

West Santa Ana Branch Transit Corridor

Draft EIS/EIR Appendix L
Final Construction Methods Report



Metro®

WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

Draft EIS/EIR Appendix L Final Construction Methods Report

Prepared for:



Metro[®]

Los Angeles County
Metropolitan Transportation Authority

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APPENDIX A UTILITY CONFLICTS MATRIX

ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
ADA	American Disabilities Act
BMP	Best Management Practices
BRT	Bus Rapid Transit
Cal/OSHA	California Occupational Safety and Health Association
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CIDH	Cast-In-Drilled-Hole
CMP	Construction Mitigation Program
COG	Council of Governments
CY	cubic yard
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
GO	General Orders
HDM	Highway Design Manual
LA	Los Angeles
LADWP	LA Department of Water and Power
LAUS	Los Angeles Union Station
LRT	light rail transit
LRTP	Long Range Transportation Plan
LRV	light rail vehicle
Metro	Los Angeles County Metropolitan Transportation Authority
MRDC	Metro Rail Design Criteria
MSE	mechanically stabilized earth
MSF	maintenance and storage facility
MWD	Metropolitan Water District
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
OCS	overhead catenary system

OCTA	Orange County Transportation Authority
PEROW	Pacific Electric Right-of-Way
ROW	right-of-way
RWQCB	Regional Water Quality Control Board
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCG	Southern California Gas
SWPPP	Stormwater Pollution Prevention Plan
TBM	tunnel boring machine
TCE	Temporary Construction Easement
TMP	Transportation Management Plan
TPSS	Traction Power Substations
TRS	Technical Refinement Study
TSCA	Toxic Substances Control Act
UPRR	Union Pacific Railroad
USDOT	United States Department of Transportation
VMT	vehicle miles traveled
WSAB	West Santa Ana Branch

1 INTRODUCTION

1.1 Study Background

The West Santa Ana Branch (WSAB) Transit Corridor (Project) is a proposed light rail transit (LRT) line that would extend from four possible northern termini in southeast Los Angeles (LA) County to a southern terminus in the City of Artesia, traversing densely populated, low-income, and heavily transit-dependent communities. The Project would provide reliable, fixed guideway transit service that would increase mobility and connectivity for historically underserved, transit-dependent, and environmental justice communities; reduce travel times on local and regional transportation networks; and accommodate substantial future employment and population growth.

1.2 Alternatives Evaluation, Screening and Selection Process

A wide range of potential alternatives have been considered and screened through the alternatives analysis processes. In March 2010, the Southern California Association of Governments (SCAG) initiated the Pacific Electric Right-of-Way (PEROW)/WSAB Alternatives Analysis (AA) Study (SCAG 2013) in coordination with the relevant cities, Orangeline Development Authority (now known as Eco-Rapid Transit), the Gateway Cities Council of Governments, the Los Angeles County Metropolitan Transportation Authority (Metro), the Orange County Transportation Authority, and the owners of the right-of-way (ROW)—Union Pacific Railroad (UPRR), BNSF Railway, and the Ports of Los Angeles and Long Beach. The AA Study evaluated a wide variety of transit connections and modes for a broader 34-mile corridor from Union Station in downtown Los Angeles to the City of Santa Ana in Orange County. In February 2013, SCAG completed the PEROW/WSAB Corridor Alternatives Analysis Report¹ and recommended two LRT alternatives for further study: West Bank 3 and the East Bank.

Following completion of the AA, Metro completed the WSAB Technical Refinement Study in 2015 focusing on the design and feasibility of five key issue areas along the 19-mile portion of the WSAB Transit Corridor within LA County:

- Access to Union Station in downtown Los Angeles
- Northern Section Options
- Huntington Park Alignment and Stations
- New Metro C (Green) Line Station
- Southern Terminus at Pioneer Station in Artesia

In September 2016, Metro initiated the WSAB Transit Corridor Environmental Study with the goal of obtaining environmental clearance of the Project under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

¹ Initial concepts evaluated in the SCAG report included transit connections and modes for the 34 mile corridor from Union Station in downtown Los Angeles to the City of Santa Ana. Modes included low speed magnetic levitation (maglev) heavy rail, light rail, and bus rapid transit (BRT).

Metro issued a Notice of Preparation (NOP) on May 25, 2017, with a revised NOP issued on June 14, 2017, extending the comment period. In June 2017, Metro held public scoping meetings in the Cities of Bellflower, Los Angeles, South Gate, and Huntington Park. Metro provided Project updates and information to stakeholders with the intent to receive comments and questions through a comment period that ended in August 2017. A total of 1,122 comments were received during the public scoping period from May through August 2017. The comments focused on concerns regarding the Northern Alignment options, with specific concerns related to potential impacts to Alameda Street with an aerial alignment. Given potential visual and construction issues raised through public scoping, additional Northern Alignment concepts were evaluated.

In February 2018, the Metro Board of Directors approved further study of the alignment in the Northern Section due to community input during the 2017 scoping meetings. A second alternatives screening process was initiated to evaluate the original four Northern Alignment options and four new Northern Alignment concepts. The *Final Northern Alignment Alternatives and Concepts Updated Screening Report* was completed in May 2018 (Metro 2018a). The alternatives were further refined and, based on the findings of the second screening analysis and the input gathered from the public outreach meetings, the Metro Board of Directors approved Build Alternatives E and G for further evaluation (now referred to as Alternatives 1 and 2, respectively, in this report).

On July 11, 2018, Metro issued a revised and recirculated CEQA Notice of Preparation, thereby initiating a scoping comment period. The purpose of the revised Notice of Preparation was to inform the public of the Metro Board's decision to carry forward Alternatives 1 and 2 into the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). During the scoping period, one agency and three public scoping meetings were held in the Cities of Los Angeles, Cudahy, and Bellflower. The meetings provided Project updates and information to stakeholders with the intent to receive comments and questions to support the environmental process. The comment period for scoping ended in August 24, 2018; over 250 comments were received.

Following the July 2018 scoping period, a number of Project refinements were made to address comments received, including additional grade separations, removing certain stations with low ridership, and removing the Bloomfield extension option. The Metro Board adopted these refinements to the project description at their November 2018 meeting.

1.3 Report Purpose and Structure

This report summarizes the anticipated construction methods for the Project, including maintenance and storage facility site options. Construction of the Project would employ conventional construction methods, techniques, and equipment typically used for the construction of other Metro LRT projects in the Los Angeles region. The analysis of construction impacts is included in the construction sections of each technical impact report.

2 PROJECT DESCRIPTION

This section describes the No Build Alternative and the four Build Alternatives studied in the WSAB Transit Corridor Draft EIS/EIR, including design options, station locations, and maintenance and storage facility (MSF) site options. The Build Alternatives were developed through a comprehensive alternatives analysis process and meet the purpose and need of the Project.

The No Build Alternative and four Build Alternatives are generally defined as follows:

- **No Build Alternative** - Reflects the transportation network in the 2042 horizon year without the proposed Build Alternatives. The No Build Alternative includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained Metro 2009 Long Range Transportation Plan (2009 LRTP) (Metro 2009) and SCAG's 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) (SCAG 2016), as well as additional projects funded by Measure M that would be completed by 2042.
- **Build Alternatives:** The Build Alternatives consist of a new LRT line that would extend from different termini in the north to the same terminus in the City of Artesia in the south. The Build Alternatives are referred to as:
 - Alternative 1: Los Angeles Union Station to Pioneer Station; the northern terminus would be located underground at Los Angeles Union Station (LAUS) Forecourt
 - Alternative 2: 7th Street/Metro Center to Pioneer Station; the northern terminus would be located underground at 8th Street between Figueroa Street and Flower Street near 7th Street/Metro Center Station
 - Alternative 3: Slauson/A (Blue) Line to Pioneer Station; the northern terminus would be located just north of the intersection of Long Beach Avenue and Slauson Avenue in the City of Los Angeles, connecting to the current A (Blue) Line Slauson Station
 - Alternative 4: I-105/C (Green) Line to Pioneer Station; the northern terminus would be located at I-105 in the city of South Gate, connecting to the C (Green) Line along the I-105

Two design options are under consideration for Alternative 1. Design Option 1 would locate the northern terminus station box at the LAUS Metropolitan Water District (MWD) east of LAUS and the MWD building, below the baggage area parking facility. Design Option 2 would add the Little Tokyo Station along the WSAB alignment. The Design Options are further discussed in Section 2.3.6.

Figure 2-1 presents the four Build Alternatives and the design options. In the north, Alternative 1 would terminate at LAUS and primarily follow Alameda Avenue south underground to the proposed Arts/Industrial District Station. Alternative 2 would terminate near the existing 7th Street/Metro Center Station in the Downtown Transit Core and would primarily follow 8th Street east underground to the proposed Arts/Industrial District Station.

Figure 2-1. Project Alternatives



Source: Metro, 2020

From the Arts/Industrial District Station to the southern terminus at Pioneer Station, Alternatives 1 and 2 share a common alignment. South of Olympic Boulevard, the Alternatives 1 and 2 would transition from an underground configuration to an aerial configuration, cross over the Interstate (I-) 10 freeway and then parallel the existing Metro A (Blue) Line along the Wilmington Branch ROW as it proceeds south. South of Slauson Avenue, which would serve as the northern terminus for Alternative 3, Alternatives 1, 2, and 3 would turn east and transition to an at-grade configuration to follow the La Habra Branch ROW along Randolph Street. At the San Pedro Subdivision ROW, Alternatives 1, 2, and 3 would turn southeast to follow the San Pedro Subdivision ROW and then transition to the Pacific Electric Right-of-Way (PEROW), south of the I-105 freeway. The northern terminus for Alternative 4 would be located at the I-105/C Line Station. Alternatives 1, 2, 3, and 4 would then follow the PEROW to the southern terminus at the proposed Pioneer Station in Artesia. The Build Alternatives would be grade-separated where warranted, as indicated on Figure 2-2.

Figure 2-2. Project Alignment by Alignment Type



Source: Metro, 2020

2.1 Geographic Sections

The approximately 19-mile corridor is divided into two geographic sections—the Northern and Southern Sections. The boundary between the Northern and Southern Sections occurs at Florence Avenue in the City of Huntington Park.

2.1.1 Northern Section

The Northern Section includes approximately 8 miles of Alternatives 1 and 2 and 3.8 miles of Alternative 3. Alternative 4 is not within the Northern Section. The Northern Section covers the geographic area from downtown Los Angeles to Florence Avenue in the City of Huntington Park and would generally traverse the Cities of Los Angeles, Vernon, Huntington Park, and Bell, and the unincorporated Florence-Firestone community of LA County (Figure 2-3). Alternatives 1 and 2 would traverse portions of the Wilmington Branch (between approximately Martin Luther King Jr Boulevard along Long Beach Avenue to Slauson Avenue). Alternatives 1, 2, and 3 would traverse portions of the La Habra Branch ROW (between Slauson Avenue along Randolph Street to Salt Lake Avenue) and San Pedro Subdivision ROW (between Randolph Street to approximately Paramount Boulevard).

Figure 2-3. Northern Section



Source: Metro, 2020

2.1.2 Southern Section

The Southern Section includes approximately 11 miles of Alternatives 1, 2, and 3 and includes all 6.6 miles of Alternative 4. The Southern Section covers the geographic area from south of Florence Avenue in the City of Huntington Park to the City of Artesia and would generally traverse the Cities of Huntington Park, Cudahy, South Gate, Downey, Paramount, Bellflower, Cerritos, and Artesia (Figure 2-4). In the Southern Section, all four Build Alternatives would utilize portions of the San Pedro Subdivision and the Metro-owned PEROW (between approximately Paramount Boulevard to South Street).

Figure 2-4. Southern Section



Source: Metro, 2020

2.2 No Build Alternative

For the NEPA evaluation, the No Build Alternative is evaluated in the context of the existing transportation facilities in the Transit Corridor (the Transit Corridor extends approximately 2 miles from either side of the proposed alignment) and other capital transportation improvements and/or transit and highway operational enhancements that are reasonably foreseeable. Because the No Build Alternative provides the background transportation

network, against which the Build Alternatives' impacts are identified and evaluated, the No Build Alternative does not include the Project.

The No Build Alternative reflects the transportation network in 2042 and includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained Metro 2009 LRTP and the SCAG 2016 RTP/SCS, as well as additional projects funded by Measure M, a sales tax initiative approved by voters in November 2016. The No Build Alternative includes Measure M projects that are scheduled to be completed by 2042.

Table 2.1 lists the existing transportation network and planned improvements included as part of the No Build Alternative.

Table 2.1. No Build Alternative – Existing Transportation Network and Planned Improvements

Project	To / From	Location Relative to Transit Corridor
Rail (Existing)		
Metro Rail System (LRT and Heavy Rail Transit)	Various locations	Within Transit Corridor
Metrolink (Southern California Regional Rail Authority) System	Various locations	Within Transit Corridor
Rail (Under Construction/Planned)¹		
Metro Westside D (Purple) Line Extension	Wilshire/Western to Westwood/VA Hospital	Outside Transit Corridor
Metro C (Green) Line Extension ² to Torrance	96th Street Station to Torrance	Outside Transit Corridor
Metro C (Green) Line Extension	Norwalk to Expo/Crenshaw ³	Outside Transit Corridor
Metro East-West Line/Regional Connector/Eastside Phase 2	Santa Monica to Lambert Santa Monica to Peck Road	Within Transit Corridor
Metro North-South Line/Regional Connector/Foothill Extension to Claremont Phase 2B	Long Beach to Claremont	Within Transit Corridor
Metro Sepulveda Transit Corridor	Metro G (Orange) Line to Metro E (Expo) Line	Outside Transit Corridor
Metro East San Fernando Valley Transit Corridor	Sylmar to Metro G (Orange) Line	Outside Transit Corridor
Los Angeles World Airport Automated People Mover	96th Street Station to LAX Terminals	Outside Transit Corridor
Metrolink Capital Improvement Projects	Various projects	Within Transit Corridor
California High-Speed Rail	Burbank to LA LA to Anaheim	Within Transit Corridor
Link US	LAUS	Within Transit Corridor

2 Project Description

Project	To / From	Location Relative to Transit Corridor
Bus (Existing)		
Metro Bus System (including BRT, Express, and local)	Various locations	Within Transit Corridor
Municipality Bus System ⁴	Various locations	Within Transit Corridor
Bus (Under Construction/Planned)		
Metro G (Orange) Line (BRT)	Del Mar (Pasadena) to Chatsworth Del Mar (Pasadena) to Canoga Canoga to Chatsworth	Outside Transit Corridor
Vermont Transit Corridor (BRT)	120th Street to Sunset Boulevard	Outside Transit Corridor
North San Fernando Valley BRT	Chatsworth to North Hollywood	Outside Transit Corridor
North Hollywood to Pasadena	North Hollywood to Pasadena	Outside Transit Corridor
Highway (Existing)		
Highway System	Various locations	Within Transit Corridor
Highway (Under Construction/Planned)		
High Desert Multi-Purpose Corridor	SR-14 to SR-18	Outside Transit Corridor
I-5 North Capacity Enhancements	SR-14 to Lake Hughes Rd	Outside Transit Corridor
SR-71 Gap Closure	I-10 to Rio Rancho Rd	Outside Transit Corridor
Sepulveda Pass Express Lane	I-10 to US-101	Outside Transit Corridor
SR-57/SR-60 Interchange Improvements	SR-70/SR-60	Outside Transit Corridor
I-710 South Corridor Project (Phase 1 & 2)	Ports of Long Beach and LA to SR-60	Within Transit Corridor
I-105 Express Lane	I-405 to I-605	Within Transit Corridor
I-5 Corridor Improvements	I-605 to I-710	Outside Transit Corridor

Source: Metro 2018, WSP 2019

Notes: ¹ Where extensions are proposed for existing Metro rail lines, the origin/destination is defined for the operating scheme of the entire rail line following completion of the proposed extensions and not just the extension itself.

² Metro C (Green) Line extension to Torrance includes new construction from Redondo Beach to Torrance; however, the line will operate from Torrance to 96th Street.

³ The currently under construction Metro Crenshaw/LAX Line will operate as the Metro C (Green) Line.

⁴ The municipality bus network system is based on service patterns for Bellflower Bus, Cerritos on Wheels, Cudahy Area Rapid Transit, Get Around Town Express, Huntington Park Express, La Campana, Long Beach Transit, Los Angeles Department of Transportation, Norwalk Transit System and the Orange County Transportation Authority.

BRT = Bus Rapid Transit; LAUS = Los Angeles Union Station; LAX = Los Angeles International Airport; VA = Veterans Affairs

2.3 Build Alternatives

2.3.1 Proposed Alignment Configuration for the Build Alternatives

This section describes the alignment for each of the Build Alternatives. The general characteristics of the four Build Alternatives are summarized in Table 2.2. Figure 2-5 illustrates the freeway crossings along the alignment. Additionally, the Build Alternatives would require relocation of existing freight rail tracks within the ROW to maintain existing operations where there would be overlap with the proposed light rail tracks. Figure 2-6 depicts the alignment sections that would share operation with freight and the corresponding ownership.

Table 2.2. Summary of Build Alternative Components

Component	Quantity			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Alignment Length	19.3 miles	19.3 miles	14.8 miles	6.6 miles
Stations Configurations	11 3 aerial; 6 at-grade; 2 underground ³	12 3 aerial; 6 at-grade; 3 underground	9 3 aerial; 6 at-grade	4 1 aerial; 3 at-grade
Parking Facilities	5 (approximately 2,780 spaces)	5 (approximately 2,780 spaces)	5 (approximately 2,780 spaces)	4 (approximately 2,180 spaces)
Length of underground, at-grade, and aerial	2.3 miles underground; 12.3 miles at-grade; 4.7 miles aerial ¹	2.3 miles underground; 12.3 miles at-grade; 4.7 miles aerial ¹	12.2 miles at-grade; 2.6 miles aerial ¹	5.6 miles at-grade; 1.0 miles aerial ¹
At-grade crossings	31	31	31	11
Freight crossings	10	10	9	2
Freeway Crossings	6 (3 freeway undercrossings ² at I-710; I-605, SR-91)	6 (3 freeway undercrossings ² at I-710; I-605, SR-91)	4 (3 freeway undercrossings ² at I-710; I-605, SR-91)	3 (2 freeway undercrossings ² at I-605, SR-91)
Elevated Street Crossings	25	25	15	7
River Crossings	3	3	3	1
TPSS Facilities	22 ³	23	17	7
Maintenance and Storage Facility site options	2	2	2	2

Source: WSP, 2020

Notes: ¹ Alignment configuration measurements count retained fill embankments as at-grade.

² The light rail tracks crossing beneath freeway structures.

³ Under Design Option 2 – Add Little Tokyo Station, an additional underground station and TPSS site would be added under Alternative 1

Figure 2-5. Freeway Crossings



Source: WSP, 2020

Figure 2-6. Existing Rail Right-of-Way Ownership and Relocation



Source: WSP, 2020

2.3.2 Alternative 1: Los Angeles Union Station to Pioneer Station

The total alignment length of Alternative 1 would be approximately 19.3 miles, consisting of approximately 2.3 miles of underground, 12.3 miles of at-grade, and 4.7 miles of aerial alignment. Alternative 1 would include 11 new LRT stations, 2 of which would be underground, 6 would be at-grade, and 3 would be aerial. Under Design Option 2, Alternative 1 would have 12 new LRT stations, and the Little Tokyo Station would be an additional underground station. Five of the stations would include parking facilities, providing a total of up to 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 2 aerial freeway crossings, 1 underground freeway crossing, 3 river crossings, 25 aerial road crossings, and 10 freight crossings.

In the north, Alternative 1 would begin at a proposed underground station at/near LAUS either beneath the LAUS Forecourt or, under Design Option 1, east of the MWD building beneath the baggage area parking facility (Section 2.3.6). Crossovers would be located on the north and south ends of the station box with tail tracks extending approximately 1,200 feet north of the station box. A tunnel extraction portal would be located within the tail tracks for both Alternative 1 terminus station options.

From LAUS, the alignment would continue underground crossing under the US-101 freeway and the existing Metro L (Gold) Line aerial structure and continue south beneath Alameda Street to the optional Little Tokyo Station between 1st Street and 2nd Street (note: under Design Option 2, Little Tokyo Station would be constructed). From the optional Little Tokyo Station, the alignment would continue underground beneath Alameda Street to the proposed Arts/Industrial District Station under Alameda Street between 6th Street and Industrial Street. (Note, Alternative 2 would have the same alignment as Alternative 1 from this point south. Refer to Section 2.3.3 for additional information on Alternative 2.)

The underground alignment would continue south under Alameda Street to 8th Street, where the alignment would curve to the west and transition to an aerial alignment south of Olympic Boulevard. The alignment would cross over the I-10 freeway in an aerial viaduct structure and continue south, parallel to the existing Metro A (Blue) Line at Washington Boulevard. The alignment would continue in an aerial configuration along the eastern half of Long Beach Avenue within the UPRR-owned Wilmington Branch ROW, east of the existing Metro A (Blue) Line and continue south to the proposed Slauson/A Line Station. The aerial alignment would pass over the existing pedestrian bridge at E. 53rd Street. The Slauson/A Line Station would serve as a transfer point to the Metro A (Blue) Line via a pedestrian bridge. The vertical circulation would be connected at street level on the north side of the station via stairs, escalators, and elevators. (The Slauson/A Line Station would serve as the northern terminus for Alternative 3; refer to Section 2.3.4 for additional information on Alternative 3.)

South of the Slauson/A Line Station, the alignment would turn east along the existing La Habra Branch ROW (also owned by UPRR) in the median of Randolph Street. The alignment would be on the north side of the La Habra Branch ROW and would require the relocation of existing freight tracks to the southern portion of the ROW. The alignment would transition to an at-grade configuration at Alameda Street and would proceed east along the Randolph Street median. Wilmington Avenue, Regent Street, Albany Street, and Rugby Avenue would be closed to traffic crossing the ROW, altering

the intersection design to a right-in, right-out configuration. The proposed Pacific/Randolph Station would be located just east of Pacific Boulevard.

From the Pacific/Randolph Station, the alignment would continue east at-grade. Rita Avenue would be closed to traffic crossing the ROW, altering the intersection design to a right-in, right-out configuration. At the San Pedro Subdivision ROW, the alignment would transition to an aerial configuration and turn south to cross over Randolph Street and the freight tracks, returning to an at-grade configuration north of Gage Avenue. The alignment would be located on the east side of the existing San Pedro Subdivision ROW freight tracks, and the existing tracks would be relocated to the west side of the ROW. The alignment would continue at-grade within the San Pedro Subdivision ROW to the proposed at-grade Florence/Salt Lake Station south of the Salt Lake Avenue/Florence Avenue intersection.

South of Florence Avenue, the alignment would extend from the proposed Florence/Salt Lake Station in the City of Huntington Park to the proposed Pioneer Station in the City of Artesia, as shown in Figure 2-4. The alignment would continue southeast from the proposed at-grade Florence/Salt Lake Station within the San Pedro Subdivision ROW, crossing Otis Avenue, Santa Ana Street, and Ardine Street at-grade. The alignment would be located on the east side of the existing San Pedro Subdivision freight tracks and the existing tracks would be relocated to the west side of the ROW. South of Ardine Street, the alignment would transition to an aerial structure to cross over the existing UPRR tracks and Atlantic Avenue. The proposed Firestone Station would be located on an aerial structure between Atlantic Avenue and Firestone Boulevard.

The alignment would then cross over Firestone Boulevard and transition back to an at-grade configuration prior to crossing Rayo Avenue at-grade. The alignment would continue south along the San Pedro Subdivision ROW, crossing Southern Avenue at-grade and continuing at-grade until it transitions to an aerial configuration to cross over the LA River. The proposed LRT bridge would be constructed next to the existing freight bridge. South of the LA River, the alignment would transition to an at-grade configuration crossing Frontage Road at-grade, then passing under the I-710 freeway through the existing box tunnel structure and then crossing Miller Way. The alignment would then return to an aerial structure to cross the Rio Hondo Channel. South of the Rio Hondo Channel, the alignment would briefly transition back to an at-grade configuration and then return to an aerial structure to cross over Imperial Highway and Garfield Avenue. South of Garfield Avenue, the alignment would transition to an at-grade configuration and serve the proposed Gardendale Station north of Gardendale Street.

From the Gardendale Station, the alignment would continue south in an at-grade configuration, crossing Gardendale Street and Main Street to connect to the proposed I-105/C Line Station, which would be located at-grade north of Century Boulevard. This station would be connected to the new infill C (Green) Line Station in the middle of the freeway via a pedestrian walkway on the new LRT bridge. The alignment would continue at-grade, crossing Century Boulevard and then over the I-105 freeway in an aerial configuration within the existing San Pedro Subdivision ROW bridge footprint. A new Metro C (Green) Line Station would be constructed in the median of the I-105 freeway. Vertical pedestrian access would be provided from the LRT bridge to the proposed I-105/C Line Station platform via stairs and elevators. To accommodate the construction of the new station platform, the existing Metro C (Green) Line tracks would be widened and, as part of the I-105 Express Lanes Project, the I-105 lanes would be reconfigured. (The I-105/C Line Station would serve

as the northern terminus for Alternative 4; refer to Section 2.3.5 for additional information on this alternative.)

South of the I-105 freeway, the alignment would continue at-grade within the San Pedro Subdivision ROW. In order to maintain freight operations and allow for freight train crossings, the alignment would transition to an aerial configuration as it turns southeast and enter the PEROW. The existing freight track would cross beneath the aerial alignment and align on the north side of the PEROW east of the San Pedro Subdivision ROW. The proposed Paramount/Rosecrans Station would be located in an aerial configuration west of Paramount Boulevard and north of Rosecrans Avenue. The existing freight track would be relocated to the east side of the alignment beneath the station viaduct.

The alignment would continue southeast in an aerial configuration over the Paramount Boulevard/Rosecrans Avenue intersection and descend to an at-grade configuration. The alignment would return to an aerial configuration to cross over Downey Avenue descending back to an at-grade configuration north of Somerset Boulevard. One of the adjacent freight storage tracks at Paramount Refinery Yard would be relocated to accommodate the new LRT tracks and maintain storage capacity. There are no active freight tracks south of the World Energy facility.

The alignment would cross Somerset Boulevard at-grade. South of Somerset Boulevard, the at-grade alignment would parallel the existing Bellflower Bike Trail that is currently aligned on the south side of the PEROW. The alignment would continue at-grade crossing Lakewood Boulevard, Clark Avenue, and Alondra Boulevard. The proposed at-grade Bellflower Station would be located west of Bellflower Boulevard.

East of Bellflower Boulevard, the Bellflower Bike Trail would be realigned to the north side of the PEROW to accommodate an existing historic building located near the southeast corner of Bellflower Boulevard and the PEROW. It would then cross back over the LRT tracks at-grade to the south side of the ROW. The LRT alignment would continue southeast within the PEROW and transition to an aerial configuration at Cornuta Avenue, crossing over Flower Street and Woodruff Avenue. The alignment would return to an at-grade configuration at Walnut Street. South of Woodruff Avenue, the Bellflower Bike Trail would be relocated to the north side of the PEROW. Continuing southeast, the LRT alignment would cross under the SR-91 freeway in an existing underpass. The alignment would cross over the San Gabriel River on a new bridge, replacing the existing abandoned freight bridge. South of the San Gabriel River, the alignment would transition back to an at-grade configuration before crossing Artesia Boulevard at-grade.

East of Artesia Boulevard the alignment would cross beneath the I-605 freeway in an existing underpass. Southeast of the underpass, the alignment would continue at-grade, crossing Studebaker Road. North of Gridley Road, the alignment would transition to an aerial configuration to cross over 183rd Street and Gridley Road. The alignment would return to an at-grade configuration at 185th Street, crossing 186th Street and 187th Street at-grade. The alignment would then pass through the proposed Pioneer Station on the north side of Pioneer Boulevard at-grade. Tail tracks accommodating layover storage for a three-car train would extend approximately 1,000 feet south from the station, crossing Pioneer Boulevard and terminating west of South Street.

2.3.3 Alternative 2: 7th Street/Metro Center to Pioneer Station

The total alignment length of Alternative 2 would be approximately 19.3 miles, consisting of approximately 2.3 miles of underground, 12.3 miles of at-grade, and 4.7 miles of aerial alignment. Alternative 2 would include 12 new LRT stations, 3 of which would be underground, 6 would be at-grade, and 3 would be aerial. Five of the stations would include parking facilities, providing a total of approximately 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 2 aerial freeway crossings, 1 underground freeway crossing, 3 river crossings, 25 aerial road crossings, and 10 freight crossings.

In the north, Alternative 2 would begin at the proposed WSAB 7th Street/Metro Center Station, which would be located underground beneath 8th Street between Figueroa Street and Flower Street. A pedestrian tunnel would provide connection to the existing 7th Street/Metro Center Station. Tail tracks, including a double crossover, would extend approximately 900 feet beyond the station, ending east of the I-110 freeway. From the 7th Street/Metro Center Station, the underground alignment would proceed southeast beneath 8th Street to the South Park/Fashion District Station, which would be located west of Main Street beneath 8th Street.

From the South Park/Fashion District Station, the underground alignment would continue under 8th Street to San Pedro Street, where the alignment would turn east toward 7th Street, crossing under privately owned properties. The tunnel alignment would cross under 7th Street and then turn south at Alameda Street. The alignment would continue south beneath Alameda Street to the Arts/Industrial District Station located under Alameda Street between 7th Street and Center Street. A double crossover would be located south of the station box, south of Center Street. From this point, the alignment of Alternative 2 would follow the same alignment as Alternative 1, which is described further in Section 2.3.2.

2.3.4 Alternative 3: Slauson/A (Blue) Line to Pioneer Station

The total alignment length of Alternative 3 would be approximately 14.8 miles, consisting of approximately 12.2 miles of at-grade, and 2.6 miles of aerial alignment. Alternative 3 would include 9 new LRT stations, 6 would be at-grade and 3 would be aerial. Five of the stations would include parking facilities, providing a total of approximately 2,780 new parking spaces. The alignment would include 31 at-grade crossings, 3 freeway undercrossings, 1 aerial freeway crossing, 3 river crossings, 15 aerial road crossings, and 9 freight crossings. In the north, Alternative 3 would begin at the Slauson/A Line Station and follow the same alignment as Alternatives 1 and 2, described in Section 2.3.2.

2.3.5 Alternative 4: I-105/C (Green) Line to Pioneer Station

The total alignment length of Alternative 4 would be approximately 6.6 miles, consisting of approximately 5.6 miles of at-grade and 1.0 mile of aerial alignment. Alternative 3 would include 4 new LRT stations, 3 would be at-grade, and 1 would be aerial. Four of the stations would include parking facilities, providing a total of approximately 2,180 new parking spaces. The alignment would include 11 at-grade crossings, 2 freeway undercrossings, 1 aerial freeway crossing, 1 river crossing, 7 aerial road crossings, and 2 freight crossings. In the north, Alternative 4 would begin at the I-105/C Line Station and follow the same alignment as Alternatives 1, 2, and 3, described in Section 2.3.2.

2.3.6 Design Options

Alternative 1 includes two design options:

- **Design Option 1:** LAUS at the Metropolitan Water District (MWD) – The LAUS station box would be located east of LAUS and the MWD building, below the baggage area parking facility instead of beneath the LAUS Forecourt. Crossovers would be located on the north and south ends of the station box with tail tracks extending approximately 1,200 feet north of the station box. From LAUS, the underground alignment would cross under the US-101 freeway and the existing Metro L (Gold) Line aerial structure and continue south beneath Alameda Street to the optional Little Tokyo Station between Traction Avenue and 1st Street. The underground alignment between LAUS and the Little Tokyo Station would be located to the east of the base alignment.
- **Design Option 2:** Add the Little Tokyo Station – Under this design option, the Little Tokyo Station would be constructed as an underground station and there would be a direct connection to the Regional Connector Station in the Little Tokyo community. The alignment would proceed underground directly from LAUS to the Arts/Industrial District Station primarily beneath Alameda Street.

2.3.7 Maintenance and Storage Facility

MSFs accommodate daily servicing and cleaning, inspection and repairs, and storage of light rail vehicles (LRV). Activities may take place in the MSF throughout the day and night depending upon train schedules, workload, and the maintenance requirements.

Two MSF options are evaluated; however, only one MSF would be constructed as part of the Project. The MSF would have storage tracks, each with sufficient length to store three-car train sets and a maintenance-of-way vehicle storage. The facility would include a main shop building with administrative offices, a cleaning platform, a traction power substation (TPSS), employee parking, a vehicle wash facility, a paint and body shop, and other facilities as needed. The east and west yard leads (i.e., the tracks leading from the mainline to the facility) would have sufficient length for a three-car train set. In total, the MSF would need to accommodate approximately 80 LRVs to serve the Project's operations plan.

Two potential locations for the MSF have been identified—one in the City of Bellflower and one in the City of Paramount. These options are described further in the following sections.

2.3.8 Bellflower MSF Option

The Bellflower MSF site option is bounded by industrial facilities to the west, Somerset Boulevard and apartment complexes to the north, residential homes to the east, and the PEROW and Bellflower Bike Trail to the south. The site is approximately 21 acres in area and can accommodate up to 80 vehicles (Figure 2-7).

2.3.9 Paramount MSF Option

The Paramount MSF site option is bounded by the San Pedro Subdivision ROW on the west, Somerset Boulevard to the south, industrial and commercial uses on the east, and All American City Way to the north. The site is 22 acres and could accommodate up to 80 vehicles (Figure 2-7).

