SR 710 North Study

LOS ANGELES COUNTY, CALIFORNIA
07-LA-710 (SR 710)
E.A. 187900
EFIS 0700000191

Draft Environmental Impact Report/ Environmental Impact Statement and Draft Section 4(f) De Minimis Findings

Volume I

Prepared by:
State of California Department of Transportation
and the
Los Angeles County Metropolitan Transportation Authority

The environmental review, consultation, and any other action required in accordance with applicable federal laws for this project is being, or has been, carried out by Caltrans under its assumption of responsibility pursuant to 23 USC 327.

March 2015

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General Information About This Document

What's in this document:

The California Department of Transportation (Caltrans), as assigned by the Federal Highway Administration (FHWA), has prepared this Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS), which examines the potential environmental impacts of the alternatives being considered for the State Route 710 (SR 710) North Study located in Los Angeles County, California. The document tells you why the project is being proposed, what alternatives we have considered for the project, how the existing environment could be affected by the project, the potential impacts of each of the alternatives, and the proposed avoidance, minimization, and/or mitigation measures.

Structure of the document:

Executive Summary. This section provides an overview of the proposed project and summarizes the environmental document and the potential impacts that may occur as a result of the implementation of the Build Alternatives.

Chapter 1: Proposed Project. This chapter introduces the proposed project for the State Route 710 (SR 710) North Study. In addition, the purpose and need of the proposed project and the existing conditions of the project study area are discussed.

Chapter 2: Project Alternatives. This chapter describes the No Build Alternative and the four Build Alternatives. The design features of each Build Alternative are outlined and described in this chapter.

Chapter 3: Affected Environment, Environmental Consequences, and Avoidance, Minimization, and/or Mitigation Measures. This chapter describes the existing affected environment in the study area for the SR 710 North Study. The affected environment is the base environmental condition on which environmental effects of the Build Alternatives are evaluated. Sections 3.1 through 3.25 in this Draft EIR/EIS analyze the permanent and temporary direct and indirect impacts of the No Build and Build Alternatives. The contribution of the Build Alternatives to cumulative effects is analyzed in Section 3.25 in this Draft EIR/EIS. Sections 3.1 through 3.25 cover the following topics:

- 3.1 Land Use
- 3.2 Growth
- 3.3 Community Impacts
- 3.4 Utilities/Emergency Services
- 3.5 Traffic and Transportation/Pedestrian and Bicycle Facilities
- 3.6 Visual/Aesthetics
- 3.7 Cultural Resources
- 3.8 Hydrology and Floodplain
- 3.9 Water Quality and Storm Water Runoff
- 3.10 Geology/Soils/Seismic/Topography
- 3.11 Paleontology
- 3.12 Hazardous Waste/Materials
- 3.13 Air Quality
- 3.14 Noise and Vibration
- 3.15 Energy
- 3.16 Natural Communities
- 3.17 Wetlands and Other Waters
- 3.18 Plant Species
- 3.19 Animal Species
- 3.20 Threatened and Endangered Species
- 3.21 Invasive Species
- 3.22 Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity
- 3.23 Irreversible and Irretrievable Commitments of Resources That Would be Involved in the Proposed Project
- 3.24 Construction Impacts
- 3.25 Cumulative Impacts

Chapter 4: California Environmental Quality Act (CEQA) Evaluation. This chapter discusses the level of significance of the impacts of the Build Alternatives under CEQA. This chapter also describes the potential impacts related to climate change as a result of implementation of the Build Alternatives.

Chapter 5: Comments and Coordination. This chapter describes the early and continuing coordination with the general public and public agencies during the environmental process. This chapter summarizes the results of the efforts of the Los Angeles County Metropolitan Transportation Authority (Metro) and Caltrans to fully identify, address, and resolve project-related issues through early and continuing coordination.

Chapter 6: List of Preparers. This chapter includes a list of all individuals, including consultants, who prepared or helped to prepare the environmental document and supporting technical studies.

Chapter 7: Distribution List. This chapter includes a list of agencies and individuals to whom the environmental document will be distributed.

What you should do:

- Please read the document.
- The libraries below are within the cities and/or communities that would be directly affected by the Build Alternatives, and would receive a hard copy of the Executive Summary (in four languages: Spanish, Chinese, Korean, and Vietnamese), a hard copy of the Draft EIR/EIS and/or a CD or USB flash drive.

Alhambra Civic Center Library 101 S 1st St, Alhambra	LA County Library-City Terrace Library 4025 E. City Terrace Dr. Los Angeles
Bruggemeyer Public Library 318 S. Ramona Ave. Monterey Park	LA County Public Library-East LA Library 4837 E. 3rd St. Los Angeles
Glendale Central Library 222 East Harvard Street Glendale	LA County Public Library-La Canada Flintridge Library 4545 N. Oakwood Ave. La Canada Flintridge
LA City Library-El Sereno Branch 5226 Huntington Dr. South Los Angeles	Pasadena Public Library-Central Library 285 E. Walnut St. Pasadena
LA City Library-Malabar Branch 2801 Wabash Avenue Los Angeles	Pasadena Public Library-San Rafael Branch 1240 Nithsdale Road Pasadena
LA County Library-Anthony Quinn Library 3965 East Cesar E Chavez Avenue Los Angeles	South Pasadena Public Library- 1100 Oxley St. South Pasadena

- The remaining libraries within the study area (which are listed below) would receive: a hard copy of the Executive Summary (in the four languages) and/or a CD or USB flash drive of the Draft EIR/EIS.

Altadena Main Library 600 East Mariposa St. Altadena	LA County Public Library-Live Oak Library 4153-55 Live Oak Ave. Arcadia
Arcadia Public Library 20 West Duarte Road Arcadia	LA County Public Library-Norwood Library 4550 N. Peck Rd. El Monte
Azusa City Library 729 N. Dalton Ave. Azusa	LA County Public Library-San Gabriel Library 500 S. Del Mar Ave. San Gabriel
Crowell Public Library 1890 Huntington Dr. San Marino	LA County Library-South El Monte Public Library 1430 Central Avenue South El Monte
Cal State University, Los Angeles Library 5151 State University Dr. Los Angeles	LA County Library-Temple City Library 5939 Golden West Avenue Temple City
Duarte Library 1301 Buena Vista Street Duarte	Monrovia Public Library 321 South Myrtle Avenue Monrovia
East Los Angeles College Library 1301 Avenida Cesar Chavez Monterey Park	Pasadena City College Library 1570 E. Colorado Blvd. Pasadena
Irwindale Public Library 5050 North Irwindale Avenue Irwindale	Pasadena Library-Hastings Branch 3325 East Orange Grove Boulevard Pasadena
LA City Library-Arroyo Seco Branch 6145 N. Figueroa St. Los Angeles	Pasadena Public Library-Hill Avenue Branch 55 South Hill Ave. Pasadena
LA City Library-Chinatown Branch 639 N. Hill Street Los Angeles	Pasadena Public Library-Lamanda Park 140 South Altadena Drive Pasadena
LA City Library-Cypress Park Branch 1150 Cypress Avenue Los Angeles	Pasadena Public Library-La Pintoresca 1355 North Raymond Avenue Pasadena
LA City Library-Eagle Rock Branch 5027 Caspar Avenue Los Angeles	Pasadena Public Library-Linda Vista Branch 1281 Bryant Street Pasadena
LA City Library-Lincoln Heights Branch 2530 Workman St. Los Angeles	Pasadena Public Library-Villa Parke Branch 363 East Villa Street Pasadena
LA City Library-Robert Louis Stevenson Library 803 Spence Street Los Angeles	Rosemead Library 8800 Valley Boulevard Rosemead

LA County Library-Baldwin Park Library 4181 Baldwin Park Boulevard Baldwin Park	Sierra Madre Library 440 Sierra Madre Boulevard Sierra Madre
LA County Public Library-El Monte Library 3224 N. Tyler Ave. El Monte	

- You may also review the document at http://www.dot.ca.gov/dist07/resources/envdocs/docs/710study/draft_eir-eis.
- We are interested in hearing what you think. Please attend one of the public hearings or send your written comments to Caltrans by the deadline (i.e., July 6, 2015):

Date and Time	Location
Saturday, April 11, 2015 at 10 a.m. to 4 p.m. 10 a.m. - 11 a.m. – Map Viewing 11 a.m. - 4 p.m. – Public Hearing	East Los Angeles College Rosco Ingalls Auditorium 1301 Avenida Cesar Chavez Monterey Park, CA 91754
Tuesday, April 14, 2015 at 5 p.m. to 9 p.m. 5 p.m. - 6 p.m. – Map Viewing 6 p.m. - 9 p.m. – Public Hearing	Pasadena Convention Center Ballroom 300 East Green Street Pasadena, CA 91101

- Submit written comments via postal mail to:

  Garrett Damrath, Chief Environmental Planner
  Division of Environmental Planning
  Department of Transportation, District 7
  100 S. Main St, MS-16A
  Los Angeles, CA 90012
  (213) 897-0357

- Submit comments via email to:
  http://www.dot.ca.gov/dist07/resources/envdocs/docs/710study/draft_eir-eis/comments.php

What happens next:

After comments are received from the public and reviewing agencies, a Preferred Alternative will be identified among the alternatives considered in this EIR/EIS.

In the event the No Build Alternative is identified as the Preferred Alternative, Caltrans, as the Lead Agency under CEQA and NEPA (as assigned by the FHWA), in cooperation with Metro, would: (1) approve the EIR/EIS, and (2) not move forward with any of the Build Alternatives.

If the Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative, Bus Rapid Transit (BRT) Alternative, or Light Rail Transit (LRT) Alternative is identified as the Preferred Alternative, Metro may: (1) adopt the EIR as the Lead Agency under CEQA, or (2) conduct additional environmental studies. If any one of these three Build Alternatives is given environmental approval and funding is appropriated, Metro could design and construct all or part of the alternative. Metro would assume responsibility for the design and construction of the improvements associated with the selected Preferred Alternative. If federal funding is available for the TSM/TDM, BRT, or LRT Alternatives, the federal agency funding the improvements would be

responsible for approval of the EIS under NEPA. Federal funding agencies could include FHWA or the Federal Transit Administration (FTA).

In the event the Freeway Tunnel Alternative is identified as the Preferred Alternative, Caltrans, as the Lead Agency under CEQA and NEPA (as assigned by the FHWA), may: (1) approve the EIR/EIS, or (2) conduct additional environmental studies. If the Freeway Tunnel Alternative is given environmental approval and funding is appropriated, Caltrans and/or Metro could design and construct all or part of the alternative. Caltrans would hold final approval over the design, construction, and maintenance of the freeway tunnel and associated improvements since it would remain a State facility.

For individuals with sensory disabilities, this document can be made available in Braille, in large print, on audiocassette, or on computer disk. To obtain a copy in one of these alternate formats, please call or write to Department of Transportation, Attn: Jason Roach, 100 South Main Street, MS 16-A, Los Angeles, CA 90012, (213) 897-0357, or use the California Relay Service TTY number, 711, or 1 (800) 735-2922.

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SCH# 1982092310
07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

Improvements on SR 710 and/or the surrounding area, north to I-210, south to I-10, east to I-605, and west to I-5 and SR 2.

Draft Environmental Impact Report/ Environmental Impact Statement and Draft Section 4(f) De Minimis Findings

Submitted Pursuant to: (State) Division 13, California Public Resources Code
(Federal) 42 USC 4332(2)(C) and 49 USC 303

THE STATE OF CALIFORNIA
Department of Transportation

COOPERATING AGENCIES:
United States Army Corps of Engineers
United States Environmental Protection Agency

RESPONSIBLE AGENCIES:
Los Angeles County Metropolitan Transportation Authority, California Department of Fish and Wildlife, California Transportation Commission, Los Angeles County Regional Water Quality Control Board, Los Angeles County Flood Control District, the County of Los Angeles, and cities within the study area for the SR 710 North Study

March 3, 2015
Date of Approval

Ronald Kosinski
Division of Environmental Planning
Deputy District Director
California Department of Transportation

The following person may be contacted for more information about this document:

Garrett Damrath, Chief Environmental Planner
Division of Environmental Planning
Department of Transportation, District 7
100 South Main Street, MS 16-A
Los Angeles, CA 90012

Abstract: The purpose of the proposed project is to effectively and efficiently accommodate regional and local north-south travel demands in the study area of the western San Gabriel Valley and east/northeast Los Angeles, including improving the efficiency of the existing regional freeway and transit networks, reducing congestion on local arterials adversely affected due to accommodating regional traffic volumes, and minimizing environmental impacts. The Build Alternatives would potentially result in the short-term and/or long-term substantial effects related to: land use, community impacts, traffic and transportation, visual and aesthetics, cultural resources, paleontological resources, hazardous wastes and materials, air quality, noise and vibration, wetlands and other waters.

