
MOS 2 Slauson Station to Bellflower Station	11.1 miles	8 stations	40 cars	18:49		
MOS 3 Slauson Station to Pioneer Station	14.2 miles	9 stations	47 cars	22:58		
MOS 4 Union Station to I-105/C (Green) Line Station	12.8 miles	9 stations	47 cars	22:51		
MOS 5 Downtown Transit Core to I-105/C (Green) Line Station*	12.9 miles	9 stations	47 to 55 cars	23:02		

Source: WSAB Evaluation of MOS Report, Table 3.1, Metro (February 2019)
Note: *MOS 5 includes evaluation of scenarios with and without a short line service between the proposed 7th Street/Metro Center Station and the proposed Slauson Station. Therefore, the fleet size (# of cars) would range between 47 to 55 cars under the different short line service scenarios.

8.3 Screening Analysis

Based on the same goals and objectives used to screen the project alternatives in prior studies, the MOS screening was conducted to provide a comparative evaluation of the MOS concepts. Table 8.2 shows the goals, objectives, and criteria used in the evaluation.

Table 8.2. MOS Concepts Goals, Objectives and Evaluation Criteria (2019)

Goals	Objectives	Evaluation Criteria
1. Provide Mobility Improvements	1.1 Provides an alternative to the freeway and arterial network. Serves local and regional trips.	▪ Number of daily boardings per mile ▪ Number of new transit trips per mile ▪ Percentage of daily one-seat rides
	1.2 Connects to other transit systems along the corridor	▪ Connections to other Metro Rail Lines (# of rail lines) ▪ Connection to other local transit lines (# of bus lines)
	1.3 Connects with the greater transit network	▪ Provides direct access to regional rail/commuter rail (e.g., Downtown Core/Union Station; Metrolink/Amtrak)

Goals	Objectives	Evaluation Criteria
	1.4 Has operational feasibility	▪ Peak load points versus operational limits ▪ Availability of potential Maintenance and Storage Facility sites ▪ Capacity limitations on connecting systems (A (Blue) and C (Green) Lines)
2. Support Local and Regional Land Use Plans and Policies	2.1 Provide First/Last Mile connections and interim parking	▪ Existing connections to bicycle and pedestrian facilities (e.g., First/Last mile connections) ▪ Adequate parking to meet interim demand
	2.2 Encourages economic development, projects, plans and jobs	▪ Consistent with development patterns and land uses (scale/intensity of development)
	2.3 Serves affordable housing	▪ Median asking price for house sales
3. Minimize Environmental Impacts	3.1 Minimizes environmental and community impacts	▪ Reduction in regional vehicle miles traveled ▪ Effects to sensitive uses and environment
	3.2 Minimizes impacts to the transportation network	▪ Traffic impacts (# of intersections improved) ▪ Disruption to existing freight rail ROW
4. Ensure Cost Effectiveness and Financial Feasibility	4.1 Financial feasibility	▪ Rough order of magnitude capital costs with consideration for P3 target cost ▪ Estimated Operating and Maintenance (O&M) costs
	4.2 Provides a cost-effective project	▪ Capital costs compared to number of new riders per year
	4.3 Minimizes risk of cost increase	▪ Infrastructure constraints and conflicts (e.g., aerial/tunnel alignment, infrastructure needs, freeway crossings, etc.) ▪ Third-party approvals
5. Ensure Equity	5.1 Provides benefits to transit-dependent and minority populations	▪ Percentage of transit-dependent persons within ½ mile of stations ▪ Percentage of station areas that qualify as Environmental Justice (EJ) communities ▪ Provision of new reliable fixed service to communities with limited transit choices

Source: WSAB Evaluation of MOS Report, Table 2.1, Metro (February 2019)

Detailed evaluation was conducted for each of MOS concepts. Table 8.3 through Table 8.7 show the summaries of the evaluation results for each of the five goals.