Figure 2-7. Maintenance and Storage Facility Options



Source: WSP, 2020

3 REGULATORY FRAMEWORK

Construction activities would occur within the jurisdictions of Los Angeles County and the cities of Los Angeles, Vernon, Huntington Park, Bell, Cudahy, South Gate, Downey, Paramount, Bellflower, Cerritos and Artesia. Construction of the Build Alternatives would employ conventional construction methods, techniques, and equipment typically used for Metro LRT construction. Construction-related activities would comply with applicable federal, state, regional and local regulations as they relate to construction, including building and safety requirements of Cal/OSH). All construction activities are subject to existing regulatory requirements and Best Management Practices (BMPs) for construction materials, waste management, erosion and sediment accumulation, as well as construction of structures that are necessary for the LRT system, which would follow all applicable State of California building codes including the latest seismic design requirements.

Refer to each appropriate technical impact analysis report for a complete discussion of applicable federal, state, regional and local regulations.

3.1 Federal

The following federal regulations apply to the construction impacts for the Project:

- National Electrical Code (NFPA 70)
- Standard for Fixed Guideway Transit and Passenger Rail Systems
- American Railway Engineering and Maintenance of Way Association Standards (AREMA)
- Standard Urban Stormwater Mitigation Plan (SUSMP)
- Stormwater Pollution Prevention Plan (SWPPP)
- Federal Clean Air Act
- Federal Clean Air Act Conformity Requirement
- National Ambient Air Quality Standards (NAAQS)
- Section 404 of the Clean Water Act
- Section 408 of the Rivers and Harbors Appropriation Act of 1899
- National Pollutant Discharge Elimination System (NPDES)
- Federal Noise Control Act
- Resource Conservation and Recovery Act of 1976 (RCRA)
- Toxic Substances Control Act of 1976 (TSCA)
- Comprehensive Environmental Response, Compensation, and Liability Act
- Federal Railroad Administration Regulation 49 CFR 200-299: Transportation
- Uniform Fire Code
- Americans Disabilities Act of 1990
- National Fire Protection Association (NFPA) 101 Life Safety Code and NFPA 130
- United States Department of Transportation (USDOT) Subway Environmental Design Handbook (USDOT, 1975)

3.2 State

The following state regulations apply to construction impacts for the Project:

- California Building Code
- Caltrans Highway Design Manual (HDM)
- California Public Utility Commission General Orders (GO) including but not limited:
 - GO 33-B—Construction, Reconstruction, Maintenance and storage of Interlocking Plants of Railroads
 - GO 52—Construction and Operation of Power and Communication Lines for the Prevention or Mitigation of Inductive Interference
 - GO 72-B—Standard Types of Pavement Construction at Railroad Grade Crossings
 - GO 88—Rules for Altering Public Highway-Rail Crossings
 - GO 95—Overhead electric line construction
 - GO 118—Construction, Reconstruction and Maintenance of Walkways and Control of Vegetation Adjacent to Railroad Tracks
 - GO 128—Construction of Underground Electric Supply and Communication Systems
 - GO 131-D—Planning and Construction of Facilities for the Generation of Electricity and Certain Electric Transmission Facilities
 - GO 143-B—Design, construction and operation of light rail transit systems
- California Ambient Air Quality Standards (CAAQS)
- State Water Resources Control Board/Regional Water Quality Control Board
- California Division of Occupational Safety and Health (Cal/OSHA)

3.3 Local and Regional

At the local level, construction of the Project would require compliance with the following regional regulations and guidelines as well as city policies and ordinances.

- South Coast Air Quality Management District (SCAQMD) Rule 403
- SCAQMD Clean Air Act Rule 1403—asbestos regulation
- City of Los Angeles General Plan
- City of Los Angeles Construction Noise Ordinance
- City of Vernon General Plan
- City of Huntington Park General Plan
- City of Huntington Park Construction Noise Ordinance
- Los Angeles County General Plan 2035
- Los Angeles County Community Standards District
- County of Los Angeles Construction Noise Ordinance
- City of Bell 2010 General Plan
- City of Cudahy General Plan
- City of Cudahy Construction Noise Ordinance
- City of South Gate General Plan 2035
- City of South Gate Construction Noise Ordinance
- City of Downey Construction Noise Ordinance

- City of Paramount General Plan
- City of Paramount Construction Noise Ordinance
- City of Bellflower General Plan: 1995-2010
- City of Bellflower Construction Noise Ordinance
- City of Artesia General Plan 2030
- City of Artesia Construction Noise Ordinance
- City of Cerritos General Plan
- City of Cerritos Construction Noise Ordinance
- Metro Rail Design Criteria
- Metro Green Construction Policy

4 CONSTRUCTION METHODS/AFFECTED ENVIRONMENT

This section provides an overview of typical construction activities required to build an LRT system and associated stations, systems, and other supporting facilities. The activities summarized in this section are based on information known to date about construction of the Build Alternatives. Actual construction methods and materials would be site specific and at the discretion of the contractor. All construction methods and materials would be conducted within the parameters set by Metro and would comply with all regulatory requirements. The final means and methods may differ from what is included in this analysis. Sequencing and methods would largely be adopted during final design and may depend on a potential public-private partnership. During final design and prior to any construction, preconstruction evaluations would be completed to determine existing conditions that would affect construction methods and timing. An environmental reevaluation will be conducted as applicable if construction means and methods vary from what was described in this report.

4.1 Construction Sequencing and Duration

The Project currently proposes to complete construction of the Project in a single construction phase. Construction activities for the Project are anticipated to commence in 2022 and last through 2028 with revenue service beginning in 2028. It is anticipated that construction activities would occur simultaneously along the project alignment. A construction plan would be developed during the final design phase of the Project to further detail the construction durations, schedule, and sequencing. Depending on the alternative selected for implementation, major components of the Project include the construction of guideways and trackwork (at-grade, aerial, and underground), grade separations, roadway improvements, utility relocations, station platforms (at-grade, aerial, and underground), a MSF, parking facilities, and supporting system facilities (e.g., TPSSs). Construction durations and activities are summarized in Table 4.1 and in the subsections that follow. Figure 4-1 and Figure 4-2 identify alignment location and configuration of the Build Alternatives.

Working hours of construction would vary to meet the type of work being performed and to meet local ordinance restrictions. Project construction would predominantly occur on weekdays between 8 a.m. and 7 p.m. Nighttime and/or weekend construction may be required to minimize impacts, such as minimizing roadway/lane closures during peak periods.

Table 4.1. General Sequence of Construction Activities and Equipment in the Northern and Southern Sections

Activity	Approximate Duration (Months) ¹	Description	Equipment Required
Demolition Activities			
At-grade guideway	3-6	Clear and grub ROW, remove abandoned/active track and abandoned utilities	Bulldozers, backhoes, loaders, bobcats, dump trucks
Parking facilities	2-4	Demolish existing structures, pavement, clear and grub site, remove abandoned utilities	Bulldozers, excavators, cranes, bobcats, backhoes, loaders, dump trucks
Maintenance facilities	3-5	Demolish existing structures, pavement, clear and grub site, remove abandoned utilities	Bulldozers, excavators, cranes, bobcats, backhoes, loaders, dump trucks
Utility Relocation			
Utilities	30-40	Relocate or temporarily reroute utilities; typically would not exceed 5-10 feet of disturbance Protect-in-place utilities that would not be relocated	Trench excavators, loaders, jackhammers, pavement saws, haul trucks, excavator/backhoes, trucks, cranes, and generator/compressors, concrete trucks, rollers, and power compactors, trenchers, concrete pavers, rollers
Freight Rail Line Relocation			
At-grade guideway	12-18	Relocate existing freight tracks	Rubber-tired graders, bulldozers, excavators, loaders, compactors, and water trucks for dust control, metal wheel compactors, road rollers, in addition to specialized equipment to handle and install rail, ties, and ballast
New freight bridge over I-105	9-12	Construction of new freight bridge over I-105 using steel plate girders or precast concrete beams. Includes demolition of existing bridge once new bridge is constructed	Cranes, air compressors, loaders, trucks, specialized water jet excavators, drilling rigs, hauling trucks, transit mix concrete trucks and concrete pumps, specialized trucks to deliver precast girders, forms, reinforcing steel, pavement saws, pre-stressed concrete post tensioning strands, jacks and related equipment

Activity	Approximate Duration (Months) ¹	Description	Equipment Required
Underground LRT			
Guideway	20-50	TBM tunnel sections (bored tunnels), supported by precast concrete segmental lining. TBM requires portal launch area and retrieval shaft, access to tunnel via shaft or station excavation. TBM dismantled and retrieved through vertical shaft or station excavation at the end of tunnel alignment. SEM for construction of cross-passages and previously remained SOE removal drifts, initially supported by canopy pipes, spiling, ground improvement, and shotcrete lining	Pressurized-face TBMs, rail-mounted equipment and material/labor/tunnel liner delivery vehicles, spoil retrieval conveyors, earth moving vehicles, substation, air compressor, grouting plant, soil conditioning plant, cranes, drilling rigs, concrete mixers and pumping equipment, flatbed trucks, electric power supply equipment, tunnel ventilation equipment, sand and gravel delivery trucks, dump trucks, and TBMs, ripper teeth or roadheader mounted excavators, drill jumbo, grouting equipment, shotcrete pump and nozzle
Stations and track crossovers	25	Cut-and-cover excavation. Excavate ground with temporary excavation support, temporary concrete decking placed over cut following first lift of excavate about 12-15 ft below ground surface to allow traffic to pass above. Once deck in place, continue excavate and internal bracing. Once construction complete, area backfilled, and surface permanently restored. SEM may be used for a crossover cavern, initially supported by canopy pipes, spiling, ground improvement, and shotcrete lining. Construction of utility rooms and entrance plaza	Bulldozers, loaders, forklifts, excavators, generators, welders, cranes, drill rigs, jackhammers, rollers, flatbed trucks, concrete delivery truck and pumping equipment, ventilation equipment, dump trucks, ripper teeth or roadheader mounted excavators, drill jumbo, grouting equipment, shotcrete pump and nozzle

Activity	Approximate Duration (Months) ¹	Description	Equipment Required
At-grade LRT			
Guideway	30	<p>Demolish section being displaced, preparation of track bed, construction of the supporting track slab, laying of rail surface track work</p> <p>Concrete jacked box tunnel for I-710 crossing. Excavate ground as concurrently jacking concrete box support, which is the permanent structure</p>	<p>Rubber-tired graders, bulldozers, excavators, loaders, compactors, and water trucks for dust control, metal wheel compactors, road rollers, in addition to specialized equipment to handle and install rail, ties, and ballast</p> <p>For jacked box tunnel: box shield, hydraulic jacks and pump, grouting equipment, welders, cranes, drill rigs, jackhammers, flatbed trucks, concrete delivery truck and pumping equipment, ventilation equipment, and dump trucks</p>
Stations	6-24	<p>Developed simultaneously with segments using standard building materials</p> <p>Construction of supporting station elements such as foundation, columns, walls, platform slab, and canopies</p>	<p>Forklifts, generator sets, loaders, small to mid-size cranes, welders, bulldozers, water trucks for dust control, trucks for the removal of excavated material, transit mix concrete trucks and pumps, trucks to deliver forms, reinforcing steel, and other building materials</p>
Surface parking facilities	2-5	<p>Demolish existing structures and foundations to nominal depth, site grading, preparation, paving, and striping. Concrete curbs, lighting, driveways, sidewalks, and landscaping would be installed as necessary</p>	<p>Demolition saws, excavators, pavement breakers, jackhammers, air compressors, concrete pumping equipment, paving machines, rollers dump trucks, front-end loaders, forklifts, crawler cranes, crawler bulldozers/loaders, rubber-tired loader/bobcats, trucks, and water trucks for dust control</p>
Parking structure facilities	6-10	<p>Demolish existing structures and foundations to nominal depth. Site grading, preparation, parking structure foundations, cast-in-place concrete columns, concrete slabs, installation of precast structural elements. Structural finishes, elevators, electrical, signage, and parking systems installation. Paving as needed, and striping. Concrete curbs, lighting, driveways,</p>	<p>Demolition saws, excavators, pavement breakers, jackhammers, air compressors, concrete pumping equipment, paving machines, rollers dump trucks, front-end loaders, forklifts, large crawler cranes, crawler bulldozers/loaders, rubber-tired loader/bobcats, trucks, and water trucks for dust control, soil augurs, pile drivers and associated equipment</p>

Activity	Approximate Duration (Months) ¹	Description	Equipment Required
		sidewalks, and landscaping would be installed as necessary	
Aerial LRT			
Guideway	12-30	Construction of foundation columns and elevated sections, rail fastened with plinth directly to the top slab of cast-in-place/pre-stressed concrete bridge, or separately placed slab on a steel beam bridge, or a precast concrete bridge Includes ascending/descending retaining walls and fill before and after elevated sections	Cranes, air compressors, loaders, trucks, backhoes and bulldozers for excavation, vibratory or pile driving equipment, rubber-tired and sheep's-foot rollers, water trucks for dust control, specialized water jet excavators, drilling rigs, hauling trucks, transit mix concrete trucks and concrete pumps, specialized trucks to deliver precast girders, forms, reinforcing steel, pavement saws, pre-stressed concrete post tensioning strands, jacks and related equipment
Stations	8-30	Foundations, columns and/or elevated sections constructed to support platform, track slabs, station amenities, and vertical circulation elements. Construction of pedestrian bridge connections as shown for select station(s)	Trucks for the removal of excavated soil and surface material, trucks to deliver forms, forklifts, backhoes, welders, drilling rigs, cranes, possibly specialized water jet excavators, trucks to remove excavated soil, transit mix concrete trucks and concrete pumps, specialized truck trailers to deliver precast concrete beams (if used), pre-stressed concrete post tensioning strands, water trucks for dust control, and related equipment
Systems			
Signals ²	16-24	Construction of foundations and conduit for electrical and signaling equipment	High-rail vehicles, bobcats, forklifts, trench diggers, backhoes, and cranes, material/equipment trucks
OCS	16-24	Construction of foundations for the OCS poles, duct banks and conduit for underground electrical feeder lines from TPSS, followed by installation of the OCS poles. Final stage includes installation of TPSS feeder cables and overhead catenary lines	High-rail vehicles, trench diggers, backhoes, bobcats, forklifts, and cranes, material/equipment trucks

Activity	Approximate Duration (Months) ¹	Description	Equipment Required
TPSS ²	16-24	Grounding mat, prefabricated structure containing electrical and electronic equipment for traction power systems, communications equipment	Backhoes, bobcats, forklifts, cranes, material/equipment trucks
Systems testing and pre-revenue operations	15	System testing and integration scenario would occur after construction completion. Testing of power, communications, signaling and ventilation systems; training of operators and maintenance personal	Small equipment, service vehicles, and rail vehicles
Maintenance and Storage Facility			
Maintenance and storage facility	36	Construct maintenance facility structures, rail vehicle storage yard and connecting tracks, parking facilities and site roadways, and lead track connections to mainline. Lead tracks may include at-grade rail crossings, retaining walls, and bridge and trench structures. Shop of concrete block, corrugated metal or similar industrial materials. Storage track and trackway to allow for movement of LRVs from mainline track to maintenance facility area. Vehicle wash, TPSS, parking facility	Bulldozers, tractor trailer rigs, loaders, earthmovers, graders, bobcats, forklifts, cranes, concrete trucks, excavators, paving machines, rollers, and materials/equipment trucks

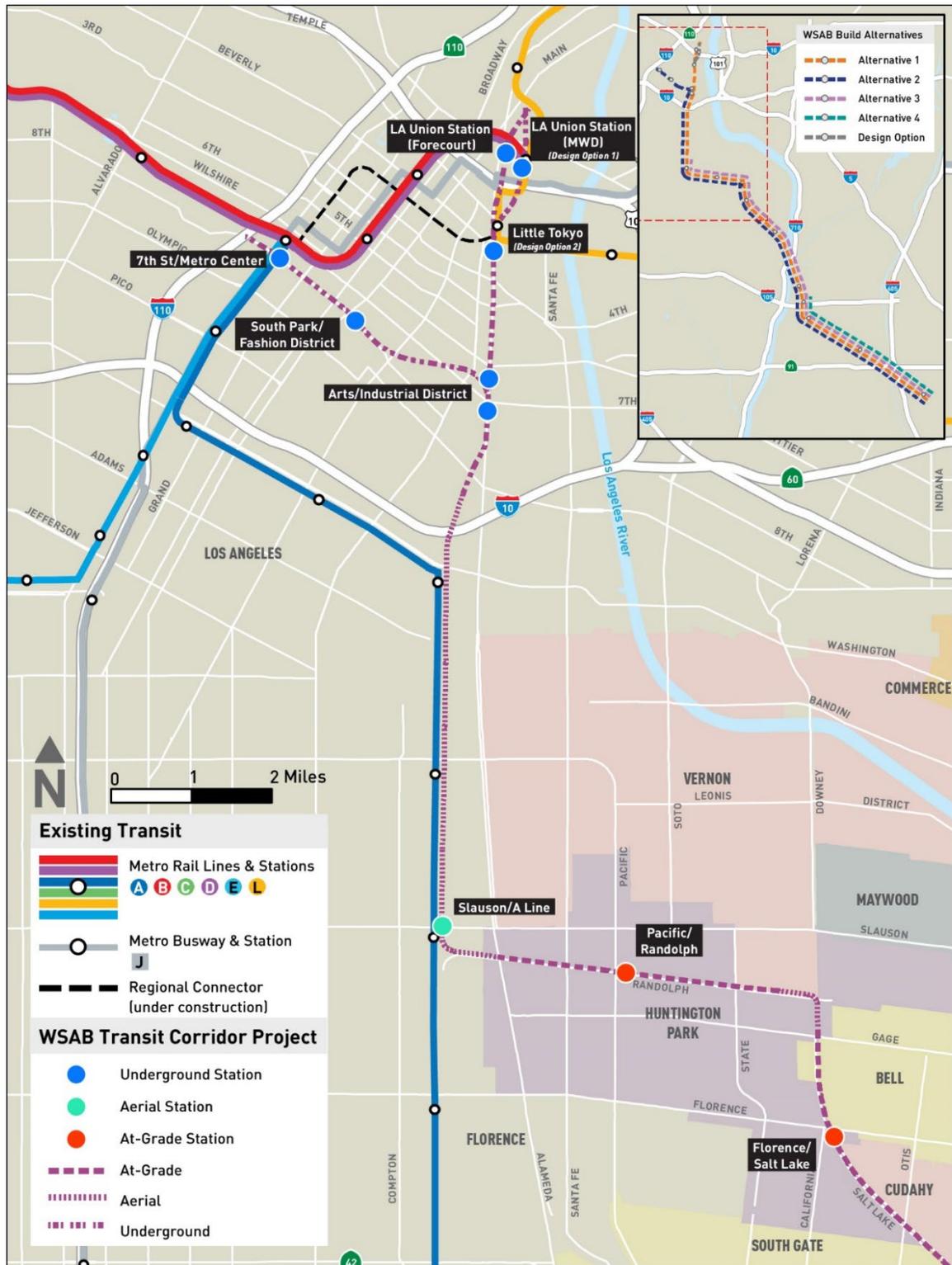
Source: Metro 2020

Notes: ¹ Portions of activities would be conducted at the same time as other activities. Therefore, the total cumulative duration may be less than the sum of the individual activities.

² Assuming phased construction with major project sections

LRT = light rail transit; LRV = light rail vehicle; OCS = overhead catenary system; ROW = right-of-way; SOE = support of excavation; SEM = sequential excavation method ;TBM = tunnel boring machine; TPSS = traction power substation

Figure 4-1. Northern Section Project Configurations



Source: WSP, 2020

Prior to construction, contractors would prepare work sites for workers, equipment, and materials. This would include clearing, grubbing, and grading, followed by mobilization of initial equipment and materials. At some construction staging sites, building demolition may be required to provide space for construction or construction work areas. Demolition necessitates strict controls to ensure that adjacent buildings and infrastructure are not damaged or otherwise affected. These controls could include the installation of fencing and barricades, environmental monitoring, and restrictions on the types of equipment and demolition procedures used during construction. For demolition equipment typically used see Table 4.1.

Preconstruction evaluations would be completed prior to construction to determine existing conditions that could affect construction methods and timing, including geotechnical investigations that would evaluate geology, groundwater and seismic conditions; structure and building analysis that would influence the method of excavation and type of support systems; and utility investigations to determine if existing utility would be protected in place, relocated or modified. In addition, transportation management plan (TMP) and traffic control plans would be prepared for construction activities where street closures and excessive truck traffic would disrupt normal street operations. Street closures are discussed in more detail in Section 4.8.4.

4.2 Utility Relocation

To the extent possible, the Project would be designed to avoid conflicts with existing major utilities. Nevertheless, positioning of project elements may require the relocation, modification, or protection in place of utilities. Utility relocation work would generally occur within the affected right-of-way (ROW) and on adjacent and nearby streets. Affected utilities would include storm drains, sanitary sewers, power lines, gas pipelines, electrical duct banks, oil pipelines, electrical transmission lines, lighting, irrigation pipelines, water lines, fiber optic lines, telephone, and cable lines. Relocation of utilities would generally be performed before construction of other project elements. Protecting-in-place is the method of choice, as this is less disruptive to stress and less costly. To accommodate the aerial guideway, relocation of existing utility support poles would be required to reroute the existing utility lines around the Project. Poles may also be removed and relocated underground. Metro would coordinate utility relocations under the terms of each provider's franchise or other agreements defining the provisions for relocation work. In addition to relocation, various new utilities would be installed as part of the Project.

Relocation and protection of underground utilities would require several types of construction activities, including, but not limited to, excavation of soil to the depth of the existing utility line; installation of a replacement utility in a new location or protection of existing utility; traffic management and control plans; backfill of soil; and reconstruction of pavement or surface improvements above the excavation. The equipment required for utility relocations is provided in Table 4.1.

Typical utility relocations would not exceed 5 to 10 feet of disturbance from ground elevation. However, some cut-and-cover sections, such as for the underground stations and crossover caverns, would either relocate or protect-in-place utilities such as storm drains and sewer lines that could be up to 25 feet below ground elevation. The utility lines and chambers could need protection and temporary support when hanging above open excavations depending on factors such as their age and condition, separation requirements to adjacent facilities, and

whether they can remain in place or if relocation is required within the new utility network. Disturbed ground would be backfilled with either the same material or clean material. Concrete encasement of ductbanks would be provided where needed.

It is anticipated that the number of utility conflicts would be refined throughout the design process. Table 4.2 identifies the potential utility relocations and removals that could occur to support construction of the Project. The full utility conflict matrix includes all other utility conflicts that would be protected in place and is provided in Appendix A.

Metro would coordinate utility relocations under the terms of each provider's franchise or other agreements defining the provisions for relocation work. In addition to relocation, various new utilities would be installed as part of the Build Alternatives. A Staged Traffic Management and Control Plan would be developed to provide measures that are designed, approved, and implemented to ensure a safe working environment with traffic control and detours where appropriate, to protect roadway users and reduce capacity impacts.

Table 4.2. Major Utility Conflicts

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
Sewer					
City of LA	20" to 24"	Active	1	2nd St. & 6th St.	Protect in Place; Relocate
City of LA	24"	Active	2	7th St. to Bay St.	Protect in Place; Relocate
City of LA	42"	Active	2	Santee St. to Los Angeles St.	Relocate
City of LA	21"	Active	2	Flower St.	Protect in Place; Temp. Relocation
City of LA	24"	Active	2	Flower St. to Figueroa St.	Protect in Place; Temp. Relocation
N/A	N/A	Active	2	Figueroa St. to Flower St.	Relocate
City of LA	22"	Active	2	Unknown (Plan No. FB 464-49)	Relocate
LA County Department of Sanitation	24"	Active	1, 2, 3	Santa Ana St.	Relocate
LA County Department of Sanitation	27"	Active	1, 2, 3	Atlantic Ave	Relocate
City of Downey	42"	Active	1, 2, 3	Flores St.	Relocate
City of Bellflower	60"	Active	1, 2, 3, 4	Flora Vista St.	Relocate

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
Storm Drain					
City of LA	21" to 16"	Active	1	6th St. to Industrial St.	Protect in Place; Relocate
City of LA	30"	Active	1	Bauchet St.	Relocate
LA County	60"	Active	2	Wall St. to Figueroa St.	Protect in Place; Relocate
City of LA	18" to 22"	Active	2	Wilshire Blvd. to End	Protect in Place; Temp. Relocation
City of LA	36" to 60" RCP	Active	1, 2, 3	MLK Jr. to Slauson Ave	Replaced; Protect in Place
LACFCD	18"	Active	1, 2, 3, 4	Santa Ana Ave & Flora Vista St.	Relocate
LACFCD	24"	Active	1, 2, 3, 4	Santa Ana Ave & Flora Vista St.	Relocate
LACFCD	7'	Active	1, 2, 3, 4	Alondra Blvd & Flora Vista St.	Relocate
LACFCD	24"	Active	1, 2, 3, 4	Alondra Blvd & Flora Vista St.	Relocate
LACFCD	72"	Active	1, 2, 3, 4	Alondra Blvd & Flora Vista St.	Relocate
LACFCD	36"-24"	Active	1, 2, 3, 4	Along Pacific Ave B/T California Ave & Ripon Ave	Relocate
LACFCD	45"	Active	1, 2, 3, 4	Cornuta Ave & Flora Vista St.	Relocate
LACFCD	36"X22"	Abandoned	1, 2, 3, 4	Woodruff Ave & Flora Vista St.	Remove Conflicting Portions
LACFCD	57"-72"	Active	1, 2, 3, 4	Flora Vista St. B/T California Ave & Ripon Ave	Relocate
Water					
LADWP	36"	Active	1	Ducommun St. to 3rd St.	Protect in Place; Relocate
LADWP	16"	Active	2	Flower St. to End	Protect in Place; Relocate

4 Construction Methods/Affected Environment

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
DWPWS	20"	Active	2	US-110 Freeway to Flower St.	Relocate
DWPWS	24"	Active	2	Flower St.	Relocate
DWPWS	8"	Active	2	Main St.	Relocate
LADWP	12"	Active	1, 2	Along Long Beach Ave	Relocate
Central Basin Municipal Water (Reclaimed)	24"	Active	1, 2, 3, 4	Rose St. to Somerset Blvd	Relocate
Central Basin Municipal Water	24"	Active	1, 2, 3, 4	Rosecrans Ave	Relocate
LA County	24"	Active	1, 2, 3, 4	Downey Ave	Relocate
Power					
LADWP	20-3"	Active	1	Traction Ave to 4th St.	Relocate; Protect in Place
LADWP	12-3 1/2"	Active	1	6th St. to Industrial St.	Relocate
DWPWS	20-3"	Completed	1	E 1st St.	Relocated
N/A	N/A	Active	2	Maple St. to San Julian St.	Relocate
N/A	N/A	Active	2	Towne Ave	Relocate
DWPPS	N/A	Active	2	Towne Ave and Stanford Ave	Relocate
DWPPS	N/A	Active	2	E 7th St	Relocate
DWPPS	N/A	Active	2	Industrial St	Relocate
DWPPS	12-3 1/2"	Active	2	Industrial St	Relocate
DWPPS	N/A	Active	2	Kohler St	Relocate
LADWP	4.8kV OH	Active	1, 2	Long Beach Ave	Relocate
LADWP	34.5kV OH	Active	1, 2	14th St.	Relocate
LADWP	4.8kV OH	Active	1, 2	Newton St.	Relocate
LADWP	4.8kV OH	Active	1, 2	15th St.	Relocate
LADWP	4.8kV OH	Active	1, 2	16th St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	20th St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	22nd St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	23rd St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	24th St.	Relocate

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
LADWP	4.8kV-34.5kV	Active	1, 2	Along Long Beach Ave. (574+00 to 575+00)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	Along Long Beach Ave. (578+00 to 602+50)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	33rd St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	MLK Blvd.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	41st St. (594+00)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	41st St. (596+00)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	42nd St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	43rd St./Vernon Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	Vernon Ave.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	48th St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	50th St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2	51st St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	55th St. (650+00)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	55th St. (650+50)	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Alba St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	North of Long Beach & Slauson Ave. going north to south of 55th S.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	South of Randolph & Slauson going north to Slauson	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	58th Place	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Holmes Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	E of Holmes Ave	Relocate

4 Construction Methods/Affected Environment

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
LADWP	4.8kV min	Active	1, 2, 3	Wilmington Ave	Relocate
LADWP	4.8kV min	Active	1, 2, 3	Alameda St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Albany Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Santa Fe Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Malabar St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Rugby Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Pacific Blvd	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Seville Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Stafford Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Miles Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Arbutus Ave	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	State St.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Bissel Pl.	Relocate
LADWP	4.8kV-34.5kV	Active	1, 2, 3	Randolph St.	Relocate
Southern California Edison (SCE)	Unknown	Active	1, 2, 3	Gage Ave	Relocate
SCE	Unknown	Active	1, 2, 3	Otis Ave	Relocate
SCE	4.8kV	Active	1, 2, 3	Salt Lake Ave and Santa Ana St.	Relocate
SCE	4.8kV	Active	1, 2, 3	Salt Lake Ave and Cecilia St.	Relocate
SCE	4.8kV	Active	1, 2, 3	Salt Lake Ave and Ardine St.	Relocate
SCE	4.8kV	Active	1, 2, 3	Patata St to Atlantic Ave	Relocate
SCE	Unknown	Active	1, 2, 3	Mason St.	Relocate
SCE	5-5" 3-16kV	Active	1, 2, 3	Firestone & Rayo Ave	Relocate
SCE	Unknown	Active	1, 2, 3	Firestone to Rayo Ave	Relocate
SCE	Unknown	Active	1, 2, 3	Rayo Ave	Relocate
SCE	Unknown	Active	1, 2, 3	Southern Ave	Relocate
SCE	34.kV	Active	1, 2, 3, 4	Century Blvd	Relocate
SCE	2-Distribution 3-Distribution	Active	1, 2, 3, 4	Downey Ave	Relocate
SCE	2-Distribution 3-Distribution	Active	1, 2, 3, 4	Lakewood Blvd	Relocate

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
SCE	4.8kV	Active	1, 2, 3, 4	Clark Ave	Relocate
SCE	Unknown	Active	1, 2, 3, 4	Woodruff Ave	Relocate
SCE	Unknown	Active	1, 2, 3, 4	Flora Vista St.	Relocate
SCE	Unknown	Active	1, 2, 3, 4	187th St.	Relocate
SCE	Unknown	Active	1, 2, 3, 4	187th St.	Relocate
SCE	Unknown	Active	1, 2, 3, 4	187th St.	Relocate
SCE	Unknown	Active	1, 2, 3, 4	188th St.	Relocate
SCE	Unknown	Active	1, 2, 3, 4	Pioneer Blvd	Relocate
Telecommunications					
AT&T	12-4"	Active	2	Olive St. to Flower St.	Protect in Place; Relocate
AT&T	18-4"	Active	2	Flower St.	Relocate
AT&T	unknown	Active	1, 2	20th St. to 43rd St.	Relocate
N/A	N/A	Active	1, 2	21st St.	Relocate
Gas					
SCG	16"	Abandoned	Design Option 2	Commercial St.	Remove
SCG	16"	Abandoned	1, 2	14th St.	Remove
SCG	16"	Active	1, 2	14th St.	Relocate or Encase
SCG	20"	Active	1, 2	15th St.	Relocate
SCG	16"	Active	1, 2	16th St.	Relocate or Encase
Gas					
SCG	16"	Abandoned	2	Spring St. to Figueroa St.	Remove
SCG	26"	Active	1, 2, 3	Gage Ave to Nevada St.	Relocate
SCG	30"	Active	1, 2, 3	Santa Ana St.	Relocate
SCG	2-26"	Active	1, 2, 3	Santa Ana St. to Patata St.	Relocate
Oil					
Crimson Pipeline	12"	Active	1, 2, 3, 4	Downey Ave to Somerset Blvd	Relocate
Crimson Pipeline	6"	Active	1, 2, 3, 4	Downey Ave to Somerset Blvd	Relocate
Crimson Pipeline	8"	Active	1, 2, 3, 4	Downey Ave to Somerset Blvd	Relocate

Owner	Size	Status	Alternatives	Nearest Cross Street	Disposition
Crimson Pipeline	10"	Active	1, 2, 3, 4	Downey Ave to Somerset Blvd	Relocate
SFPP Oil Pipeline – Kinder Morgan	16 – 18"	Active	1, 2, 3, 4	Alondra Blvd to Flora Vista St.	Relocate

Source: BA Inc., 2019

4.3 Freight Relocation

Segments of the Project would share the rail ROW with active freight operations and require relocation of freight tracks. The areas of relocation are shown on Figure 2-6 and the length of relocation are identified in Table 4.3. Metro would coordinate with rail operators to help maintain freight operations during construction activities of the Project to the extent feasible.

Table 4.3. Freight Relocation

Rail ROW	Total Relocation along ROW (miles)	Freight Relocation by Build Alternatives (miles)			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Wilmington Branch	0.1	0.1	0.1	0.1	—
La Habra Branch	2.0	2.0	2.0	2.0	—
San Pedro Subdivision	5.4	5.4	5.4	5.4	0.7
Metro-owned PEROW	0.6	0.6	0.6	0.6	0.6
Total	8.1	8.1	8.1	8.1	1.3

Source: WSP, 2020

Note: PEROW = Pacific Electric Right-of-Way; ROW = right-of-way

Over the I-105 Freeway, the bridge for the Project alignment would be required in nearly the same location as the existing freight bridge. Thus, a new freight bridge would be constructed west of the existing bridge. Once this is complete, freight service would be relocated to the new bridge and the old bridge demolished. Then, the new light rail bridge would be constructed. The new freight bridge would be a two-span structure compared to the current four-span structure over the freeway. It would require building abutments closer to the Somerset Ranch frontage roads to reduce the span lengths to the center supporting column in the middle of the freeway. Depending on the material selected for the new freight bridge (steel plate girders or pre-cast concrete), closures would also be required as the steel girders are lifted into place, or during key points during the construction of wooden falsework if a concrete bridge is selected. Additional information on construction activities in I-105 is provided in Section 4.7.