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Executive Summary

Introduction

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro) proposes transportation improvements to improve mobility and relieve congestion in the area between State Route 2 (SR 2), SR 2/Interstate 5 (I-5), and Interstates 10, 210, and 605 (I-10, I-210, and I-605, respectively) in east/northeast Los Angeles and the western San Gabriel Valley.

The information in this Executive Summary is based on the analyses and other information documented in the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) and the technical studies in support of the Draft EIR/EIS for the State Route 710 (SR 710) North Study.

Overview of the Project Area

Study Area

As shown on Figure ES-1, the study area for the SR 710 North Study is approximately 100 square miles (sq mi) and generally bounded by I-210 on the north, I-605 on the east, I-10 on the south, and I-5 and SR 2 on the west.

Existing Facilities

Metro currently operates 7 bus routes in the study area to downtown Los Angeles, and other routes provide east-to-west and north-to-south service in the study area.

Metro Rail service in the study area is provided via the Gold Line, a 19.7-mile light rail line that connects Pasadena and East Los Angeles with Union Station in downtown Los Angeles. The Gold Line includes 15 stations located in Pasadena, South Pasadena, Highland Park, Arroyo Seco (Mount Washington), Lincoln Heights, and East Los Angeles, as well as 6 additional stations in parts of Los Angeles outside the study area.

There are four major north-south freeway routes (I-5, State Route 110 [SR 110], Interstate 710 [I-710], and I-605) and two east-west freeway routes (I-210 and State Route 134 [SR 134]) that are located partially in the study area, two of which (SR 110 and SR 710) terminate in the study area without connecting to another freeway. The limits of the planned SR 710 corridor were originally defined in 1933 as extending from San Pedro east to Long Beach and north to the vicinity of Monterey Park. In 1959, the planned northern limits of SR 710 were extended to the planned I-210. The segment of the facility from Long Beach to I-10 has been constructed and was incorporated in 1983 into the Interstate Highway System as I-710. The segments from I-10 to Valley Boulevard and from Del Mar Boulevard to the I-210/SR 710/State Route 134 (SR 134) interchange were designated SR 710 in 1984. The segment between Valley Boulevard and I-210 has not been constructed.

Purpose and Need

Project Purpose

The purpose of the proposed action is to effectively and efficiently accommodate regional and local north-south travel demands in the study area of the western San Gabriel Valley and east/northeast Los Angeles, including the following considerations:

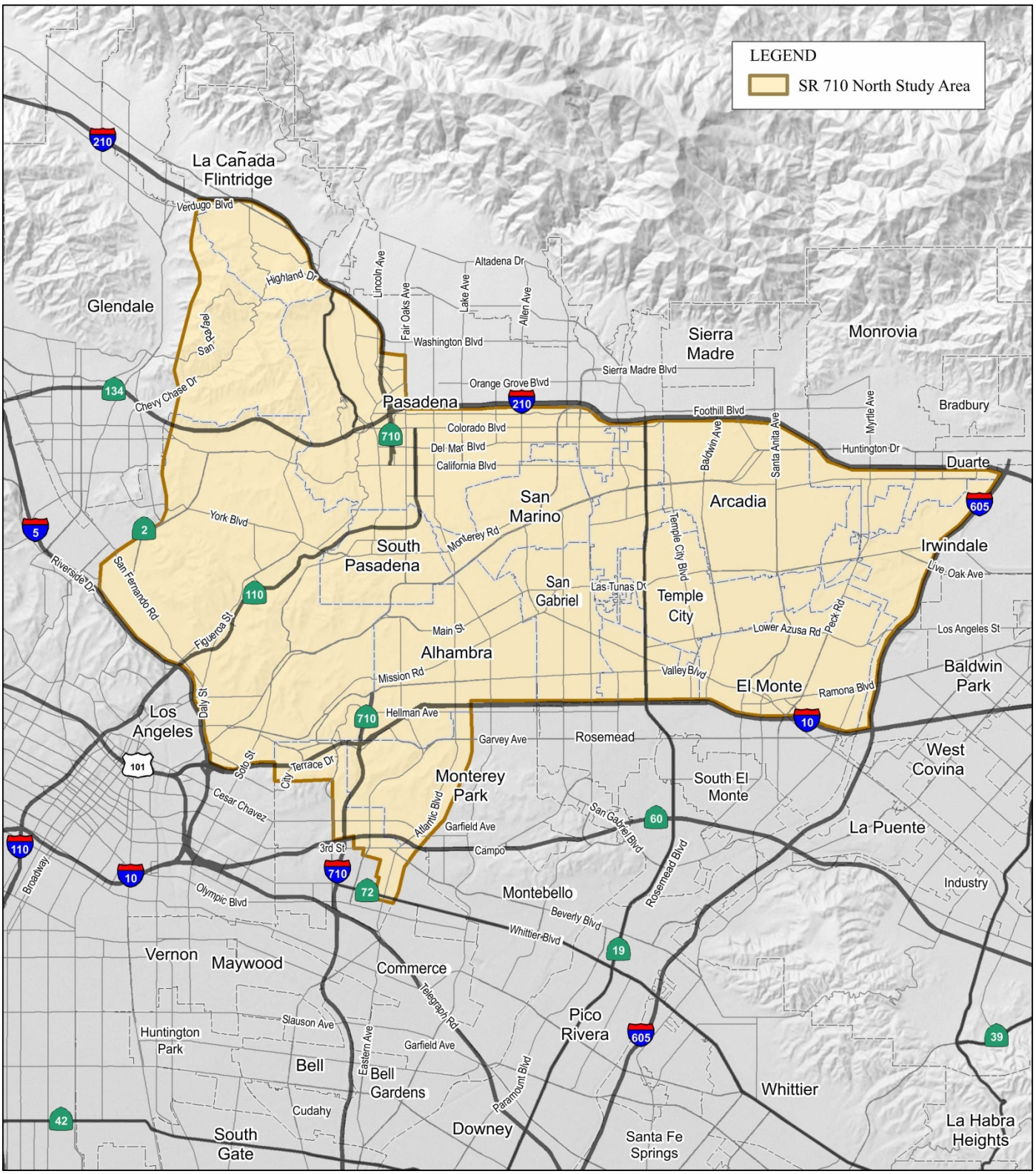


Figure ES-1: SR 710 North Study Area

- Improve efficiency of the existing regional freeway and transit networks.
- Reduce congestion on local arterials adversely affected due to accommodating regional traffic volumes.
- Minimize environmental impacts related to mobile sources.

Project Need

The need for the SR 710 North Study is based on consideration of the following factors:

Capacity, Transportation Demand, and Safety: The lack of continuous north-south transportation facilities in the study area affects the overall efficiency of the larger regional transportation system, which results in congestion on freeways in the study area, cut-through traffic that affects the local streets in the study area, and poor transit operations in the study area due to congestion on the local arterial roads. Figure ES-2 shows the travel times to downtown Pasadena from locations within the project study area, illustrating the lack of continuous north-south transportation facilities.

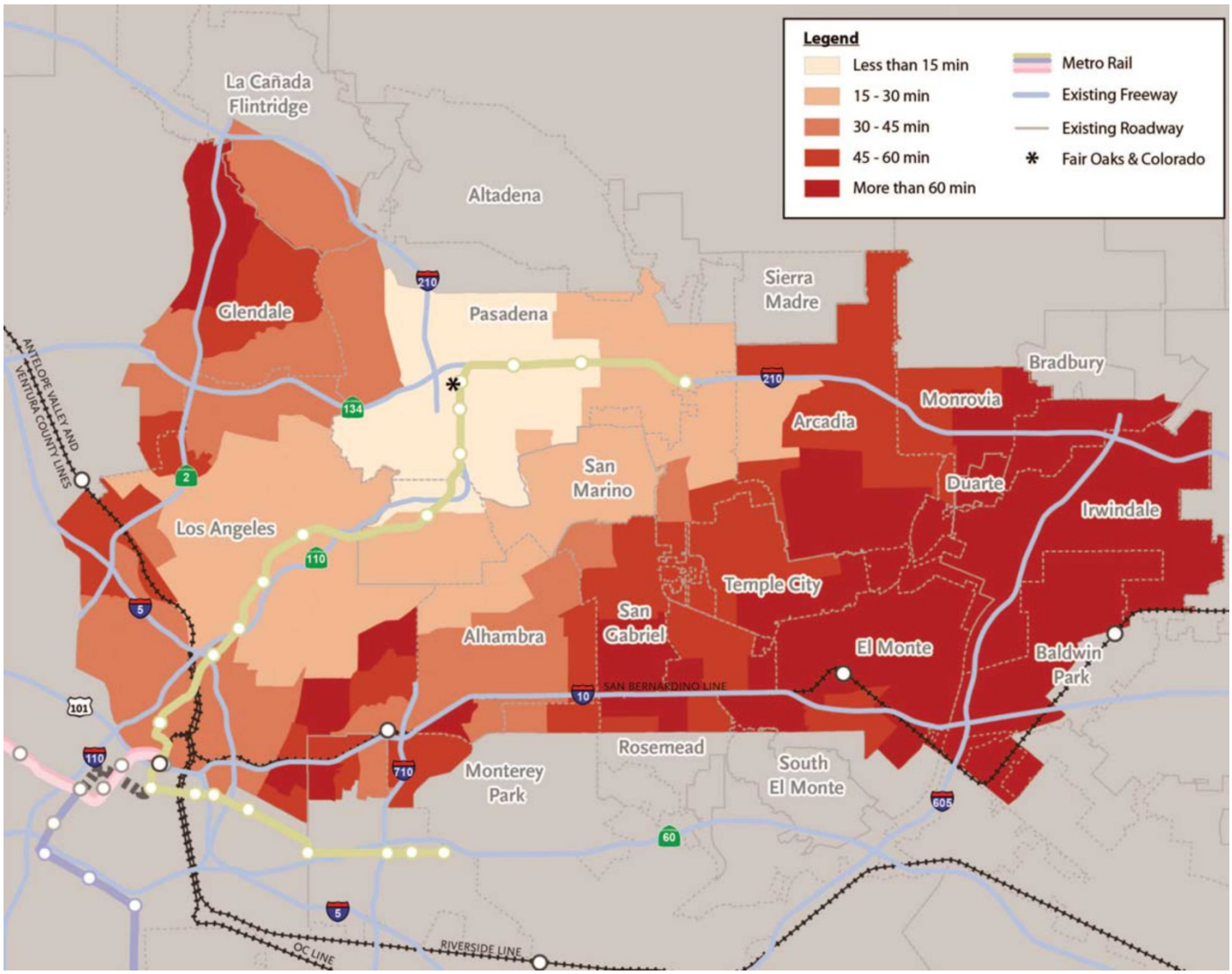


Figure ES-2: Travel Times in Minutes to Downtown Pasadena

- **Modal Interrelationships and System Linkages:** Because SR 110 and I-710 terminate in the study area without connecting to other freeways, a high percentage of the north-south regional travel demand is concentrated on a few freeways or diverted to local streets in the study area. This effect is exacerbated by the overall southwest-northeast orientation of I-605, which makes it an unappealing route for traffic between the southern part of the region and the urbanized areas to the northwest in the San Fernando Valley, the Santa Clarita Valley, and the Arroyo-Verdugo area.
- **Social Demands or Economic Development:** The SR 710 North Freeway Extension (Tunnel) Alternative is included in the Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS): Towards a Sustainable Future, in the SCAG Federal Transportation Improvement Program (FTIP), and Metro's 2009 Long Range Transportation Plan (LRTP).
- **Environmental Factors:** Since the 1950s, growth in southern California, the County of Los Angeles, and the study area has resulted in dramatic increases in population, changes to land use patterns, and a substantial increase in vehicle use and traffic congestion on the regional freeway system and local roadway network. Increased traffic congestion throughout the region and study area has contributed to increased noise levels near freeways and roadways as well as elevated ambient air pollution levels. By 2035, the study area population and employment base are forecasted to increase by approximately 12 percent, which will continue to decrease the overall efficiency of the larger regional transportation system. These system degradations would exacerbate existing congestion throughout the County and communities in the study area and the environmental effects related to mobile sources.
- **Legislation:** Measure R, a one-half-cent sales tax dedicated to transportation projects in Los Angeles County, was approved by a two-thirds majority of Los Angeles County voters in November 2008 and took effect in July 2009. Over 30 years, Measure R is projected to generate $40 billion for mobility improvement programs. The goals of Measure R focus on reducing congestion, improving traffic flow, improving mobility, and increasing accessibility to public transportation. Included in the Measure R plan is the commitment of $780 million for improvements to SR 710.