Table 8.3. Summary of MOS Concepts Evaluation Results - Goal 1: Provide Mobility Improvements Summary (2019)

Evaluation Criteria	MOS Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 Union Station to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
1.1 Provides an alternative to the freeway and arterial network. Serves local and regional trips. (Daily boardings; new transit trips, daily one-seat rides)	1,836 Boardings and 787 new riders per mile 64% one-seat rides	2,126 Boardings and 486 new trips per mile 63% one-seat rides	2,162 Boardings and 648 new trips per mile 65% one-seat rides	4,883 Boardings and 617 new trips per mile 49% one-seat rides	4,930 Boardings and 814 new trips per mile 43% one-seat rides
	Medium	Low	Medium	Medium	High
1.2 Supports other transit systems along the corridor (Connects to other Metro Lines; connects to local transit)	Medium rail and local transit connectivity	Medium rail and low local transit connectivity	Medium rail and low local transit connectivity	High rail and local transit connectivity	High rail and local transit connectivity
	Medium	Low	Low	High	High
1.3 Connects with the greater transit network (Connects to regional and commuter rail)	Transfer to regional or commuter rail services	Transfer to regional or commuter rail services	Transfer to regional or commuter rail services	Provides direct access to regional and commuter rail services at Union Station	Transfer to regional or commuter rail services
	Medium	Medium	Medium	High	Medium
1.4 Has operational feasibility (Peak load assessment; potential maintenance facility sites, capacity limitations)	Under peak load capacity; 2 MF site options; Under capacity Green Line and near capacity N-S Lines	Under peak load capacity; 4 MF site options; Under capacity Green Line Over capacity N-S Line Over	Under peak load capacity; 4 MF site options; Under capacity Green Line Over capacity N-S Line	Under peak load capacity; 2 MF site options; Under capacity Green Line Under capacity N-S Line	Over peak load capacity; 2 MF site options; Under capacity Green Line Under capacity N-S Line
	Medium	High	High	Medium	Low
Goal 1 Overall Ratings	◑	○	◑	●	◑

Source: WSAB Evaluation of MOS Report, Table 5.17, Metro (February 2019)
Note: ○= Low; ◑= Medium; ●= High

Table 8.4. Summary of MOS Concepts Evaluation Results - Goal 2: Support Local and Regional Land Use Plans and Policies Summary

Objectives and Evaluation Criteria	MOS Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
2.1 Provides First/Last Mile connections and interim parking (Connects to bicycle and pedestrian facilities; adequate parking to meet interim demand)	Walkability - Medium Bicycle - Low Parking - High	Walkability - Medium Bicycle - Medium Parking - Medium	Walkability - Medium Bicycle - Medium Parking - Medium	Walkability - Medium Bicycle - High Parking - Low	Walkability - Medium Bicycle - High Parking - Low
	Medium	Medium	Medium	Medium	Medium
2.2 Encourages economic development, projects, plans and jobs (Consistent with development plans)	LU % Residential – 54.5% Commercial – 30.6% Industrial – 5.2% Education – 2.7% Public – 1.1% Open Space – 3.4% Transportation – 1.7% Utilities – 1.0%	LU % Residential – 50.5% Commercial – 22.7% Industrial – 15.0% Education – 4.0% Public – 1.2% Open Space – 3.0% Transportation – 2.2% Utilities – 1.5%	LU % Residential – 50.5% Commercial – 26.8% Industrial – 12.0% Education – 3.3% Public – 1.3% Open Space – 3.3% Transportation – 1.8% Utilities – 1.2%	LU % Residential – 37.4% Commercial – 22.8% Industrial – 27.1% Education – 2.2% Public – 5.6% Open Space – 2.8% Transportation – 1.2% Utilities – 0.8%	LU % Residential – 39.4% Commercial – 25.5% Industrial – 27.0% Education – 2.2% Public – 1.4% Open Space – 2.4% Transportation – 1.2% Utilities – 0.8%
	High	High	High	Medium	Medium
2.3 Serves affordable housing (median market rate for housing near stations)	Median Market Rate $453,180 26 % Less than LA County	Median Market Rate $510,923 11 % Less than LA County	Median Market Rate $425,769 34 % Less than LA County	Median Market Rate $398,629 43 % Less than LA County	Median Market Rate $422,249 35 % Less than LA County
	Medium	Low	High	High	High
Goal 2 Overall Ratings	◑	○	●	◑	◑