To minimize disruptions and maintain active freight operations, new freight track(s), storage, and/or siding track would be constructed first. In locations where the new freight track(s) are within the fouling envelope of the existing freight tracks, either the freight service would be temporarily shut down and the existing tracks moved to the new location (and rehabilitated

as necessary, e.g. new ties, etc.) using specialty track alignment equipment, or it would be moved temporarily beyond the fouling envelope of the new freight alignment. Once the new tracks are built then the old tracks would be demolished. At the completion of the new freight infrastructure, existing freight operations would be transferred to the new freight track. The old freight track would be demolished, to allow space for the construction of the new LRT tracks. At this point the construction of the new WSAB tracks would commence. In the San Pedro Subdivision, which is currently used for freight, a temporary shoo-fly track would be constructed to allow for the construction of new freight tracks. Freight trains would be redirected to the temporary shoo-fly while new freight tracks are constructed. After construction of the new freight tracks is complete, freight rail services would be transferred to the newly constructed freight tracks. The new LRT tracks would be constructed after the existing freight track service is switched to the relocated track. Coordination with the existing freight operator would be required.

4.4 At-Grade Construction Activities

4.4.1 Guideway

All four Build Alternatives would include at-grade guideway construction. The locations of proposed at-grade guideway construction is shown in Figure 4-1 and Figure 4-2. The existing at-grade guideway is owned and used by various entities, such as UPRR, Ports of Los Angeles and Ports of Long Beach, and Metro. UPRR owns the Wilmington Branch ROW and La Habra Branch ROW (currently used as storage and deliveries). Metro owns the PEROW, and the Ports of Los Angeles and Long Beach own the San Pedro Subdivision ROW. The proposed at-grade guideways would be constructed at existing ground level within rail or street ROW. Metro would develop a construction mitigation program (CMP) with community input to directly address specific construction impacts.

4.4.2 Construction Methods within Rail ROW

Construction activities for the LRT tracks would occur within active and inactive rail corridors, depending on the location. Refer to Section 4.3 for information regarding freight relocation. Construction activities would include the preparation of the track bed, installation of the supporting base, and rail track laydown. The supporting base for the ties and rails consists of compacted material and hard rock (ballast). Rail and ties would be installed with specialized equipment. The compacted material and ballast are imported to the site by trucks and placed with rubber-tired equipment. Rail or rubber-tired equipment is used to remove the existing rail tracks as needed, and earth removal equipment is used to remove surface material, such as existing ballast gravel. As applicable, utility relocations within the rail ROW and construction of the new LRT tracks would occur.

4.4.3 Construction Methods within City Streets

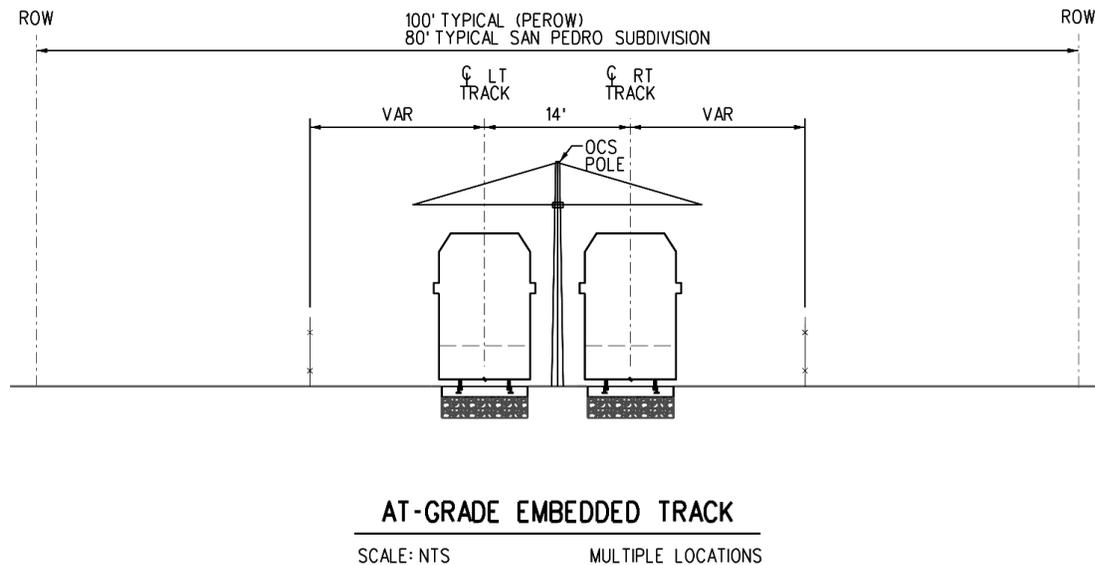
At-grade guideway within city streets and at grade crossings would use embedded tracks. The construction method for embedded tracks would begin with the demolition of existing median or roadway where the LRT would be built, the preparation of the rail track bed, installation of the supporting track slab and laying of the rail tracks. Grade crossings would be constructed using prefabricated panels that incorporate the rails and roadway surface.

Specifically, construction activities at-grade may include excavation of the existing roadway and surface material in certain locations. As previously discussed, removal of surface material that cannot be used would be handled in accordance with the appropriate regulatory

requirements. Typically, the surface material would be excavated and loaded onto trucks for disposal at a determined disposal site.

Figure 4-3 illustrates typical at-grade guideway cross sections of embedded track.

Figure 4-3. Typical Cross Section of an At-Grade Guideway with Embedded Track



Source: WSP 2020

4.4.4 Street Reconfiguration and Reconstruction

To accommodate the guideway, street sections may require reconfiguration and/or reconstruction. Street reconstruction activities would be required at proposed at-grade crossing locations and within the affected street ROW. Street reconstruction would allow for track slab placement, crossing gates, traffic signals and rails.

Street reconfiguration and/or reconstruction activities would also provide beneficial infrastructure modifications to the existing street elements, such as street curbs, gutters, medians and sidewalks that would be affected by the proposed rail grade crossings and/or street reconfiguration. Construction of new curbs and gutters, medians, sidewalks and traffic lanes would be followed by the installation of lighting, signage, striping, street furniture, traffic signals, and landscaping. Property acquisition and the removal of structures and vegetation may also be required.

4.4.5 Stations

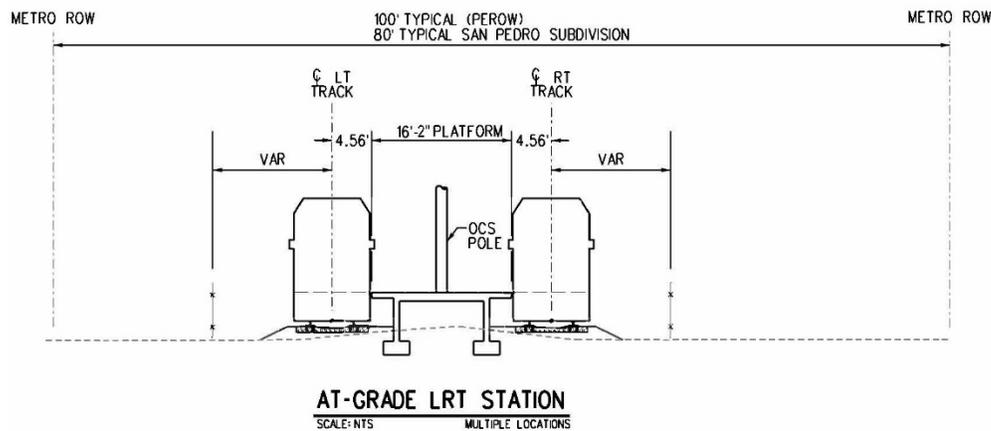
At-grade station locations would have a center platform configuration within the rail ROW, with the exception of the I-105/C Line Station which would have a side-platform configuration. Per Metro Rail Design Criteria (MRDC), the platforms would be approximately 270 feet long, with an additional approximately 105 feet for the entrance area that would consist of map cases, ticket vending machines, and ramps. The station platform would have a minimum width of approximately 16 feet.

Construction of the at-grade stations would involve cast-in-place concrete or pre-cast panels to construct an approximately 40-inch high platform along with ramps and stairs. Station

furnishings including canopies, railings, lighting, seating, signage, artwork, bike racks and fare vending equipment, would then be installed. The at-grade stations would be constructed of standard building materials such as concrete, steel, and other materials. Steel-wheeled or rubber-tired compactors, graders, and small bulldozers would be required for subgrade preparation below the platform. All station design would comply with MRDC, Systemwide Station Design (MRDC/SDD), and Americans with Disabilities Act (ADA) requirements. For typical construction durations and equipment used for at-grade stations see Table 4.1.

The locations of the at-grade stations are presented in Figure 4-1 and Figure 4-2. Figure 4-4 shows an example and dimensions of an at-grade LRT station.

Figure 4-4. At-Grade LRT Station



Source: WSP 2020

4.4.6 Parking Facilities

Surface parking facilities are proposed at four station locations: Firestone, I-105/C Line, Paramount/Rosecrans, and Bellflower. A parking structure is proposed at the Pioneer. Proposed parking locations are shown in Figure 4-1 and Figure 4-2.

Construction of the surface parking facilities would involve initial demolition of each site where existing structures and pavement are present, subgrade preparation of the parking area, paving, and striping. Concrete curbs, lighting, driveways, sidewalks, and landscaping would be installed as necessary. The parking structure at Pioneer Station would also require installation of new concrete foundations, cast-in-place structural columns, and installation of pre-cast parking structure elements. Elevators, electrical, signage, and parking systems would also be installed. For typical construction durations and equipment used for construction of surface parking facilities, see Table 4.1.

4.4.7 Maintenance and Storage Facility

One MSF would be constructed as part of the Project. The construction of a MSF would involve the following construction phases:

- Demolition and site preparation and grading
- Installation of foundations for new buildings

- Erection of buildings with steel framing, masonry blocks, and building aesthetic materials
- Preparation of the rail track bed, installation of the supporting track slab, and laying of the rail tracks for the LRT storage area
- Construction of roadway and parking facilities, including concrete curbs, lighting, driveways, and sidewalks as necessary
- Site aesthetic improvements such as landscaping

Construction is anticipated to occur over an approximate 41-month period, including demolition. Typical equipment could include excavators, loaders, lifts, backhoes, bulldozers, compactors, cranes, saws, compressors, pneumatic and equipment, pavers, and graders. For more information regarding potential Maintenance and Storage Facility site options see Section 4.4.7.

4.5 Aerial Construction Activities

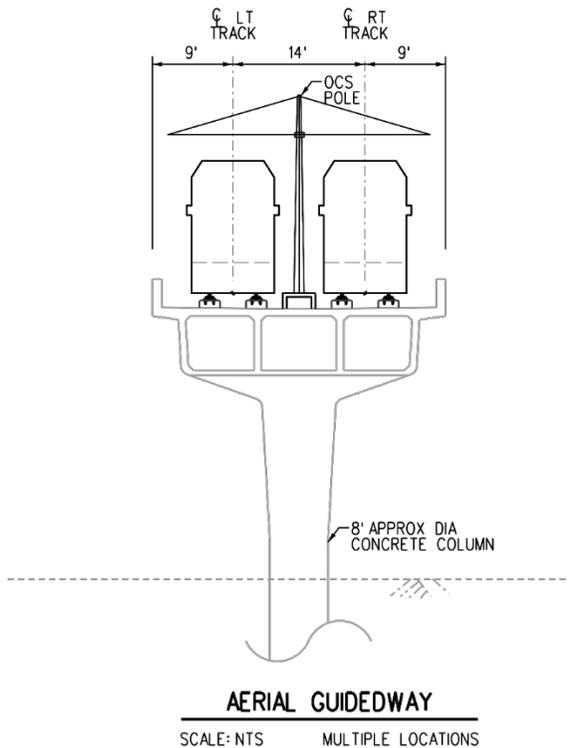
4.5.1 Guideway

All four Build Alternatives would include aerial guideway construction. The location of aerial guideway construction along the alignment is shown in Figure 4-1 and Figure 4-2. Aerial LRT structures are typically constructed of concrete in several stages. Aerial LRT guideway rails would be fastened with plinths directly to either the top of the slab of a cast-in-place/pre-stressed (CIP/PS) concrete box structure, precast concrete structure, or a separately placed slab or plinths on a steel beam structure. Aerial LRT guideway also carry the OCS with foundation, system duck bank and signal equipment. An aerial guideway would be located along Long Beach Avenue between 14th Street and Slauson Avenue. Aerial grade separations of varying lengths would cross numerous roads along the alignment south of Randolph Street.

Construction of an LRT aerial guideway would begin with the installation of piles for columns and piers that support the structure and loads that would be carried on it. Pile supported columns would be constructed in two main stages. In the first stage, piles made from steel or concrete, typically about 12 to 15 inches in diameter, would be driven into the ground by vibratory or pile driving equipment or, alternatively, cast-in-drilled-hole (CIDH) piles. The second stage joins the piles with the construction of the pile cap, typically a four to five feet thick slab of reinforced concrete. The pile cap would be constructed to distribute the structural load to two or more piles.

Large diameter CIDH pile construction consists of drilling shafts that are up to eight feet in diameter, or larger, with the placement of a rebar cage inside the shaft, and then filling it with concrete. The diameter of the CIDH piles would depend on the structural load limit to be supported. Driven piles and regular CIDH piles require a pile cap. Large diameter CIDH piles do not require a pile cap and can be as large, or larger than, the column it supports. Figure 4-5 illustrates a typical cross section of an aerial LRT guideway.

Figure 4-5. Typical Cross Section of an Aerial Guideway



Source: WSP 2020

Reinforced concrete columns are constructed in numerous sizes and can be poured inside reusable steel forms. To support aerial guideway the columns would be large in diameter, such as eight feet or larger. The shape of the columns is generally circular but can vary. Once the reinforced concrete columns are constructed, the horizontal support of the guideway with the aerial girders and bent/pier cap would be constructed. Cast-in-place concrete spans would require the construction of falsework (temporary framing) to support the forms into which concrete is poured and the post-tensioning spans after. The depth of the falsework is determined by the length of the spans and can be several feet deep. If a bridge is spanning an active roadway, the bridge would be designed with sufficient clearance under the falsework to allow traffic to pass. Alternatively, clearance may be temporarily reduced during construction and trucks and other vehicles may need to be detoured.

Due to the large size of the cranes, special staging areas close to the construction site would be required to set up the cranes and to temporarily store the precast and steel girders. Placement of girders over active roads may occur during nights to minimize impacts to traffic. Once the girders have been placed on the columns, a concrete slab would be built to secure the girders, and then, the rail with plinth is attached to the slab. Metro would develop a CMP with community input to directly address specific construction impacts.

At a few locations along Long Beach Avenue, straddle bents would be used when a singular column supporting the aerial guideway is not feasible. These would occur, for example, to maintain an existing left-hand turn lane. Straddle bents consist of two large diameter columns, offset from the row of typical columns, with a beam between them and the aerial

guideway on top of the beam or integrated with beam. For typical construction durations and equipment used for aerial guideway construction see Table 4.1.

4.5.2 River Crossings

The LRT aerial guideways would span the LA River, Rio Hondo Channel, and San Gabriel River. Crossings over the LA River and Rio Hondo would require construction of new bridges parallel to the existing active freight bridges. At the San Gabriel River, an existing abandoned freight structure owned by Metro would be demolished and replaced with a new LRT structure.

Construction would occur during dry seasons to the extent feasible. Construction within these concrete-lined channels may require the use of temporary coffer dams that would create an enclosed area where dry season low-flow water could be pumped out as needed to facilitate the construction of the new foundations for the structures. Once the foundations are completed, piers and bent caps to support the structure would be constructed. The channels would then be repaved around the piers, and the coffer dams would be removed.

After substructures and piers are completed and cured, there are two methods that could be employed to construct the superstructure. For longer spans, construction of the bridges would require the erection of temporary false work towers mid-span between the newly constructed piers and bent caps. Precast spliced girders would be placed over the bent caps and falsework towers and then post tensioned. Following the post tensioning of the girders, the temporary falsework towers would be removed, and the remaining elements of the LRT structure would be completed.

For shorter spans precast/pre-stressed girders would be transported to the job site and erected onto the bent caps. After girders are erected on bent caps, stay-in-place steel/or precast panels would be used for casting deck slabs so no falsework would be required. This method would minimize the impact to river.

Extended piers would be tied to existing piers and supported by pile foundations. The extended piers would be similar or stronger than existing piers per current design codes. During the final design phases, pile foundations and piers would be designed for resisting all possible forces and combinations per AASHTO, AREMA, USACE requirements, whichever is more stringent, for service, strength, extreme events and stability while meeting hydraulic requirements. For excavation calculations see Table 4.7.

4.5.3 Retained Fill Guideway

Retained fill guideway would be constructed where there is a transition between the aerial and at-grade guideway. Retained cut would be constructed in transition areas between underground to at-grade guideway. A typical transition section area is about 500 to 700 feet in length.

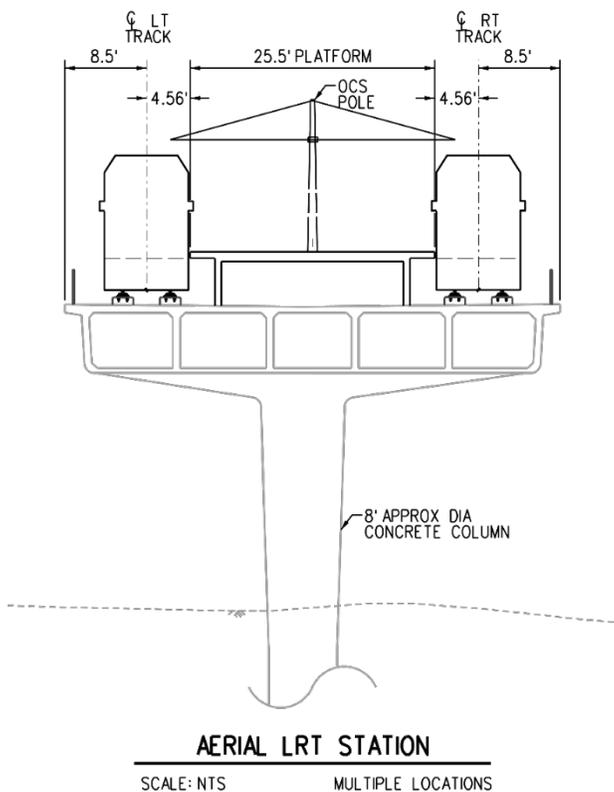
The locations include the transition from tunnel to at-grade and then viaduct near I-10, near Wilmington Avenue and Randolph Street, and the following grade separations: Randolph Street, Atlantic/Firestone, Los Angeles River crossing, Rio Hondo Channel crossing, Imperial/Garfield, Paramount/Rosecrans, Downey Avenue, Woodruff/Flower, San Gabriel River crossing, and 183rd/Gridley Road. Typical equipment used to construct retained fill include backhoes and bulldozers for excavation, vibratory or pile driving equipment, loaders,

cranes, rubber-tired and sheep's-foot rollers, hauling trucks, transit mix concrete trucks, concrete pumps, and water trucks for dust control.

4.5.4 Stations

Figure 4-1 and Figure 4-2 identify the location of the proposed aerial stations along the Project alignment. All station design would comply with MRDC, Systemwide Station Design (MRDC/SDD), and Americans with Disabilities Act (ADA) requirements. Specifically, the aerial stations would be approximately 22 to 42 feet above the existing ground and would have a center platform configuration. The platforms would be designed to be approximately 270 feet long and 25 feet and 6 inches wide. Figure 4-6 shows an example of an aerial LRT station.

Figure 4-6. Typical Aerial LRT Station



Source: WSP 2020

Construction of aerial stations would involve construction techniques similar to those for aerial guideways described in Section 4.5.1. Foundations and columns would be constructed to support the platform. The station platform would typically be constructed of cast-in-place concrete with falsework. Forms would be erected, reinforcing steel put in place, and concrete would be placed into the forms to construct the columns and the platform slab. Ancillary facilities would then be added, including stairs, elevators, canopy, railings, lighting, seating, signage, and fare vending equipment. For excavation calculations see Table 4.7. For typical construction durations and equipment used for aerial structures see Table 4.1.

4.5.5 Slauson/A Line Station

The project alignment would be elevated and adjacent to the A (Blue) Line just north of the A (Blue) Line Slauson Station. The proposed Slauson/A Line Station would be an independent structure from the existing A (Blue) Line station but can be accessed either at ground level or by a new pedestrian bridge crossing between the two platforms and above the freight track.

The basic steps for reconfiguring the station and approximate construction durations are shown below. Some of the tasks can be performed concurrently. The estimated construction time for each task is given in parentheses. A bus bridge for the A (Blue) Line during construction would be needed for approximately 3 months.

- Construct the project viaduct and the station frames (30 months)
- Construct the new vertical circulation and pedestrian bridge column at existing A (Blue) Line Station and install pedestrian bridge with Bus Bridges (6 months)
- Construct the proposed Slauson/A Line Station including platform, vertical circulation, pedestrian bridge column and station finishes (18 months)
- Construct viaduct tracks (12 months)
- WSAB and A (Blue) Line systems integration and testing (12 months)

4.6 Underground Construction Activities

Alternatives 1 and 2 would require underground guideway and station construction. Underground structures are typically constructed of concrete in several stages. Underground guideway and stations would be located primarily beneath Alameda Street for Alternative 1 and 8th Street for Alternative 2. The location of underground guideway construction along the alignment is shown in Figure 4-1 and Figure 4-2.

4.6.1 Twin Bore Tunnel

The underground guideway construction would take place in the Northern Section, with TBM tunneling proposed from downtown Los Angeles to the I-10 freeway. TBMs continuously excavate predominantly circular tunnels. This method creates a tunnel with little or no disruption at the surface and is suitable for creating a circular opening at decent depths and greater length that would not be practical for cut-and-cover construction. Tunnels would be constructed using pressurized face TBMs to control ground and groundwater inflows into the tunnel that can potentially lead to surface settlement if not mitigated. In addition, this technology allows the tunnel lining to be installed concurrently which also prevents groundwater and naturally occurred gases from entering the tunnel behind the TBM.

Entrances for TBM operations (tunnel portal locations) would follow similar construction methods as the station excavations. TBM Launching area and portal construction would employ open cut excavation and construction methods typically performed for the construction of U-structures. The portal would remain permanently open and no decking would be required during construction. The TBM would be launched from a portal located on a property adjacent to Long Beach Avenue between E 14th and Newton Streets. The TBM would be retrieved at a designated end point, through a retrieval shaft or through the tunnel as the TBM shield being abandoned in place at the end of tail tracks.

Tunnel excavation would generally range from 6 to 12 months for a typical one-mile length by a single TBM, but is generally dependent on ground conditions encountered, site and work area constraints, and TBM workmanship.

The extraction of the TBM(s) would occur at the terminus locations for Alternative 2 west of the Downtown Transit Core and Alternative 1 north of LAUS. In-street work areas would only be utilized when no off-street alternative exists. Typically, a main tunnel staging site of approximately five acres is ideally required to support and efficient tunnel operation for each tunnel drive. TBM tunneling would take place from downtown Los Angeles to approximately Newton Street and Long Beach Avenue, north of I-10. All alignment crossovers outside of station boxes would also require cut-and-cover.

Metro would develop a CMP with community input to directly address specific construction impacts. For excavation calculations see Table 4.7.

4.6.2 Cut-and-Cover Construction

Build Alternatives 1 and 2 would require cut-and-cover construction for underground stations and track crossovers from the ground surface. This entails a construction shoring system with a temporary deck over the excavated area, constructing the underground facilities beneath the deck, and then backfilling and restoring the surface once the facilities are complete.

Cut-and-cover construction would begin with the same type of preconstruction evaluation and site preparation as defined in Section 4.6.1. Dewatering may be required at cut-and-cover excavation locations to temporarily lower the groundwater level below the excavation depth or to an impermeable layer. Dewatering facilitates installation of shoring systems, improves soil stability, and allows excavation in dry conditions. To dewater an area, groundwater would be pumped from wells installed around the perimeter of the excavation, limiting impacts to surrounding structures, ground, and utilities adjacent to the excavation. Any contaminated groundwater would be properly treated prior to being discharged. Uncontaminated groundwater may be treated and pumped back into the groundwater table, pumped to the sewer or storm drain system, or used on-site for dust control purposes.

Temporary support of excavation (SOE) would be provided to stabilize the ground and excavation would be carried out inside the supported area. Temporary concrete decking can be placed over the cut immediately following the first lift of excavation (at about 8 feet below ground surface) to allow traffic to pass above. Once the deck is in place, excavation and internal bracing would continue to the required depth. Temporary SOE walls would be typically installed before excavation commences. Depending on the depth of excavation and ground and groundwater conditions, the excavation support could consist of reinforced concrete drilled-in-place piles (tangent pile wall² or secant pile wall³), soldier piles and lagging⁴, slurry walls⁵, or deep soil mix wall⁶. These wall systems are braced with internal struts or supported by tiebacks as the excavation progresses. Tiebacks consist of horizontal or inclined wire strands or steel rods installed in drilled holes in the ground behind the wall. One end of the tieback would be secured to the wall and the other end anchored to stable ground to provide sufficient resistance and to limit ground movement.

² Tangent pile walls consist of contiguous drilled piles.

³ Secant pile walls consist of overlapping contiguous drill piles.

⁴ Soldier pile and lagging consist of vertical steel beams (soldier piles) at regular intervals and placing timber or shotcrete (lagging) between the piles to form the retaining structure.

⁵ Slurry walls consist of cast-in-place structural concrete panels.

⁶ Deep soil mix walls consist of cement mix with in-situ soils and reinforcements.

After installation of the temporary SOE system and initial excavation, deck beams would be installed, followed by multiple sequences of excavation and installation of cross-bracing. Decking would be placed on the deck beams to allow traffic and pedestrian circulation to resume after the initial excavation. Decking installation could require temporary street closures and would be installed in progressive stages. With the decking installed and the utilities supported, the major excavation work for the station box can proceed. Spoils from station sites would be moved to an off-street work site or closed parking/traffic lane and loaded into haul trucks. Each station structure is anticipated to be approximately 350 to 360 feet long, 70 feet wide, and up to 60 to 100 feet deep below street level. For excavation calculations see Table 4.7.

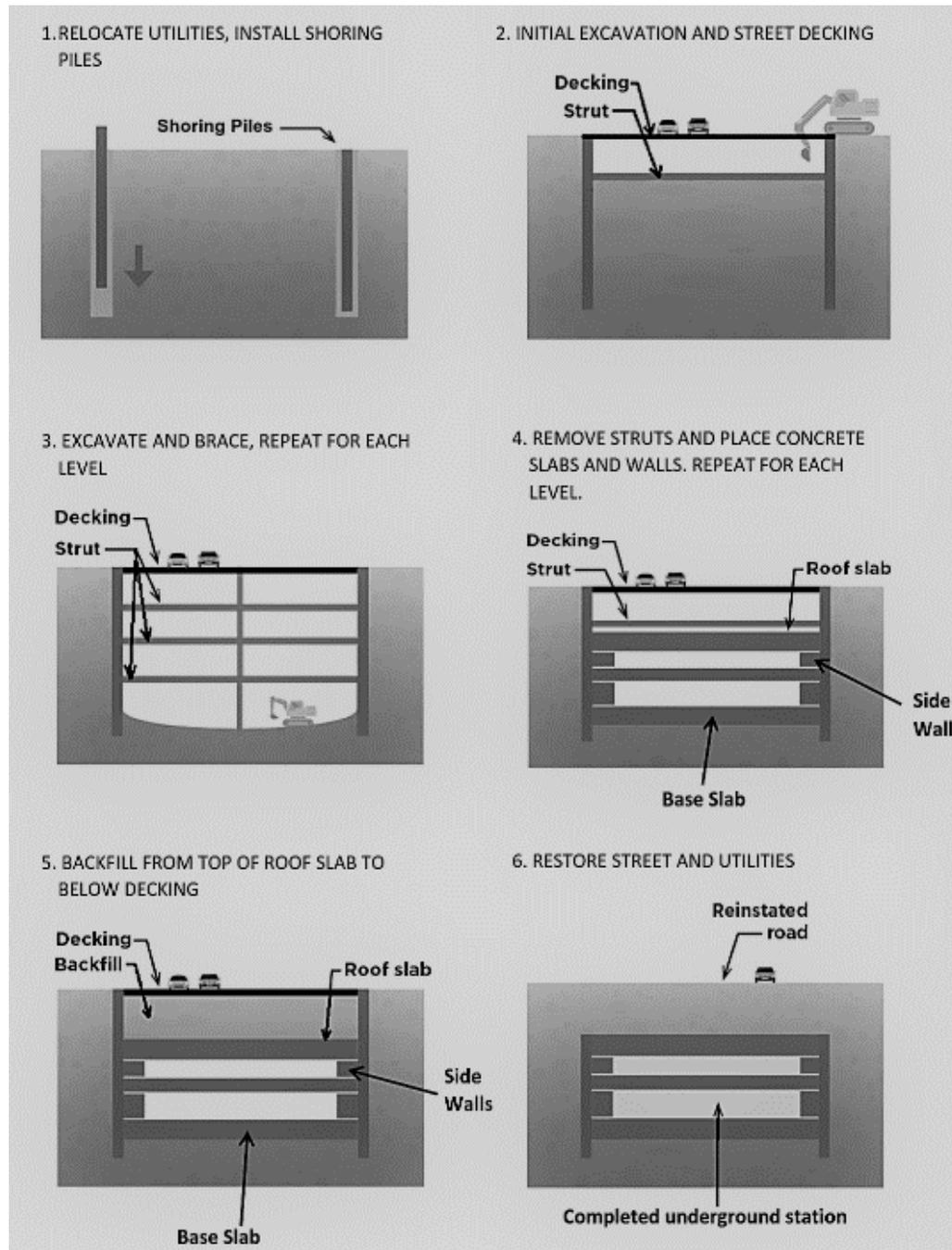
Upon completion of excavation to the final depth, the construction sequence for the final structures would commence with the construction of the foundation base slab, followed by installation of exterior walls and any interior column elements. Slabs are typically poured as the columns and intermediate floor and roof wall pours progress. For station constructions, entrance locations are generally used as access points during construction. Exterior entrances would be constructed after completion of the structure. Final structure concrete and architectural finish works would take place after tunnel construction is completed. The final structures would be constructed with cast-in-place concrete, and the time of construction would vary depending on the length and the design configuration for each structure. The typical duration for completing the concrete and architectural works for a single station is expected to take approximately 25 months.

Once the installation of desired final structure is completed inside the excavated area, the excavation would be backfilled and the surface is restored permanently. Excavations would require backfilling over the top (roof) of the structure to fill the area between the structure and the street. This backfilling is typically done with imported soils delivered by truck. Typically, backfilling would be carried out in the last 3 to 6 months of station construction. Depending on the station configuration, this operation would be done in stages. For excavation calculations see Table 4.7.

Underground stations may include above-ground structures that would be constructed near the end of the station construction cycle, as parts of the surface restoration. These above-ground structures would include entrance features, stairways, and elevator/escalator entry points. In some cases, Metro operations and maintenance spaces, including power equipment, communications facilities, and control rooms, may be housed in above-ground structures. Street and site restoration activities and appurtenant features, such as signage and landscaping, would complete each station.

Figure 4-7 illustrates a typical cut-and-cover station excavation and construction sequence.

Figure 4-7. Typical Cut-and-Cover Construction Sequence



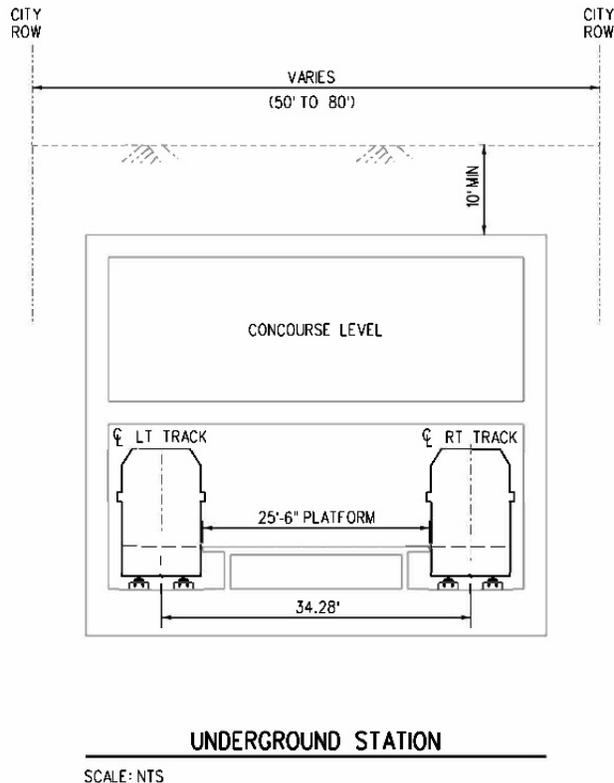
Source: WSP 2020

Note: Station walls would be constructed inside the shoring piles.