Proposed Action

Project Alternatives

Each of the alternatives under evaluation in the EIR/EIS are described below. Please note that the alternatives are not listed in any order of priority. Construction cost and schedule will be further refined when a Preferred Alternative is selected and moves into final design.

No Build Alternative

The No Build Alternative does not include any improvements to the SR 710 North Study area. The traffic modeling for the Opening Year and Horizon Year for the No Build Alternative includes projects/planned improvements through 2035 that are contained in the FTIP, as listed in the SCAG 2012 RTP/SCS, Measure R, and the funded part of Metro's 2009 LRTP. Those projects are shown later on Figure 2-1 in Chapter 2, Project Alternatives.

Transportation System Management/Transportation Demand Management Alternative

The Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative consists of strategies and improvements to increase efficiency and capacity for all modes in the transportation system with lower capital cost investments and/or lower potential impacts. The TSM/TDM Alternative is designed to maximize the efficiency of the existing transportation system by improving capacity and

reducing the effects of bottlenecks and chokepoints. The TSM and TDM improvements included in the TSM/TDM Alternative are described in the following sections.

Transportation System Management. TSM strategies increase the efficiency of existing facilities by identifying actions that increase the number of vehicle trips a facility can carry without increasing the number of through lanes. Examples of TSM strategies include: ramp metering, auxiliary lanes, turning lanes, reversible lanes, and traffic signal coordination. TSM also encourages multimodal transportation, including automobile, public and private transit, ridesharing programs, and bicycle and pedestrian improvements, as elements of a unified urban transportation system. TSM strategies in the TSM/TDM Alternative are:

- **Intelligent Transportation System (ITS) Improvements:** As shown on Figure ES-3, ITS improvements include traffic signal upgrades, synchronization and transit prioritization, arterial changeable message signs (CMS), and arterial video and speed data collection systems. The TSM/TDM Alternative includes signal optimization on corridors with signal coordination hardware already installed as part of Metro's Traffic Signal Synchronization Program (TSSP). These corridors include Del Mar Avenue, Rosemead Boulevard, Temple City Boulevard, Santa Anita Avenue, Fair Oaks Avenue, Fremont Avenue, and Peck Road. The only remaining major north-south corridor in the San Gabriel Valley in which TSSP has not been implemented is Garfield Avenue; therefore, TSSP on that corridor is included in the TSM/TDM Alternative.
- **Local Street and Intersection Improvements:** As shown on Figure ES-4, local street and intersection improvements are proposed in the Cities of Los Angeles, Pasadena, South Pasadena, Alhambra, San Gabriel, Rosemead, and San Marino.
- **Active Traffic Management (ATM):** The major elements of ATM are arterial speed data collection and CMS. Data on arterial speeds would be collected and distributed through Los Angeles County's Information Exchange Network. Travel time data collected through this effort could be provided to navigation system providers for distribution to the traveling public. Arterial CMS or "trailblazer" message signs would be installed at key locations to make travel time and other traffic data available to the public.

Transportation Demand Management. TDM strategies focus on regional means of reducing the number of vehicle trips and vehicle miles traveled as well as increasing vehicle occupancy. The TDM strategies included in the TSM/TDM Alternative are: Expanded Bus Service and Bus Service Improvements (Figure ES-5) and Active Transportation Improvements (Figure ES-6).

Improvements in the TSM/TDM Alternative have also been incorporated into the remaining Build Alternatives, with the following exceptions because those improvements would conflict with the improvements proposed in the other Build Alternatives:

- Local Street Improvement L-8 (Fair Oaks Avenue from Grevelia Street to Monterey Road), the reversible lane component of Local Street Improvement L-3 (Atlantic Boulevard from Glendon Way to I-10), and enhancements to Bus Route 762 would not be implemented with the Bus Rapid Transit (BRT) Alternative.
- Other Road Improvement T-1 (Valley Boulevard to Mission Road Connector Road) would not be implemented with the Light Rail Transit (LRT) Alternative.
- Other Road Improvements T-1 (Valley Boulevard to Mission Road Connector) and T-3 (St. John Extension between Del Mar Boulevard and California Boulevard) would not be implemented with the Freeway Tunnel Alternative.

The construction of the TSM/TDM Alternative is estimated to cost approximately $105 million (in 2014 dollars). Construction of the improvements in the TSM/TDM Alternative is expected to take approximately 2 years.

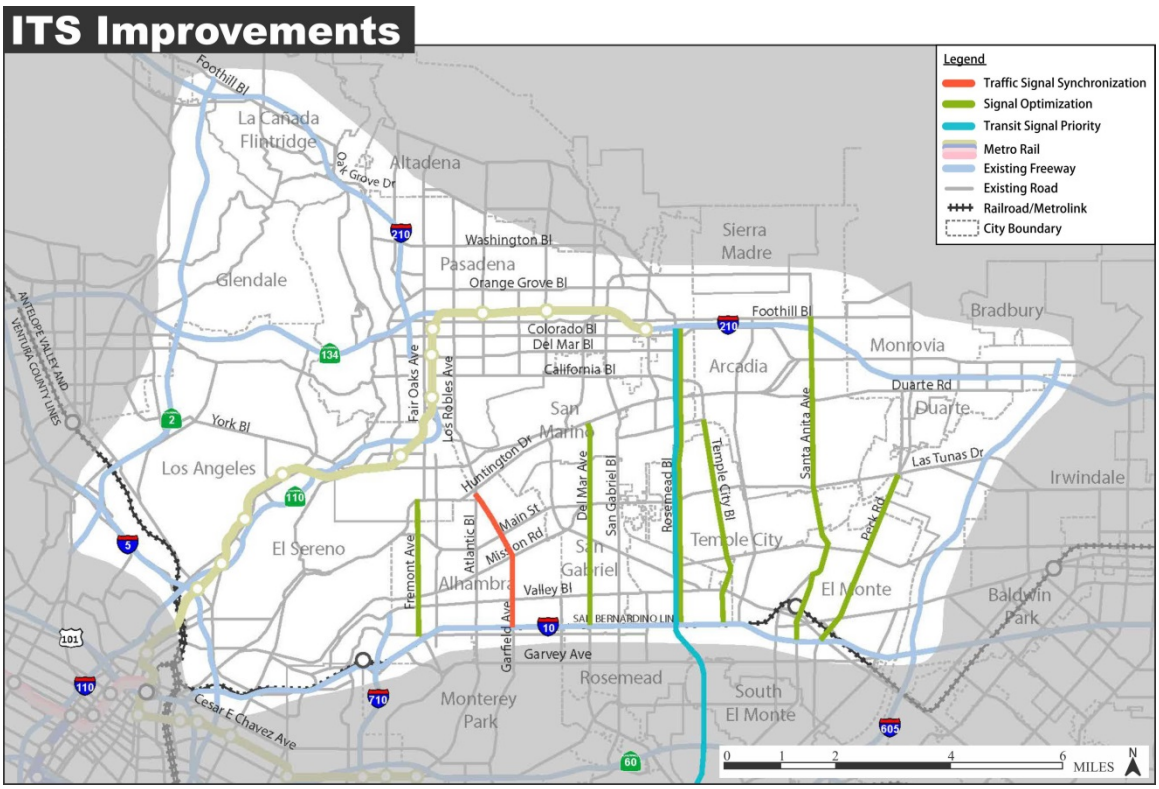


Figure ES-3: TSM/TDM Alternative ITS Improvements

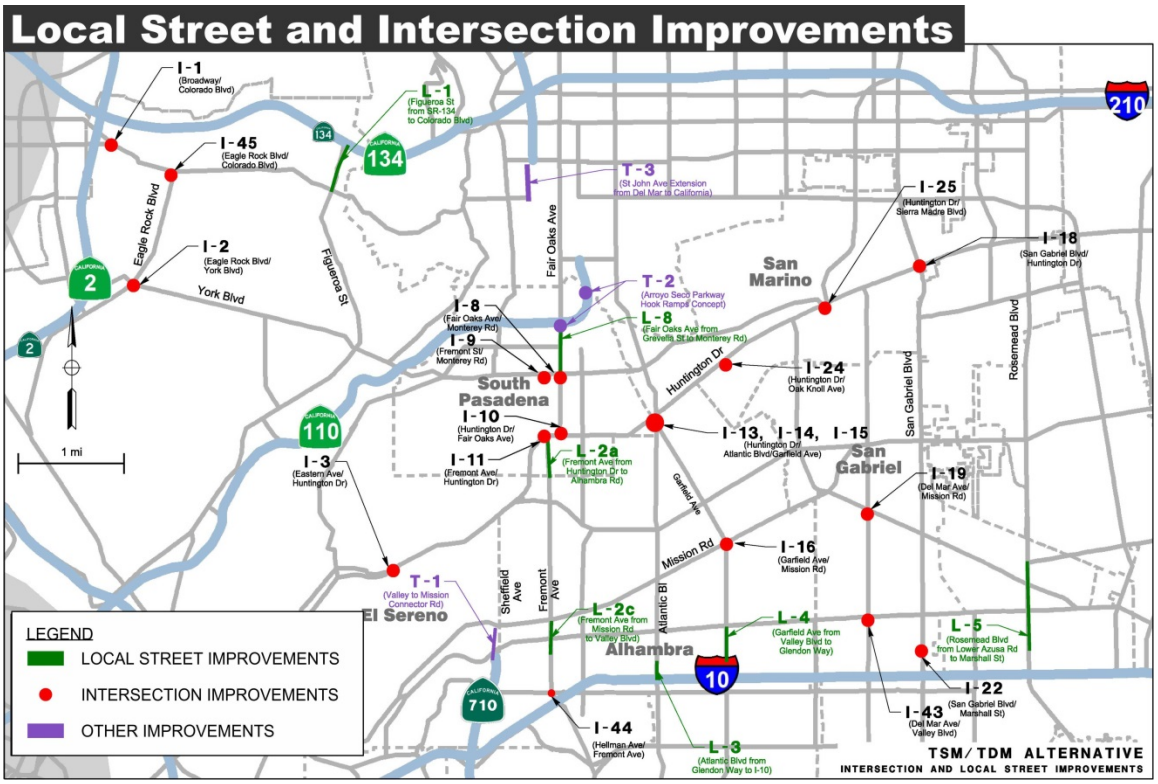
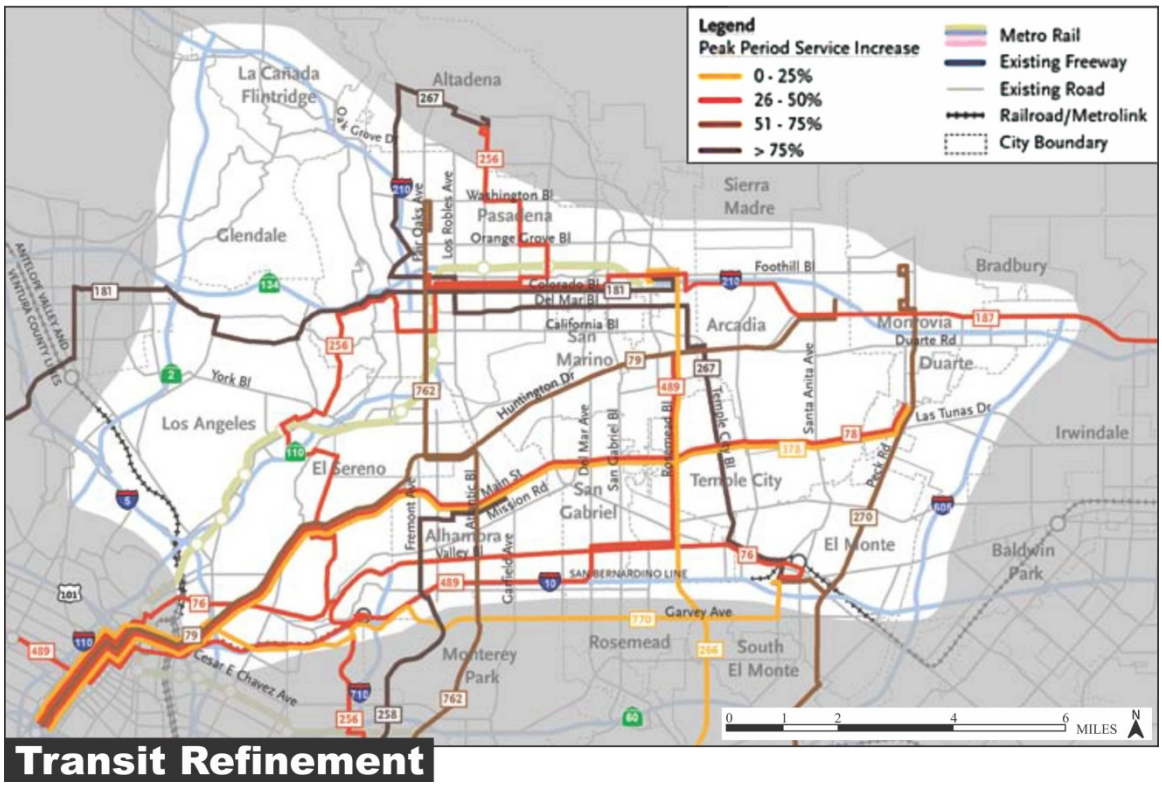
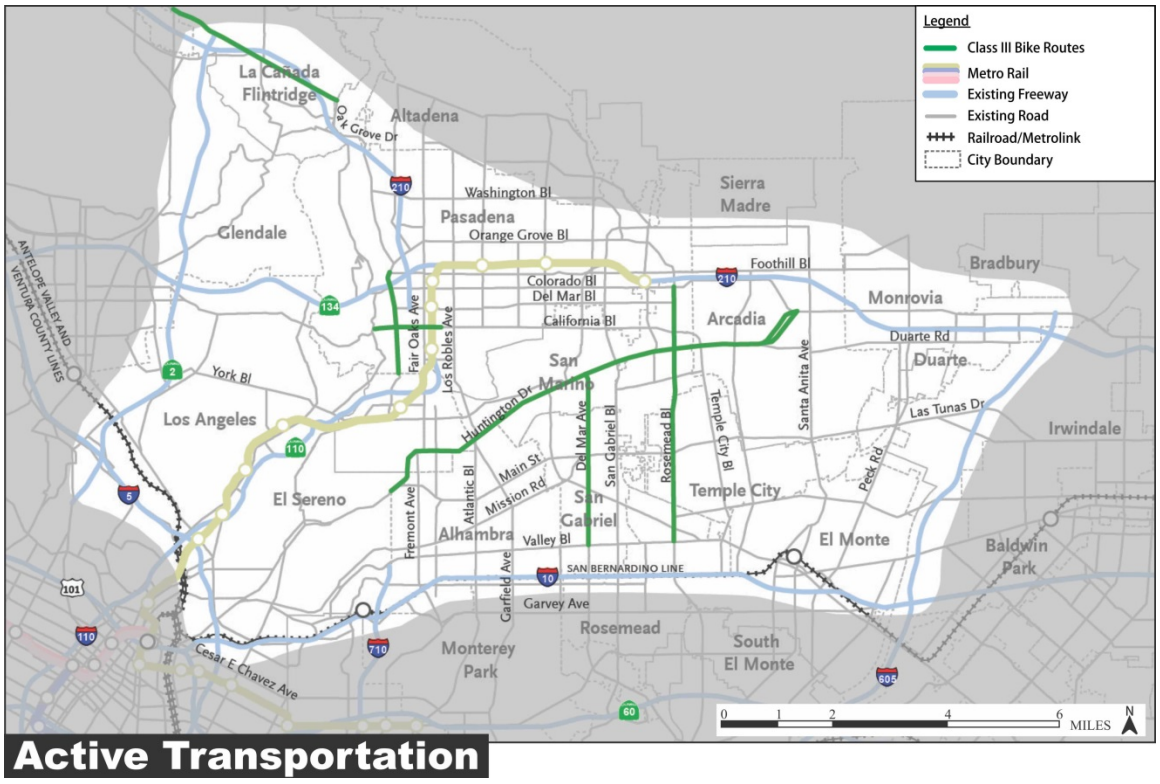