Source: WSAB Evaluation of MOS Report, Table 5.30, Metro (February 2019)
Note: ○= Low; ◑ = Medium; ● = High

Table 8.5. Summary of MOS Concepts Evaluation Results – Goal 3: Minimize Environmental Impacts Summary

Evaluation Criteria	Minimal Operable Segment (MOS) Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 Union Station to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
3.1 Minimizes environmental and community impacts. (Reduction in VMT on a per mile of alignment basis; Effects to sensitive uses and other environmental considerations)* See Table 5.34	11,800 VMT per mile	4,500 VMT per mile	6,700 VMT per mile	20,150 VMT per mile	12,800 VMT per mile
	Low	Low	Low	High	Medium
	Minimal effects to sensitive uses and the environment	Moderate effects to sensitive uses and the environment	Moderate effects to sensitive uses and the environment	Greater effects to sensitive uses and the environment	Greater effects to sensitive uses and the environment
	High	Medium	Medium	Low	Low
3.2 Minimizes impacts to the transportation network (Traffic impacts; disruption to existing rail ROW)* See Table 5.39	Greater potential for traffic impact improvement	Lower potential for traffic impacts improvement	Lower potential for traffic impacts improvement	Moderate potential for traffic impact improvement	Moderate potential for traffic impact improvement
	High	Low	Low	Medium	Medium
	1.8 miles of overlap with rail ROW	9.7 miles of overlap with rail ROW	9.7 miles of overlap with rail ROW	9.6 miles of overlap with rail ROW	9.6 miles of overlap with rail ROW
	High	Low	Low	Low	Low
Goal 3 Overall Ratings	●	○	◑	◑	◑

Source: WSAB Evaluation of MOS Report, Table 5.40, Metro (February 2019)
Note: ○= Low; ◑= Medium; ●= High; O&M = operations and maintenance; ROW = right-of-way; VMT = vehicle miles traveled

Table 8.6. Summary of MOS Concepts Evaluation Results – Goal 4: Cost Effectiveness and Financial Feasibility Summary

Evaluation Criteria	Minimal Operable Segment (MOS) Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 Union Station to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
4.1 Cost are financially feasible. (ROM Capital cost; P3 considerations; O&M estimated cost)	$1.9 billion capital $34.8 million O&M (2017$)	$3.0 billion capital $53.3 million O&M (2017$)	$3.6 billion capital $62.3 million O&M (2017$)	$5.0 billion capital $63.0 million O&M (2017$)	$5.2 Billion $63.1 million to $67.9 million O&M (2017$)
	High	Medium	Medium	Low	Low
4.2 Provides a cost-effective project (Capital costs compared to number of new riders per year)	$940	$1,580	$1,010	$1,900	$1,480
	High	Medium	High	Low	Medium
4.3 Risk of cost increase (infrastructure constraints and conflicts; third-party approvals)	Less infrastructure constraints	Moderate infrastructure constraints	Moderate infrastructure constraints	Greater infrastructure constraints	Greater infrastructure constraints
	High	Medium	Medium	Low	Low
	13 Anticipated Third-Party Approvals	20 Anticipated Third-Party Approvals	22 Anticipated Third-Party Approvals	18 Anticipated Third-Party Approvals	18 Anticipated Third-Party Approvals
	Medium	Low	Low	Low	Low
Goal 4 Overall Ratings	●	◑	◑	○	○

Source: WSAB Evaluation of MOS Report, Table 5.52, Metro (February 2019)
Note: ○= Low; ◑ = Medium; ● = High; O&M = operations and maintenance; P3 = public-private-partnership; ROM = rough order of magnitude