The Alternatives 1 and 2 would have up to three underground stations: LAUS, Little Tokyo (added with Design Option 2), 7th Street/Metro Center, Fashion District/South Park, and Arts/Industrial District and three underground crossovers. The location of the underground stations is displayed in Figure 4-1 and Figure 4-2. The underground stations would house emergency ventilation fan shafts, as well as separate emergency exit shafts at both ends of the stations. Ventilation fans would be installed to extract smoke from tunnels and stairs for

evacuation in the event of an emergency, such as a fire in the underground areas. These shafts would be built as extensions of the station excavations using cut-and-cover construction methods. Figure 4-8 shows an example of an underground LRT station.

Figure 4-8. Typical Underground LRT Station



Source: WSP, 2020

Approximately 12 to 18 months would be needed to establish the surface work area, install the excavation support system, and complete excavation to the extent the station could be used for tunnel operations or be concreted. The total sequences for a single underground station construction from the start of temporary shoring to completion of street restoration could be up to 50 months.

Depending on the contractor's means and methods the bored tunnels may be constructed prior to the station excavations. Should the tunnels be excavated first, the station excavation would follow and the tunnel segments within the station would be removed during the station construction. The length of a station excavation could vary depending on the inclusion of certain components, such as TPSS sites and incoming service. The underground station structures are typically sized at approximately 470 feet in length and approximately 50 to 80 feet wide, with the depths below street level depending on location. Stations with adjacent crossovers would be approximately 1,000 to 1,250 feet long, 70 feet wide, and up to 60 to 100 feet deep. For excavation calculations see Table 4.7.

4.6.3 Sequential Excavation Method

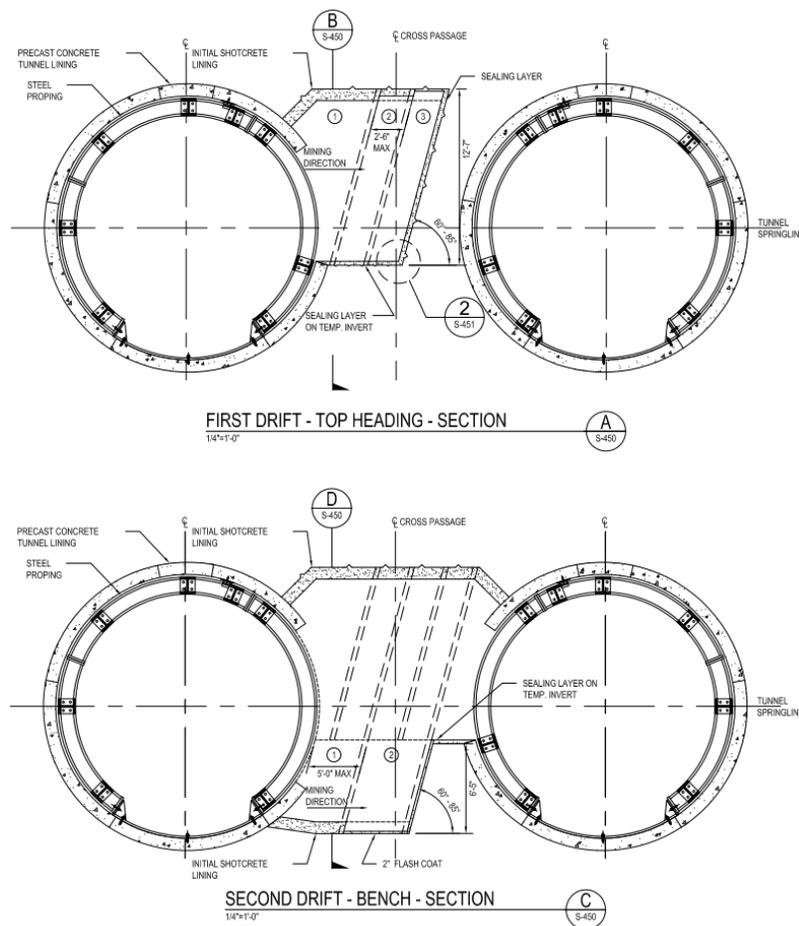
Alternatives 1 and 2 would require cross passages at a maximum interval of 800 feet along the underground guideway, pedestrian tunnels, and other temporary mined tunnels for removal of previously remained SOE structure. Based on the expected ground conditions and lengths, the excavations of these underground elements would be performed using the sequential excavation method (SEM), which offers flexibility in geometry such that it can accommodate various shapes and sizes of opening. This method excavates small portions of ground in sequences until the anticipated excavation geometry is achieved. At each step in the excavation sequence, the newly exposed ground is stabilized by installing a ground-support system before the subsequent excavation advances. SEM is founded on the observational method that links careful observations of the ground behavior to incremental excavation. Instrumentation and visual inspection are used for the ground behavior observations. During SEM excavation, the construction sequence and ground support is routinely adjusted to account for the changes in ground conditions and required support. The execution of excavation and ground support using SEM typically includes the following key guidelines:

- Ground and excavation and support classification based on a thorough ground investigation
- Pre-definition and implementation of ground support classes based on actual ground conditions observed in a routine manner
- Continuous monitoring of ground settlements and conditions using geotechnical instrumentation
- Installation of pre-excavation support elements and ground improvement as required prior to tunneling excavation including grouting, spiling, dewatering, ground freezing, and other measures
- During excavation, placement of ground support elements including shotcrete, lattice girders, steel sets and other elements providing a rapid and fast-setting support to the exposed ground. Shotcrete is typically reinforced by steel/glass fibers or welded wire fabric
- Employment of a dual-lining support consisting of an initial shotcrete lining and a final, cast-in-place (CIP) concrete lining with water/gas proofing membrane.

Pre-excavation support is provided early on in SEM tunneling. In soft ground and weak rock, pre-excavation support is required directly following the excavation of a specified length and is installed prior to the excavation of the next round in sequence. The intent is to provide structural support to the newly anticipated opening and ensure safe tunneling conditions. Pre-excavation support layout is dictated by engineering principles, economic considerations and risk management needs.

Figure 4-9 show a typical cross passage excavation sequence by SEM. The example is from Metro Contract No. C0980 Regional Connector Project for final design of construction of the cross passages as of August 2016.

Figure 4-9. Typical Cross Passage Excavation Sequence by SEM



Source: Metro Contract No. C0980 (Regional Connector) – Issued for Construction for Cross passages, 2016.

4.7 Freeway Crossings

In the Northern Section, Alternative 1 would cross under US-101 and Alternative 2 would partially cross under I-110. Both alternatives would cross over I-10. At the US-101 crossing and I-110 partial crossing, the alignment crosses in a bore tunnel configuration underneath the freeway. Construction would not impact the existing freeway infrastructure.

To avoid potential traffic impacts to 15th and 16th Street, Alternatives 1 and 2 would cross over the I-10 freeway in an aerial configuration. The alignment would pass over the I-10 freeway in an aerial viaduct structure and continue south, parallel to the existing Metro A (Blue) Line at Washington Boulevard. Construction would require temporary overnight and/or weekend closure(s) of the existing freeway traffic lanes in order to construct/remove key elements of the falsework needed to construct the pre-cast concrete beam structure. Temporary sidewalk closures may be necessary in some locations for the delivery of materials and modifications. For more details on staging area location options see Table 4.6.

In the Southern Section, Alternatives 1, 2, and 3 would cross the existing I-710 freeway, and all four alternatives would cross existing freeways at I-105, SR-91, and I-605. At the SR-91 and I-605 freeway crossings, the existing bridge structures contain sufficient space to

accommodate the LRT tracks. Construction would be below the existing bridges and would not impact the existing freeway travel lanes.

At I-710 there is insufficient horizontal clearance for the new LRT tracks and the opening through the embankment would need to be widened. One solution would be to install a jacked box structure underneath the freeway. The construction is not anticipated to impact peak freeway operations though ground improvements from the surface of the freeway may be needed to maintain support. It is anticipated the freeway lanes would remain open during this process, although there may be temporary closures to install ground-monitoring instruments and/or ground support infrastructure in the median. The basic steps of a jacked box structure are as follows:

- Construct jacked box structure segments in-line with and adjacent to the freeway embankment and a thrust block;
- Perform ground improvements and/or install structural ground support along the entire jacked tunnel alignment from either the surface and/or sides;
- Install a tunnel shield at the front end of the box with hydraulic jacks provided at the rear;
- Excavate ground from within the shield and jacking the box forward;
- Repeat the preceding three steps until the new box structure is in the final position

Excavation and jacking is typically carried out alternately in 2 to 4 feet increments. The I-710 freeway would require ground monitoring to measure potential settlement that may occur during the jacking and excavation operations.

4.7.1 I-105

At I-105, a new infill Metro C (Green) Line Station would be constructed in the median of the I-105 Freeway as part of the Project. Vertical pedestrian access would be provided from the LRT bridge to the proposed I-105/C Line Station platform via stairs, escalators, and/or elevators. To accommodate the construction of the new station platform, the existing Metro C (Green) Line tracks would be widened and the I-105 lanes would be reconfigured. As a separate project, Metro and Caltrans are evaluating alternatives to convert existing high-occupancy vehicle lane(s) on the I-105 Freeway to ExpressLanes. The project limits are from Imperial Highway/Sepulveda Boulevard (west of I-405) to Studebaker Road (east of I-605). It is anticipated that construction of both the I-105 ExpressLanes Project and WSAB Project would occur concurrently.

Three structures crossing I-105 in the area of the proposed infill station:

- Century Boulevard Overpass carries one heavy-rail track for UPRR along the proposed WSAB alignment
- Façade Avenue Overcrossing located approximately 186 feet west of Century Boulevard Underpass, that carries one lane of vehicular traffic in each direction
- Arthur Avenue Pedestrian Overcrossing, located approximately 250 feet east of Century Boulevard UP, carries 12-foot wide pedestrian path, a sewer line and casing, and a storm drain

Demolition and reconstruction of the freight bridge is required to accommodate the new LRT bridge over the freeway. Demolition and reconstruction of the Arthur Avenue Pedestrian Overcrossing and the Façade Avenue Overcrossing are required because the current column

locations of these four-span bridges cannot accommodate both the I-105 ExpressLanes Project and the infill Metro C (Green) Line Station. Therefore, demolition and reconstruction of the Arthur Avenue Pedestrian Overcrossing and the Façade Avenue Overcrossing would occur as part of the WSAB Project.

To accommodate the construction activities needed for the new bridges and LRT in-fill station, the C (Green) Line transit operations would be temporarily suspended in this area and a bus bridge would be needed for approximately 21 months. Many of the construction activities associated with the new bridges and LRT infill station would occur simultaneously. The basic steps for construction within the freeway are as follows:

- Realign the I-105 lanes (1 month)
- Remove existing C (Green) Line tracks and establish construction area (2 months)
- Construct new freight bridge (10 months)
 - Construct falsework and then a cast-in-place concrete bridge over the freeway lanes and frontage roads, maintaining vehicular access to the extent feasible
- Shift the existing freight operations to the new bridge and demolish the existing bridge (3 months)
- Construct new LRT bridge (17 months)
 - Construct median column(s) and abutments for the LRT bridge
 - Construct falsework and then a cast-in-place concrete bridge, including a pedestrian walkway, over the freeway lanes and frontage roads, maintaining vehicular access
 - Connect the pedestrian walkway to the new C (Green) Line Station platform
- Demolish and replace Façade Avenue Overcrossing and Arthur Avenue Pedestrian Overcrossing; this work can be performed concurrently with the new LRT structure (25 months)
- Realign the C (Green) Line tracks to the final location for the station (7 months)
- Construct in-fill C (Green) Line station (8 months)

The freeway lanes would be reconfigured to accommodate the wider median. The width of the shoulder lanes may decrease during construction to accommodate falsework or other construction elements. In general, vehicular traffic on the freeway and frontage roads would be maintained during the duration of construction. Temporary freeway and frontage road closures, with appropriate detours, may be required during off-peak hours for the demolition of the existing freight bridge, and if the final design calls for placement of precast structural beams across the roadways. For excavation calculations see Table 4.7.

Alternatively, Metro is considering single-track operations along the Metro C (Green) Line, which would reduce the duration of the bus bridge but could increase the overall duration of construction in this location. Construction methods would be considered further during the advancement of design. Construction activities for the WSAB Project would be coordinated with the I-105 ExpressLanes Project.

4.8 Other Construction Activities

4.8.1 Systems

4.8.1.1 Traction Power Substations

The TPSS sites must be placed along the alignment at designated locations, typically near stations to provide the electric power needed for the LRVs. For underground TPSS sites, equipment would need to be installed within station boxes along underground segments of the alignment. TPSS are electrical substations that distribute power to the LRVs. A TPSS is typically a metal prefabricated building approximately 15 feet wide by 40 feet long by 15 feet high. The TPSS site would include a perimeter barrier and space for utility equipment, manholes, and pull boxes, and would allow vehicle access. The entire TPSS site would require an area approximately 80 feet by 45 feet or equivalent in different configurations. The actual size of the site would also depend on ROW considerations.

Each TPSS site would be cleared and graded, and a concrete slab would be constructed with the appropriate underground utility connections, as needed. The TPSS structure would be delivered, mounted on the slab, and connected to the utilities. Fencing or another type of barrier would be installed around the perimeter of the site, and architectural and landscaping treatments would be applied, as feasible. Typical equipment used to construct TPSS include graders, backhoes, bobcats, forklifts, cranes, and concrete and materials/equipment trucks.

Utility Company Vista Switches would be required at ground level for each underground station. These switches would transmit electric power from the LA Department of Water and Power (LADWP) electric grid to the underground station switchgear and other equipment to transform into traction power.

Approximately 19 at-grade TPSS sites are proposed along the alignment as listed in Table 4.4. Additionally, a TPSS would be required at each underground station and the maintenance and storage facility, totaling 23 TPSS site locations for the entire project. For many of the sites, two options have been identified (A and B), but only one TPSS per pair would be constructed as part of the Project. Final locations are subject to refinement during the advancement of design.

Table 4.4. Proposed TPSS Locations (North to South)

TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing	Alternative(s)
22c	Located underground at 8th St between Flower St and Figueroa St	Underground	410+00	2
22a	Located underground at Alameda and Los Angeles St at Union Station Square.	Underground	418+00	1
22b	Located underground at Union Station Square near the MWD Building	Underground	420+00	1 (Design Option 1)
21a	Located underground at E 8th St and Los Angeles St	Underground	444+00	2
21b	Located underground at E 3rd St and Alameda St.	Underground	447+00	1 (Design Option 2)

TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing	Alternative(s)
20b	Located underground south of E 6th St along Alameda St.	Underground	490+00	1
20a	Located underground south of E 7th St along Alameda St.	Underground	500+00	2
19	North of E 14th St and w	At-Grade	528+00	1, 2
19(e)*	North of E 16th St and under the Interstate 10 Freeway within private property.	At-Grade	538+50	1, 2
19(e)*	South of E 16th St and east of Long Beach Ave within private property.	At-Grade	541+00	1, 2
18	South of E Martin Luther King Jr Blvd on the east side of Long Beach Ave and within private property.	At-Grade	589+50	1, 2
18(e)*	South of E Martin Luther King Jr Blvd on the west side of Long Beach Ave and within private property.	At-Grade	589+00	1, 2
17	South of E 51st St on the west side of Long Beach Ave within private property.	At-Grade	638+00	1, 2
17b*	Just north of E 52nd St on the west side of Long Beach Ave within private property.	At-Grade	640+00	1, 2
17a*	Between E 52nd and 53rd St on the west side of Long Beach Ave within private property.	At-Grade	642+25	1, 2
17 Slauson	South of Slauson Ave and west of Randolph Ave within Union Pacific Railroad property.	At-Grade	665+25	1, 2, 3
16	West of Alameda St and south of Randolph St within private property.	At-Grade	686+50	1, 2, 3
16(e)*	West of Regent St and north of Randolph St within private property.	At-Grade	694+25	1, 2, 3
15	North of Randolph St and east of Seville Ave within private property	At-Grade	729+00	1, 2, 3
15(e)*	East of Stafford Ave and north of Randolph St within private property.	At-Grade	737+75	1, 2, 3
14	West of State St and north of Randolph St within private property.	At-Grade	761+75	1, 2, 3
13	East of Atlantic Ave and north of Randolph Ave within public property	At-Grade	787+00	1, 2, 3
13(e)*	North of Live Oak St and west of Atlantic Ave within private property.	At-Grade	832+75	1, 2, 3
12	North of Live Oak St and east of Atlantic Ave within private property.	At-Grade	834+75	1, 2, 3
11	South of Cecelia St and east of Atlantic Ave within private property.	At-Grade	887+00	1, 2, 3

TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing	Alternative(s)
10	South of Firestone Blvd and east of Branyon Ave within private property.	At-Grade	938+75	1, 2, 3
9	Between Miller Way and the Interstate 710 Freeway and north of the existing tracks. This potential TPSS site would occur within private property.	At-Grade	987+75	1, 2, 3
10(e)*	Southeast of the Rio Hondo Channel and north of Meadow Rd within private property.	At-Grade	998+75	1, 2, 3
8	North of Laurel St within a vacant, private-owned property.	At-Grade	1044+75	1, 2, 3
9(e)*	South of Gardendale and adjacent to the west side of Dakota Ave within private property.	At-Grade	1052+25	1, 2, 3
7	North of Century Blvd and east of Industrial Ave within private property.	At-Grade	1080+00	1, 2, 3, 4
8(e)*	Just southwest of Arthur Ave/Rose St and north of Rosecrans Ave within public-owned property.	At-Grade	1110+50	1, 2, 3, 4
6	South of Paramount High School's tennis courts and just east of the existing pedestrian bridge within public-owned property	At-Grade	1140+00	1, 2, 3, 4
6(e)*	North of Hegel St and south of the Bellflower Bike Trail	At-Grade	1195+50	1, 2, 3, 4
5	North of Hegel St and the Bellflower Bike Trail within private property.	At-Grade	1196+50	1, 2, 3, 4
4	East of Olive St and north of Pacific Ave within private property.	At-Grade	1243+50	1, 2, 3, 4
3	South of Flora Vista Park and just east of Beach St. within Metro-owned property.	At-Grade	1301+50	1, 2, 3, 4
3(e)*	Just east of Studebaker St within Metro-owned property.	At-Grade	1345+00	1, 2, 3, 4
3(e)*	Southwest of Rosewood Park within Metro-owned property.	At-Grade	1350+75	1, 2, 3, 4
2	Just northwest of the crossing at Gridley Rd and 183rd St. This potential TPSS site would impact a Public Property.	At-Grade	1372+50	1, 2, 3, 4
1	Between Corby Ave and Pioneer Blvd north of 188th St impacting a private property.	At-Grade	1405+00	1, 2, 3, 4
1(e)*	Just north of South St and west of Clarkdale Ave impacting a private property.	At-Grade	1416+50	1, 2, 3, 4

Source: Metro 2020

Note: * = optional site

4.8.2 Train Control House

Train control houses containing signal equipment would be located periodically along the alignment within the ROW and no more than 30 feet away from the nearest track. Train control houses would also be located at each grade crossing to control gates and flashers. Where grade crossings are shared with the UPRR, two signal houses would be provided (one for UPRR and one for WSAB).

Signal houses are typically pre-fabricated metalclad buildings 10 ft x 16 ft, although size may vary. Signal houses are placed upon a concrete foundation and may be placed within a fenced area. The site would include ductbanks and manholes. Typical equipment used to construct signal houses include graders, backhoes, bobcats, forklifts, and concrete and materials/equipment trucks.

4.8.3 Overhead Catenary Systems

The Overhead Catenary System (OCS) electrically powers the LRT through a copper or bronze contact wire suspended above the track. A device called a pantograph on the roof of the LRV slides along the underside of the contact wire and delivers electric power to the LRV. This contact wire, the poles, and other structures that support it, are collectively known as the OCS. In a catenary system, the contact wire is supported from a parallel “messenger” wire that is directly above the contact wire. The messenger wire is then supported from cross-span wires or brackets as appropriate to the location. The poles are fabricated from steel pipe and mounted on reinforced concrete foundation. With the Project, the wires would be located approximately 20 feet above the track, supported by poles spaced at an average of 150 feet.

Construction of the OCS in at-grade and aerial guideway sections would initially involve constructing the foundations for the OCS poles. This would be accompanied by the construction of duct banks and conduit for the underground electrical feeder lines from the TPSS sites, followed by installation of the OCS poles. For underground segments (located in the Northern Section), the OCS would typically be fixed to the tunnel ceiling with no poles. Installation of the feeder cables and overhead catenary lines would occur after guideway construction.

Construction equipment to be used during the construction of the foundations and ducts, and installation of the poles and feeder cables would include augers, cranes, back hoes, and concrete and materials trucks. The overhead wires would be installed from the guideway using high-rail equipment and specialized vehicles with the ability to operate on both roadways and rails. The exact location of the facilities would be determined during the advancement of design.

4.8.4 Temporary Street and Lane Closures

Street and lane closures may be necessary during construction of the Project. The extent and duration of the closures would depend on a number of factors, including the construction contract limits, construction methods, and individual contractors’ choices. The closures would be coordinated with each affected jurisdiction. Restrictions on the extent and duration of the closures would be incorporated in the project construction specifications. In some cases, short-term full closures might be substituted for extended partial closures to reduce overall impacts.

Street closures required for construction would generally be limited to nighttime, weekend, and/or off-peak travel hours including overnight hours to minimize the disruption to the traveling public. However, some temporary street lane closures would occur during the daytime for construction activities such as utility relocations that might generate a lot of noise near sensitive receptors. Partial road closures, such as at underground stations, would occur over extended periods of time. Detours for vehicular, transit or nonmotorized traffic could be required. The local community would be consulted concerning the road closures. The implementation of a Transportation Management Plan (TMP) would address construction impacts on transportation facilities under the jurisdiction of all involved cities and agencies including Caltrans. The TMP would include specific strategies to address short term, project related construction effects on traffic, bicyclists, pedestrians, and area residents and businesses. More details on the TMP are provided in Section 6 of the *West Santa Ana Branch Transportation Impact Analysis Report* (Metro 2021).

Some permanent road closures would also occur throughout the project. These include 188th Street in Artesia between Pioneer Boulevard and Corby Ave, the bifurcation of Long Beach Avenue between Olympic Boulevard and 14th Street in Los Angeles, as well as the bifurcation of 14th Street between Compton Ave and Long Beach Ave in Los Angeles. Metro would work with these cities to obtain the proper street vacation approvals. Additionally, the following grade crossings would be closed along Randolph Street at the following cross streets; Wilmington Ave, Regent St, Albany St, Rugby Ave, and Rita Ave. Also, the 187th Street grade crossing in Artesia would be closed. Please see Table 4.5 for all anticipated construction related closures.

Table 4.5. Construction Related Closures by Jurisdiction

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
City of Los Angeles									
1	1, Design Option 2	Road	Little Tokyo Station	Temporary	Alameda St	1st St and Traction Ave	24-48	-	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
2	1, Design Option 2	Sidewalk	Little Tokyo Station	Temporary	Alameda St	1st St and Traction Ave	24-48	-	Half of west sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
3	1	Road	Arts/Industrial District Station	Temporary	Alameda St	6th St and Industrial St	24-48	-	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
4	1	Sidewalk	Arts/Industrial District Station	Temporary	Alameda St	6th St and Industrial St	24-48	-	Half of west sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
5	1, 2	Road	Tunnel Portal	Permanent	Long Beach Ave	Olympic Blvd and Newton St	N/A	-	-
6	1, 2	Sidewalk	Tunnel Portal	Permanent	Long Beach Ave	Olympic Blvd and 14th St	N/A	-	At tunnel portal only.
7	1, 2	Sidewalk	Tunnel Portal	Temporary	Long Beach Ave	Olympic Blvd and Newton St	24-48	-	Sidewalks on either side of street leading to portal.

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
8	1, 2	Road	Tunnel Portal	Permanent	14th St	Compton Ave and Long Beach Ave	N/A	-	-
9	1, 2	Sidewalk	Tunnel Portal	Permanent	14th St	Compton Ave and Long Beach Ave	N/A	-	-
10	2	Road, Bicycle	7th Street/Metro Center Station Pedestrian Tunnel	Temporary	Figueroa St	7th St and 8th St	24-48	Metro 493, 495, 497, 498, 499, 699; DASH 423, F	Two traffic lanes closed during construction.
11	2	Sidewalk	7th Street/Metro Center Station Pedestrian Tunnel	Temporary	Figueroa St	7th St and 8th St	24-48	Metro 493, 495, 497, 498, 499, 699; DASH 423, F	East side full sidewalk closure (typically intermittently during nighttime or off-peak periods).
12	2	Road	7th Street/Metro Center Station	Temporary	8th St	Francisco St to Figueroa Ave	24-48	Metro 66	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
13	2	Sidewalk	7th Street/Metro Center Station	Temporary	8th St	Francisco St to Figueroa Ave	24-48	Metro 66	North half of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
14	2	Road	7th Street/Metro Center Station	Temporary	8th St	Figueroa Ave to Flower St	24-48	Metro 66	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).

4 Construction Methods/Affected Environment

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
15	2	Sidewalk	7th Street/Metro Center Station	Temporary	8th St	Figueroa Ave to Flower St	24-48	Metro 66	Southern half of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
16	2	Road	7th Street/Metro Center Station	Temporary	8th St	Flower St to Hope St	24-48	Metro 66	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
17	2	Sidewalk	7th Street/Metro Center Station	Temporary	8th St	Flower St to Hope St	24-48	Metro 66	Southern half of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
18	2	Road	South Park/Fashion District Station	Temporary	8th St	Main St to Los Angeles St	24-48	Metro 66	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
19	2	Sidewalk	South Park/Fashion District Station	Temporary	8th St	Main St to Los Angeles St	24-48	Metro 66	Southern half of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
20	2	Road	South Park/Fashion District Station	Temporary	8th St	Los Angeles St to Santee St	24-48	Metro 66	Half of temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
21	2	Sidewalk	South Park/Fashion District Station	Temporary	8th St	Los Angeles St to Santee St	24-48	Metro 66	Southern half of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
22	2	Road	Arts/Industrial District Station	Temporary	8th St	Alameda St to Naomi St	24-48	-	Half of street temporarily; full street closure (typically intermittently during nighttime or off-peak periods).
23	2	Sidewalk	Arts/Industrial District Station	Temporary	8th St	Alameda St to Naomi St	24-48	-	Both sides of sidewalk temporarily; full sidewalk closure (typically intermittently during nighttime or off-peak periods).
24	1, 2	Road	I-10 Bridge	Temporary	I-10	-	12-24	-	Intermittent nighttime closures.
25	1, 2, 3	Road	Long Beach Ave Viaduct	Temporary/Permanent	Long Beach Ave; NB Lanes	Washington Blvd to Slauson Blvd	24-48	Metro A (Blue) Line	Half of northbound road temporarily closed; intersections closed (typically intermittently during nighttime or off-peak periods). Up to 18' width of road to be permanently closed at viaduct columns.
City of Huntington Park									
26	1, 2, 3	Road	Grade Crossing	Permanent Grade Crossing	Randolph St	Wilmington Ave, Regent St, Albany St, Rugby Ave, Rita Ave	N/A	-	Cross street closed to crossing railroad right-of-way; access to Randolph St limited to right-in and right-out turning movements.
27	1, 2, 3	Road	Pacific/Randolph Station	Permanent	Randolph St	Rugby Ave to Arbutus Ave	N/A	-	Loss of street parking on both sides of street (due to Pacific/Randolph Station).

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
28	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Randolph St	Santa Fe Ave, Malabar St, Seville Ave, Miles Ave, Pacific Blvd, Arbutus St, State St, Alameda St	1	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
29	1, 2, 3	Road	Grade Crossing	Temporary	Randolph St	State St	3-6	Metro 254	Temporary lane closures and relocations during grade crossing construction.
30	1, 2, 3	Road	Grade Crossing	Temporary	Gage Ave	-	1	Metro 110	Temporary lane closures and relocations during grade crossing construction; full closures (typically intermittently during nighttime).
31	1, 2, 3	Road	Grade Crossing	Temporary	Otis Ave	-	1	-	Temporary lane closures and relocations during grade crossing construction; full closures (typically intermittently during nighttime).
32	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Gage Ave	-	1	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
33	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Otis Ave	-	1	Metro 612	Close sidewalks during reconstruction and integration of new grade crossing equipment.

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
City of Bell									
34	1, 2, 3	Road	Grade Crossing	Temporary	Bell Ave	-	1	-	Temporary lane closures and relocations during grade crossing construction; intermittent nighttime closures.
35	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Bell Ave	-	1	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
City of Huntington Park/Bell/Cudahy									
36	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Florence Ave	-	1-3	Metro 111, 612	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
37	1, 2, 3	Road	Grade Crossing	Temporary	Florence Ave	-	1-3	Metro 111, 612	Close sidewalks during reconstruction and integration of new grade crossing equipment.
City of Huntington Park/Cudahy/South Gate									
38	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Santa Ana St	Salt Lake Ave	1-3	Metro 611	Close sidewalks during reconstruction and integration of new grade crossing equipment.
39	1, 2, 3	Road	Grade Crossing	Temporary	Santa Ana St	Salt Lake Ave	1-3	Metro 611	Temporary lane closures and relocations during grade crossing and median construction; intermittent nighttime closures.

4 Construction Methods/Affected Environment

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
City of Cudahy									
40	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Ardine St	Salt Lake Ave	1-3	-	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
41	1, 2, 3	Road	Grade Crossing	Temporary	Ardine St	Salt Lake Ave	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
City of South Gate									
42	1, 2, 3	Road	Firestone Grade Separation	Temporary	Atlantic Ave and Firestone Blvd	-	12-24	Metro 115, 260, 762	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
43	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Southern Ave, Rayo Ave	-	1-3	Metro 115	Close sidewalks during reconstruction and integration of new grade crossing equipment.
44	1, 2, 3	Road, Bicycle	Grade Crossing	Temporary	Southern Ave, Rayo Ave	-	1-3	Metro 115	Temporary lane closures and relocations during grade crossing construction; full closures (typically intermittently during nighttime).
45	1, 2, 3	Road	I-710 Undercrossing	Temporary	I-710	-	6-12	-	Full lane closures (typically intermittently during nighttime).
46	1, 2, 3	Road	Grade Crossing	Permanent Grade Crossing	Frontage Rd and Miller Way	-	1-3	-	Closure of private driveway grade crossings.

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
47	1, 2, 3	Road	Grade Separation	Temporary	Imperial Blvd and Garfield Ave	-	12-24	Metro 117, 120, 258	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
48	1, 2, 3	Sidewalk	Grade Separation	Temporary	Imperial Blvd and Garfield Ave	-	12-24	-	Close sidewalks during reconstruction.
49	1, 2, 3	Road	Grade Crossing	Temporary	Main St	-	1-3	-	Temporary lane closures and relocations during grade crossing construction; full closures (typically intermittently during nighttime).
50	1, 2, 3	Sidewalk	Grade Crossing	Temporary	Main St	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
51	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Century Blvd	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
52	1, 2, 3, 4	Road	Grade Crossing	Temporary	Century Blvd	-	1-3	-	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).

4 Construction Methods/Affected Environment

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
City of South Gate/Cudahy									
53	1, 2, 3, 4	Road	Grade Crossing	Temporary	Gardendale St	-	1 - 3	-	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
54	1, 2, 3, 4	Road	Grade Crossing	Permanent	Gardendale St	-	-	-	Westbound left-turn lane closed.
55	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Gardendale St	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
City of Paramount									
56	1, 2, 3, 4	Road	Grade Separation	Temporary	N. Somerset Ranch Rd	-	12-24	-	Full closures (typically intermittently during nighttime).
57	1, 2, 3, 4	Road	Grade Separation	Temporary	I-105	-	12-24	Metro C (Green) Line	Full closures (typically intermittently during nighttime); potential lane width reduction.
58	1, 2, 3, 4	Road	Grade Separation	Temporary	S. Somerset Ranch Rd	-	12-24	-	Full closures (typically intermittently during nighttime).
59	1, 2, 3, 4	Road	Grade Separation	Temporary	Paramount Blvd	-	12-24	Metro 265	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
60	1, 2, 3, 4	Sidewalk	Grade Separation	Temporary	Paramount Blvd	-	12-24	Metro 265	Close sidewalks during reconstruction.

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
61	1, 2, 3, 4	Road	Grade Separation	Temporary	Rosecrans Ave	-	12-24	Metro 125	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
62	1, 2, 3, 4	Sidewalk	Grade Separation	Temporary	Rosecrans Ave	-	12-24	Metro 125	Close sidewalks during reconstruction.
63	1, 2, 3, 4	Road	Grade Separation	Temporary	Downey Ave	-	12-24	LBT 22	Lane width reduction to accommodate construction of modified median and grade separation column; full road closures (typically intermittently during nighttime).
64	1, 2, 3, 4	Sidewalk	Grade Separation	Temporary	Downey Ave	-	12-24	LBT 22	Close sidewalks during reconstruction.
65	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Somerset Blvd	-	1-3	Metro 127	Close sidewalks during reconstruction and integration of new grade crossing equipment.
66	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Temporary	Somerset Blvd	-	1-3	Metro 127	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
67	1, 2, 3, 4	Road, Bicycle	Grade Separation	Temporary	Woodruff Ave and Flower St	-	12-24	NTS 1; LBT 92	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).