Figure ES-4: TSM/TDM Alternative Local Street and Intersection Improvements



Transit Refinement

Figure ES-5: TSM/TDM Alternative Transit Refinement Improvements



Active Transportation

Figure ES-6: TSM/TDM Alternative Active Traffic Management Improvements

Bus Rapid Transit Alternative

The BRT Alternative would provide high-speed, high-frequency bus service through a combination of new, dedicated, and existing bus lanes and mixed-flow traffic lanes to key destinations between East Los Angeles and Pasadena. The proposed route length is approximately 12 miles.

The BRT Alternative includes the BRT arterial street and station improvements, frequent bus service, new bus feeder services, and enhanced connecting bus services. Buses would operate every 10 minutes during peak hours and every 20 minutes during off-peak hours. The BRT service would generally replace the existing Metro Route 762 service in the study area. As shown on Figure ES-7, the approximately 12-mile-long BRT route would begin at Atlantic Boulevard and Whittier Boulevard to the south; extend along Atlantic Boulevard, Huntington Drive, Fair Oaks Avenue, and Del Mar Boulevard; and end with a terminal loop in Pasadena to the north. Buses operating in the corridor would be given transit signal priority from a baseline transit signal priority project that will be implemented separately by Metro.

Buses would operate in dedicated bus lanes adjacent to the curb, either in one direction or both directions, during peak periods. The new dedicated bus lanes would generally be created within the existing street rights of way through a variety of methods that include restriping the roadway, restricting on-street parking during peak periods, and narrowing medians, planted parkways, or sidewalks. Buses would share existing lanes with bicyclists and vehicles in cases where there is not enough right of way. The dedicated bus lanes would be limited to buses and right-turning traffic during AM and PM peak hours only. At other times of day, the dedicated bus lanes would be available for on-street parking use.

The BRT service would be operated using 60-foot-long articulated buses with three doors, and would have the latest fare collection technology such as on-board smart card (transit access pass [TAP] card) readers to reduce dwell times at stations.

Typical Bus Rapid Transit Vehicles

Additionally, the BRT Alternative would include bus feeder routes that would connect additional destinations with the BRT Alternative alignment. Two bus feeder routes are proposed: (1) Colorado Boulevard, Rosemead Boulevard, and Valley Boulevard to the El Monte transit station; and (2) Atlantic Boulevard near the Gold Line station to the Metrolink stations in the Cities of Commerce and Montebello via Beverly Boulevard and Garfield Avenue. In addition, the frequency and/or span of service for other existing bus services in the study area, such as the El Sol shuttle routes that serve East Los Angeles, would be increased.

The total estimated cost of the BRT Alternative is approximately $241 million (in 2014 dollars), which includes the vehicles, stations, roadway improvements, structures, and right-of-way costs for the BRT Alternative and the TSM/TDM Alternative improvements included in the BRT Alternative. The total cost includes $102 million (in 2014 dollars) for the TSM/TDM improvements. Construction of the improvements in the BRT Alternative is expected to take approximately 2 years.

Typical Light Rail Trains

Light Rail Transit Alternative

The LRT Alternative would include a passenger rail line that is operated along a dedicated guideway similar to other Metro light rail lines. The LRT alignment is approximately 7.5 miles long, with approximately 3 miles of aerial segments and approximately 4.5 miles of bored tunnel segments, and 7 stations (Figure ES-8).

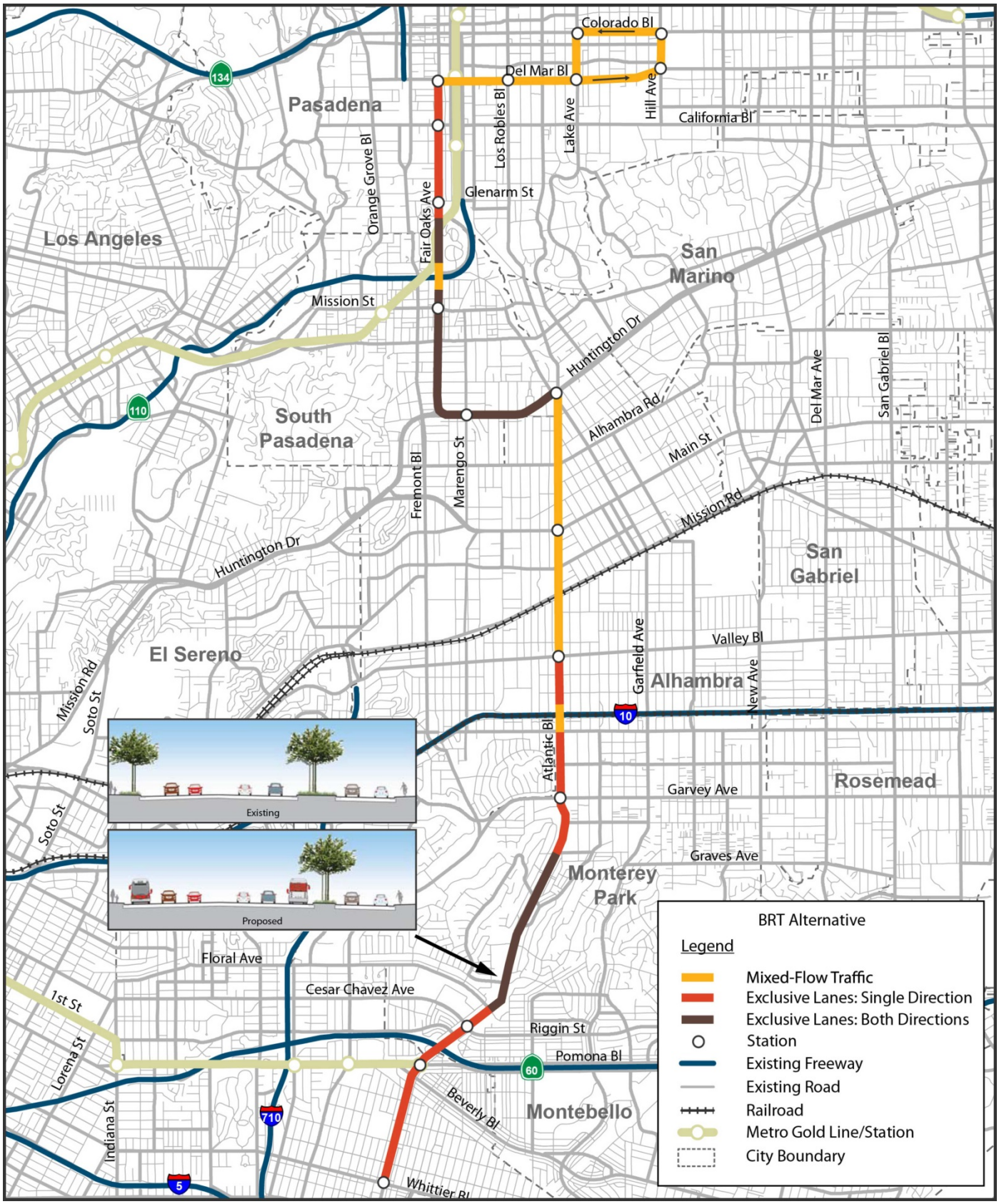


Figure ES-7: BRT Alternative

The LRT Alternative would begin at an aerial station on Mednik Avenue adjacent to the existing East Los Angeles Civic Center Station on the Metro Gold Line (Eastside Extension). The alignment would remain elevated as it travels north on Mednik Avenue, west on Floral Drive, north across Corporate Center Drive, and then along the west side of I-710, primarily in State right of way, to a station adjacent to California State University, Los Angeles (Cal State LA). The alignment would descend into a tunnel south of Valley Boulevard and travel northeast to Fremont Avenue, north under Fremont Avenue, and east to Fair Oaks Avenue. The alignment would then cross under SR 110 and end at an underground station beneath Raymond Avenue, adjacent to the existing Fillmore Station on the Metro Gold Line in Pasadena. The LRT service would be operated using light rail trains similar to the trains on the existing Metro light rail lines.

Two approximately 20-foot-diameter tunnels (one in each direction) are proposed with cross passages connecting the tunnels to allow for emergency access. The LRT tunnels are expected to be constructed using pressurized-face tunnel boring machines (TBMs) while the portals and the stations would be constructed using the cut-and-cover construction method. A TBM has a rotating cutting head at the front of the machine that excavates soil and rock as it is advanced through the ground. The excavated materials are typically removed from the tunnel by rail cars or a continuous conveyor system and taken to the construction portal. As the TBM advances, positive face pressure can be maintained to address ground loss at the face of the excavation, and a precast concrete tunnel lining system is installed, providing immediate support of the ground. The vertical and horizontal alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.

Cross passages are anticipated to be excavated using the sequential excavation method (SEM) from within the tunnels excavated by the TBMs. In the SEM, tunnel excavation and support is typically performed in a series of drifts, depending on the anticipated ground conditions, which are sequenced to develop successively larger openings until the design profile is achieved. As the SEM excavation is taking place, the appropriate ground support measures are installed to maintain stability of the excavation.