Table 8.7. Summary of MOS Concepts Evaluation Results – Goal 5: Ensure Equity Summary

Evaluation Criteria	Minimal Operable Segment (MOS) Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 Union Station to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
5.1 Provides benefits to transit-dependent and minority populations. (% of transit-dependent persons; identified as an EJ community; new reliable fixed service to communities with limited transit options)	7.3% Transit-dependent population	10.3% Transit-dependent population	9.4% Transit-dependent population	18.5% Transit-dependent population	24.1% Transit-dependent population
	Medium	Medium	Medium	High	High
	EJ Communities Identified	EJ Communities Identified	EJ Communities Identified	EJ Communities Identified	EJ Communities Identified
	High	High	High	High	High
	New Service to cities of South Gate, Paramount, Bellflower, and Artesia currently underserved by Metro	New service to South Gate, Paramount, Bellflower currently underserved by Metro	New service to South Gate, Paramount, Bellflower, Artesia currently underserved by Metro	New service to South Gate currently underserved by Metro	New service to South Gate currently underserved by Metro
		Current heavily Metro-served areas (A (Blue) and C (Green) Lines): Florence-Firestone community of LA County, Huntington Park, Vernon	Current heavily Metro-served areas (A (Blue) and C (Green) Lines): Florence-Firestone community of LA County, Huntington Park, Vernon	Current heavily Metro-served areas (A (Blue), B (Red), and C (Green) Lines): communities surrounding Union Station, Little Tokyo and the Arts District in the City of Los Angeles, the Florence-Firestone community of LA County and Huntington Park	Current heavily Metro-served areas (A (Blue), B (Red), and C (Green) Lines): communities surrounding Union Station, Little Tokyo and the Arts District in the City of Los Angeles, the Florence-Firestone community of LA County and Huntington Park and South Gate
	High	Medium	High	Low	Low
Goal 5 Overall Ratings	◑	◑	●	◑	◑

Source: WSAB Evaluation of MOS Report, Table 5.57, Metro (February 2019)
Note: ○= Low; ◑ = Medium; ● = High; EJ = Environmental Justice

Each of the MOS concepts provided benefits that was considered against the potential costs and challenges. Table 8.8 presents a summary of the overall evaluation results.

Table 8.8. Summary of MOS Concepts Evaluation Results (2019)

Evaluation Criteria	Minimal Operable Segment (MOS) Concepts				
	MOS 1 I-105/C (Green) Line Station to Pioneer Station	MOS 2 Slauson Station to Bellflower Station	MOS 3 Slauson Station to Pioneer Station	MOS 4 Union Station to I-105/C (Green) Line Station	MOS 5 Downtown Transit Core to I-105/C (Green) Line Station
1. Provide Mobility Improvements	◑	○	◑	●	◑
2. Support Local and Regional Land Use Plans and Policies	◑	○	●	◑	◑
3. Minimize Environmental Impacts	●	○	◑	◑	◑
4. Ensure Cost Effectiveness and Financial Feasibility	●	◑	◑	○	○
5. Ensure Equity	◑	◑	●	◑	◑
Overall Rankings and Scores	●	○	●	◑	◑
	High	**Low**	**High**	**Medium**	**Medium**

Source: WSAB Evaluation of MOS Report, Table 6.1, Metro (February 2019)
Note: ○= Low; ◑= Medium; ●= High

8.4 Findings

Based on the evaluation results and the input from key stakeholders and Metro staff, MOS 1 (I-105/C (Green) Line Station to Pioneer Station) and MOS 3 (Slauson Station to Pioneer Station) were determined to provide the highest benefits. The following summarizes the key findings:

- **MOS 1: I-105/C (Green) Line Station to Pioneer Station was recommended to be carried forward.** This MOS concept's high performance was driven by several factors. MOS 1 would be cost effective and financially feasible ($1.9 B capital cost, $34.8M operating and maintenance (O&M), and $940/new rider) with lower risk of cost increase due to the alignment configuration (no underground segments), number of stations, length (6.1 miles), and availability of the Metro-owned PEROW (13 anticipated third-party approvals). MOS 1 would also result in minimal environmental effects and would have new benefits to the communities in the southern end of the corridor since there is currently no fixed rail transit south of the I-105 freeway. Although MOS 1 would have less boardings and new trips compared to the other MOS concepts, it would serve a significantly higher percentage of one-seat rides (64 percent) as a majority of the riders would board and align within the WSAB study area. MOS 1

would also access a high percentage of transit-supportive land uses (92.3 percent) and serve an affordable housing market near its stations ($453,180 median market rate compared to Los Angeles County ($569,350). MOS 1 demonstrated overall project benefits and high scores in environmental and cost-effectiveness goals.

- **MOS 2: Slauson Station to Bellflower Station: was not recommended to be carried forward.** With the exception of Goal 3, MOS 2 scored moderately under all of the project goals (mobility, land use, cost considerations, and equity) by providing a balance of modest ridership, rail and bus connectivity, land use consistency, and cost compared to the other MOS concepts. However, under Goal 3 minimizing environmental impacts, MOS 2 scored low due to the smaller VMT benefit (average of 4,500 VMT reduced per mile of alignment); the amount of overlap with existing rail right-of-way (9.7 miles); and the potential traffic and parking impacts at the terminus in Bellflower. MOS 2 did not demonstrate significant benefits with only moderate scores for cost effectiveness and equity and low scores under mobility, land use, and environmental goals.
- **MOS 3: Slauson Station to Pioneer Station was recommended to be carried forward.** MOS 3 would follow a similar alignment and have similar station characteristics compared to MOS 2. However, unlike MOS 2, MOS 3 provides additional service to Pioneer Station which would significantly increase some of the project benefits for mobility (648 new trips per mile) and equity by directly connecting to the communities on the south end of the corridor that are currently transit limited. Although this MOS concept would have a greater cost compared to MOS 1, it would serve a large number of new riders, thereby scoring high in cost effectiveness ($1,010 per new rider/year). MOS 3 demonstrated overall project benefits and high scores in equity and local land use.
- **MOS 4: Los Angeles Union Station to I-105/C (Green) Line Station was not recommended to be carried forward.** MOS 4 would provide high mobility benefits by linking downtown Los Angeles and the C (Green) Line. With 4,883 boardings per mile and direct connectivity with regional and local rail and bus lines, this MOS concept would increase service for an already highly served transit-dependent community. However, with high ROM capital cost ($5.0B), high O&M cost ($63.0M), and greater risks of cost increases (due to underground segments), this MOS scored low under the cost-effectiveness goal. MOS 4 would also not serve any of the communities south of the I-105 freeway. Although MOS 4 scores high in mobility improvements, it did not demonstrate other benefits as great as the other MOS concepts with only moderate scores for land use, environmental goals, and equity, and a low score under the cost-effectiveness goal.
- **MOS 5: Downtown Transit Core to I-105/C (Green) Line Station was not recommended to be carried forward.** MOS 5 had similar findings as MOS 4 in that this concept generally follows the same alignment and station characteristics except for the termini at the Downtown Transit Core. However, unlike MOS 4, MOS 5 would have potential peak operational capacity issues and a lower cost-effectiveness ratio ($1,480 per new rider/year). Although MOS 5 would have the highest capital cost ($5.2B) and O&M cost ($67.9M), it would also serve the largest percentage of transit-dependent population (24.1 percent) compared to the other MOS concepts. MOS 5 did not demonstrate high overall benefits compared to the other MOS concepts with only moderate scores for mobility, land use, environmental, and equity goals, and a low score under the cost-effectiveness goal.

These recommendations were confirmed and approved by the Metro Board in September 2019.

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