4 Construction Methods/Affected Environment

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
68	1, 2, 3, 4	Sidewalk	Grade Separation	Temporary	Woodruff Ave and Flower St	-	12-24	NTS 1; LBT 92	Close sidewalks during reconstruction.
City of Bellflower									
69	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Lakewood Blvd	-	1-3	Metro 266	Close sidewalks during reconstruction and integration of new grade crossing equipment.
70	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Temporary	Lakewood Blvd	-	1-3	Metro 266	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
71	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Clark Ave	-	1-3	NTS 1	Close sidewalks during reconstruction and integration of new grade crossing equipment.
72	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Temporary	Clark Ave	-	1-3	NTS 1	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
73	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Permanent	Clark Ave	-	-	NTS 1	Lane width reduction.
74	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Alondra Blvd	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
75	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Temporary	Alondra Blvd	-	1-3	Metro 127, 128	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
76	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Permanent	Alondra Blvd	-	-	Metro 127, 128	Lane width reduction.
77	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Bellflower Blvd	-	1-3	LBT 91, 93	Close sidewalks during reconstruction and integration of new grade crossing equipment.
78	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Temporary	Bellflower Blvd	-	1-3	LBT 91, 93	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
79	1, 2, 3, 4	Road, Bicycle	Grade Crossing	Permanent	Bellflower Blvd	-	-	LBT 91, 93	Lane width reduction.
City of Cerritos									
80	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Artesia Blvd	-	1-3	Metro 130; COW 1B, 1C	Close sidewalks during reconstruction and integration of new grade crossing equipment.
81	1, 2, 3, 4	Road	Grade Crossing	Temporary	Artesia Blvd	-	1-3	Metro 130; COW 1B, 1C	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
82	1, 2, 3, 4	Road	Private Driveway	Permanent	Extra Space Storage	San Gabriel River and Artesia Blvd	-	-	Close private driveway.

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No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
83	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Studebaker Rd	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
84	1, 2, 3, 4	Road	Grade Crossing	Temporary	Studebaker Rd	-	1-3	Metro 130; COW 1B, 1C; LBT 172, 173; NTS 2	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
85	1, 2, 3, 4	Road	Grade Crossing	Permanent	South St	-	-	COW 1B, 1C; LBT 173; OCTA 30	Lane width reduction.
City of Cerritos/Artesia									
86	1, 2, 3, 4	Road	Grade Separation	Temporary	Gridley Rd and 183rd St	-	12-24	Metro 62; COW 1B, 1C; LBT 172, 173; NTS 2; OCTA 30	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).
87	1, 2, 3, 4	Sidewalk	Grade Separation	Temporary	Gridley Rd and 183rd St	-	12-24	Metro 62; COW 1B, 1C; LBT 172, 173; NTS 2; OCTA 30	Close sidewalks during reconstruction.
88	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	Pioneer Blvd	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
89	1, 2, 3, 4	Road	Grade Crossing	Temporary	Pioneer Blvd	-	1-3	-	Temporary lane closures and relocations during grade crossing and median construction; full closures (typically intermittently during nighttime).

No.	Build Alternative	Closure Element	Project Element/Area	Closure Type	Street	Cross Street	Approximate Closure Duration (months)	Affected Transit Routes	Closure Details
90	1, 2, 3, 4	Road	Grade Crossing	Permanent	Pioneer Blvd	-	-	-	Lane width reduction.
City of Artesia									
91	1, 2, 3, 4	Road	Grade Crossing	Temporary	186th St	-	1-3	-	Temporary lane closures and relocations during grade crossing construction; full closures (typically intermittently during nighttime).
92	1, 2, 3, 4	Sidewalk	Grade Crossing	Temporary	186th St	-	1-3	-	Close sidewalks during reconstruction and integration of new grade crossing equipment.
93	1, 2, 3, 4	Road	Grade Crossing	Permanent	187th St	Corby Ave (West) to Corby Ave (East)	N/A	-	-
94	1, 2, 3, 4	Sidewalk	Grade Crossing	Permanent	187th St	Corby Ave (West) to Corby Ave (East)	N/A	-	-
95	1, 2, 3, 4	Road	Parking Structure	Permanent	188th St	Corby Ave (West) to Pioneer Blvd	N/A	-	-

Source: Metro 2021a

Notes: COW = Cerritos on Wheels; I = Interstate; LBT = Long Beach Transit; N/A = not applicable; NTS = Norwalk Transit System; OCTA = Orange County Transportation Authority

4.8.5 Staging Areas

Various locations would be used for construction staging. The locations would be needed at underground station locations, underground track crossovers, tunnel portals, grade separations, new bridge crossings, certain freeway crossings, and intermittently along viaduct structures. Typically, the staging areas would be located within the alignment ROW or on land to be acquired for guideway construction, stations, maintenance and storages facility, parking facilities, or TPSS sites. Temporary easements would be required to allow construction staging on public sidewalks, streets, and in some cases, private property if necessary. Site clearance and demolition of existing structures at the construction staging areas would begin before major construction activity.

Staging areas would be used for the storage of construction materials and equipment, locations of temporary offices for field personnel, parking for field personnel, and fabrication of construction materials (e.g. on-site welding of rail strings). Construction staging for both aerial and at-grade guideway in the rail ROW located within public streets would require temporary lane closures.

At the TBM launching site, the staging area would also be used for storage and preparation of precast concrete segments, temporary spoil storage, ventilation lines, shaft support (air, water, electricity, spoil hoisting), workshops, mixing and processing slurry for excavation support or tunnel excavation, and post-excavation slurry treatment (separation), which would include filters, centrifuges, and vibrator equipment. Typically, the area would be at station excavation site to facilitate access to the tunnel. Temporary easements, typically a portion of the sidewalk, traffic lanes, and parking areas, may be required at various locations for staging. Potential temporary easements are included in Table 4.6.

Tunnel staging areas must be large enough for the contractor to perform all activities associated with tunnel construction for the duration of the project. These activities would include the following:

- Site mobilization and site development work
- Equipment, material deliveries, and storage
- Ground improvement operations
- Shaft/station excavation and muck handling, stockpiling, loading, and hauling
- Storage of tunnel segments
- Delivery, assembly, and launching of TBMs
- Operation of ancillary tunnel equipment
- Removal of TBMs

Additional area would be necessary for the following items:

- Material storage
- Limited on-site muck storage
- Construction offices
- Parking for tunnel crews

In addition, contractors and construction managers would establish field offices in existing office space near work areas or in temporary jobsite trailers at the staging areas. Often, these offices are operational on a 24-hour basis, consistent with construction activities. Table 4.6 lists potential staging and laydown area options.

Table 4.6. Staging Areas

Construction Laydown #	Location and Permanent Project Use (if applicable)	Alternative(s)
No. 1	South of Main St. and west of Alameda St.	1
No. 2	West of the Los Angeles Union Station, just south of Cesar E Chaves Ave. and north of El Monte Busway.	1 - Design Option 1
No. 3	South of Cesar E Chaves Ave and east of Alameda St. This site would be used for a future station entrance.	1
No. 5	Located along the west side of Alameda St., between 1st and 2nd St. and on the east side of Alameda St. between 2nd St and Traction Ave. This site would be used for a future station entrance.	1 - Design Option 2
No. 7	Along 8th St. between Francisco St. and Figueroa St.	2
No. 8	Along 8th St. between Figueroa St. and Flower St.	2
No. 9	West of Flower St. between W 7th St and W 8th St.	2
No. 10	Along 8th St. between Flower St. and Hope St.	2
No. 11	Along 8th St. between Main St. and Los Angeles St.	2
No. 13	Southwest of 8th St. and Santee St.	2
No. 14	Along 8th St. between Los Angeles St. and Santee St.	2
No. 15	Along the west side of Alameda St. between 6th St. and 7th St. This site would be used for a future station entrance.	1
No. 16	Along the east side of Alameda St., just south of 7th St.	2
No. 17	Along Long Beach Ave. just south of Olympic Blvd. Potential Construction Laydown areas include parcels on the east and west of Long Beach Ave. This site would be used as the future tunnel portal as well as a potential TPSS site.	1, 2
No. 18	Along the west side of Long Beach Ave between Olympic Blvd. and Newton St.	1, 2
No. 19	Along the west side of Long Beach Ave between Newton St. and 15th St.	1, 2
No. 20	Along the west side of Long Beach Ave between 15th St. and 16th St. beneath the Interstate 10 Santa Monica Freeway.	1, 2
No. 21	Along the east side of Long Beach Ave between Washington Blvd. and 20th St.	1, 2
No. 22	Along the west side of Long Beach Ave between Washington Blvd. and 20th St.	1, 2
No. 23	Along the west side of Long Beach Ave between 20th St. and 22nd St.	1, 2
No. 24	Along the east side of Long Beach Ave just south of Vernon Ave. (Alt 1 and 2) / Along the east side of Long Beach Ave between 57th St. and Slauson Ave. (Alt 1, 2, and 3).	1, 2, 3

Construction Laydown #	Location and Permanent Project Use (if applicable)	Alternative(s)
No. 25	Along the east side of Long Beach Ave just north of Slauson Ave. This site would be used for a future station.	1, 2, 3
No. 26	Along the east side of Long Beach Ave. between 57th St. and Slauson Ave. This site would be used for a future station.	1, 2, 3
No. 40	Along the west side of Long Beach Ave between 57th St. and Slauson Ave.	1, 2, 3
No. 41	Beginning just south of Slauson Ave. and continuing along Randolph St. to Holmes Ave.	1, 2, 3
No. 43	Along Randolph St. just west of Boyle Ave. This site is also a potential TPSS site.	1, 2, 3
No. 44	Along the south side of Randolph St between Hollenbeck St and Bissell Pl. This site is also a potential TPSS site.	1, 2, 3
No. 45	Along the east side of Salt Lake Ave between Santa Ana St. and Cecilia St. This site is also a potential TPSS site.	1, 2, 3
No. 46	Just south of Patata St. on the east side of Atlantic Ave. This site would be used for future station parking.	1, 2, 3
No. 47	Along the east side of Atlantic Ave north of Mason St. This site would be used for access to future station parking.	1, 2, 3
No. 48	On the east side of Salt Lake Ave. between Duncan Way and Wood Ave. just west of the Los Angeles River.	1, 2, 3
No. 49	South of Wood Ave. and west of the Los Angeles River.	1, 2, 3
No. 50	Between the east side of the Interstate 710 Freeway and the west side of the Rio Hondo Channel. This site would be used for the future track.	1, 2, 3
No. 51	South of the Imperial Hwy. and east of Garfield Pl.	1, 2, 3
No. 52	On the east side of the existing LT Track and north of Laurel St. This site is a potential TPSS site.	1, 2, 3
No. 53	West of Industrial Ave. just north of Century Blvd. This site would be used for future station parking.	1, 2, 3, 4
No. 54	East of Center St. just north of Century Blvd. This site would be used for future station parking.	1, 2, 3, 4
No. 55	Southeast of the Racine/Façade Ave Cul-de-sac in a vacant right of way parcel.	1, 2, 3, 4
No. 56	Just north of Rosecrans Ave and east of the existing LT Track. This site would be used for future station parking.	1, 2, 3, 4
No. 57	West of Bellflower Blvd. and north of Pacific Ave. This site would be used for future station parking.	1, 2, 3, 4
No. 58	Just south of the Interstate 91 Artesia Fwy and west of the San Gabriel River. This site would be used for the future track.	1, 2, 3, 4

Construction Laydown #	Location and Permanent Project Use (if applicable)	Alternative(s)
No. 59	East of Corby Ave and north of 188th St. This site would be used for future station parking.	1, 2, 3, 4
No. 60	West of Pioneer Blvd within 188th St Street right of way. This site would be used for future station parking.	1, 2, 3, 4
No. 61	West of Pioneer Blvd and east of Corby Ave. This site would be used for future station parking.	1, 2, 3, 4

Source: WSP 2020

4.8.6 Haul Routes

Haul routes to disposal sites would be predetermined by agreement with local authorities before construction. The haul routes would follow major arterial streets and highways forming the safest or shortest route with the least adverse effect on traffic, residences, and businesses. Detail haul routes are further discussed in the Construction Section of the *West Santa Ana Branch Transportation Impact Analysis Report* (Metro 2021).

4.8.7 Excavated Materials

The amount of estimated excavated material from tunnels, trenches, and passenger walkways would be compared to estimated fill needs for the Build Alternatives to determine the excess or shortage of material at project completion. Excess material would have to be placed in available Project space such as construction staging areas or disposed of at third-party site. Any material shortage would require obtaining additional soil from a borrowed site.

Quantities are reported in a cubic yard unit. Table 4.7 lists the excavation and fill quantities estimated for the Project. A complete geotechnical investigation program would be performed during Preliminary Engineering and Final Design. The calculations would be adjusted based on the results of the geotechnical investigation in order to refine the excavation quantity estimates.

Table 4.7. Excavation Calculations

Location	Cut (CY)	Fill (CY)	Truck Trips (10CY) ¹	Truck Trips (20CY) ²	Trucking Days (30 trips/day)	Trucking Days (60 trips/day)
Alternative 1						
Typical Underground Station	186,000	40,100	4,010	9,300	440	220
Stations and Caverns	557,849	204,476	20,450	27,890	1,610	810
Tunnels	310,853	-	-	15,540	520	260
Design Option 1 Stations and Caverns	615,605	239,043	23,900	30,780	1,820	910
Design Option 1 Tunnels	331,851	-	-	16,590	550	280
Design Option 2 Station and Caverns	179,517	23,498	2,350	8,980	380	190

4 Construction Methods/Affected Environment

Location	Cut (CY)	Fill (CY)	Truck Trips (10CY) ¹	Truck Trips (20CY) ²	Trucking Days (30 trips/day)	Trucking Days (60 trips/day)
Alternative 2						
Typical Underground Station	186,000	40,100	4,010	9,300	440	220
Stations and Caverns	709,123	159,545	15,950	35,460	1,710	860
Tunnels	279,683	-	-	13,980	470	230
Alternatives 1 and 2						
Tunnel Portal and I-10 Grade Separation	20,665	4,123	410	1,030	50	20
Long Beach Avenue Viaduct (columns)	19,555	-	-	980	30	20
Alternatives 1, 2, and 3						
Slauson/A Line Station and Grade Separation	17,613	-	-	880	30	10
Randolph Street Grade Separation	774	39,968	4,000	40	130	70
San Pedro Subdivision Retaining Wall	1,760	1,006	100	90	10	-
South Gate Retaining Wall	670	383	40	30	-	-
Firestone Station and Grade Separation	1,936	151,929	15,190	100	510	250
Los Angeles River Abutment	18,324	33,317	3,330	920	140	70
Los Angeles River Piers	2,267	-	-	110	-	-
I-710 Undercrossing	11,375	-	-	570	20	10
Rio Hondo Channel Abutment	14,947	27,177	2,720	750	120	60
Rio Hondo Channel Piers	932	-	-	50	-	-
Imperial Highway/ Garfield Avenue Grade Separation	1,162	45,235	4,520	60	150	80
Alternatives 1, 2, 3, and 4						
I-105 Bridge Abutments	1,197	4,633	460	60	20	10
I-105 Freight Bridge Abutments	-	3,843	380	-	10	-
San Pedro Subdivision and PEROW Grade Separation	2,711	-	-	140	-	-

Location	Cut (CY)	Fill (CY)	Truck Trips (10CY) ¹	Truck Trips (20CY) ²	Trucking Days (30 trips/day)	Trucking Days (60 trips/day)
Paramount/Rosecrans Station and Grade Separation	581	30,489	3,050	30	100	50
Paramount School Pedestrian Underpass	430	-	-	20	-	-
Downey Ave Grade Separation	-	41,720	4,170	-	140	70
Woodruff Ave/Flower St Grade Separation	581	53,177	5,320	30	180	90
San Gabriel River Abutment	-	40,634	3,060	-	100	50
San Gabriel River Piers	923	-	-	50	-	-
183rd/Gridley Road Grade Separation	581	50,283	5,030	30	170	80
TOTALS						
Alternative 1	987,687	722,392	72,230	49,400	4,040	2,020
Alternative 1, Design Option 1 (MWD)	1,066,441	756,959	75,680	53,340	4,280	2,140
Alternative 1, Design Option 2 (Little Tokyo)	1,167,204	745,890	74,580	58,380	4,420	2,210
Alternative 1, Design Options 1 & 2 (MWD and Little Tokyo)	1,245,958	780,457	78,030	62,320	4,660	2,330
Alternative 2	1,107,791	677,460	67,730	55,410	4,090	2,040
Alternative 3	78,765	513,792	51,370	3,960	1,830	910
Alternative 4	7,004	214,778	21,470	360	720	360

Source: WSP 2020

Notes: ¹ 10 CY Truck Trips correspond to Fill Quantities

² 20 CY Truck Trips correspond to Cut Quantities using double-trailer trucks

CY = cubic yards; MWD = Metropolitan Water District; PEROW = Pacific Electric Right-of-Way

5 REFERENCES

- California Public Utilities Commission (CPUC). 1991. General Order 143-B. http://docs.cpuc.ca.gov/Published/General_order/1295.htm. Accessed May 2017.
- City of Artesia. 2010. *City of Artesia General Plan 2030*. Artesia, California.
- City of Bellflower. 1994. *City of Bellflower General Plan*. Bellflower, California. December.
- City of Cudahy. 2010. *City of Cudahy 2010 General Plan*. Cudahy, California. September 15.
- City of Downey. 2005. *City of Downey General Plan Vision 2025*. Downey, California. January 25.
- City of Huntington Park. 1991. *City of Huntington Park General Plan*. Huntington Park, California. February 19.
- City of Los Angeles. 1996. *Los Angeles City General Plan*. Department of City Planning, Los Angeles, California. November 26.
- City of Los Angeles, *Mobility Plan 2035: An Element of the General Plan*, adopted September 7, 2016.
- City of Paramount. 2007. *Paramount General Plan*. Community Development Department, Paramount, California. August 7.
- City of South Gate, *South Gate General Plan 2035*, December 2009.
- City of Vernon. 2007. *City of Vernon General Plan*. Vernon, California. December 3.
- Federal Railroad Administration Office of Safety Analysis. 2017. Office of Safety Analysis website. <https://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx>.
- Federal Transit Administration. 2016. *Project and Construction Management Guidelines*. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Project_and_Construction_Mgmt_Guidelines_2016.pdf.
- Los Angeles County Department of Regional Planning. 2015. *General Plan 2035*. <http://planning.lacounty.gov/generalplan>. Adopted by the Los Angeles County Board of Supervisors on October 6, 2015
- Los Angeles County Metropolitan Transportation Authority (Metro). 2009. *Long Range Transportation Plan (LRTP)*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2010a. *Metro Rail Design Criteria*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2010b. *Metro Fire/Life Design Criteria*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2021. *West Santa Ana Branch Transportation Impact Analysis Report*.
- National Fire Protection Association (NFPA). 2017. NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems. www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=130. Retrieved May 2018.

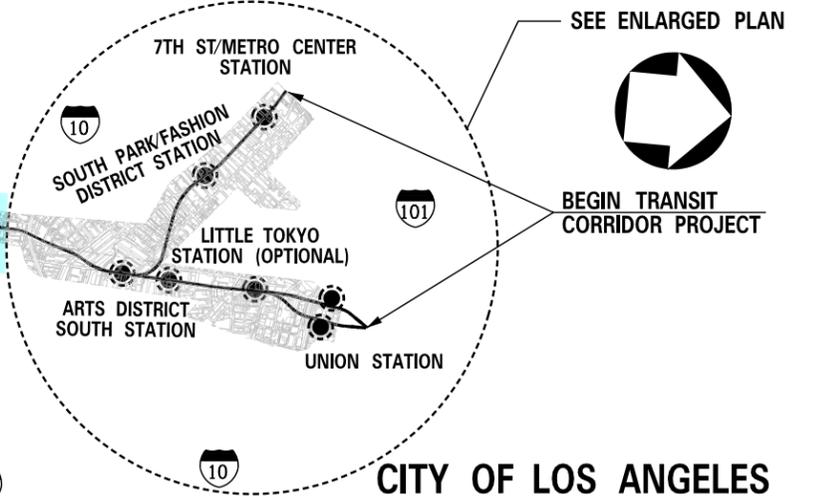
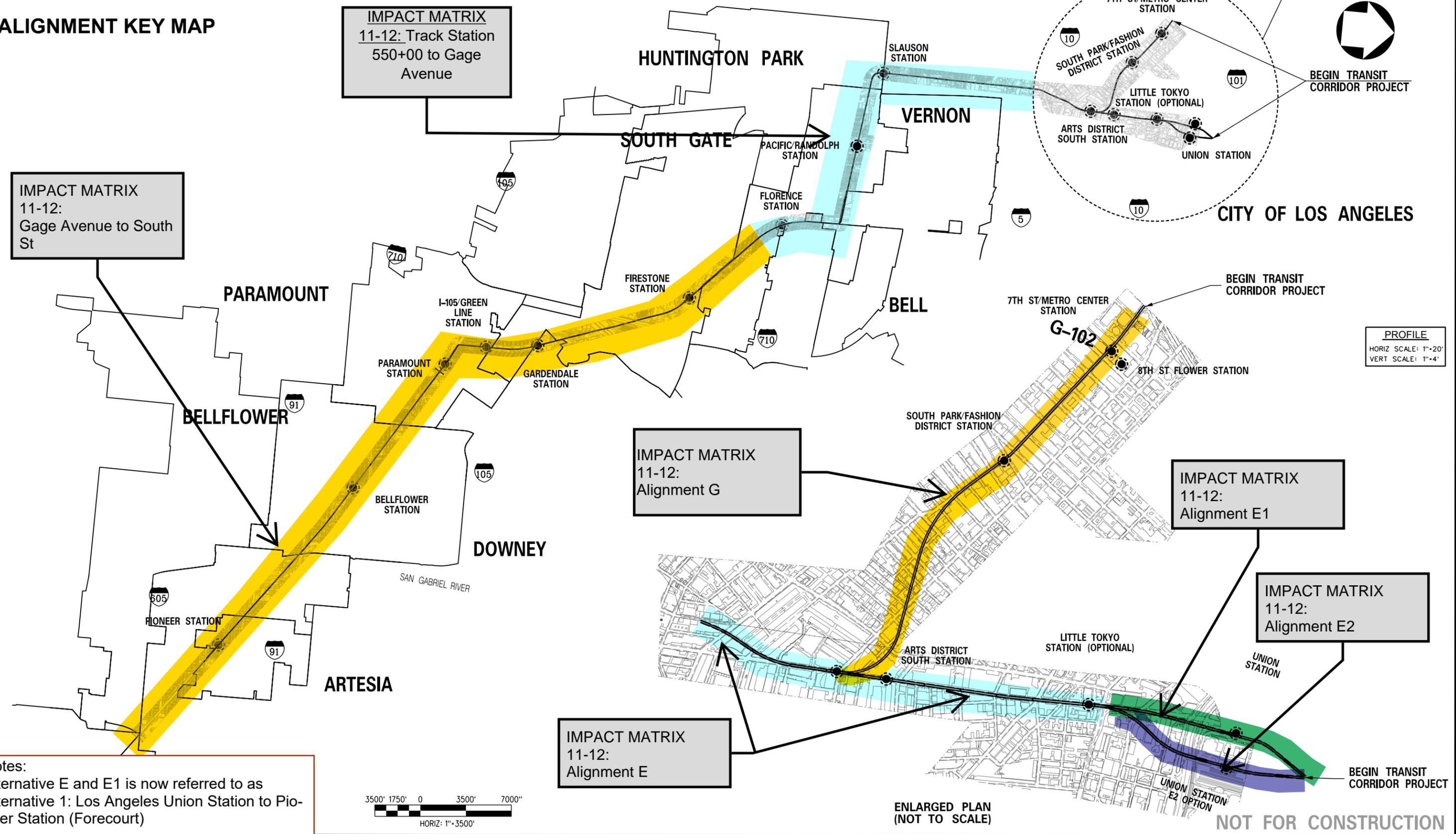
- Parsons Brinckerhoff, Inc. 2015. *West Santa Ana Branch Transit Corridor Technical Refinement Study*. Prepared for Los Angeles County Metropolitan Transportation Authority, Los Angeles, California. July.
- Southern California Association of Governments (SCAG). 2016. *Regional Transportation Plan/Sustainable Communities Strategy*. <http://rtpscs.scag.ca.gov/Pages/default.aspx>. Retrieved May 2018.
- U.S. Department of Transportation (USDOT). 1975. *USDOT Subway Environmental Design Handbook*. Prepared by Transit Development Corporation, Incorporated and Urban Mass Transportation Administration.
- WSP | Parsons Brinckerhoff. 2017. *West Santa Ana Branch Transit Corridor Environmental Study Prior Studies and Plans – Final*. Prepared for Los Angeles County Metropolitan Transportation Authority, Los Angeles, California.

APPENDIX A UTILITY CONFLICT MATRIX

ALIGNMENT KEY MAP

IMPACT MATRIX
11-12: Track Station
550+00 to Gage Avenue

IMPACT MATRIX
11-12:
Gage Avenue to South St



PROFILE
HORIZ SCALE: 1"=20'
VERT SCALE: 1"=4'

IMPACT MATRIX
11-12:
Alignment G

IMPACT MATRIX
11-12:
Alignment E1

IMPACT MATRIX
11-12:
Alignment E2

IMPACT MATRIX
11-12:
Alignment E



Notes:
Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
Alternative E2 is now referred to as Alternative 1 with Design Option 1
Alternative G is now referred to as Alternative 2

ENLARGED PLAN
(NOT TO SCALE)

NOT FOR CONSTRUCTION

10:26:30 AM 10/18/2019 \$FILES\$

DESIGNED BY D. BULLOCK DRAWN BY D. BULLOCK CHECKED BY J. SALMERON IN CHARGE B. PERNELL DATE 10/17/19	M Metro LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY		WSP 444 South Flower Street Suite 800 Los Angeles, CA 90071 TEL (213) 362-9470	TRUE ENGINEERING EXCELLENCE <small>300 W. 4TH STREET, FLOOR 10, LOS ANGELES, CA 90013 213.622.1100 OFFICE, 213.622.1300 FAX</small>	WEST SANTA ANA BRANCH LRT ADVANCED CONCEPTUAL ENGINEERING UTILITY IMPACT MATRIX COVER PAGE		CONTRACT NO. AE5999300
					DRAWING NO. G-100	REV	
					SCALE 1" = 3500'	SHEET NO.	

Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Storm Drain Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	COLA	SD	30"	600	-	90	Bauchet Street	D-4580	E1	Protect in Place	8' depth of cover near station 408+00 @ Union Station
2	COLA	SD	90"	N/A	-	90	Cesar Chavez Avenue	D-3648	E1	Protect in Place	12' depth of cover near station 412+50 @ Union Station
3	COLA	SD	18"	N/A	-	90	Arcadia St	D-4537	E1	Protect in Place	10' depth of cover near station 419+00
4	COLA	SD	138"	N/A	-	90	Arcadia St	D-8912	E1, E2	Protect in Place	15' depth of cover; 27' to invert near station 419+00 (E1) & 423+50 (E2)
5	COLA	SD	75"	2200	N/A	N/A	Alameda Street to Traction Ave	UNL-26951	E1	Protect in Place	6' depth of cover, 13' to invert from station 430+00 to 452+00
6	COLA	SD	18"	N/A	-	90	Temple Street	D-17508	E1	Protect in Place	10' depth of cover near station 436+50
7	COLA	SD	24"	N/A	-	90	Temple Street	P-36520	E2	Protect in Place	7' depth of cover near station 438+00
8	COLA	SD	18"	N/A	14	90	1st Street	D-24649	E1, E2	Protect in Place	6' depth of cover near station 444+00
9	COLA	SD	24"	N/A	40	100	1st Street	D-26951	E1, E2	Protect in Place	7' depth of cover near station 444+50
10	COLA	SD	18"	N/A	25	60	1st Street	D-26951	E1, E2	Protect in Place	7' depth of cover near station 445+00
11	COLA	SD	18"	N/A	18	95	1st Street	D-24649	E1, E2	Protect in Place	7' depth of cover near station 445+00
12	LA County	SD	2-96"	N/A	-	90	2nd Street	Z-1084	E	Protect in Place	15' depth of cover; 25' to invert near station 451+00; Confirm limits to proposed Little Tokyo Station
13	LA County	SD	156"	N/A		90	2nd Street	Z-1084	E	Protect in Place	15' depth of cover; 25' to invert near station 451+00; Confirm limits to proposed Little Tokyo Station
14	COLA	SD	44"	N/A	55	130	Traction Ave	UNL-11607	E	Protect in Place	6' depth of cover near station 452+00

15	COLA	SD	90"	N/A	23	130	Traction Ave	UNL-11607	E	Protect in Place	3' depth of cover; 11' to invert near station 452+00
16	COLA	SD	18"	N/A	38	35	3rd Street	D-24649	E	Protect in Place	6' depth of cover near station 457+00
17	COLA	SD	20"-36"	1800	N/A	N/A	3rd Street to 5th Street	UNL-26025	E	Protect in Place	5' depth of cover from station 457+00 to 475+00
18	COLA	SD	18"	N/A	25	66	4th Street	D-24649	E	Protect in Place	6' depth of cover near station 458+00
19	COLA	SD	27"	370	N/A	N/A	3rd Street to 4th Street	D-24649	E	Protect in Place	6' depth of cover from 453+00 to 465+00
20	COLA	SD	18"	N/A	30	60	4th Street (270' N)	D-24649	E	Protect in Place	6' depth of cover near station 463+00
21	COLA	SD	18"	N/A	20	307	4th Street (70' N)	D-24649	E	Protect in Place	6' depth of cover near station 464+50
22	LA County	SD	8'x5' Box	N/A	-	90	4th Street	D-24239	E	Protect in Place	8' depth of cover near station 465+00
23	COLA	SD	18"	N/A	28	78	5th Street	UNL-20196	E	Protect in Place	6' depth of cover near station 472+00
24	COLA	SD	39"	340	N/A	N/A	Factory Place to 6th Street	D-26025	E	Protect in Place	5' depth of cover from station to 481+00 to 484+00
25	COLA	SD	21" to 16"	290	N/A	N/A	6th Street to Industrial Street	D-24649	E	Protect in Place; Relocate (300 LF)	6' depth of cover from station 484+00 to 492+00; Portions within Arts District South Station to be relocated (approximately 300 LF)
26	COLA	SD	24"	300	N/A	N/A	Industrial Street to 7th Street	D-21564	E	Protect in Place	8' depth of cover from station 492+00 to 495+00
27	COLA	SD	18"	200	N/A	N/A	7th Street to 7th Street (200' S)	D-22175	E	Protect in Place	7' depth of cover from station 496+00 to 498+00
28	COLA	SD	26"	900	N/A	N/A	7th Street (200' S) to 8th Street	UNL-26639	E	Protect in Place	12' depth of cover from station 498+00 to 507+00
29	COLA	SD	21"	N/A	30	105	Bay Street (150' S)	D-5122	E	Protect in Place	4' depth of cover near station 509+00
30	COLA	SD	126"	N/A	-	108	8th Street	D-4961	E	Protect in Place	15' depth of cover; 28' to invert near station 512+00; Confirm proximity to tunnel
31	COLA	SD	21"	560	N/A	N/A	8th Street to Olympic Blvd	D-5088	E	Protect in Place	10' depth of cover from station 512+00 to 519+00

32	LA County	SD	8.5'x10' Box	N/A	-	90	15th Street	D-21919	E	Protect in Place	15' depth of cover near station 536+00; Confirm loading on pipe
33	COLA	SD	90"	330'		80	Cesar E Chavez Ave	D-3648	E2	Protect in Place	411+00, tunnel
34	COLA	SD	138"	860		90	I-101 Freeway	D-8912	E1 & E2	Protect in Place	424+50, tunnel, runs along 101-Fwy
35	COLA	SD	24"	375'		90	Temple St	P-36520	E2	Protect in Place	438+00, tunnel
35	COLA	SD	18"	60'		-	Temple St	UNL- 26951	E2	Protect in Place	437+00, tunnel, does not cross the alignment but is very close
36	COLA	SD	68"-75"	1300'		N/A	N Alameda St	UNL-26951	E1 & E2	Protect in Place	439+00-452+00, tunnel and cut & cover
37	COLA	SD	90"	850'		90	Cesar E Chavez Ave	D-3895	E1	Protect in Place	411+00, tunnel
38	COLA	SD	70"-75"	4100		-	N Alameda St	UNL- 26951	E1	Protect in Place	411+00-452+00, tunnel and cut & cover, along Alameda St, starts off about 200' away from alignment on Alameda St, as alignment approaches Alameda SD ends up along the alignment.
39	COLA	SD	111"	1145'		-	N Alameda St	D-9547	E1	Protect in Place	411+00-422+00, tunnel and cut & cover, along Alameda St, 140' away from alignment
40	COLA	RCP SD	18"	100'		90	Temple St	D-17508, P-33139	E1	Protect in Place	436+00, tunnel, 4 lines converging into one which connects to 75" UNL-26951
41	COLA	RCP SD	36"	95'		90	Temple St	D-102	E1	Protect in Place	438+00, tunnel, connects to 75" UNL-26951
42	COLA	SD	16"	100'		-	E 1St St	UNL- 26951	E1	Protect in Place	443+50, tunnel, 2 lines connecting to 75" UNL-26951
43	COLA	SD	24"	370'		90	E 1St St	UNL- 26951	E1	Protect in Place	444+00, tunnel, connects to 75" UNL-26951
44	COLA	SD	18"	135'		90	E 1St St	D-24649	E1	Protect in Place	445+00, tunnel, connects to 75" UNL-26951
45	COLA	SD	156"	860'		90	E 2nd St	Z-1084	E1	Protect in Place	451+00, tunnel, branches off to 2 96" diam. Pipes crossing Alameda St and converges back to one.
46	COLA	SD	44"	820'		45	E 2nd St	UNL- 11607	E1	Protect in Place	452+00, tunnel, 75" UNL-26951 connects to this pipe
47	COLA	SD	24"	140'		45	E 3rd St	D-25313	E1	Protect in Place	457+00, tunnel, does not reach alignment but is connected to 24" D-24649