The depth of the bored tunnel will vary from approximately 20 to 90 feet below ground surface (bgs) measured from the crown (top) of the tunnel. The depth would be shallower near the construction portals. The cut-and-cover tunnel would vary from 5 to 20 feet bgs.

The tunnel design would include a ventilation system that would maintain the air velocity and temperature within the tunnel and underground stations at a comfortable level for passengers and staff.

The tunnel design would also include a fire detection and suppression system, and emergency evacuation walkways for pedestrians. An Emergency Response Plan for tunnel operations would be prepared during final design in coordination with the applicable agencies, including the Los Angeles County Sheriff, the State Fire Marshal, and local fire agencies.

Two bus feeder services would also be provided as part of the LRT Alternative: one from the Commerce Station on the Orange County Metrolink line and the Montebello Station on the Riverside Metrolink line to the Floral Station, via East Los Angeles College; and the other from the El Monte Bus Station to the Fillmore Station via Rosemead and Colorado Boulevards. In addition, the frequency and/or span of service of other existing bus services in the study area, such as the El Sol shuttle, would be increased.

The total estimated cost of the LRT Alternative structures and right of way is approximately $2,420 million (in 2014 dollars). The total cost includes $52 million (in 2014 dollars) for TSM/TDM improvements. Construction of the improvements in the LRT Alternative is expected to take approximately 6 years.

Freeway Tunnel Alternative

As shown on Figure ES-9, the alignment for the Freeway Tunnel Alternative would start at the existing southern stub of SR 710 in Alhambra, north of I-10, and connect

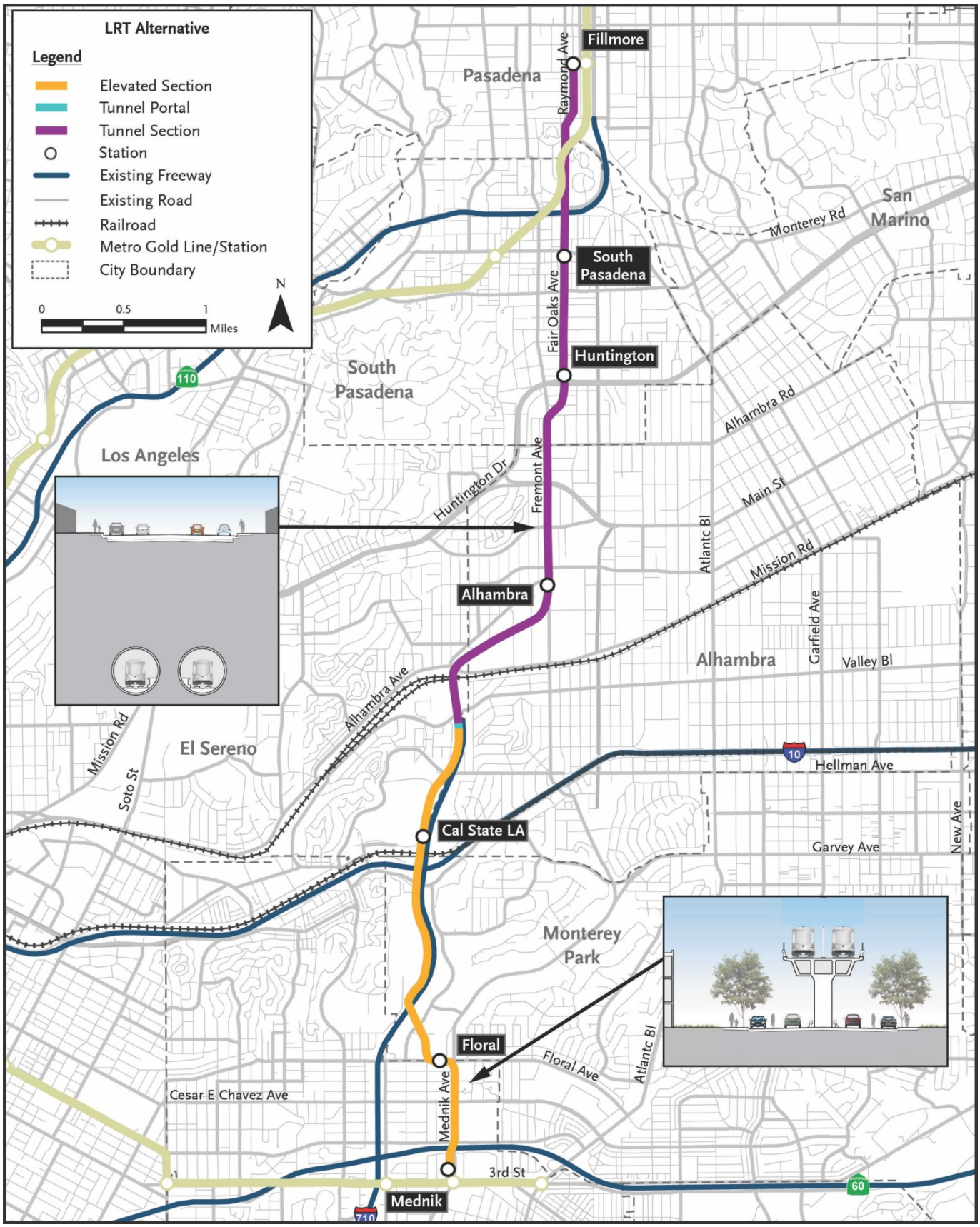


Figure ES-8: LRT Alternative

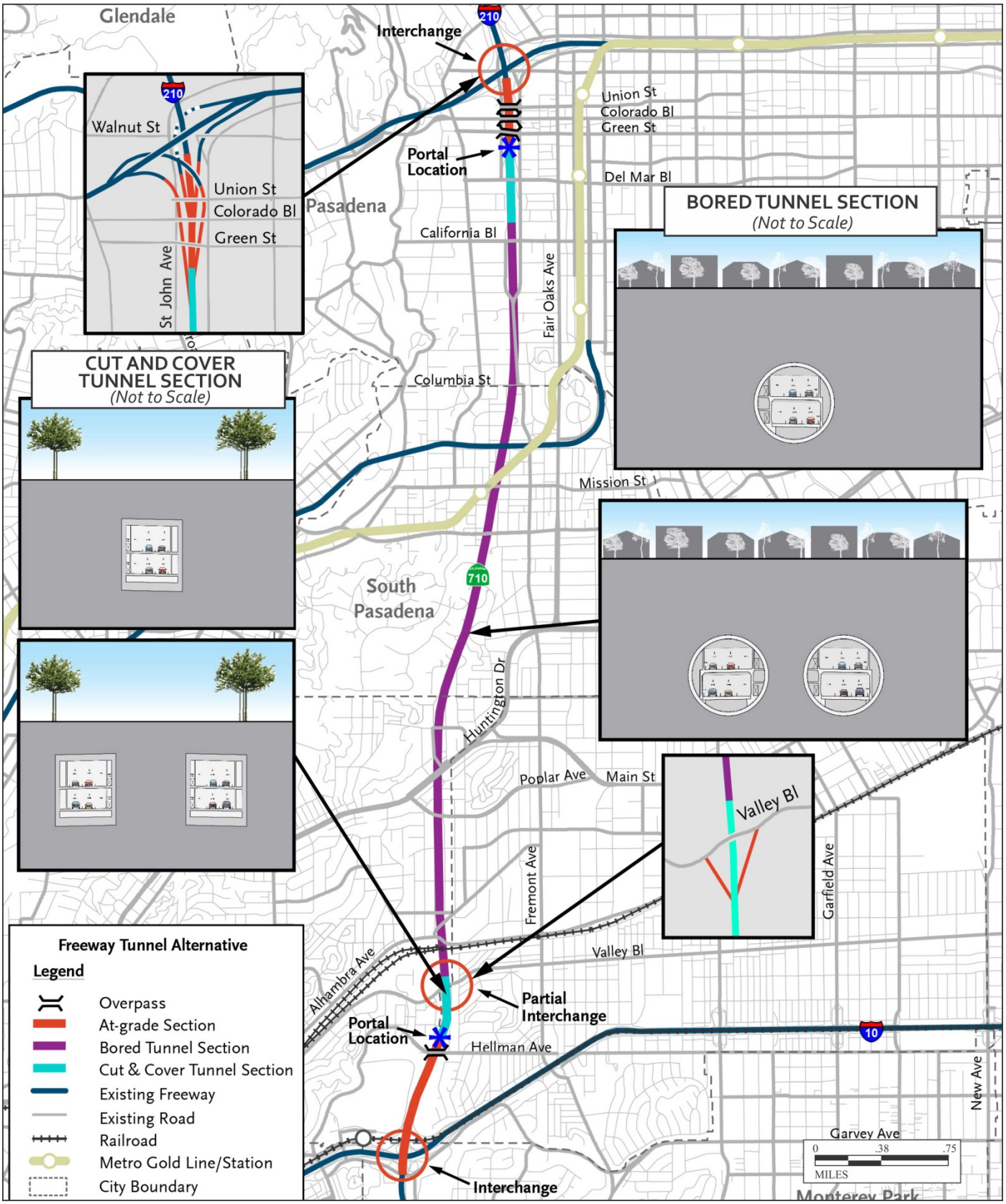
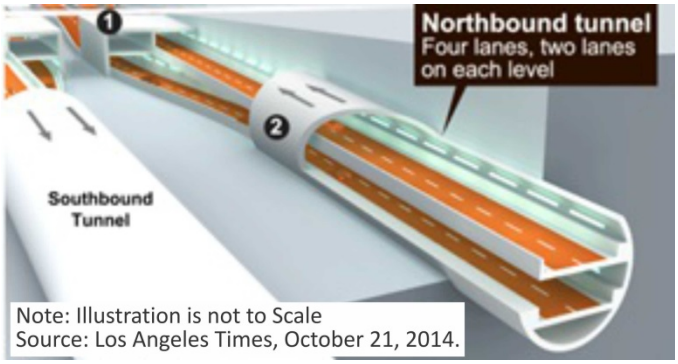


Figure ES-9: Freeway Tunnel Alternative

to the existing northern stub of SR 710, south of the I-210/SR 134 interchange in Pasadena. Short segments of cut-and-cover tunnels would be located at the south and north termini to provide access via portals to the bored tunnels. The portal at the southern terminus would be located south of Valley Boulevard. The portal at the northern terminus would be located north of Del Mar Boulevard. No intermediate interchanges are planned for the tunnel.

Current design plans indicate that the bored tunnel section of the Freeway Tunnel Alternative would be excavated using pressurized-face TBMs. It is expected that the freeway tunnels would be constructed using two TBMs for each bore (two TBMs for the single-bore design variations and four TBMs for the dual-bore design variations). Please refer to the description of TBM operation provided earlier in the LRT Alternative discussion for additional detail regarding the operation of TBMs and other construction activities associated with tunnels.

The Freeway Tunnel Alternative includes two design variations related to the number of tunnels (i.e., dual-bore and single-bore). The dual-bore design variation includes two tunnels that independently convey northbound and southbound vehicles. The single-bore design variation includes one tunnel that carries both northbound and southbound vehicles. These design variations are described below.



Conceptual Plan of the Dual-Bore Design Variation for the Freeway Tunnel Alternative

- **Dual-Bore Tunnel:** The dual-bore tunnel design variation is approximately 6.3 miles long, with approximately 4.2 miles of bored tunnel, 0.7 mile of cut-and-cover tunnel, and 1.4 miles of at-grade segments. The dual-bore tunnel variation would consist of two side-by-side tunnels (one northbound, one southbound), each of which would have two levels. Each tunnel would consist of two lanes of traffic on each level, traveling in one direction, for a total of four lanes in each tunnel. Roadway shoulders will also be provided within each tunnel. The easterly tunnel would be constructed for northbound traffic, and the westerly tunnel would be constructed for southbound traffic.

  Each bored tunnel would have an outside diameter of approximately 60 feet and would be located approximately 20 to 280 feet bgs from the top of the tunnel. Vehicle cross passages would be provided connecting the two tunnels for use in an emergency situation. The cross passages would be excavated using the SEM, similar to the LRT Alternative.

- **Single-Bore Tunnel:** The single-bore tunnel design variation is also approximately 6.3 miles long, with approximately 4.2 miles of bored tunnel, 0.7 mile of cut-and-cover tunnel, and 1.4 miles of at-grade segments. This tunnel design variation would consist of a single, two-level, bored tunnel with two lanes on each level in each direction. Northbound traffic would use the two lanes on the upper level, and southbound traffic would use the two lanes on the lower level. The single-bore tunnel would provide a total of four travel lanes.

  The single bore tunnel would also have an outside diameter of approximately 60 feet and would be located approximately 20 to 280 feet bgs. The single-bore tunnel would be in the same location as the northbound tunnel in the dual-bore tunnel design variation.

The depth of the tunnels for the Freeway Tunnel Alternative with the single-bore and dual-bore design variations would be shallower near the north and south construction portals. The majority of the underground segment of the freeway is expected to be constructed using a TBM while the remaining segments are expected to be constructed using the cut-and-cover construction method. The top of the cut-and-cover

tunnel in the south portal would be approximately 5 to 60 feet bgs. The top of the cut-and-cover tunnel segment at the north portal would be approximately 0 to 30 feet bgs. The vertical and horizontal alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.

Operational variations have been identified for the Freeway Tunnel Alternative dual-bore and single-bore design variations, as described below:

- **Dual-Bore Operational Variation:**
  - **No Tolls:** The facility would operate as a freeway with all travel lanes open to all vehicles.
  - **No Tolls and No Trucks:** The facility would operate as a freeway, but trucks would be excluded from using the tunnel. Signs would be provided along I-210, SR 134, I-710, and I-10 to provide advance notice of the truck restriction.
  - **With Tolls:** All vehicles, including trucks, using the tunnels would be tolled.
- **Single-Bore Operational Variation:**
  - **With Tolls:** All vehicles, including trucks, using the tunnel would be tolled.
  - **With Tolls and No Trucks:** The facility would operate as a tolled freeway, but trucks would be excluded from using the tunnel. All automobiles would be tolled. Signs would be provided along I-210, SR 134, I-710, and I-10 to provide advance notice of the truck restriction.
  - **With Tolls and Express Bus:** The single-bore tunnel would operate as a tolled facility and would include an Express Bus component. Express Buses would be allowed in any of the travel lanes in the tunnel. The tunnel would not include any bus-only or restricted lanes. The Express Bus route would start at the Commerce Station on the Orange County Metrolink line, and then serve the Montebello Station on the Riverside Metrolink line and East Los Angeles College before entering I-710 at Floral Drive. The bus would travel north to Pasadena via the freeway tunnel, making a loop serving Pasadena City College, the California Institute of Technology, and downtown Pasadena before re-entering the freeway and making the reverse trip.

The tunnel design would include a ventilation system that would maintain the air velocity and temperature within the tunnel at a comfortable level for travelers using the tunnel.

The tunnel design would also include a fire detection and suppression system and emergency evacuation walkways for pedestrians. An Emergency Response Plan for tunnel operations would be prepared in coordination with the applicable agencies, including the California Highway Patrol, the State Fire Marshall, and local fire agencies.

The total estimated cost of the Freeway Tunnel Alternative roadway, structures, and right of way is approximately $5,650 million (in 2014 dollars) for the dual-bore design variation and $3,150 million (in 2014 dollars) for the single-bore design variation. The total cost includes approximately $50 million (in 2014 dollars) for TSM/TDM improvements.

Construction of the Freeway Tunnel Alternative would take approximately 4 to 5 years for the single-bore design variation and approximately 5 years for the dual-bore design variation. A maximum of four TBMs would be used to construct either the dual- or single-bore design variation.

Vehicles carrying flammable or hazardous materials would be restricted from using the tunnel under both the single-bore and dual-bore design variations.

Alternatives Considered but Not Carried Forward

During the preliminary studies for the SR 710 North Study, a wide range of possible transportation alternatives was evaluated. Alternatives were identified based on past studies and comments from stakeholders, including elected officials, city and agency staff, and the community. The resulting alternatives were evaluated and refined through a sequential screening process

(including preliminary, initial, and secondary screenings) to identify the alternatives that best meet the Need and Purpose of the study. Alternatives that were evaluated and not carried forward included two BRT, three LRT, four freeway, and two highway alternatives.

Identification of a Preferred Alternative

After circulation of the Draft EIR/EIS, all comments will be considered, and Caltrans, in consultation with Metro, will identify a preferred alternative and make the final determination of the project's effect on the environment. Under the California Environmental Quality Act (CEQA), Caltrans will certify that the project complies with CEQA, will prepare Facts and Findings, and, if necessary, will prepare a Statement of Overriding Considerations (SOC) for impacts that will not be mitigated below a level of significance under CEQA, and certify that the findings and SOC have been considered prior to project approval. Caltrans will then file a Notice of Determination (NOD) with the State Clearinghouse that will identify whether the project will have significant impacts, if mitigation measures were included as conditions of project approval, findings were made, and an SOC was adopted. With respect to the National Environmental Policy Act (NEPA), Caltrans, as assigned by the Federal Highway Administration (FHWA), will document and explain its decision regarding the selected alternative, project impacts, and mitigation measures in a Record of Decision (ROD).

Joint CEQA/NEPA Document

The proposed project is a joint project by Caltrans and Metro, and is subject to State and federal environmental review requirements. Project documentation, therefore, has been prepared in compliance with both CEQA and NEPA. Caltrans is the lead agency under NEPA and CEQA. In addition, environmental review, consultation, and any other action required in accordance with applicable federal laws for this project is being, or has been, carried out by Caltrans under its assumption of responsibility pursuant to 23 United States Code (USC) 327. If the Freeway Tunnel Alternative is identified as the Preferred Alternative, Caltrans, as assigned by the FHWA, may approve the EIR/EIS or conduct additional environmental studies. If the TSM/TDM Alternative, BRT Alternative, or LRT Alternative is identified as the Preferred Alternative, Metro may adopt the approved EIR or conduct additional environmental studies. If the No Build Alternative is identified as the Preferred Alternative, Caltrans, as assigned by the FHWA, in cooperation with Metro, would approve the EIR/EIS and not move forward with any of the Build Alternatives.

As shown on Figure ES-10, after receiving comments from the public and reviewing agencies, a Final EIR/EIS will be prepared. Caltrans may prepare additional environmental and/or engineering studies to address comments. The Final EIR/EIS will include responses to

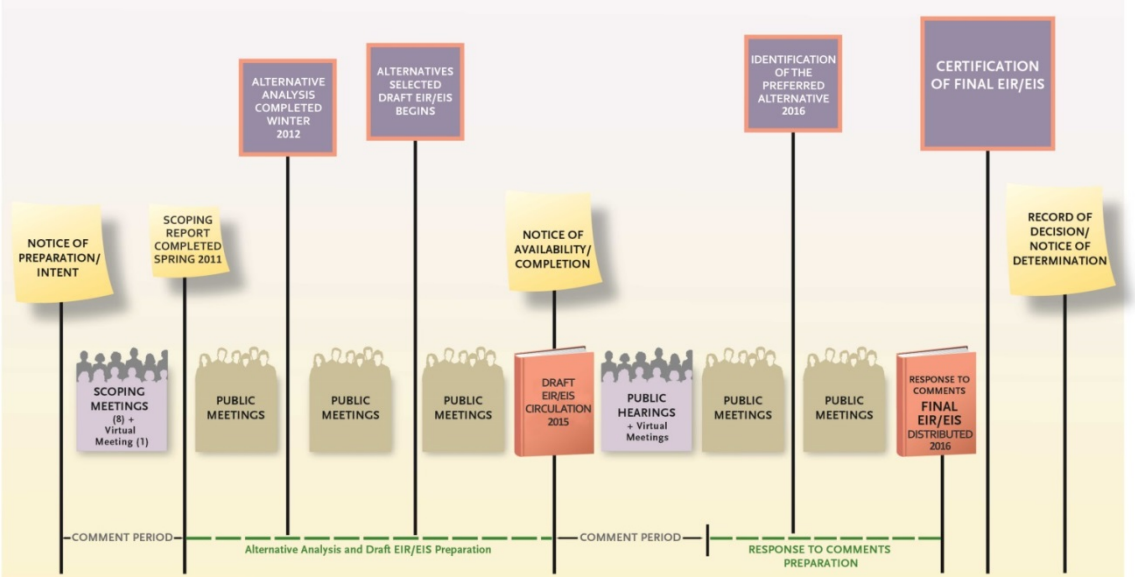


Figure ES-10: Environmental Process Timeline

comments received on the Draft EIR/EIS and will identify the preferred alternative. After the Final EIR/EIS is distributed, if Caltrans decides to approve the project, a NOD will be published for compliance with CEQA, and a ROD will be published for compliance with NEPA.

NEPA requires that the effects of a project be considered and addressed. However, because NEPA is concerned with the significance of the project as a whole, NEPA does not require that a determination of significant impacts be stated in an EIS. Therefore, some impacts determined to be significant under CEQA may not lead to a determination of significance under NEPA.

CEQA, on the other hand, does require Caltrans to identify each "significant effect on the environment" resulting from the project as well as ways to mitigate each significant effect. If the project may have a significant effect on any environmental resource, then an EIR must be prepared. Each and every significant effect on the environment must be disclosed in the EIR and mitigated, if reasonably feasible. In addition, the CEQA Guidelines list a number of mandatory findings of significance, which also require the preparation of an EIR. There are no types of actions under NEPA that parallel the findings of mandatory significance of CEQA.

Project Impacts

Summary of Impacts and Measures

Table ES-1 provides a brief comparison of the impacts associated with each of the Build Alternatives based on the environmental and technical studies conducted for the project. Table ES-1 also describes avoidance, minimization, and mitigation measures included in the Build Alternatives to address adverse environmental impacts of those alternatives. Table ES-1 is provided following the last page of text in this section. The environmental impacts related to Community Character and Cohesion, Relocations and Real Property Acquisitions, Traffic and Transportation, Visual/Aesthetics, Cultural Resources, Air Quality, and Construction Impacts have been raised by many people during the environmental process and are discussed briefly in the following sections.

Temporary and short-term effects are impacts that would occur during and as a result of project construction activities. Permanent and long-term effects are impacts that would occur as a result of the project construction and/or operations activities that would occur over a period longer than the project construction period. The environmental impacts described below for the Build Alternatives would not occur under the No Build Alternative.

Community Character and Cohesion

Because the TSM/TDM and Freeway Tunnel Alternatives would result in a minimal number of non-residential displacements and the BRT Alternative would not result in any non-residential displacements, these alternatives would not affect the character or cohesion of the communities in which the improvements would be located.

Although the LRT Alternative would result in a number of nonresidential displacements, those displacements would not affect the character or cohesion of most of the communities in which the LRT Alternative improvements would be located (i.e., Alhambra, El Sereno, Irwindale, Monterey Park, Pasadena, and South Pasadena). However, in the unincorporated community of East Los Angeles, the LRT Alternative would result in the displacement of 15 businesses along Mednik Avenue just south of State Route 60 (SR 60), which may disrupt the social fabric of the community in this area. Based on the currently available properties for relocation, these businesses are not likely to be relocated in the immediate vicinity of their current locations. Due to the types of services these businesses offer (i.e., laundromat, drinking water, credit union, and restaurants), their location near the East Los Angeles Civic Center, and the high percentage of transit-dependent residents in the area, local residents are likely to rely on the services provided by these businesses on a day-to-day basis. Therefore, the displacement of 15 businesses would adversely affect the community character and cohesion of this part of East Los Angeles.

Relocations and Real Property Acquisitions

The TSM/TDM Alternative would result in 1 full parcel acquisition in Pasadena and 31 partial parcel acquisi-

tions in Alhambra, Eagle Rock, Pasadena (which would not displace any existing land uses), Rosemead, San Gabriel, and South Pasadena. The TSM/TDM Alternative would also result in the displacement of 1 business with 6 employees that has a lease on a State-owned parcel in El Sereno. No residential relocations would be required.

The BRT Alternative would require no full parcel acquisitions and 45 partial parcel acquisitions in Alhambra, East Los Angeles, Monterey Park, Pasadena, and South Pasadena. No business or residential relocations would be required.

The LRT Alternative would result in 58 full parcel acquisitions in Alhambra, East Los Angeles, Monterey Park, Pasadena, and South Pasadena and 11 partial parcel acquisitions in Alhambra, East Los Angeles, El Sereno, Monterey Park, Pasadena, and South Pasadena. The property acquisitions would require 73 business relocations, which would displace 645 employees. In addition, displacement of 1 business with a lease on a State-owned parcel in El Sereno would displace 30 employees. No residential relocations would be required.

The Freeway Tunnel Alternative single-bore and dual-bore design variations would result in 1 full parcel acquisition in Alhambra. The single-bore and dual-bore design variations would result in 2 and 3 partial parcel acquisitions, respectively, in El Sereno. Both design variations would result in 1 full parcel acquisition in Alhambra, which would result in the relocation of 1 business and the displacement of 5 employees. Both design variations would also result in the displacement of 1 business with a lease on a State-owned parcel in El Sereno, which would displace 30 employees. No residential relocations would be required.