48	COLA	SD	18"-21"	100'		-	E 3rd St	D-24649	E1	Protect in Place	456+00-457+00, tunnel
49	COLA	SD	24"	60'		45	E 3rd St	D-24649	E1	Protect in Place	457+00, tunnel
50	COLA	SD	27"-30"	700'		-	E 3rd St	D-24649	E1	Protect in Place	458+00-465+00, tunnel
51	COLA	SD	18"	180'		100	E 4th Pl	D-24649	E1	Protect in Place	458+00, tunnel
52	COLA	SD	39"-20"	3500'		-	E 4th Pl to Industrial St	UNL- 26025 & D-24649	E1	Protect in Place	456+00-491+00, tunnel and cut & cover
53	COLA	SD	24"	150'		-	E 4th St	D-12170,D-34824	E1	Protect in Place	465+00, tunnel connects to 87"
54	COLA	SD	87"-90"	370'		90	E 4th St	D-24239,D-34824	E1	Protect in Place	465+00, tunnel connects to 90"
55	COLA	SD	18"	130'		100	E 5th St	PLAN No 20196-P.1	E1	Protect in Place	472+00, tunnel
56	COLA	SD	24"	160'		100	Palmeto St	D-31608	E1	Protect in Place	477+50, tunnel
57	COLA	SD	18"	90'		90	Factory Pl	D-21564	E1	Protect in Place	480+50, tunnel, calls out 2 SD lines 40' from each other
58	COLA	SD	18"	300'		-	Factory Pl to E 6th St	D-21565	E1	Protect in Place	480+50-483+50, tunnel, connects to 95" UNL-11616
59	COLA	SD	16"	260'		90	E 6th St	UNL-11616	E1	Protect in Place	483+00, tunnel
60	COLA	SD	95"	270'		90	E 6th St	UNL-11616	E1	Protect in Place	484+00, tunnel
61	COLA	SD	97"	641			E 6th St	UNL11600	E1	Protect in Place	484+tunnel
62	COLA	SD	21"	400'		-	E 6th St	D-26249	E1	Protect in Place	483+00-487+00, tunnel and cut & cover
63	COLA	SD	18"	100'		-	Industrial St	D-21564	E1	Protect in Place	491+00, cut & cover, 2 SD lines combine and connect to a 24" line
64	COLA	SD	24"	400'		-	Industrial St	D-21565	E1	Protect in Place	491+00-495+00, cut & cover and tunnel, connects to a 30" line

65	COLA	SD	30"	140'		-	E 7th St	D-22175	E1	Protect in Place	495+00, tunnel, an 18" and the previous 24" SD lines connect to this one and leads away from Alameda on 7th St.
66	COLA	SD	26"	1050'		-	Alameda St	UNL-26639	E1	Protect in Place	497+50-508+00, tunnel and cut & cover, at 508+00 alignment turns out of Alameda St but SD line continues on Alameda St.
67	COLA	SD	21"	600'		-	E 8th St to E Olympic Blvd		E1	Protect in Place	512+00-518+00, tunnel
68	COLA	SD	30"	300'			Bauchet St	D-4580	E1	Relocate	405+53-407+98.53
69	COLA	SD	36"-60"	7400'			Martin Luther King Jr Blvd	D-17982, D-4744-1	E1	Protect in place	588+50-662+50
70	LA COUNTY	SD	120"-7'-9"	1300'			E 15th to E 20th st.	D-21919 P.5 & P.6	E1	Protect in Place	536+00-549+00, Connects to 7'-9" RCB
71	COLA	SD	81"	400'			E 20th St to E 21 St	Plan D-20969-P.11	E1	Protect in Place	556+00-560+00
72	COLA	SD	30"	N/A			E 52nd St	Plan D-10417-1	E1	Protect in Place	641+50
73	LA County	SD	45"	N/A			E 55th St	(D-25789-2)	E1	Protect in Place	663+00
74	LA County	SD	69"	N/A			Slauson	D-4743-3	E1	Protect in Place	663+00
75	LA County	SD	75"	300'			Alameda st east to Albany St	PDF023455-LINE C-NO 181-1-D181 S-81	E1	Protect in Place	669+00-702+00
76	LA County	SD	60"	N/A			Rugby Ave	PDF023455-LINE C-NO 181-1-D181 S-81	E1	Protect in Place	
77	LA County	SD	63"	N/A				Plan pdf 036411-NO 364-4201-D2.6-s-6	E1	Protect in Place	732+00
78	LA County	SD	33"-66"	N/A			Cedar St	Plan pdf 036411-NO 364-4201-D2.6-s-9	E1	Protect in Place	
79	LA County	SD	96"	N/A			Cedar St	Plan pdf 036411-NO 364-4201-D2.6-s-9	E1	Protect in Place	
80	LA County-East Compton Creek Drain	SD	11'-3"x7'0"-10'-9"x7' RCB Box to 81"	N/A			Gage Ave	PDF023455-LINE B-NO 181-1-D1.37 S-81, DC52	E1	Protect in Place	

FROM LA CITY PLANNING DEPT											
83	UNK	SD	UNK	N/A			I-101 Freeway	D-19921, UNL 26035	E	Protect in Place	
84	UNK	SD	UNK	N/A			8TH ST	UNL-5642, UNL-12522, UNL-25115, UNL-6742, UNL-12545	E	Protect in Place	

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on as-built records and NavigateLA. A datum discrepancy of approximately 2.5 feet may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Sewer Impacts

Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	COLA	SS	20" to 24"	5600	-	90	2nd Street & 6th Street	UNL-12522	E1, E	Protect in Place; Relocate (300 LF)	20' depth of cover from station 451+00 to 507+00; located along RT tunnel wall with perpendicular crossings at 2nd St and 6th St; approx. 300 LF between Factory PI and Bay St to be relocated
2	COLA	SS	18" to 20"	5000	-	90	2rd Street & Bay Street	UNL-15055	E1, E	Protect in Place	16' depth of cover from station 457+00 to 507+00; located along LT tunnel wall
3	COLA	SS	38"	N/A	30	90	Bay Street	UNL-9014	E	Protect in Place	16' depth of cover near station 507+00
4	COLA	SS	40"	180	N/A	N/A	Bay Street to 8th Street	UNL-9014	E	Protect in Place	17' depth of cover from station 507+00 to 510+00
5	COLA	SS	40"	N/A	-	90	8th Street	UNL-9014	E	Protect in Place	17' depth of cover near station 512+00
6	COLA	SS	66"	N/A	-	90	16th Street	UNL- 29580	E	Protect in Place	10' depth of cover near station 540+00; Confirm loading on pipe
7	N/A	SS	N/A	440'		135	Bauchet St	N/A	E2	Protect in Place	407+00, cut & cover
8	COLA	VCP SS	N/A	375'		120	Temple St	N/A	E2	Protect in Place	438+50, tunnel
9	COLA	SS	N/A	220'		100	N Alameda St	N/A	E2	Protect in Place	442+00, tunnel
10	COLA	SS	N/A	400'		-	N Alameda St	N/A	E2	Protect in Place	439+00-443+00, tunnel
11	COLA	SS	27"	370'		80	Cesar E Chavez	D-8068	E1	Protect in Place	411+50, tunnel
12	COLA	VCP SS	16"	400'		-	N Alameda St	F.B. 2891-6	E1	Protect in Place	429+50-433+50, tunnel
13	COLA	VCP SS	N/A	413'		90	E 1st St	PLAN No. 11778	E1	Protect in Place	444+00, tunnel

14	COLA	SS	22"	600'		-	2nd St to 3rd St	UNL-12708	E1	Protect in Place	451+00-457+00, tunnel, transitions to 18" PLAN No. FB464-49
15	COLA	SS	16"	235'		100	3rd St and 4th Pl	UNL-11237	E1	Protect in Place	457+00, tunnel
16	COLA	SS	18"-22"	4900'		-	4th Pl to Bay St	F.B.464-40-41, FB-464-40-41, PLAN No. FB4006, FB-464-27-49, FB-464-49, unl-F.B.4006-11, FB2891.6	E1	Protect in Place	457+00-506+50, tunnel, 2 sewer lines running parallel to alignment
17	COLA	SS	20"-24"	2350		-	E 6th St to Bay St	F.B.3156-49, F.B.3026-50	E1	Protect in Place	483+50-506+50, tunnel and cut & cover
18	COLA	SS	38"	180'		90	Bay St	UNL-9014	E1	Protect in Place	507+00, tunnel
19	COLA	SS	40"	850'		-	Bay St to E 8th St	UNL-9014	E1	Protect in Place	507+00-512+00, tunnel, sewer line runs along Alameda St. starting from Bay St and turns onto 8th St
20	COLA	SS	132"	N/A			22nd St	D-31870	E1	Protect in Place	564+00
21	COLA	SS	45"	N/A			E 41st Pl	D-3657	E1	Protect in Place	599+00
22	COLA	SS	42"-36"	N/A			Alameda Street	Map 1, Map 6, Subs 63-5	E1	Protect in Place	717+00
23	COLA	SS	24"	1800'			Newell	Map-18	E1	Protect in Place	764+00-782+00

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on as-built records and NavigateLA. A datum discrepancy of approximately 2.5 feet may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Water Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	LADWP	WTR	36"	2200	N/A	N/A	Ducommun Street to 3rd Street	SUBS 79-7	E1	Protect in Place; Relocate (300 LF)	Depth is approximated at 4' below grade from station 435+00 to 457+00; portions within Little Tokyo Station option to be relocated (approximately 300 LF)
2	LADWP	WTR	16"	N/A	-	90	1st Street	SUBS 79-6	E1, E2	Protect in Place	Depth is approximated at 4' below grade near station 445+00
3	LADWP	WTR	16"	N/A	-	115	3rd Street	D-24649	E	Protect in Place	Depth is approximated at 4' below grade near station 457+00
4	LADWP	WTR	16"	N/A	-	90	7th Street	SUBS 93-5	E	Protect in Place	Depth is approximated at 4' below grade near station 495+00
5	LADWP	WTR	20"	N/A	-	90	16th Street	SUBS 131-25	E	Protect in Place	Depth is approximated at 4' below grade near station 550+00
6	LADWP	WTR	24"	N/A	-	90	Washington Boulevard	SUBS 149-15	E	Protect in Place	Depth is approximated at 4' below grade near station 550+00
7	DWPWS	WTR	16"	325		70	Cesar E Chavez Ave	Del. No. 58606(43)	E2		411+00, tunnel
8	DWPWS	WTR	N/A	332'		120	Temple St	N/A	E2		438+50, tunnel
9	DWPWS	WTR	N/A	600'		-	N Alameda St	N/A	E2 & E1		438+00-444+00, tunnel, at E1 444+00 connects to 16" WTR DWPWS
10	N/A	WTR	36"	1750'		-	N Alameda St	SUB-79-7 & SUB-79-5	E2 & E1		439+00-456+50, tunnel and cut & cover
11	DWPWS	WTR	20"	560'		-	N Alameda St	WSM 130-213	E1		432+00-437+00, tunnel
12	DWPWS	WTR	36"	3000'		-	N Alameda St	SUBS-63-5, 79-7,79-5	E1		427+00-457+00, tunnel
13	DWPWS	WTR	16"	830'		90	E 1ST ST		E1		444+50, tunnel
14	DWPWS	WTR	30"	400'		45	E 3rd St to 4th Pl	SUB- 79-5	E1		457+00, tunnel
15	DWPWS	WTR	16"	170'		45	E 3RD ST	UNL-26951	E1		457+00, tunnel, connects to SUBS-79-7, 79-5, 63-5
16	DWPWS	WTR	24"	550'		80	E 7th St	SUBS- 93-5	E1		495+00, tunnel
17	N/A	WTR	20"	300'		-	McGarry St	SUBS131-9	E1		515+00-518+00, tunnel

18	DWPWS	WTR	12"	2100'			ALONG LONG BEACH AVE	N/A	E1	Relocate	575+00-596+00
19	DWPWS	WTR	16"	N/A				HP Water Map 26	E!	Protect in Place	725+00

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Power Impacts



Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	LADWP	PWR	6-5" & 5-3 1/2"	N/A	-	90	Ducommun Street	Plate 172, Plate 396	E1	Protect in Place	Depth is approximated at 42" below grade near station 432+00
2	LADWP	PWR	4-6", 6-5" & 2-4"	N/A	-	90	1st Street	5H8014	E1, E2	Protect in Place	Depth is approximated at 42" below grade near station 444+00
3	LADWP	PWR	20-3"	1200	N/A	N/A	Traction Avenue to 4th Street	D-24649	E	Protect in Place; Relocate (300 LF)	Depth is approximated at 42" below grade from station 453+00 to 465+00; located adjacent to LT track; portion within limits of Little Tokyo Station option to be relocated (approximately 300 LF, includes vault)
4	LADWP	PWR	12-3 1/2"	500 LF	N/A	N/A	6th Street to Industrial Street	D-24649	E	Relocate	Depth is approximated at 42" below grade from station 485+00 to 490+00; located adjacent to LT track; portion within limits of Arts District South Station to be relocated (approximately 500 LF, includes vaults)
5	LADWP	PWR	4.8kv OH	N/A	-		Long Beach Ave	Field	E	Relocate	Overhead Line to be relocated underground near station 525+00
6	LADWP	PWR	34.5kv OH	N/A	-	90	14th Street	Field	E	Relocate	Overhead Line to be relocated underground near station 530+00
7	LADWP	PWR	4.8kv OH	N/A	-	90	Newton Street	Field	E	Relocate	Overhead Line to be relocated underground near station 533+00
8	LADWP	PWR	4.8kv OH	N/A	-	90	15th Street	Field	E	Relocate	Overhead Line to be relocated underground near station 536+00
9	LADWP	PWR	4.8kv OH	N/A	-	90	16th Street	Field	E	Relocate	Overhead Line to be relocated underground near station 540+00
10	N/A	UG PWR	N/A	275'		45	Bauchet St	N/A	E2		406+00, cut & cover
11	DWPPS	PWR	N/A	660'		-	Cesar E Chavez Ave	N/A	E2		409+50-414+50, tunnel, turns out of alignment onto Union Station parking lot
12	N/A	PWR	N/A	400'		-	Cesar E Chavez Ave	N/A	E2		410+00-414+00, tunnel

13	DWPPS	UG PWR	N/A	900'		-	Union Station	N/A	E2		413+00-422+00, tunnel cut & cover, two lines running close to each other along alignment
14	DWPPS	UG PWR	N/A	245'		90	Union Station	N/A	E2		418+50, cut & cover
15	LADWP	PWR	N/A	285'		90	E Commercial St	N/A	E2		427+00, tunnel
17	LADWP	UG PWR	N/A	100'		-	N Alameda St	N/A	E2		442+00-443+00, tunnel, two separate lines close to each other
18	LADWP	PWR	N/A	340'		90	Ducommun St	N/A	E2		429+50, tunnel, two lines one on each side of Ducommon St
19	DWPPS	PWR	N/A	270'		90	Cesar E Chavez Ave	N/A	E1		412+00, tunnel
20	DWPPS	PWR	N/A			-	Union Station	N/A	E1		416+00-419+00, cut & cover
21	Metro	PWR	N/A	1650'		-	Commercial St to 1st St		E1		427+00-443+50, tunnel, Metro Gold Line OCS
22	DWPPS	OH PWR	N/A	300'		-	E 1ST ST	N/A	E1		442+00-445+00, tunnel, 2 lines
23	DWPPS	UG PWR	N/A	390'		90	E 1ST ST	N/A	E1		444+00, tunnel
24	DWPPS	PWR	20-3"	3250'		-	E 1ST ST	D-24649	E1	RELOCATED	450+00-482+50, tunnel, multiple lines(2-3) called out with same name
25	DWPPS	OH PWR	N/A	1100'		-	Traction Ave to 4th St	N/A	E1		453+00 to 464+00, tunnel
26	DWPPS	OH PWR	N/A	134'		100	N Alameda St	N/A	E1		463+00, tunnel
27	DWPPS	OH PWR	N/A	800'		-	E 5TH ST to Factory Pl	N/A	E1		471+00-479+00, tunnel
28	DWPPS	OH PWR	N/A	1150'		-	E 6th St to E 7th St	N/A	E1		484+00-495+50, tunnel and cut & cover

29	N/A	OH PWR	N/A	230'		90	Industrial St	N/A	E1		490+50, cut & cover
30	DWPPS	OH PWR	N/A	1900'		-	Industrial St to 8th St	N/A	E1		491+00-510+00, tunnel and cut & cover, a few PWR lines combine into one at 495+50 and continues on Alameda past the point where alignment turns out of Alameda St.
31	N/A	OH PWR	N/A	180'		80	E 8th St	N/A	E1		512+00, tunnel
32	DWPPS	PWR	N/A	315'		75	E Olympic Blvd	N/A	E1		518+50, tunnel
33	N/A	PWR	N/A	270'		75	E Olympic Blvd	N/A	E1		519+00, tunnel
34	DWPPS	OH PWR	N/A	325'		75	E Olympic Blvd	N/A	E1		519+00, tunnel

Notes:

- 1) Only major impacts were considered for duct systems known to have 12 or more conduits
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Gas Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment		Location Nearest Cross Street	Source Company Drawings / Field Visits / Other	Alternative	Disposition	Comments ³	
				Longitudinal (LF)	Crossing ²						
					LF						Angle°
1	SCG	GAS	16"	N/A	-	90	Cesar Chavez	SUBS	E1, E2	Protect in Place	Depth is approximated at 4' below grade near station 412+00;
2	SCG	GAS	16" (ABAND)	N/A	-	90	Commercial Street	SUBS	E2	Remove	Depth is approximated at 4' below grade near station 427+00; conflicting portions to be removed.
3	SCG	GAS	16"	N/A	-	90	2nd Street	Z-1084	E	Protect in Place	Depth is approximated at 4' below grade near station 451+00; in proximity to Little Tokyo Station option; assumes pipe can be supported in place.
4	SCG	GAS	30"	N/A	-	90	7th Street	SUBS 93-5	E	Protect in Place	Depth is approximated at 4' below grade near station 495+00; in proximity to Arts District South Station; assumes pipe can be supported in place.
5	SCG	GAS	16" (ABAND)	N/A	-	90	14th Street	SUBS 131-21	E	Remove	Depth is approximated at 4' below grade near station 530+00
6	SCG	GAS	16"	N/A	-	90	14th Street	SUBS 131-21	E	Relocate or Encase	Depth is approximated at 4' below grade near station 530+00
7	SCG	GAS	20"	N/A	-	90	15th Street	SUBS 131-25	E	Relocate	Depth is approximated at 4' below grade near station 536+00
8	SCG	GAS	16"	N/A	-	90	16th Street	SUBS 131-25	E	Relocate or Encase	Depth is approximated at 4' below grade near station 540+00
9	Plains All America	OIL	20"	11000	N/A	N/A	Main Street to Olympic Boulevard	117M0415-117M0421	E1, E	Protect in Place	Pipeline runs parallel to centerline of Alameda Street from station 405+00 to 520+00; depth of cover varies between 5'-10'; Assumes temporary hanging of pipe within limits of Little Tokyo
10	So Cal Gas	GAS	N/A	340'		45	Augusta St	N/A	E2	Protect in Place	402+00, tunnel
11	So Cal Gas	GAS	N/A	496'		135	Bauchet St	N/A	E2	Protect in Place	407+00, cut & cover
12	So Cal Gas	GAS	N/A	490'		135	Bauchet St	N/A	E2	Protect in Place	407+00, cut & cover
13	So Cal Gas	GAS	16"	325'		80	Cesar E Chavez Ave	N/A	E2	Protect in Place	411+00, tunnel
14	So Cal Gas	GAS	16"	315'		100	Cesar E Chavez Ave	N/A	E2	Protect in Place	411+00, tunnel
15	So Cal Gas	GAS	16"	465'		90	E Commercial St.	N/A	E2	Protect in Place	427+00,
16	So Cal Gas	GAS	N/A	230'		100	N Alameda St	N/A	E2	Protect in Place	441+50, tunnel
17	So Cal Gas	GAS	N/A	500'		-	N Alameda St	N/A	E2 & E1	Protect in Place	438+00-450+50, tunnel and cut & cover, 3 gas lines running along alignment
18	PPS/PPA	OIL	20'	7300'		-	N Alameda St	117M0415 & U-106	E2 & E1	Protect in Place	439+00-512+00, tunnel and cut & cover
19	So Cal Gas	GAS	16"	270'		90	Cesar E Chavez Ave	Structure Maps 63-1	E1	Protect in Place	411+50, tunnel, labeled as g
20	So Cal Gas	GAS	16"	380'		90	Cesar E Chavez Ave	Structure Maps	E1	Protect in Place	411+50, tunnel labeled as gs

21	SCG	GAS	N/A	300'		-	E 1ST ST	N/A	E1	Protect in Place	442+00-445+00, tunnel
22	SCG	GAS	N/A	800'		-	E 1ST ST to 2nd St	N/A	E1	Protect in Place	442+00-450+00, tunnel and cut & cover
23	SCG9	AS (ABN)	N/A	100'		-	E 1ST ST	N/A	E1	Protect in Place	443+00-444+00, tunnel
22	So Cal Gas	AS (ABN)	N/A	395'		90	E 7th St	SUBS-93-6	E1	Protect in Place	495+00, tunnel
23	So Cal Gas	GAS	30"	300'		90	E 7th St	SUBS-93-5	E1	Protect in Place	495+50, tunnel
23	PAA	OIL	20"	658'		45	E 8th St	N/A	E1	Protect in Place	513+00, tunnel

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade unless otherwise noted.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-2: Alternative E, E1, and E2
Telecommunication Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location Nearest Cross Street	Source Company Drawings / Field Visits / Other	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°					
1	AT&T	TEL	12 DU	N/A	-	90	4th Street	D-24649	E	Protect in Place	Depth is approximated at 36" below grade near station 465+00
2	AT&T	TEL	10DU				1st st	G305 873767	E	Protect in Place	444+00
3	N/A	TELE	N/A	160'		90	E Commercial St	N/A	E2	Protect in Place	427+00, tunnel
4	N/A	TELE	N/A	340'		100	Ducommun St	N/A	E2	Protect in Place	427+00, tunnel
5	PPT	TELE	N/A	331'		90	Cesar E Chavez Ave	N/A	E1	Protect in Place	411+50, tunnel, two lines near each other one connects to lines on Alameda St, the other turns and comes back to alignment at 412+50
6	N/A	TELE	N/A	700'		-	N Alameda St	N/A	E1	Protect in Place	443+50-450+00,tunnel and cut & cover
7	N/A	TELE	N/A	600'		-	E 1st St	N/A	E1	Protect in Place	444+00-450+00,tunnel and cut & cover
8	N/A	TELE	N/A	270'		75	E Olympic Blvd	N/A	E1	Protect in Place	519+00, tunnel
9	N/A	TELE	N/A				21st Street	N/A	E1	Protect in Place	558+00 to 552+50
10	N/A	TELE	N/A	5100'			21st Street	N/A	E1	Relocate	558+00 to 609+00

- Notes:**
- 1) Only major impacts were considered for duct systems known to have 12 or more conduits
 - 2) Unless otherwise noted, facilities cross the entire track/tunnel width
 - 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
 - 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08-08-18.
 - 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
 - 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
 - 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Storm Drain Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle ^o	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	LA County	SD	60"	4400	N/A	N/A	Wall Street to Figueroa Street	D-21919, D-8456	G	Protect in Place; Relocate (300 LF)	20' depth of cover from station 452+00 to 408+00 (G1); Assumes segment within South Park Fashion District Station is temporarily relocated with material change (approximately 300 LF)
2	LA County	SD	18"	N/A	-	90	Los Angeles Street	D-21919	G	Protect in Place	20' depth of cover near station 445+00; potential conflict with South Park Fashion District Station
6	LA County	SD	18"	N/A	-	90	Main Street	D-21919	G	Protect in Place	20' depth of cover near station 440+00
7	LA County	SD	18"	N/A	-	90	Main Street	D-21919	G	Protect in Place	20' depth of cover near station 440+00
8	LA County	SD	48"	N/A	-	90	Main Street	D-24368	G	Protect in Place	20' depth of cover near station 440+00
9	LA County	SD	18"	N/A	-	90	Spring Street	D-21919	G1	Protect in Place	20' depth of cover near station 437+00
10	LA County	SD	18"	N/A	-	90	Broadway	D-21919	G1	Protect in Place	20' depth of cover near station 434+00
11	LA County	SD	48"	N/A	-	90	7th Street	D-26054	G1	Protect in Place	6' depth of cover near station 430+00
12	COLA	SD	66"	N/A	-	90	Wilshire Boulevard	UNL-11621	G1	Protect in Place	8' depth of cover near station 424+00
3	COLA	SD	18" to 22"	1900	N/A	N/A	Wilshire Boulevard to End	UNL-11801	G1	Protect in Place; Temporary Relocation (300 LF)	8' depth of cover from station 424+00 to 405+00; Assumes segment within 8th/Flower Street Station is temporarily relocated with material change (approximately 300 LF)
4	COLA	SD	33"	N/A	-	90	6th Street	D-24239	G2	Protect in Place; Temporary Relocation (100 LF)	8' depth of cover near station 410+00; Assumes segment within Pershing Square Station is temporarily relocated with material change (approximately 100 LF)
4	City of La	SD	27"	500'	N/A	N/A	Francisco St to Figueroa St	N/A	G	Protect in Place	403+50 to 408+50, connects to 30" SD pipe D-27909, cut & cover and tunnel
5	City of La	SD	30"	160'	N/A	90	Along Figueroa St	D-27909	G	Protect in Place	408+50, does not cross the LRT alignment but is close to alignment and passenger tunnel connection to 7th St/Metro Center

7	N/A	SD	27"	400'	N/A	-	Olive St to Hill St	N/A	G	Protect in Place	425+00-429+00, tunnel
8	La County	SD	18"	75'	-	90	Broadway Blvd	D-21919	G	Protect in Place	434+00, tunnel
9	La County	SD	18"	35'	N/A	80	between Broadway and Spring	D-21919	G	Protect in Place	435+50, tunnel, alley between Broadway and Spring
10	La County	SD	18"	205'	N/A	90	Spring St	D-21919	G	Protect in Place	437+50, tunnel
11	La County	SD	48"	265'	-	90	Spring St	D-24368	G	Protect in Place	440+00, tunnel
12	La County	SD	18"	170'	N/A	90	Main St	D-21919	G	Protect in Place	440+00, tunnel
13	City of La	SD	N/A	60'		90	Maple ave	N/A	G	Protect in Place	448+00, tunnel
14	City of La	SD	21"		N/A	N/A	Maple ave to Wall St	D-8456	G	Protect in Place	449+00-452+50, tunnel
15	City of La	SD	72"	165'	-	90	Wall St	D-5297	G	Protect in Place	452+00, tunnel
16	City of La	SD	90"	100'	-	90	Wall St	D-5421	G	Protect in Place	452+50, tunnel
17	City of La	SD	126"	550'	N/A	-	Wall St to San Pedro St	D-5298	G	Protect in Place	452+50-458+00, tunnel
18	City of La	SD	45"	710'		135	E 7th St	D-30917	G	Protect in Place	475+00, tunnel
19	COLA	SD	18"-24"	150'		-	InduStrial St	D-21564	G	Protect in Place	490+00, tunnel

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on as-built records and NavigatELA. A datum discrepancy of approximately 2.5 feet may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Water Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

Item No.	Utility Features										
	Owner	Type	Size ¹	Track Encroachment			Location Nearest Cross Street	Source Company Drawings / Field Visits / Other	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°					
1	LADWP	WTR	30"	N/A	-	90	Central Ave	SUBS 93-5	G	Protect in Place	Depth is approximated at 4' below grade near station 484+00
2	LADWP	WTR	16"	N/A	-	30	7th Street	SUBS 93-4	G	Protect in Place	Depth is approximated at 4' below grade near station 475+00
3	LADWP	WTR	24"	N/A	-	90	Los Angeles Street	C-17714/SUBS 115-6	G	Protect in Place	Depth is approximated at 4' below grade near station 443+50; assumes pipe is supported in place within limits of South Park Fashion District Station
4	LADWP	WTR	16"	2300	N/A	N/A	Flower Street to End	SUBS 96-14	G	Protect in Place; Relocate (300 LF)	Depth is approximated at 4' below grade near station 430+00 to end;
5	LADWP	WTR	24"	N/A	-	90	Flower Street	SUBS 96-14	G	Protect in Place	Depth is approximated at 4' below grade near station 412+50; assumes pipe is supported in place within limits of 8th/Flower Street Station
6	DWPWS	WTR	20"	1300'	N/A	N/A	US-110 Freeway to Flower St	SUBS 114-6	G	Relocate	400+00-413+00, tunnel and cut & cover
7	DWPWS	WTR	24"	375'	-	90	Flower St	SUBS 96-14	G	Relocate	413+00, cut & cover
8	DWPWS	WTR	16"	240'	-	90	Broadway Blvd	SUBS 114-10	G		433+50, tunnel
9	DWPWS	WTR	24"	680'	-	90	Los Angeles St	C-17714/SUBS 115-6	G	Protect in Place	443+50, cut & cover
10	DWPWS	WTR	16"	715'	-	135	E 7th St	SUBS 93-4	G		475+00-476+00, tunnel
11	DWPWS	WTR	24"	710'	-	135	E 7th St	SUBS 93-5	G		475+50-476+50, tunnel
12	DWPWS	WTR	N/A	410'	-	80	S. Central St	N/A	G		484+500, tunnel

13	DWPWS	WTR	8"	250"	-	-	MAIN ST	N/A	G	Relocate	440+00-442+50
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Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Sewer Impacts



Item No.	Utility Features										
	Owner	Type	Size ¹	Track Encroachment			Location Nearest Cross Street	Source Company Drawings / Field Visits / Other	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
				LF	Angle°						
1	COLA	SS	24"	N/A	-	90	Maple Street	UNL-11228	G	Protect in Place	15' depth of cover near station 451+50
2	COLA	SS	30"	N/A	-	90	Maple Street	UNL-26675-5	G	Protect in Place	17' depth of cover near station 451+50
3	COLA	SS	24"	5600	-	90	7th Street to Bay Street	UNL-15055	G	Protect in Place; Relocate (300 LF)	20' depth of cover from station 493+00 to 507+00; located along RT tunnel wall; approx. 300 LF relocation between 7th St and Bay St within limits of proposed Arts District Station.
4	COLA	SS	42"	270	-	90	Santee Street to Los Angeles Street	D-145	G	Relocate	28' depth of cover from station 446+00 to 443+50; potential conflict with So. Park/Fashion District Station
5	COLA	SS	24"	N/A	-	90	Hill Street	UNL-9141	G1	Protect in Place	18' depth of cover near station 429+00
6	COLA	SS	21"	N/A	-	90	Flower Street	UT-1626/78	G1	Protect in Place; Temporary Relocation (100 LF)	16' depth of cover near station 412+00; Assumes segment within 8th/Flower Street Station is temporarily relocated with material change (approximately 100 LF)
7	COLA	SS	24"	420	N/A	N/A	Flower Street to Figueroa Street	D-29670	G1	Protect in Place; Temporary Relocation (100 LF)	17' depth of cover from station 408+00 to 412+00; Assumes segment within 8th Street/Flower Street Station is temporarily relocated with material change (approximately 100 LF)
8	COLA	SS	30" to 42"	N/A	-	90	Figueroa Street	D-30125	G1	Protect in Place	18' depth of cover near station 408+00
9	COLA	SS	27"	N/A	-	90	7th Street	UNL-13822-6	G2	Protect in Place	24' depth of cover near station 430+00
10	COLA	SS	16"	N/A	-	90	7th Street	FB-483-17	G2	Protect in Place	17' depth of cover near station 430+00
11	COLA	SS	24"	600	N/A	N/A	7th Street to 6th Street	UNL-13822	G2	Protect in Place	24' depth of cover from station 430+00 to 424+00
12	COLA	SS	24"	N/A	-	90	6th Street	UNL-13822	G2	Protect in Place	23' depth of cover near station 424+50
13	COLA	SS	18" to 24"	1420	N/A	N/A	6th Street to 4th Street	UNL-13822	G2	Protect in Place; Temporary Relocation (300 LF)	24' depth of cover from station 424+50 to 410+00; Assumes segment within Pershing Square Station is temporarily relocated with material change (approximately 300 LF)