Traffic and Transportation

Temporary Effects. Construction of the improvements in the TSM/TDM Alternative would require lane width reductions, reductions in the number of lanes, and/or restrictions on the number of lanes during off-peak hours. These restrictions would be relatively minor, and no detours are anticipated to be needed. Temporary lane restrictions and delays for the traveling public could occur in Alhambra, Eagle Rock, El Sereno, Glassell Park, Pasadena, Rosemead, San Gabriel, San Marino, South Pasadena, and the Unincorporated San Gabriel Valley Communities during construction of the TSM/TDM Alternative.

For the BRT Alternative, where widening or improvements are proposed on Atlantic Boulevard, Huntington Drive, and Fair Oaks Avenue in Alhambra, East Los Angeles, Monterey Park, and South Pasadena, temporary lane restrictions would be required, including lane width reductions, reductions in the number of lanes, and/or restrictions on the number of lanes during off-peak hours. No detours are anticipated to be required. Construction activities associated with the improvements under the BRT Alternative would result in minor delays for the traveling public.

Construction of the LRT Alternative could result in temporary lane restrictions at several locations. In addition, where the elevated alignment of the LRT would cross SR 60, I-710, or other roads, overnight closures of those roads would be required to accommodate the placement of concrete barriers adjacent to the median and the construction of falsework. Although no road closures are anticipated to require signed detour routes, the weekend full road closures would require public and driver notification to use alternative routes. Some construction activities associated with the improvements under the LRT Alternative would result in delays for the traveling public.

Construction of the single- and dual-bore design variations of the Freeway Tunnel Alternative would result in delays and detours for the traveling public in in the vicinity of the south tunnel portal in Alhambra, El Sereno, and Monterey Park, and in the City of Pasadena in the vicinity of the north tunnel portal. In addition, the construction of either design variation is anticipated to require temporary closures of the freeway on- and off-ramps, which may inconvenience the traveling public.

Construction of the TSM/TDM and BRT Alternatives would involve only minor street work (e.g., restriping or

changes to curbs) and would be temporary and short in duration. The temporary loss of some on-street parking spaces during the minor street work construction would only result in very limited impacts to on-street parking availability. Temporary parking losses of 240 spaces would occur during construction of the LRT Alternative. All but 4 of those on-street parking spaces would be restored and available for use after construction is complete. The Freeway Tunnel Alternative would include construction on, and the temporary closure of, the Green Street Bridge, resulting in the temporary loss of 17 parking spaces on that bridge. At the completion of construction at the Green Street Bridge, all the parking spaces on that bridge will be restored and available for normal use.

Construction of the Build Alternatives may require temporary closures of sidewalks, crosswalks, and bicycle facilities to protect the safety of pedestrians, bicyclists, and construction workers. As a result, pedestrian and bicycle access routes and Americans with Disabilities Act accessibility would be temporarily disrupted during construction.

Permanent Effects. In 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in minor increases in AM and PM peak-hour vehicle miles traveled (VMT). VMT is defined as the number of miles traveled by vehicles in a specific region (in this case, the project study area) for a specific time period (in this case, the AM and PM peak hours). The Freeway Tunnel Alternative single-bore design variation would result in a 110,000-mile (1.0 percent) increase in the combined AM and PM peak-period VMT. The Freeway Tunnel Alternative dual-bore design variation would result in a 210,000-mile (approximately 2.0 percent) increase in the combined AM and PM peak-period VMT, which is the most additional capacity and largest differences in mobility of all the Build Alternatives. By shifting trips to freeways, the Freeway Tunnel Alternative would divert VMT off of local arterials, resulting in less cut-through traffic.

In 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in either no change or very minor changes in AM and PM peak-hour vehicle hours traveled (VHT). VHT is defined as the number of hours spent traveling in a specific region (in this case, the project study area) for a specific time period (in this case, the AM and PM peak hours). The Freeway Tunnel Alternative single-bore design variation would result in a 4,000-hour (approximately 1.4 percent) reduction in total peak-period study area VHT. The Freeway Tunnel Alternative dual-bore design variation would result in a 7,000-hour (approximately 2.5 percent) reduction in VHT, which is the largest reduction in study area VHT of all the Build Alternatives.

In 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in minor increases in daily north-south person trips though the study area. The Freeway Tunnel Alternative single-bore design variation would result in approximately half the increase in person throughput (trips) as the dual-bore operational variations. The Freeway Tunnel Alternative dual-bore design variation would result in the largest increase in the total north-south person throughput (trips) of all the Build Alternatives.

The Build Alternatives would result in increases in job accessibility of between 20,000 and 65,000 jobs compared to the No Build Alternative. The Freeway Tunnel Alternative would result in the highest increase in job accessibility due to the increased mobility and speed provided by the single-bore tolled operational variations.

In 2035, the TSM/TDM, BRT, and LRT Alternatives would all result in a minor decrease in freeway performance and modest increase in arterial performance. The Freeway Tunnel Alternative would have the largest increase in freeway and arterial performance, with the dual-bore design variation performing slightly better than the single-bore design variation.

In 2035, the truck VMT for the TSM/TDM, BRT, and LRT Alternatives is the same as for the No Build Alternative. For the Freeway Tunnel Alternative, the arterial system truck intensity generally decreases for all the design and

operational variations, with the freeway system truck intensity the same as or lower than the No Build Alternative, depending on the design and operational variation.

The potential for the Build Alternatives to result in adverse effects at intersections and on freeway segments is based on the level of service (LOS) criteria. The numbers of intersections and freeway segments projected to experience adverse effects under the Build Alternatives in 2035 are summarized in Table ES-1.

Visual/Aesthetics

The TSM/TDM, BRT, LRT, and Freeway Tunnel Alternatives would have short-term temporary impacts to visual quality during construction that would cease after completion of construction. Construction of the tunnel for the Freeway Tunnel Alternative would take up to approximately 5 years, and construction of the LRT Alternative could take up to approximately 6 years; therefore, the construction of the LRT and Freeway Tunnel Alternatives would result in temporary impacts to visual quality due to construction activities for a longer period than the TSM/TDM and BRT Alternatives. The TSM/TDM, BRT, and LRT Alternatives would result in moderate to moderately high visual impacts during construction while the Freeway Tunnel Alternative would result in moderately low to moderate visual impacts during construction. Existing land uses would not experience glare from night lighting during the construction of the tunnel and/or the associated freeway. Overall, construction activities would be temporary, and the visual impacts related to construction activities would cease after completion of construction.

The Build Alternatives would result in the following permanent visual impacts to Key Views:

- **TSM/TDM Alternative:** The TSM/TDM Alternative mainly involves minor improvements to existing roads and intersections without substantive changes in the physical facilities or views to and from these improvements. As a result, there would only be minor visible impacts to the environment under the TSM/TDM Alternative. Due to the low-profile (ground-level) nature of these improvements and the low perspective of potential viewers, the TSM/TDM Alternative would not result in permanent visual impacts. The TSM/TDM Alternative would also not result in permanent impacts related to views, light, glare, shade, and shadows. Seven noise barriers proposed for the TSM/TDM Alternative would result in potential visual impacts on the areas near the noise barriers.

Typical Noise Barrier Along a Freeway

- **BRT Alternative:** The BRT Alternative would result in the addition of new bus stops and signage that would not change the existing condition or the visual quality, and the overall resource change would be low. The operation of the BRT Alternative would result in a low permanent visual impact based on the visual quality, the resource change, the visual character and the viewer response to the implementation of this alternative. The BRT Alternative would also not result in permanent impacts related to views, light, glare, shade, and shadows. The BRT Alternative would result in no change to visual quality from the existing condition for the Key Views evaluated. Three noise barriers proposed for the BRT Alternative would result in potential visual impacts on the areas adjacent to the noise barrier.
- **LRT Alternative:** The LRT Alternative would result in a moderately low to moderate permanent visual impact based on the visual quality, the resource change, the visual character, and the viewer response to this alternative. The LRT Alternative

would result in low permanent impacts related to views, light, glare, shade, and shadows. No noise barriers are proposed for the LRT Alternative. A new screen wall with a height of 8 feet is proposed along the perimeter of the LRT maintenance yard (which is proposed on both sides of Valley Boulevard at the terminus of SR 710) and would result in a moderate impact.

- **Freeway Tunnel Alternative:** The Freeway Tunnel Alternative would result in a moderately low to moderate permanent visual impact based on the visual quality, the resource change, the visual character, and the viewer response to the implementation of this alternative. The Freeway Tunnel Alternative would not result in permanent impacts related to light, glare, shade, and shadows. The Freeway Tunnel Alternative would result in moderately low to moderate visual changes. Four noise barriers proposed for the Freeway Tunnel Alternative dual-bore and single-bore design variations would have a visual impact on the adjacent area. Two additional preliminary noise barriers ranging in height from 12 to 20 feet are proposed only for the dual-bore design variation and would also have a visual impact on the adjacent area. The visual impacts as a result of the noise barriers would range from moderate to high, depending on the wall location, height, and affected viewer group.

Cultural Resources

There are 73 properties in the Area of Potential Effects (APE) for the Build Alternatives that are listed or eligible for listing in the National Register of Historic Places (National Register), including buildings, Historic Districts, and archaeological sites in the Cities of Los Angeles, Monterey Park, Alhambra, South Pasadena, Pasadena, San Gabriel, Rosemead, and San Marino, and the unincorporated community of East Los Angeles. There are an additional 9 properties that are historical resources pursuant to CEQA but are not listed or eligible for listing in the National Register. Based on the preliminary *Finding of No Adverse Effect for the State Route 710 North Study*, the Build Alternatives would result in either no adverse effect or no adverse effect based on compliance with standard conditions and/or project conditions on historic properties in the APE.

For all the Build Alternatives, there is potential for previously undocumented cultural materials or human remains to be unearthed during site preparation, grading, or excavation. Because there are no identified Native American sacred sites/Traditional Cultural Properties in the APE for the Build Alternatives, the construction and operation of the Build Alternatives would not result in impacts on those types of resources.

Air Quality

Temporary Effects. During construction of the Build Alternatives, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment during construction of the Build Alternatives are anticipated and would include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_X), volatile organic compounds (VOCs), ozone (O_3), directly-emitted particulate matter (particulate matter less than 10 and 2.5 microns in size [PM_{10} and $PM_{2.5}$, respectively]), and toxic air contaminants (TACs) such as diesel particulate matter plus diesel exhaust organic gases (diesel PM). Some phases of construction, particularly asphalt paving, would result in short-term odors in the immediate area of paving activities. Those odors would be quickly dispersed below detectable thresholds as the distance from the paving activities increases.

All the Build Alternatives would comply with applicable South Coast Air Quality Management District (SCAQMD) requirements related to the control of construction dust and equipment emissions.

Long-Term Effects. The SR 710 North Freeway Extension (Tunnel) Alternative is listed in the 2012 financially constrained RTP and 2015 FTIP. The tolled operational variation of the Freeway Tunnel Alternative dual-bore design variation is consistent with the scope of the

design concept of the RTP and FTIP. Therefore, the tolled operational variation of the Freeway Tunnel Alternative dual-bore design variation is in conformance with the SIP. The RTP and FTIP would have to be amended should one of the following be selected: TSM/TDM Alternative, BRT Alternative, LRT Alternative, Freeway Tunnel Alternative single-bore design variation, or the non-tolled operational variations of the Freeway Tunnel Alternative dual-bore design variation.

The SR 710 North Study area is in a nonattainment area for the federal $PM_{2.5}$ standards and in an attainment/maintenance area for the federal CO and PM_{10} standards; therefore, the Build Alternatives are not expected to result in any concentrations exceeding the 1-hour or 8-hour CO standards.

A $PM_{2.5}$ and PM_{10} hot-spot form (May 2014) was submitted to and reviewed by the Transportation Conformity Working Group (TCWG). The TCWG determined that the TSM/TDM, BRT, and LRT Alternatives are not Projects of Air Quality Concern (POAQC). The Freeway Tunnel Alternative single-bore and dual-bore design variations are considered POAQCs. If the Freeway Tunnel Alternative with either the single-bore or dual-bore design variation is identified as the Preferred Alternative, a quantitative PM hot-spot analysis will be conducted to demonstrate that the project would not delay attainment of, worsen existing violation of, or cause an exceedance of the $PM_{2.5}$ or PM_{10} NAAQS, and meets conformity requirement.