14	COLA	SS	33"	N/A	-	90	4th Street	D-114	G2	Protect in Place; Temporary Relocation (100 LF)	23' depth of cover near station 410+00; Assumes segment within Pershing Square Station is temporarily relocated with material change (approximately 100 LF)
15	N/A	Sanitary Sewer	N/A	700'	-	-	US 110 Freeway to Figueroa St	N/A	G		400+00-407+00, tunnel and cut & cover
16	COLA	VCP SS	30"	365'	-	90	Figueroa St	D-30125	G		409+00, end of tunnel
17	N/A	Sanitary Sewer	N/A	400'	N/A	-	Figueroa St to Flower St	N/A	G	Relocate	409+00-413+00, end of tunnel and cut & cover
18	COLA	VCP SS	21"	370'	-	90	Flower St	A-165	G		413+00, cut & cover
19	COLA	SS	24"	255'	-	90	Hill St	9141	G		429+50, tunnel
20	COLA	SS	42"	200'	-	-	Los Angeles St, Santee St	D-145	G		444+50-446+50, cut & cover and tunnel,
21	City of LA	SS	30"	265'	-	90	Maple Ave	26675-5	G		448+50, tunnel
22	City of LA	VCP SS	24"	265'	-	90	Maple Ave	11228	G		449+00, tunnel
23	N/A	N/A	N/A	530'		135	Industrial St	N/A	G		490+00, tunnel
24	COLA	SS	22"	325'		135	Industrial St	F.B.464-27-49	G		490+00, tunnel
25	COLA	VCP SS	24"		N/A	N/A	?	F.B.302 6-50	G		490+00, tunnel
26	COLA	VCP SS	22"		N/A	N/A	?	Plan No. FB 464-49	G	Relocate	490+00, Tunnel

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on as-built records and NavigateLA. A datum discrepancy of approximately 2.5 feet may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Power Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	LADWP	PWR	6-4 1/2" & 6-2"	1500	N/A	N/A	Broadway to Hope Street	SUBS 114-9	G1	Protect in Place	Depth is approximated at 42" below grade from station 432+00 to 417+00
2	LADWP	PWR	16-2"	N/A	-	90	Hope Street	SUBS 114-7	G1	Protect in Place	Depth is approximated at 42" below grade near station 417+00
3	LADWP	PWR	16-4"	N/A	-	90	Figueroa Street	Plate 62	G1	Protect in Place	Depth is approximated at 42" below grade near station 408+50
4	LADWP	PWR	12-4"	N/A	-	90	Figueroa Street	Plate 62	G1	Protect in Place	Depth is approximated at 42" below grade near station 408+50
5	LADWP	PWR	36"x31"	900	N/A	N/A	5th Street to End	SUBS 77-6	G1	Protect in Place; Relocate (300 LF)	Depth is approximated at 42" below grade from station 414+00 to End; Relocate portion within limits of Pershing Square Station (approximately 300 LF)
5	DWPPS	PWR	9-4"	300'	N/A	-	US-110 Freeway to Francisco St	N/A	G1	Protect in Place	400+00-403+00, tunnel and cut & cover
6	DWPPS	ELEC	16-4"	365'	-	90	Figueroa St	Plate 62	G1	Protect in Place	409+00, cut & cover
7	DWPPS	ELEC	16-2"	220'	-	90	Hope St	114-7	G1	Protect in Place	417+00, cut & cover
8	DWPPS	PWR	N/A	50'	-	-	Main St	634-E5	G1	Protect in Place	440+00-440+50, tunnel
9	DWPPS	PWR	N/A	565'	-	90	Los Angeles St	634-E5	G1	Protect in Place	444+00, cut & cover
10	N/A	UG PWR	N/A	580'	-	-	Main St to Maple St	N/A	G1	Protect in Place	440+50-449+00, tunnel and cut & cover
11	N/A	OH PWR	N/A	600'	-	-	Los Angeles St to Maple St	N/A	G1	Protect in Place	443+00-449+00, tunnel and cut & cover
12	N/A	OH PWR	N/A	650'	-	-	Maple St to San Julian St	N/A	G1	Relocate	449+00-455+50, tunnel
13	N/A	OH PWR	N/A	290'	-	45	Towne Ave	N/A	G1	Relocate	464+500, tunnel



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Gas & Oil Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle ^o	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	SCG	GAS	30"	N/A	-	30	7th Street	SUBS 93-5	G	Protect in Place	Depth is approximated at 4' below grade near station 475+00
2	SCG	GAS	16" (ABAND)	2800	N/A	N/A	Spring Street to Figueroa Street	SUBS 114-6, 114-8	G	Remove	Depth is approximated at 4' below grade from station 438+00 to 409+00; portions conflicting with cut and cover areas and Pershing Square Station to be removed.
3	SCG	GAS (ABAND)	16"	3900'	N/A	N/A	US-110 Freeway to Main St	114-6, 114-8	G		400+00-439+00, tunnel and cut & cover
4	N/A	OIL	N/A	560'		135	Industrial St	N/A	G		489+00-491+00, tunnel
5	PAA	OIL	20"		N/A	N/A	6th St to Center St	N/A	G		
6	SCG	GAS	30"	N/A	-	90	E 7th St	SUB-93-5	G		
7	SCG	GAS	12"	100'			E 7th St	15E5053	G		495+00-496+00, Tunnel

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-1: Alternative G and G1
Telecommunication Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Alternative	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²						
					LF	Angle°	Nearest Cross Street	Company Drawings / Field Visits / Other			
1	AT&T	TEL	15 DU	N/A	-	30	7th Street	SUBS 93-4	G	Protect in Place	Depth is approximated at 36" below grade near station 475+00
2	AT&T	TEL	12-4"	1100	N/A	N/A	Olive Street to Flower Street	SUBS 114-7	G1	Protect in Place; Relocate (100 LF)	Depth is approximated at 36" below grade from station 424+00 to 413+00; relocated within limits of 8th/Flower Street Station (approximately 100 LF)
3	AT&T	TEL	18-4"	N/A	-	90	Flower Street	G305C92	G1	Relocate	Depth is approximated at 36" below grade near station 413+00; relocated within limits of 8th/Flower Street Station (approximately 200 LF)
4	Unknown	TEL	Unknown	2500	N/A	N/A	Flower Street to End	SUBS 96-14	G2	Protect in Place; Relocate (100 LF)	Depth is approximated at 36" below grade between stations 430+00 to end; relocate portions within limits of Pershing Square Station at 5th Street crossing (approximately 100 LF)
5	AT&T	MCD	18-4"	365'	-	90	Flower St	G305C92	G	Protect in place	413+00, cut & cover
6	AT&T	TELE	12-4", 18-4"	3100'	N/A	-	Figueroa St to Main St	114-7	G	Protect in Place	409+00-440+00, turns onto alignment from Figueroa St. transitions to a '15 MtoAT&T (subs 115-6)', tunnel and cut & cover
7	AT&T	TEL	15 MTD	400'			Main St. to Los Angeles St	Subs-115-6	G	Protect in Place	440+00-444+00
8	AT&T	TEL	12 MTD	700'			Main St. to Maple	Subs 115-7	G	Protect in Place	442+00-449+00

Notes:

- 1) Only major impacts were considered for duct systems known to have 12 or more conduits
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Storm Drain Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location Nearest Cross Street	Source Company Drawings / Field Visits / Other	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°				
1	LACFCD	SD	96 RCB	N/A	-	90	Randolph & Alcoa	PDF023414	Protect in place	Near station 776+00; Potential casing extension
2	LACFCD	SD	33" RCP	N/A	-	90	Boyle Ave/State St	PDF036415	Protect in place	Near station 773+00; Potential casing extension
3	LACFCD	SD	63" RCP	N/A	-	90	Randolph Ave/Seville Ave	PDF036411	Protect in place	Near station 733+00; Potential casing extension
4	LACFCD	SD	75" RCP	N/A	-	45	Albany St	PDF023455	Protect in place	Near station 702+00; Potential casing extension
3	COLA	SD	36" RCP	N/A	-	90	Slauson Ave	D-4384	Protect in place	Near station 663+00; Potential casing extension; Line going East along Slauson, outlet from 60" system.
4	COLA	SD	69" RCP	N/A	-	90 & 45	Slauson Ave	D-4743	Protect in place	Near station 663+00; Potential casing extension; 69" going along Slauson from West to East, then curving north to join 60"
5	COLA	SD	36" TO 60" RCP	7400	N/A	N/A	MLK Jr. to Slauson Ave	D-4744	Protect in place; Portions to be relocated	From 589+00 to 663+00; parallels track; confirm lateral loading effects and placement of structure columns; majority of line will be replaced with track drainage.
6	COLA	SD	15" RCP	N/A	32	90	Long Beach & 47th	D-8376	Protect in place	Line going East
7	UNKNOWN	SD	15" RCP	N/A	40	90	Long Beach & Vernon	D-4587	Protect in place	Lateral going East

- Notes:
- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
 - 2) Unless otherwise noted, facilities cross the entire track/tunnel width
 - 3) Approximate pipe depths are based on as-built records and NavigateLA. A datum discrepancy of approximately 2.5 feet may apply.
 - 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
 - 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
 - 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
 - 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Sewer Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°	Cross Street	Company Drawings / Field Visits / Other		
1	City of Vernon	SS	24" VCP	N/A	-	82	Randolph & Alcoa	HP MAP-18	Protect in Place	Near Station 776+00; potential casing extension
2	City of Huntington Park	SS	15"	N/A	-	90.00	Rita Ave	HP MAP-8	Protect in Place	Near Station 728+00; potential casing extension at Alameda St
3	LA COUNTY	SS	36" to 42" VCP	3800	N/A	N/A	Alameda St to Malabar St	HP MAP 1 thru 6	Protect in Place	Parallel to freight track; ~25' offset from track; confirm lateral loading effects; station 680+00 to 718+00
4	COLA	SS	21" VCP	N/A	-	90	57th Street	Plan No. 18581	Protect in place	Perpendicular to elevated track; near station 657+00
5	COLA	SS	18" VCP	N/A	-	90	Long Beach & E 50th, along E 50th	D-2040	Protect in place	Near station 633+00; Perpendicular to elevated track
6	COLA	SS	10" VCP	N/A	-	90	48th PI	D-12750	Protect in Place	Near Station 661+00; potential casing extension; under elevated track
7	COLA	SS	12" VCP	N/A	-	90	Vernon Ave	D-28996	Protect in Place	Near Station 627+50; potential casing extension; under elevated track
8	COLA	SS	45" VCP	N/A	-	90	Long Beach & 41st St	D-3648	Protect in place	Perpendicular to elevated track; Near station 599+00
9	COLA	SS	132" VCP	N/A	-	90	Long Beach & E 22nd St	D-31870	Protect in place	Perpendicular to elevated track; near station 564+00; under elevated track

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on as-built records and NavigateLA. A datum discrepancy of approximately 2.5 feet may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.

- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Water Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°	Cross Street	Company Drawings / Field Visits / Other		
1	LADWP	WTR	12"	N/A	-	90	20TH ST TO 41ST ST	SUBSTRUCTURE	Protect in Place	POTENTIAL RELOCATION CONTINGENT UPON COLUMN LOCATIONS AND DWP ACCEPTANCE UNDER GUIDEWAY; FROM STATION 557+00 TO 595+00
2	SOUTHERN CALIFORNIA WATER COMPANY	WTR	2-12"	N/A	-	90	SANTE FE AVE	HP WATER MAP-10	Protect in Place	POTENTIAL CASING EXTENSION; IMPACT CONTINGENT UPON COLUMN LOCATIONS; NEAR STATION 709+00
3	SOUTHERN CALIFORNIA WATER COMPANY	WTR	16"	N/A	-	90	PACIFIC BLVD	HP WATER MAP-26	Protect in Place	POTENTIAL CASING EXTENSION; IMPACT CONTINGENT PACIFIC/RANDOLPH STATION STRUCTURE; NEAR STATION 724+00
4	SOUTHERN CALIFORNIA WATER COMPANY	WTR	12"	N/A	-	90	MILES AVE	HP WATER MAP-34	Protect in Place	POTENTIAL CASING EXTENSION; IMPACT CONTINGENT UPON COLUMN LOCATIONS; NEAR STATION 743+00
5	SOUTHERN CALIFORNIA WATER COMPANY	WTR	12"	N/A	-	90	S BOYLE AVE	HP WATER MAP-49	Protect in Place	POTENTIAL CASING EXTENSION; IMPACT CONTINGENT UPON COLUMN LOCATIONS; NEAR STATION 763+00

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter, unless known casing existed on smaller line size
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Telecommunication Impacts



Utility Features										
Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°	Cross Street	Company Drawings / Field Visits / Other		
1	AT&T	TELECOM	12	N/A	-	90	20TH ST	SUBSTRUCTURE	Protect in Place	Potential casing near station 557+00
2	AT&T	TELECOM	Unknown	5100 (3400' Relocate)	N/A	N/A	20TH ST TO 43RD ST	SUBSTRUCTURE	Relocate	Runs parallel to track; potential conflict with columns; relocation station 575+00 to 609+00

Notes:

- 1) Only major impacts were considered for duct systems known to have 12 or more conduits
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Power Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source Company Drawings / Field Visits / Other	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Cross Street	Station			
					LF	Angle°					
1	LADWP	PWR (OH)	4.8kV -34.5kV	8900	-	N/A	Washington Street to E 52nd Street	N/A	Field Verification	Protect in Place	Parallels track alignment along Long Beach Blvd between station 551+00 and 640+00; confirm horizontal/vertical separation
2	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90 (1) 60 (2)	20th Street	N/A	Field Verification	Relocate	Underground two (2) ex. overhead crossings near station 557+00 at Long Beach Blvd & 20th Street
3	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90	22nd Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 563+00 near Long Beach Blvd & 22nd Street
4	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90	23rd Street	N/A	Field Verification	Relocate	Underground two(2) ex. overhead crossing near station 567+00 and 568+00 near Long Beach Blvd & 23rd Street
5	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	24th Street	N/A	Field Verification	Relocate	Underground two (2) ex. overhead crossings near station 571+00 at Long Beach Blvd & 24th Street
6	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	N/A	Along Long Beach Ave.	N/A	Field Verification	Relocate	Underground ex. overhead crossings near station 574+00-575+00 along Long Beach Blvd
7	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	N/A	Along Long Beach Ave.	N/A	Field Verification	Relocate	Underground ex. overhead crossings near station 578+00-602+50 along Long Beach Blvd
8	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	33rd Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 587+00 at Long Beach Blvd & 33rd Street
9	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	MLK Boulevard	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 589+00 at Long Beach Blvd & MLK Blvd
10	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	41st Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 594+00 at Long Beach Blvd & 41st Street
11	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	41st Street	N/A	Field Verification	Relocate	Underground two ex. overhead crossing near station 596+00 at Long Beach Blvd & 41st Street
12	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	42nd Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 604+00 at Long Beach Blvd & 42nd Street
13	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	45.0	43rd Street/Vernon Avenue	N/A	Field Verification	Relocate	Underground ex. overhead crossing and pole near station 610+00 at Long Beach Blvd & 43rd Street
14	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Vernon Avenue	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 614+00 at Long Beach Blvd & Vernon Avenue
15	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	48th Place	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 627+00 at Long Beach Blvd & 48th Place
16	LADWP	PWR (OH)	4.8-34.5kV	N/A	-	900.0	49th Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 629+00 at Long Beach Blvd & 48th Place

17	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	50th Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 632+50 at Long Beach Blvd & 50th Street
18	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	51st Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 638+00 at Long Beach Blvd & 51st Street
19	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	55th Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 650+00 at Long Beach Blvd & 55th Street
20	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	55th Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 650+50 at Long Beach Blvd & 55th Street
21	LADWP	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Alba Street	N/A	Field Verification	Relocate	Underground ex. overhead crossing near station 650+50 at Long Beach Blvd & 55th Street
22	LADWP	PWR (OH)	4.8kV -34.5kV	900	-	N/A	North of Long Beach/Slauson Ave, going north to south of 55th St	N/A	Field Verification	Relocate	Parallels track near station 662+00; potential undergrounding may be required; confirm horizontal/vertical separation
23	LADWP	PWR (OH)	4.8kV -34.5kV	480	-	N/A	South of Randolph & Slauson, going north to Slauson	N/A	Field Verification	Relocate	Parallels track near station 665+00; potential undergrounding may be required; confirm horizontal/vertical separation
24	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	58th Place	665+00	Field Verification	Relocate	Underground ex. overhead crossing near Slauson station near STA 665+00 to 668+00 at Randolph & 58th Place.
25	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	58th Place	668+00	Field Verification	Relocate	Underground ex. overhead crossing near Slauson station near STA 665+00 at Randolph & Slauson Ave.
26	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Holmes Ave	675+00	Field Verification	Relocate	Underground ex. overhead crossing near station 675+00 at Randolph & Holmes Ave
27	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	E. of Holmes Ave	677+50	Field Verification	Relocate	Underground ex. overhead crossing near station 677+00 near Randolph & Holmes Ave
28	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90.0	Wilmington Ave	682+00	Field Verification	Relocate	Underground ex. overhead crossing near station 682+00 at Randolph & Wilmington Ave
29	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90.0	Alameda Street	682+00	Field Verification	Relocate	Underground ex. overhead crossing near station 687+00 at Randolph & Alameda Street
30	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Albany Street	702+00	Field Verification	Relocate	Underground overhead crossing near station 702+00
31	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Santa Fe Avenue	709+00	Field Verification	Protect in Place	Underground two (2) overhead crossings near station 709+00 and 710+00
32	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Malabar Street	716+00	Field Verification	Protect in Place	Underground overhead crossing near station 716+00
33	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Rugby Avenue	721+00	Field Verification	Protect in Place	Underground overhead crossing near station 721+00
34	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	45.0	Pacific Boulevard	725+50	SCE Website	Relocate	Utility drop near the track and location of the Pacific/Randolph Station Platform.
35	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	91.0	Rita Ave	728+50	Field Verification	Protect in Place	Existing underground SCE Line

36	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	45.0	Seville Avenue	723+00 to 733+00	Field Verification	Relocate	Underground overhead crossing near station 733+00
37	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Stafford Avenue	733+00	Field Verification	Relocate	Underground overhead crossing near station 736+00
38	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90 (1) 45 (2)	Miles Avenue	2 overhead crossings near station 742+00 and 742+50	Field Verification	Relocate	Underground two (2) overhead crossings near station 742+00 and 742+50
39	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90 (1) 45 (2)	Arbutus Avenue	756+00	Field Verification	Relocate	Underground two (2) overhead crossings near station 756+00 and 757+50
40	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	N/A	Randolph Street	762+50	SCE Website	Relocate	Undergourn OH Power crossing the tracks, will need field verification for vertical clearance.
41	SO. CAL EDISON	PWR (OH)	4.8kV-34.5IV	N/A	-	90 (1) 45 (2)	State Street	762+50	Field Verification	Relocate	Underground two (2) overhead crossings near station 762+00 and 763+00
42	LADWP	PWR (OH)	4.8kV-34.5IV	N/A	-	90.0	Bissel Street	781+50	Field Verification	Protect in Place	Perpendicular transmission crossing near station 781+50; confirm vertical clearance
43	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Bissel Street	784+00	Field Verification	Protect in Place	Crosses track at STA 784+00; potential undergrounding may be required; confirm horizontal/vertical separation
44	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	90.0	Bissel Street	784+50	SCE Website	Protect in Place	Underground crossing near station 785+00
45	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	500	-	N/A	Bissel Street	783+00 and 788+00	Field Verification	Relocate	Underground overhead crossing near station 789+00
46	SO. CAL EDISON	PWR (OH)	4.8kV -34.5kV	N/A	-	90.0	Randolph Street	789+00	Field Verification	Relocate	Crosses track at STA 789+00; potential undergrounding may be required; confirm horizontal/vertical separation

Notes:

- 1) Unless otherwise noted, facilities cross the entire track/tunnel width
- 2) For underground facilities, approximate pipe depths are based on industry standards of 3-4' below grade.
- 3) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted May 2019

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Gas Impacts



Utility Features										
Item No.	Owner	Type	Size ¹	Track Encroachment			Location Cross Street	Source Company Drawings / Field Visits / Other	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°				
1	SCG	GAS	16"	N/A	-	90	ALAMEDA ST	DPW SUBSTRUCTURE MAPS (M3)	PROTECT IN PLACE	PARALLEL TO ALAMEDA ST, CROSSES TRACK; POTENTIAL CASING EXTENSION
2	SCG	GAS	20"	N/A	-	90	55TH ST	SCG WAT-5	PROTECT IN PLACE	PARALLEL TO E 55TH ST, CROSSES TRACK.

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-3: Track Station 550+00 to Gage Avenue
Hazardous Pipe Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location	Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²					
					LF	Angle°	Cross Street	Company Drawings / Field Visits / Other		
1	EDR	UNKNOWN	UNKNOWN	N/A	-	45	BORWICK ST & BALFERN AVE	FM16	Protect in Place	Runs along 91 Artesia Hwy north of Brodwick St & Balfern Ave intersection. Runs at 45° across track.
2	EDR	UNKNOWN	UNKNOWN	N/A	-	45	MAPLE ST & WOODRUFF AVE	FM15	Protect in Place	Runs north of Maple St & Woodruff Ave intersection. Runs at 45° across track.
3	EDR	UNKNOWN	UNKNOWN	N/A	-	45	FLOWER ST & PACIFIC AVE	FM15	Protect in Place	Runs north of Flower St & Pacific Ave intersection. Runs at 45° across track.
4	EDR	UNKNOWN	UNKNOWN	N/A	-	45	SOMERSET BLVD & HAYTER AVE	FM13	Protect in Place	Runs parallel to Somerset Blvd. Runs at 45° across track.
5	EDR	UNKNOWN	UNKNOWN	N/A	-	45	DOWNEY AVE & 2ND ST	FM13	Protect in Place	815' southeast of Downey Ave & 2nd St intersection. Runs east to west at 45° across track.
6	EDR	UNKNOWN	UNKNOWN	N/A	-	45	DOWNEY AVE & 2ND ST	FM13	Protect in Place	815' southeast of Downey Ave & 2nd St intersection. Runs north to south at 45° across track.
7	EDR	UNKNOWN	UNKNOWN	1275	N/A	N/A	BETWEEN DOWNEY AVE & 2ND ST INTERSECTION AND ROSECRANS AVE & PARAMOUNT BLVD INTERSECTION	FM13	Protect in Place	Runs between Downey Ave & 2nd St intersection and Rosecrans Ave & Paramount Blvd intersection. Runs 45° to track, then parallels track. Relocate hazardous pipe due to proximity of track as necessary.
8	EDR	UNKNOWN	UNKNOWN	N/A	-	45	ROSECRANS AVE & PARAMOUNT BLVD	FM13	Protect in Place	Runs parallel to Rosecrans Ave. Runs 45° to track.
9	EDR	UNKNOWN	UNKNOWN	N/A	-	45	ROSECRANS AVE & PARAMOUNT BLVD	FM13	Protect in Place	Runs 233' north of Rosecrans Ave. Runs 45° to track.
10	EDR	UNKNOWN	UNKNOWN	N/A	-	30	GARDENDALE ST & CENTER ST	FM12	Protect in Place	Runs east of the Gardendale St & Center St intersection. Runs 30° across track.

11	EDR	UNKNOWN	UNKNOWN	N/A	-	45	GARFIELD PL & IMPERIAL HWY	FM12	Protect in Place	Runs northeast of Imperial Hwy & Garfield Pl intersection. Runs 45° across track.
12	EDR	UNKNOWN	UNKNOWN	N/A	-	45	LONG BEACH FWY & MILLER WAY	FM12	Protect in Place	Runs southwest of Miller Way & Long Beach Fwy intersection. Runs 45° across track.
13	EDR	UNKNOWN	UNKNOWN	N/A	-	30	SALT LAKE AVE & WOOD AVE	FM10	Protect in Place	Runs across track at 30°.
14	EDR	UNKNOWN	UNKNOWN	N/A	-	30	SALT LAKE AVE & DUNCAN WAY	FM10	Protect in Place	Runs across track at 30°.
15	EDR	UNKNOWN	UNKNOWN	N/A	-	45	FIRESTONE BLVD & BRANYON AVE	FM10	Protect in Place	Runs parallel to Firestone Blvd.
16	EDR	UNKNOWN	UNKNOWN	N/A	-	30	FIRESTONE BLVD & BRANYON AVE	FM9	Protect in Place	Runs south to north across tracks.
17	EDR	UNKNOWN	UNKNOWN	N/A	-	30	FIRESTONE BLVD & BRANYON AVE	FM9	Protect in Place	Runs south to north across tracks.
18	EDR	UNKNOWN	UNKNOWN	N/A	-	90	ATLANTIC AVE & WRIGHT PL	FM9	Protect in Place	Runs southeast of Atlantic Ave & Wright Pl intersection.
19	EDR	UNKNOWN	UNKNOWN	4700	N/A	N/A	BETWEEN ATLANTIC AVE & WRIGHT PL INTERSECTION AND BROADWAY & OTIS AVE INTERSECTION	FM9	Protect in Place	Runs northwest of Atlantic Ave & Wright Pl intersection. Runs parallel to track.
20	EDR	UNKNOWN	UNKNOWN	2000	N/A	N/A	BETWEEN BROADWAY & OTIS AVE INTERSECTION AND HOPE ST & SALT LAKE AVE INTERSECTION	FM9	Protect in Place	Runs parallel to track. Relocate hazardous pipe due to proximity of track as necessary.
21	EDR	UNKNOWN	UNKNOWN	1900	N/A	N/A	SALT LAKE AVE BETWEEN HOPE ST & FLORENCE AVE	FM9	Protect in Place	Runs parallel to track. Relocate hazardous pipe due to proximity of track as necessary.
22	EDR	UNKNOWN	UNKNOWN	N/A	-	45	SALT LAKE AVE BETWEEN CECILIA ST & SANTA ANA ST	FM9	Protect in Place	Runs 45° across track.
23	EDR	UNKNOWN	UNKNOWN	N/A	-	45	SALT LAKE AVE & WALNUT ST	FM9	Protect in Place	Runs 45° across track.

24	EDR	UNKNOWN	UNKNOWN	625	N/A	N/A	SALT LAKE AVE BETWEEN FLORENCE AVE & BELL AVE		Protect in Place	Runs parallel to track. Relocate hazardous pipe due to proximity of track as necessary.
25	EDR	UNKNOWN	UNKNOWN	N/A	-	90	SALT LAKE AVE & BELL AVE	FM8	Protect in Place	Runs perpendicular to track.
26	EDR	UNKNOWN	UNKNOWN	N/A	-	90	SALT LAKE AVE BETWEEN GAGE AVE & RANDOLPH ST	FM8	Protect in Place	Runs perpendicular to track.
27	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & HOLD AVE	FM8	Protect in Place	Runs perpendicular to track.
28	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & PLASKA AVE	FM8	Protect in Place	Runs perpendicular to track.
29	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & SANTA FE AVE	FM7	Protect in Place	Runs perpendicular to track.
30	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & COTTAGE ST	FM7	Protect in Place	Runs perpendicular to track.
31	EDR	UNKNOWN	UNKNOWN	N/A	-	45	RANDOLPH ST & REGENT ST	FM7	Protect in Place	Runs 45° across track.
32	EDR	UNKNOWN	UNKNOWN	N/A	-	60	RANDOLPH ST BETWEEN REGENT ST & S ALAMEDA ST	FM7	Protect in Place	Runs 60° across track.
33	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & ALAMEDA ST	FM7	Protect in Place	East of Randolph St & Alameda St. Runs perpendicular to track.
34	EDR	UNKNOWN	UNKNOWN	N/A	-	90	RANDOLPH ST & ALAMEDA ST	FM7	Protect in Place	West of Randolph St & Alameda St. Runs perpendicular to track.
35	EDR	UNKNOWN	UNKNOWN	N/A	-	60	RANDOLPH ST & HOLMES AVE	FM7	Protect in Place	West of Randolph St & Holmes Ave intersection. Runs 60° across track.
36	EDR	UNKNOWN	UNKNOWN	N/A	-	90	LONG BEACH AVE & SLAUSON AVE	FM7	Protect in Place	Runs perpendicular to track. Runs on south side of Slauson Ave.

37	EDR	UNKNOWN	UNKNOWN	N/A	-	90	LONG BEACH AVE & SLAUSON AVE	FM7	Protect in Place	Runs perpendicular to track. Runs in the middle of Slauson Ave.
38	EDR	UNKNOWN	UNKNOWN	N/A	-	90	LONG BEACH AVE & E 22ND ST	FM5	Protect in Place	Runs perpendicular to track.
39	EDR	UNKNOWN	UNKNOWN	N/A	-	30	LONG BEACH AVE & E 21ST ST	FM5	Protect in Place	Runs 30° across track.

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Storm Drain Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source Company Drawings / Field Visits / Other	Disposition ⁸	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station			
					LF	Angle°					
1	LACFCD	SD-RCB	9'-6"	N/A	-	127	FLORENCE AVE & SALT LAKE AVE	830+00	LACFCD NO. 181-1-D1.34	PROTECT IN PLACE	EAST COMPTON CREEK DRAIN LINE
2	LACFCD	SD-RCP	39"	N/A	-	128	LIVE OAK ST & SALT LAKE AVE	841+50	SUBSTRUCTURE MAP D.C. 52	PROTECT IN PLACE	
3	LACFCD	SD-RCB	10'-9"x7' TO 11'-3"x7'-9"	12600	N/A	N/A	FLORENCE AVE TO CLARA ST	830+00 TO 956+80	LACFCD NO. 181-1-D1.33	PROTECT IN PLACE	EAST COMPTON CREEK DRAIN LINE
4	LACFCD	SD-RCP	13'-3"X 8'0" to 9'6"x7'	N/A	-	-	GAGE AVE	801+00	LACFCD	PROTECT IN PLACE	CASING EXTENSION
5	LACFCD	SD-RCP	39"	N/A	-	60	LIVE OAK ST	841+50	LACFCD	PROTECT IN PLACE	CASING EXTENSION
6	LACFCD	SD-RCP	30"	N/A	-	42	HOPE ST. & SALT LAKE AVE	850+00	SUBSTRUCTURE MAP D.C. 52	PROTECT IN PLACE	CASING EXTENSION
7	LACFCD	SD-RCP	30"	N/A	-	36	OLIVE ST. & SALT LAKE AVE	859+00	LACFCD NO. 181-1-D1.32	PROTECT IN PLACE	CASING EXTENSION
8	LACFCD	SD-RCP	UNK	N/A	-	36	BROADWAY & SALT LAKE AVE	869+00	LACFCD NO. 181-1-D1.31	PROTECT IN PLACE	CASING EXTENSION
9	LACFCD	SD-CMP	8'-6" x7'-9"	N/A	-	60	SANTA ANA ST	880+00	LACFCD NO. F6 PF 528625	PROTECT IN PLACE	CASING EXTENSION
10	LACFCD	SD-RCP	130"	N/A	79	90	NORTH OF CECILIA ST ON SALT LAKE AVE	887+00	SUBSTRUCTURE MAP D.C. 85	PROTECT IN PLACE	CASING EXTENSION
11	LACFCD	SD-CMP	21"	N/A	-	60	ARDINE ST	902+20	LACFCD NO. F6 PF 528626	PROTECT IN PLACE	CASING EXTENSION

12	LACFCD	SD-RCP	24"	N/A	79	90	NORTH OF PATATA ST ON SALT LAKE AVE	909+50	DEPARTMENT OF PUBLIC WORKS - SOUTH GATE - STORM 705-06	PROTECT IN PLACE	SEE ALSO PF528626_F6; CASING EXTENSION
13	LACFCD	SD-RCP	DOUBLE 11'-3" X 8'-6"	N/A	-	-	S ATLANTIC AVE	913+00	PF528626	PROTECT IN PLACE	CASING EXTENSION
14	LACFCD	SD-RCP	10' X 7'	N/A	-	-	MASON ST	928+00	F4-PF528621	PROTECT IN PLACE	CASING EXTENSION
15	LACFCD	SD-RCP	60"	N/A	-	-	FIRESTONE PL	936+00	PF 528619	PROTECT IN PLACE	CASING EXTENSION
16	LACFCD	SD-RCP	66"	N/A	-	-	RIO HONDO CHANNEL	995+00	NO. 470-7850-D10.6	PROTECT IN PLACE	CASING EXTENSION
17	LACFCD	SD-RCP	51"	N/A	79	90	PATATA ST & SALT LAKE AVE	910+50	LACFCD AS-BUILT # 470-7850-D13.5	PROTECT IN PLACE	PROJECT NO. 7850, UNIT 3 LINE "C"; CASING EXTENSION
18	LACFCD	SD-RCP	6'x3'	N/A	N/A	110	SOUTHERN AVE & SALT LAKE AVE	957+00	CITY OF SOUTH GATE DPW AS-BUILT # 470-7850-D10.10	PROTECT IN PLACE	5' DEPTH OF COVER; CASING EXTENSION
19	LACFCD	SD-RCP	6'x3'	N/A	84	63	SOUTHERN AVE & SALT LAKE AVE	957+00	DEPARTMENT OF PUBLIC WORKS - SOUTH GATE - STORM 705-11	PROTECT IN PLACE	PROJECT NO. 7850, UNIT 1 LINE "E" CASING EXTENSION
20	LACFCD	SD-RCP	UNK	N/A	-	64	MCCALLUM AVE & SALT LAKE AVE	960+30	DEPARTMENT OF PUBLIC WORKS - SOUTH GATE - STORM 705-11	PROTECT IN PLACE	CASING EXTENSION
21	LACFCD	SD-RCB	10'-3"X8'-0"	N/A	-	105	GARDENDALE ST. & UNION PACIFIC R.R	1046+30	CITY OF DOWNEY SD0269 NO. 181-19-D1.5	PROTECT IN PLACE	PROJECT NO. 19 HOLLYDALE A LINE I
22	LACFCD	SD-RCP	42"	N/A	-	63	RACINE AVE	1106+20	SUBSTRUCTURE MAP D.C. 233	PROTECT IN PLACE	PROJECT NO. 559; CASING EXTENSION
23	LACFCD	SD-RCB	8'-0"X6'-0"	N/A	-	57	ARTHUR AVE & UNION PACIFIC R.R.	1111+50	SUBSTRUCTURE MAP D.C. 233	PROTECT IN PLACE	PROJECT NO. 19 HOLLYDALE A
24	LACFCD	SD-RCB	9'X4 DOUBLE RCB CULVERT	N/A	-	34.0	ROSECRANS AVE & PARAMOUNT BLVD	1122+00	SUBSTRUCTURE MAP D.C. 234	PROTECT IN PLACE	PROJECT NO. 559
25	LACFCD	SD-RCP	30"	N/A	-	-	ROSECRANS AVE & PARAMOUNT BLVD	1123+00	SUBSTRUCTURE MAP D.C. 235	PROTECT IN PLACE	
26	LACFCD	SD-RCP	24"	N/A	-	58	ROSECRANS AVE & PARAMOUNT BLVD	1124+00	SUBSTRUCTURE MAP D.C. 234	PROTECT IN PLACE	CASING EXTENSION

27	LACFCD	SD-RCP	69"	N/A	-	-	DOWNEY AVE	1139+00	SUBSTRUCTURE MAP D.C. 249	PROTECT IN PLACE	CASING EXTENSION
28	LACFCD	SD- A.M.P. ARCH. ASPH	36"X22"	N/A	-	58	3RD ST & DOWNEY AVE	1154+00	SUBSTRUCTURE MAP D.C. 250	PROTECT IN PLACE	CONFIRM CASING EXTENSION OR BLANKET PROTECTION
29	LACFCD	SD-RCP	78"	N/A	-	58	3RD ST & DOWNEY AVE	1154+50	SUBSTRUCTURE MAP D.C. 250	PROTECT IN PLACE	CONFIRM CASING EXTENSION OR BLANKET PROTECTION
30	LACFCD	SD- A.M.P. ARCH. ASPH	36"X22"	N/A	-	58	3RD ST & DOWNEY AVE	1155+00	SUBSTRUCTURE MAP D.C. 250	PROTECT IN PLACE	CONFIRM CASING EXTENSION OR BLANKET PROTECTION
31	LACFCD	SD-RCP	30"	N/A	-	32	SOMERSET BLVD & HAYTER AVE	1171+00	SUBSTRUCTURE MAP D.C. 265	PROTECT IN PLACE	COMPTON BLVD. DRAIN; POTENTIAL BLANKET PROTECTION OR CASING
32	LACFCD	SD-RCP	18"	N/A	13	90	SANTA ANA AVE & FLORA VISTA ST.	1207+00	SUBSTRUCTURE MAP D.C. 280	PROTECT IN PLACE	WITHIN IMPACT ZONE PERPENDICULARLY BUT DOES NOT CROSS PROPOSED TRACK.
33	LACFCD	SD-RCP	18"	N/A	17	90	SANTA ANA AVE & FLORA VISTA ST.	1208+50	SUBSTRUCTURE MAP D.C. 280	RELOCATE	WITHIN IMPACT ZONE PERPENDICULARLY BUT DOES NOT CROSS PROPOSED TRACK.
34	LACFCD	SD-RCP	24"	900	N/A	N/A	SANTA ANA AVE & FLORA VISTA ST.	1207+00 TO 1215+75	SUBSTRUCTURE MAP D.C. 280	RELOCATE	PROJ. NO. 606 UNIT 1 - LINE B
35	LACFCD	SD-RCP	66"	N/A	99	58	CLARK AVE & FLORA VISTA ST.	1216+50	SUBSTRUCTURE MAP D.C. 280	PROTECT IN PLACE	PROJ. NO. 606 UNIT 1 - LINE B; POTENTIAL CASING EXTENSION
36	LACFCD	SD-CORR. PIPE ARCHES	27"	110	N/A	N/A	CLARK AVE & FLORA VISTA ST.	1216+50	SUBSTRUCTURE MAP D.C. 280	PROTECT IN PLACE	POTENTIAL BLANKET PROTECTION
37	LACFCD	SD-CORR. PIPE ARCHES	21"X37"	N/A	32	90	CLARK AVE & FLORA VISTA ST.	1216+80	SUBSTRUCTURE MAP D.C. 280	PROTECT IN PLACE	WITHIN IMPACT ZONE PERPENDICULARLY BUT DOES NOT CROSS PROPOSED TRACK.
38	LACFCD	SD-DOUBLE RCB CULVERT	1'X6'	N/A	84	90	ALONDRA BLVD & FLORA VISTA ST.	1221+00	SUBSTRUCTURE MAP D.C. 281	PROTECT IN PLACE	
39	LACFCD	OPEN CONCRETE DITCH	7'	230	N/A	N/A	ALONDRA BLVD & FLORA VISTA ST.	1221+00 TO 1223+25	SUBSTRUCTURE MAP D.C. 281	RELOCATE	
40	LACFCD	SD-RCP	24"	180	N/A	N/A	ALONDRA BLVD & FLORA VISTA ST.	1221+00 TO 1223+00	SUBSTRUCTURE MAP D.C. 281	RELOCATE	
41	LACFCD	SD-RCP	84"	N/A	N/A	N/A	ALONDRA BLVD & FLORA VISTA ST.	1221+00	SUBSTRUCTURE MAP D.C. 295	PROTECT IN PLACE	

42	LACFCD	SD-RCP	69"	N/A	159	31	ALONDRA BLVD & FLORA VISTA ST.	1223+30	SUBSTRUCTURE MAP D.C. 296	RELOCATE	PROJECT NO. 1903 UNIT 1 LINE A
43	LACFCD	SD-RCP	36" - 24"	2100	N/A	N/A	ALONG PACIFIC AVE B/T ALONDRA BLVD & BELLFLOWER BLVD	1225+80 TO 1246+75	SUBSTRUCTURE MAP D.C. 296	RELOCATE	
44	LACFCD	SD-RCP	18"	N/A	62	90	HARVARD AVE & PACIFIC AVE	1228+25	SUBSTRUCTURE MAP D.C. 296	PROTECT IN PLACE	PROJ. NO. M-3041 CITY OF BELLFLOWER; POTENTIAL CASING EXTENSION
45	LACFCD	SD-RCP	24"	N/A	-	90	ORCHARD AVE	1240+00	SUBSTRUCTURE MAP D.C. 297	PROTECT IN PLACE	PROJ. NO. M-3041 CITY OF BELLFLOWER; POTENTIAL CASING EXTENSION
46	LACFCD	SD-RCP	45"	N/A	-	-	CORNUTA ST & BELLFLOWER BIKE TRAIL	1267+00	SUBSTRUCTURE MAP D.C. 298	PROTECT IN PLACE	
47	LACFCD	SD-RCP	85"	N/A	-	-	FLORA VISTA ST & BELLFLOWER BIKE TRAIL	1285+00	DC-313	PROTECT IN PLACE	
48	LACFCD	SD-RCP	(2)-47"X27"	N/A	-	-	FLORA VISTA ST & BELLFLOWER BIKE TRAIL	1285+01	DC-313	PROTECT IN PLACE	
49	LACFCD	SD-RCP	30"	N/A	-	-	FLORA VISTA ST	1296+00	DC-313	PROTECT IN PLACE	
50	LACFCD	SD-RCP	72"	N/A	-	-	FLORA VISTA ST	1296+00	DC-313	PROTECT IN PLACE	
51	LACFCD	SD-RCP	24"	N/A	-	-	186TH ST	1392+00	SF-396	PROTECT IN PLACE	
52	LACFCD	SD-CMP	48"	N/A	-	60	ALBURTIS AV	1399+00	SUBSTRUCTURE MAP SF-406	PROTECT IN PLACE	EXTENSION OF CULVERT

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Where available, approximate pipe depths are based on as-built records. A datum discrepancy may apply.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.
- 8) Protect in place dispositions assume the facility will require some protection measures or further analysis for effects of loading, drainage modifications, etc.

Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Sewer Impacts



Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station			
					LF	Angle°					
1	LA COUNTY DEPT OF SANITATION	SS	18"	N/A	-	97°	FLORENCE AVE	830+20	PDF023409 (LINE B) - NO 181-1-D1.34 S-34 (LA COUNTY (CI 548)	PROTECT IN PLACE	28' N.S. PL; POTENTIAL CASING EXTENSION
2	LA COUNTY DEPT OF SANITATION	SS	24"	N/A	-	-	SALT LAKE AVE	814+00	MAP-20	PROTECT IN PLACE	
3	LA COUNTY DEPT OF SANITATION (DIST NO. 1)	SS	24"	N/A	-	28°	SANTA ANA ST	879+50	LA COUNTY SUBSTRUCTURE MAP DC85	RELOCATE	LA COUNTY SANITARY DISTRICT NO. 1, EAST COMPTON CREEK NO. 1; POTENTIAL CASING EXTENSION
4	LA COUNTY DEPT OF SANITATION	SS	36"	N/A	-	45°	SANTA ANA ST	886+20	LA COUNTY SUBSTRUCTURE MAP DC85	PROTECT IN PLACE	JOINT OUTFALL "H" TRUNK 2'-4" N.S.; POTENTIAL CASING EXTENSION
5	LA COUNTY DEPT OF SANITATION	SS	24"-42"	N/A	-	-	CALIFORNIA AVE	827+00	MAP-20	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
6	LA COUNTY DEPT OF SANITATION	SS	36"	N/A	-	30	CECELIA ST	886+00	LA COUNTY SUBSTRUCTURE MAP DC85	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
7	LA COUNTY DEPT OF SANITATION	SS	27"	N/A	-	38°	ATLANTIC AVE	915+90	NO 470-4850-D13.5 SHEET 5 OF 9 (PD042737)	RELOCATE	SEWER ON C/L (PROJECT NO. 7850, UNIT 3 LINE C); POTENTIAL CASING EXTENSION
8	LA COUNTY DEPT OF SANITATION	SS	18"	N/A	-	87°	NEVILLE AVE	924+25	SEWER MAP SHEET NO. 9	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
9	LA COUNTY DEPT OF SANITATION	SS	18"	N/A	-	89°	NEVILLE AVE	924+40	SEWER MAP SHEET NO. 9	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
10	LA COUNTY DEPT OF SANITATION	SS	16"	N/A	-	66°	RAYO AVE	945+00	PF528619	PROTECT IN PLACE	EAST COMPTON CREEK F3; POTENTIAL CASING EXTENSION

11	LA COUNTY DEPT OF SANITATION	SS	78"	N/A	-	84°	MILLER WAY	990+30	LACFCD PROJECT NO. 7850, UNIT 1 LINE D (NO. 470-7850-D10.6) SHEET 6 OF 14 PD042712	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
12	CITY OF DOWNEY	SS	42"	N/A	-	29°	FLORES ST	1034+40	DPW WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
13	CITY OF SOUTHGATE	SS	UNK	N/A	-	90	GARDENDALE AVE	1045+25	THIRD PARTY	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
14	CITY OF DOWNEY	SS	54"	N/A	-	84°	MAIN ST	1067+00	CITY OF DOWNEY AS-BUILT (DWG NO. J.O.-4 DRAWING (SN1956)	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
15	CITY OF PARAMOUNT	SS	18"	N/A	-	63°	ARTHUR AVE	1111+70	LA COUNTY SUBSTRUCTURE MAP DC233	PROTECT IN PLACE	POTENTIAL CASING EXTENSION; A&1 240 (25' W.E.)
16	LA COUNTY DEPT OF SANITATION	SS	15"	N/A	-	60	DOWNEY AVE	1154+50	2-P-13	PROTECT IN PLACE	DOWNEY-BELLFLOWER TRUNK C/L; POTENTIAL CASING EXTENSION
17	CITY OF BELLFLOWER	SS	24"	N/A	-	58°	CLARK AVE	1216+50	LA COUNTY SUBSTRUCTURE MAP DC280	PROTECT IN PLACE	DOWNEY-BELLFLOWER TRUNK C/L; POTENTIAL CASING EXTENSION
18	CITY OF BELLFLOWER	SS	24"	N/A	-	-	CORNUTA ST	1266+00	MWD PLAN B-17803	PROTECT IN PLACE	
19	CITY OF BELLFLOWER	SS	15"	N/A	-	60	WOODRUFF AVE	1275+50	LA COUNTY SUBSTRUCTURE MAP DC313	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
20	CITY OF BELLFLOWER	SS	21"	N/A	-	-	FLORA VISTA ST	1285+00	LA COUNTY DC-320	PROTECT IN PLACE	
21	CITY OF BELLFLOWER	SS	60"	N/A	-	37°	FLORA VISTA ST	1286+50	LA COUNTY SUBSTRUCTURE MAP DC 320	RELOCATE	TRUNK 20' N.S. JOINT OUTFALL "F"; POTENTIAL CASING EXTENSION
22	CITY OF ARTESIA	SS	18"	N/A	-	53°	N. PIONEER BLVD.	1408+00	LA COUNTY SUBSTRUCTURE MAP S.F. 406	PROTECT IN PLACE	J.O.C. UNIT 8 TRUNK, 33' W.E.; POTENTIAL CASING EXTENSION

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Where available, approximate pipe depths are based on as-built records. A datum discrepancy may apply.

- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Water Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

Item No.	Utility Features										
	Owner	Type	Size ¹	Track Encroachment			Location		Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station			
				LF	Angle°						
1	SOUTHERN CALIFORNIA WATER COMPANY	WTR	16"	N/A	-	60.0	FLORENCE AVE & SALT LAKE AVE	830+60	HP WTR MAP-71	PROTECT IN PLACE	30' NORTH OF NEAREST PL ON FLORENCE; POTENTIAL CASING EXTENSION
2	CITY OF SOUTH GATE	WTR	16"	N/A	-	114.0	RAYO AVE & SALT LAKE AVE	945+20	WATER ATLAS BOOK SHEET 09A	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
3	METROPOLITAN WATER DISTRICT	WTR	79"	N/A	-	60.0	RAYO AVE & SALT LAKE AVE	946+50	WATER ATLAS BOOK SHEET 16	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
4	CITY OF SOUTH GATE	WTR	16"	N/A	-	62.0	SOUTHERN AVE & SALT LAKE AVE	957+00	WATER ATLAS BOOK SHEET 17	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
5	METROPOLITAN WATER DISTRICT	WTR	67"	N/A	-	141.0	GARFIELD AVE & GARFIELD PLACE	1024+30	WATER ATLAS BOOK SHEET 33A	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
6	CENTRAL BASIN MUNI. WATER (RECLAIMED)	WTR	24"	7500 (RELOCATE 1500 LF NEAR ROSECRANS & 300 LF AT SOMERSET)	-	N/A	ROSE ST TO SOMERSET BLVD	1110+00 TO 1175+00	SUBSTRUCTURE MAPS	PROTECT IN PLACE, RELOCATE (1110+00 TO 1150+00) RELOCATE (1172+00 TO 1175+00)	CONFIRM LATERAL LOADING EFFECTS; RELOCATE XING AT SOMERSET BLVD
7	PARAMOUNT CO. W	WTR	16"	N/A	-	31.0	ROSCRANS AVE & PARAMOUNT BLVD	1122+50	SUBSTRUCTURE MAP D.C. 234	PROTECT IN PLACE	48' SOUTH OF PL ON ROSECRANS; POTENTIAL CASING EXTENSION
8	PARAMOUNT CO. W	WTR	16"	N/A	-	121.0	ROSCRANS AVE & PARAMOUNT BLVD	1123+50	SUBSTRUCTURE MAP D.C. 234	PROTECT IN PLACE	45' WEST OF PL ON PARAMOUNT BLVD; POTENTIAL CASING EXTENSION
9	PARAMOUNT CO. W	WTR	24"	N/A	-	32.0	HAYTER AVE & SOMERSET BLVD	1172+30 to 1286+00	SUBSTRUCTURE MAP D.C. 265	PROTECT IN PLACE	LOCATION VARIES. 24" STL CASING; POTENTIAL CASING EXTENSION
10	CITY OF BELLFLOWER	WTR	20"	N/A	-	121.0	BELLFLOWER BLVD	1247+50	SUBSTRUCTURE MAP D.C. 297	PROTECT IN PLACE	26' WEST OF NEAREST PROPERTY LINE; POTENTIAL CASING EXTENSION

11	METROPOLITAN WATER DISTRICT	WTR	48"	N/A	-	58.0	WOODRUFF AVE	1276+00	SUBSTRUCTURE MAP D.C. 313	PROTECT IN PLACE	36' EAST OF WOODRUFF AVE PL; POTENTIAL CASING EXTENSION
12	CENTRAL BASIN MUNI. WATER (RECLAIMED)	WTR	24"	N/A	-	143.0	FLORA VISTA	1286+00	SUBSTRUCTURE MAP D.C. 320	PROTECT IN PLACE	25' NORTH OF FLORA VISTA PL; POTENTIAL CASING EXTENSION
13	CENTRAL BASIN MUNI.W	WTR	24"	1200"	-	-	ROSECRANS AVE	1109+00-1121+00	DC234	Relocate	-
14	LA COUNTY	WTR	24"	3000"	-	-	DOWNEY AVE	1143+50-1173+50	DC265	Relocate	-

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Power Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source	Disposition	Comments ³
				Longitudi nal (LF)	Crossing ²		Nearest Cross Street	Station			
					LF	Angle°					
1	SO. CAL EDISON	PWR(OH)	UNKNOWN	N/A	-	N/A	Gage Ave	788+00 TO 820+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
2	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	90	Gage Ave	800+50	SCE WEBSITE	PROTECT IN PLACE	UNDERGROUND SCE FACILITY, CONFIRM DEPTH OF SOUNDWALL
3	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Bell Ave	814+00	FIELD VERIFICATION	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
4	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Florence Avenue & California Avenue	830+00	FIELD VERIFICATION	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
5	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Florence Avenue & California Avenue	830+00	DWG NO. 099-4228-5	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
6	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Salt Lake Avenue & Walnut Street	833+50	DWG NO. 099-4228-5	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
7	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Salt Lake Avenue & Walnut Street	852+00	DWG NO. 099-4228-5	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
8	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	90	Salt Lake Avenue & Walnut Street	862+50	FIELD VERIFICATION	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
9	SO. CAL EDISON	PWR	8-5" 3-1000-16KV 3-1000-16KV	N/A	-	126.0	Otis Ave	869+25	FIELD VERIFICATION	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE
10	SO. CAL EDISON	PWR	2-3 1/2" & 2-4"	N/A	-	126.0	Otis Ave	869+50	DWG NO. 094-4233-0	PROTECT IN PLACE	POSSIBLE RELOCATE UNDERGROUND; POTENTIAL JOINT OVERHEAD SYSTEM WITH TELECOM
11	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	90.0	Otis Ave	870+25	DWG NO. 094-4233-0	PROTECT IN PLACE	257' BORE AREA & 20" CASING; POTENTIAL CASING EXTENSION
12	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	45.0	Otis Ave	869+75	FIELD VERIFICATION	PROTECT IN PLACE	ASSUMES VERTICAL CLEARANCES ARE ADEQUATE; POTENTIAL JOINT OVERHEAD SYSTEM WITH TELECOM
13	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	45.0	Otis Ave	869+75	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND; POTENTIAL JOINT OVERHEAD SYSTEM WITH TELECOM
14	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	90.0	Otis Ave	872+50	FIELD VERIFICATION	PROTECT IN PLACE	UNDERGROUND SCE FACILITY, CONFIRM DEPTH OF SOUNDWALL

15	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	45	Salt Lake Avenue & Santa Ana Street	879+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
16	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	60	Salt Lake Avenue & Cecilia St	887+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND; POTENTIAL JOINT OVERHEAD SYSTEM WITH TELECOM
17	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	45	Salt Lake Avenue & Ardine Street	903+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND; CONFLICT WITH AERIAL STRUCTURE
18	SO. CAL EDISON	PWR (OH)	4.8kV Min	1000	-	N/A	Patata Street to Atlantic Avenue	911+50 TO 914+50	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
19	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	90	S Atlantic Avenue	915+50	FIELD VERIFICATION	PROTECT IN PLACE	POTENTIAL RELOCATION, CONFIRM DEPTH OF SOUNDWALL
20	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	100	S Atlantic Avenue	916+50	FIELD VERIFICATION	PROTECT IN PLACE	POTENTIAL RELOCATION, CONFIRM DEPTH OF SOUNDWALL
21	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	135	S Atlantic Avenue	917+50	FIELD VERIFICATION	PROTECT IN PLACE	POTENTIAL RELOCATION, CONFIRM DEPTH OF SOUNDWALL
22	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	N/A	Mason Street	930+50	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND; CONFLICT WITH AERIAL STRUCTURE
23	SO. CAL EDISON	PWR	1-5" COMM 4-5" 3-750-16KV	N/A	-	138	Firestone Place & Rayo Avenue	935+25	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
24	SO. CAL EDISON	PWR (OH)	UNKNOWN	1000.0	-	N/A	Firestone Boulevard to Rayo Avenue	935+00 TO 945+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
25	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	60	Rayo Avenue	946+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
26	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	45	Rayo Avenue	946+75	FIELD VERIFICATION	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
27	LADWP	PWR (OH)	UNKNOWN	N/A	-	45	Rayo Avenue	947+00	DWG NO. 070-4251-0	PROTECT IN PLACE	TRANSMISSION LINE
28	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	60	Southern Avenue	957+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND; POWER POLE MAY CONFLICT WITH LIMITS OF WORK
29	LADWP	PWR (OH)	UNKNOWN	N/A	-	60	I-710 Highway & Los Angeles River Bed	980+00	FIELD VERIFICATION	PROTECT IN PLACE	OH TRANSMISSION LINES TO BE PROTECTED IN PLACE
30	LADWP	PWR (OH)	UNKNOWN	N/A	-	60	Rio Hondo Channel	997+50	FIELD VERIFICATION	PROTECT IN PLACE	CONFIRM VERTICAL CLEARANCE
31	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	60	Meadow Road	1006+00	FIELD VERIFICATION	PROTECT IN PLACE	CONFIRM VERTICAL CLEARANCE

32	SO. CAL EDISON	PWR (OH)	UNKNOWN	N/A	-	60	Imperial Highway	1022+00	DWG NO. 41-79A-2	PROTECT IN PLACE	ASSUMES HORIZONTAL/VERTICAL CLEARANCES ARE ADEQUATE
33	SO. CAL EDISON	PWR (OH)	34.kV Min	N/A	-	90	Garfield Avenue	1024+00	DWG NO. 41-79A-6	PROTECT IN PLACE	60" BORE AREA FOR CASING; POTENTIAL CASING EXTENSION
34	SO. CAL EDISON	PWR (OH)	34.kV Min	N/A	-	45	Gardendale Street	1050+40	DWG NO. 41-79D-8	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
35	SO. CAL EDISON	PWR (OH)	34.kV Min	N/A	-	90	Main Street	1066+75	FIELD VERIFICATION	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
36	SO. CAL EDISON	PWR (OH)	34.kV Min	N/A	-	45	Century Boulevard	1083+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
37	LADWP	PWR	34.kV Min	N/A	-	N/A	Racine Ave	1109+00 TO 1124+00	FIELD VERIFICATION	PROTECT IN PLACE	OH TRANSMISSION LINES TO BE PROTECTED IN PLACE
38	SO. CAL EDISON	PWR	UNK	N/A	-	30	Rosecrans Ave	1124+00	FIELD VERIFICATION	PROTECT IN PLACE	UNDERGROUND SCE FACILITY CROSSING TRACK
39	SO. CAL EDISON	PWR	UNK	N/A	-	90	Paramount Blvd/Rosecrans Ave	1124+00	FIELD VERIFICATION	PROTECT IN PLACE	UNDERGROUND SCE FACILITY CROSSING TRACK
40	SO. CAL EDISON	PWR	UNK	N/A	-	135	Downey Avenue	1151+00	FIELD VERIFICATION	PROTECT IN PLACE	UNDERGROUND SCE FACILITY CROSSING TRACK
41	SO. CAL EDISON	PWR (OH)	2-DISTRIBUTION 3-TRANSMISSION	N/A	-	90	Downey Avenue	1154+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
42	SO. CAL EDISON	PWR	UNK	N/A	-	45	Somerset Boulevard	1171+50	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
43	SO. CAL EDISON	PWR	UNK	N/A	-	45	Somerset Boulevard	1173+00	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
44	SO. CAL EDISON	PWR	UNK	N/A	-	45	Somerset Boulevard	1175+00	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
45	SO. CAL EDISON	PWR (OH)	2-DISTRIBUTION 3-TRANSMISSION	N/A	-	90	Lakewood Boulevard	1185+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
46	SO. CAL EDISON	PWR (OH)	4.8kV Min	N/A	-	45	Clark Avenue	1216+00	FIELD VERIFICATION	RELOCATE	RELOCATE UNDERGROUND
47	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	45	Alondra Boulevard	1222+50	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
48	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	45	Alondra Boulevard	1223+00	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION

49	SO. CAL EDISON	PWR	UNKNOWN	N/A	-	45	Alondra Boulevard	1224+00	SCE WEBSITE	PROTECT IN PLACE	POTENTIAL CASING EXTENSION
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Notes:

Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)

Alternative E2 is now referred to as Alternative 1 with Design Option 1

Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Telecommunication Impacts



Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station	Company Drawings / Field Visits / Other		
					LF	Angle°					
1	PACIFIC TEL (AT&T)	TELECOM	12 MTD	N/A	-	78	BELL AVE	814+00	PDF023410-LINE-B-NO. 181-1-D1.35 S-35	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
2	PACIFIC TEL (AT&T)	TELECOM	12 MCD	N/A	-	53	OTIS AVE	869+00	SUBSTRUCTURE MAPS D.C. 69	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
3	PACIFIC TEL (AT&T)	TELECOM	12 TR. D.	N/A	-	60	PARAMOUNT BLVD	1123+00	LA COUNTY ROAD PLAN LOCATION VARIES D.C. 234	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
4	GENERAL TELECOM	TELECOM	12 TR. D.	N/A	-	147	ALONDRA BLVD	1222+70	LA COUNTY ROAD PLAN LOCATION VARIES D.C. 296	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
5	GENERAL TELECOM	TELECOM	4 MTD	N/A	-	-	BELLFLOWER BLVD	1247+50	LA COUNTY ROAD PLAN LOCATION VARIES D.C. 297	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
6	GENERAL TELECOM	TELECOM	UNKNOWN	N/A	-	58	CORNUTA AVE	1264+00	LA COUNTY ROAD PLAN LOCATION VARIES D.C. 312	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
7	AT&T	TELECOM	UNKNOWN	N/A	-	60	GRIDLEY RD	1375+00	WR33644-37	POTENTIAL CASING EXTENSION	PROTECT IN PLACE
8	GENERAL TELECOM	TELECOM	2-2.5"	N/A	-	-	187TH & PIONEER BLVD	1406+00	SF-407	POTENTIAL CASING EXTENSION	PROTECT IN PLACE

Notes:

- 1) Only major impacts were considered for duct systems known to have 12 or more conduits
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.



WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Gas Impacts

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Fore-court)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

Item No.	Utility Features											
	Owner	Type	Size ¹	Track Encroachment			Location		Source		Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station	Company Drawings / Field Visits / Other			
				LF	Angle ^o							
1	SOCAL GAS	GAS	26"	1500	N/A	N/A	GAGE AVE TO NEVADA ST	800+00 TO 815+00	PDF023411- LINE B (NO. 181-1-D1.37) S-37; PDF023410- LINE B (NO. 181-1-D1.35) S-35	RELOCATE	10' WE RR ROW	
2	SOCAL GAS	GAS	30"	N/A	218	36°	SANTA ANA ST	879+25	LA COUNTY SUBSTRUCTURE MAP DC-85	RELOCATE	20.8' S.N.; POTENTIAL CASING EXTENSION	
3	SOCAL GAS	GAS	24"	N/A	-	90	SANTA ANA ST	881+00	LA COUNTY SUBSTRUCTURE MAP DC-86	PROTECT IN PLACE	POTENTIAL CASING EXTENSION	
4	SOCAL GAS	GAS	16"	N/A	-	90	SANTA ANA ST	881+65	LA COUNTY SUBSTRUCTURE MAP DC-86	PROTECT IN PLACE	POTENTIAL CASING EXTENSION	
5	SOCAL GAS	GAS	2-26"	3100	N/A	N/A	SANTA ANA ST TO PATATA ST	879+00 TO 910+00	PDF023409- LINE B (NO. 181-1-D1.34); LA COUNTY SUBSTRUCTURE MAP DC-85	RELOCATE	30' E RR ROW; CONFIRM LOADING AND ACCEPTANCE FROM SCG TO PROTECT IN PLACE UNDERNEATH STRUCTURE ENVELOPE	
6	SOCAL GAS	GAS	12"	N/A	-	56°	WOODRUFF AVE	1275+80	LA COUNTY SUBSTRUCTURE MAP DC-321	PROTECT IN PLACE	POTENTIAL CASING EXTENSION	

- Notes:
- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter unless otherwise noted.
 - 2) Unless otherwise noted, facilities cross the entire track/tunnel width
 - 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
 - 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
 - 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
 - 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
 - 7) Proposed station areas assumed cut and cover construction where track section is underground.

Notes:
 Alternative E and E1 is now referred to as Alternative 1: Los Angeles Union Station to Pioneer Station (Forecourt)
 Alternative E2 is now referred to as Alternative 1 with Design Option 1
 Alternative G is now referred to as Alternative 2

WEST SANTA ANA BRANCH TRANSIT CORRIDOR ENVIRONMENTAL STUDY
TABLE 3-4: Southern Corridor (Gage Ave to South St)
Oil Impacts



Utility Features

Item No.	Owner	Type	Size ¹	Track Encroachment			Location		Source Company Drawings / Field Visits / Other	Disposition	Comments ³
				Longitudinal (LF)	Crossing ²		Nearest Cross Street	Station			
					LF	Angle°					
1	CONTINENTAL OIL CO	OIL	16"	N/A	-	58°	DOWNEY AVE	1155+00	LA COUNTY SUBSTRUCTURE MAP DC-250	PROTECT IN PLACE	21' W.E. (16" CASING); POTENTIAL CASING EXTENSION
2	CRIMSON PIPELINE	OIL	12"	1500	N/A	N/A	DOWNEY AVE TO SOMERSET BLVD	1150+00 TO 1171+00	LA COUNTY SUBSTRUCTURE MAP DC-250 AND DC-265	RELOCATE	20' +/- SOUTH OF PROP. TRACK; CONFIRM LATERAL LOADING EFFECTS
3	CRIMSON PIPELINE	OIL	6"	1500	N/A	N/A	DOWNEY AVE TO SOMERSET BLVD	1150+00 TO 1171+00	LA COUNTY SUBSTRUCTURE MAP DC-250 AND DC-265	RELOCATE	20' +/- SOUTH OF PROP. TRACK; CONFIRM LATERAL LOADING EFFECTS
4	CRIMSON PIPELINE	OIL	8"	1500	N/A	N/A	DOWNEY AVE TO SOMERSET BLVD	1150+00 TO 1171+00	LA COUNTY SUBSTRUCTURE MAP DC-250 AND DC-265	RELOCATE	20' +/- SOUTH OF PROP. TRACK; CONFIRM LATERAL LOADING EFFECTS
5	CRIMSON PIPELINE	OIL	10"	1500	N/A	N/A	DOWNEY AVE TO SOMERSET BLVD	1150+00 TO 1171+00	LA COUNTY SUBSTRUCTURE MAP DC-250 AND DC-265	RELOCATE	20' +/- SOUTH OF PROP. TRACK; CONFIRM LATERAL LOADING EFFECTS
6	CRIMSON PIPELINE	OIL	12"	N/A	-	32°	SOMERSET BLVD	1171+50	LA COUNTY SUBSTRUCTURE MAP DC-265	PROTECT IN PLACE	(AKA STANDARD OIL) 12' N.N.; POTENTIAL CASING EXTENSION
7	SFPP OIL PIPELINE - KINDER MORGAN	OIL	16"-18"	1800	N/A	N/A	ALONDRA BLVD TO FLORA VISTA ST	1225+10 TO 1287+25	LA COUNTY SUBSTRUCTURE MAP DC-320 AND DC-312	RELOCATE	MAJORITY OF LINE IS LOCATED ALONG BIKE TRAIL; CASING EXTENSION AT 1251+50 & 1247+50; RELOCATION 1283+00 TO 1288+00 (500 LF)
8	SO PACIFIC PIPELINES	OIL	24"	N/A	-	35°	FLORA VISTA ST	1285+20	LA COUNTY SUBSTRUCTURE MAP DC-321	PROTECT IN PLACE	30' N.S.; POTENTIAL CASING EXTENSION
9	SO PACIFIC PIPELINES	OIL	10"	N/A	-	35°	FLORA VISTA ST	1285+70	LA COUNTY SUBSTRUCTURE MAP DC-321	PROTECT IN PLACE	14" CASING; POTENTIAL CASING EXTENSION
10	SO PACIFIC PIPELINES	OIL	16"	N/A	-	72°	91 ARTESIA FWY	1310+00	LA COUNTY SUBSTRUCTURE MAP DC-321	PROTECT IN PLACE	2' E.W.; POTENTIAL CASING EXTENSION

Notes:

- 1) Only major impacts were considered for pipelines equal to or greater than 16 inches in diameter.
- 2) Unless otherwise noted, facilities cross the entire track/tunnel width
- 3) Approximate pipe depths are based on industry standards of 3-4' below grade.
- 4) Track vertical and horizontal depths are based on WSAB Track Alignment Drawings prepared by WSP/CH2M plotted on 08/08/18
- 5) Locations of potential TBM pit (i.e., extraction areas) were not considered.
- 6) Track construction outside of station areas assumes use of tunnel boring machine versus cut and cover with temporary decking; should cut and cover be used, utilities with approximate depths of 3' to 5' may require relocation.
- 7) Proposed station areas assumed cut and cover construction where track section is underground.