In addition to the demonstration of conformity requirement, $PM_{2.5}$ and PM_{10}, 24-hour $PM_{2.5}$, annual $PM_{2.5}$, and 24-hour PM_{10} concentration values were calculated along the existing and proposed roadways in the project area based on the EPA *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (November 2013). This modeling demonstrates that the highest 24-hour $PM_{2.5}$, annual hour $PM_{2.5}$, and annual hour PM_{10} concentrations for both design variations of the Freeway Tunnel Alternative would not exceed the 2025 and 2035 No Build Alternative concentrations.

The Build Alternatives would not generate new vehicular traffic trips because it would not construct new homes or businesses. However, there is a possibility that some traffic currently using other routes would use the new facilities, thereby increasing VMT and vehicle emissions in the project area.

In 2020/2025 and 2035, the regional criteria pollutant emissions for all Build Alternatives would be lower than existing condition emissions, with the exception of the Freeway Tunnel Alternative dual-bore design variation PM_{10} emissions in 2035. The 2020/2025 regional criteria pollutant emissions for the Build Alternatives would be lower than the 2020/2025 No Build Alternative emissions with exception of the following:

- TSM/TDM PM_{10} emissions
- Freeway Tunnel Alternative single-bore design variation PM_{10} and $PM_{2.5}$ emissions
- Freeway Tunnel Alternative dual-bore design variation CO and ROG emissions

The 2035 regional criteria pollutant emissions for the Build Alternatives would be lower than the 2035 No Build Alternative emissions with exception of the following:

- TSM/TDM, BRT, and LRT, and Freeway Tunnel Alternative (dual-bore) CO, NO_X, PM_{10}, and $PM_{2.5}$ emissions
- Freeway Tunnel Alternative single-bore design variation PM_{10} and $PM_{2.5}$ emissions

A substantial decrease in mobile source air toxics (MSAT) emissions can be expected between the existing (2012) and future (2020, 2025, and 2035) No Build Alternative. The 2020/2025 MSAT emissions for the Build Alternatives would be lower than the 2020/2025 No Build emissions with the exception of diesel PM emissions for the LRT and Freeway Tunnel Alternatives. The 2035 MSAT emissions for the Build Alternatives would be lower than the 2035 No Build emissions with the exception of diesel PM emissions for the TSM/TDM, BRT, and Freeway Tunnel Alternatives. While the Build Alternatives would result in a small increase in localized

MSAT emissions, the EPA vehicle and fuel regulations, coupled with fleet turnover, would result in substantial reductions over time that would cause regionwide MSAT levels to be substantially lower than they are today.

The EPA and FHWA have not issued explicit guidance or methods to conduct project-level greenhouse gas (GHG) analysis. The four strategies set forth by the FHWA to lessen climate change impacts (i.e., improved transportation system efficiency, cleaner fuels, cleaner vehicles, and reduction in the growth of VHT) correlate with efforts that the State of California has undertaken and is undertaking to deal with transportation and climate change.

Construction Impacts

For all Build Alternatives, both typical and resource-specific construction impacts could occur. Construction impacts typical to all of the Build Alternatives include delays from lane closures and narrowing, roadway drainage pattern alterations, waste from roadway widening, and short-term increases in noise levels and air pollutant emissions. Resource-specific construction impacts are listed below:

- **Land Use:** Construction of the Build Alternatives would temporarily affect nearby land uses and would include disruption of local traffic patterns and access to residences and businesses; temporary construction easements; increased traffic congestion; and increased noise, vibration, and dust.
- **Parks and Recreation:** Parks, recreation resources, and bikeways within 500 feet of the physical improvements of the Build Alternatives that would be constructed at or above the ground surface would be subject to short-term air quality, noise, and traffic/access impacts, In some cases, on-street bikeways in the vicinity of the Build Alternative improvements may need to be temporarily rerouted around construction zones. Detoured on-street bikeways would be restored to their original condition at the completion of construction. The BRT Alternative would require the temporary use of 0.02 acre for a TCE during project construction and the permanent acquisition of 0.011 acre of Cascades Park in Monterey Park.
- **Community Character and Cohesion:** Construction of the improvements for the Build Alternatives is anticipated to result in short-term access disruptions related to construction and therefore result in a short-term impact to community character and cohesion. A Traffic Management Plan (TMP) would be implemented during construction with minimal interference to the traveling public. In addition, construction jobs would be created by the construction of the Build Alternatives.
- **Environmental Justice:** Construction activities would potentially temporarily affect environmental justice populations and non-environmental justice populations in the study area. However, construction activities would provide jobs, which would benefit local economies that include minority and low-income populations.
- **Utilities and Emergency Services:** Construction activities that require closures of travel lanes and ramps could result in traffic delays that could affect the ability of fire, law enforcement, and emergency service providers to meet response time goals within the Study Area. Measures will be implemented to protect utilities in-place to avoid utility service disruptions.
- **Traffic Circulation/Transportation:** During construction, the Build Alternatives would result in temporary impacts to traffic circulation due to traffic diversions resulting from temporary closures to local roadways, sidewalks and bikeways, and freeway lanes and ramps. A TMP will be implemented to address changes in traffic flows and provide measures to minimize the effects of construction activities on traffic flows and travel within the Study Area.
- **Visual/Aesthetics**: Short-term visual impacts under the Build Alternatives would occur during the construction period and would include removal of existing structures and vegetation, construction of the Build Alternative improvements, construction vehicles, and construction staging areas. Construction

activities are temporary, and the visual impacts related to construction activity would cease after completion of construction.

- **Hydrology/Floodplains:** Construction impacts would only affect the Laguna Regulating Basin and Dorchester Channel (dual-bore design variation only) under the Freeway Tunnel Alternative. Land and vegetation would be cleared, exposing soil to the potential for erosion and downstream transport of sediments to occur.
- **Water Quality:** Events such as the accidental discharge of waste products produced during construction are of primary concern. Other concerns, such as disturbed soil and erosion; runoff from the construction site; and groundwater de-watering (LRT and Freeway Tunnel Alternative) are potential issues during construction of the Build Alternatives. Standard construction practices require the capture and treatment of all runoff from the construction area.
- **Geology, Soils, Seismic, and Topography:** Construction activities related to the Build Alternatives may result in temporary impacts including the potential for minor ground settlement. The construction activities associated with the proposed Build Alternatives could potentially be affected by ground motion, liquefaction, and fault-induced ground rupture if an earthquake were to occur during construction, although the probability is low.
- **Paleontology:** Earth-moving operations could result in the destruction of fossils and fossiliferous rock units within the construction disturbance limits. These types of impacts can be partially mitigated by collecting and preserving a representative sample of the entire fossil assemblage and associated geological information in the areas disturbed by project construction.
- **Hazardous Waste:** There is potential for all four Build Alternatives to encounter hazardous materials during ground-disturbing activities. Hazardous materials that may be encountered during construction of the Build Alternatives include aerially deposited lead (ADL); asbestos-containing materials (ACMs), polychlorinated biphenyls (PCBs), and/or lead-based paint (LBP); and elevated concentrations of metals such as lead.
- **Air Quality/Greenhouse Gases:** During construction, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment also are anticipated and would include CO, NOX, volatile organic compounds (VOCs), PM_{10}, $PM_{2.5}$, toxic air contaminants, and GHGs.
- **Construction Noise:** The operation of equipment and other related activities will result in temporary noise impacts during construction of the Build Alternatives. These noise levels would vary depending on the types of equipment and construction activities occurring at a specific time. These impacts would be temporary and would cease when construction of the Build Alternatives is completed.
- **Energy:** Construction equipment and construction worker vehicles operating during construction of the Build Alternatives would use fossil fuels. This increased fuel consumption would be temporary, would cease at the end of construction activities, and would not have a residual requirement for additional energy input. The marginal increases in fossil fuel use resulting from project construction are not expected to have appreciable impacts on energy resources.
- **Wetlands/Other Waters:** Temporary impacts to jurisdictional areas may occur during construction where wetlands or waters are temporarily disturbed during construction of the Freeway Tunnel Alternative
- **Plant Species:** Temporary impacts to populations of special-status plant species and trees protected by local ordinances could occur under the LRT and Freeway Tunnel Alternative
- **Animal Species:** Temporary impacts to animal species may occur during construction where habitats are temporarily disturbed during grading or other construction-related activities. Temporary indirect

construction effects to animal species are expected as a result of construction noise, light, vibration, dust, and human encroachment.

- **Threatened & Endangered Species**: Temporary impacts to threatened and/or endangered species may occur during construction where habitats are temporarily disturbed during grading or other construction-related activities. Temporary construction effects to listed species are expected as a result of construction noise, light, vibration, dust, and human encroachment.
- **Invasive Species:** Construction of the SR 710 Build Alternatives has the potential to spread invasive species through the entering and exiting of construction equipment contaminated by invasive species, the inclusion of invasive species in seed mixtures and mulch, and the improper removal and disposal of invasive species so that its seed is spread through construction equipment.
- **Cumulative Impacts:** Temporary cumulative impacts as a result of the Build Alternatives, in combination with other past, present, and reasonably foreseeable future projects, are anticipated to occur if projects are under construction concurrently. Temporary impacts described above sections, as well as impacts for other projects in the Study Area, will be minimized or mitigated and will, therefore, not have an cumulative impact on humans or the physical environment. Additionally, it is possible that, if more than one project is being constructed in the same general area, there could be a cumulative effect on consumption of local resources such as fuel, energy, construction materials, etc. Temporary cumulative impacts to traffic and circulation can also result from the construction of more than one project in a general area. In this case, TMPs for each project will be coordinated to ensure adequate circulation in the area.

Summary of Significant Unavoidable Adverse Impacts Under CEQA

Even with implementation of the proposed mitigation measures, some of the project impacts identified would still remain significant, a summary of which is provided below.

Land Use and Planning

Conflict with Land Use Plans

The four Build Alternatives would result in the permanent acquisition and conversion of land currently planned for non-transportation uses into transportation uses, which would result in inconsistencies with land use designations in local jurisdictions' General Plans. If a Build Alternative is selected for implementation, those inconsistencies would exist until the applicable local General Plans are amended to reflect the use of the affected land for transportation improvements in the selected Build Alternative. Neither Metro nor Caltrans has land use planning authority, and neither has authority to require local jurisdictions to amend their General Plans. Therefore, it will be the decision of the affected local jurisdictions on how and when to address the identified General Plan land use inconsistencies. However, because it is generally desirable that the General Plans be consistent with existing conditions, Metro and Caltrans will request that the applicable local jurisdictions amend their General Plans to reflect the permanent use of land for the improvements included in the selected Build Alternative, as specified in Measure LU-1. However, because Metro and Caltrans have no authority to require a General Plan amendment, a significant unavoidable impact would remain until the General Plans are amended.

Transportation and Traffic

The TSM/TDM, BRT, LRT, and Freeway Tunnel Alternatives would result in impacts to study area intersections and freeway segments in 2035. Improvements to

address those impacts are not proposed at all the impacted intersections and freeway segments because some of the improvements would result in increased full and partial property acquisitions, would require substantial physical or structural improvements (bridges, overcrossings, retaining walls, grade-separated roundabouts or flyovers, and/or tieback walls) that could result in additional environmental effects, would provide only nominal congestion relief in a limited area, would result in relatively minor improvement in traffic operations, and/or could have potential effects on Union Pacific Railroad (UPRR) rail operations. As a result, the TSM/TDM, BRT, LRT, and Freeway Tunnel Alternatives would all result in significant impacts on study area intersections and freeway segments that cannot be mitigated to below a level of significance under CEQA.

Visual/Aesthetics

The I-710 corridor currently has an open view, with vegetation and office buildings on the east and an undeveloped steep slope on the west. However, under the LRT Alternative, the elevated light rail line would run diagonally across the freeway at a height of approximately 25 feet above the road. The visual quality of this view would be reduced because the proposed LRT Alternative facility would block most of the view to the San Gabriel Mountains in the distance as it crosses over the freeway.

As shown on Figure ES-11, Key View 13-LRT would experience a major reduction in visual quality because a narrow concrete median would be installed to accommodate the concrete columns for the LRT Alternative overhead. A safety railing would also be built on top of the elevated track, resulting in the view being dominated by high retaining walls and the LRT Alternative overpass. The overall visual change would be major. Therefore, the visual quality would be reduced due to the proposed installation of the elevated LRT Alternative facility.

Based on the above discussion, the LRT Alternative would have a significant visual impact, specifically at Key Views 13-LRT and 9-LRT (Figures ES-11 and ES-12, respectively).

Existing View and View Simulating the LRT Alternative along Mednik Avenue

Paleontological Resources

All of the Build Alternatives involve some amount of ground disturbance that may impact paleontological

Figure ES-11: View Simulation of the LRT Alternative at the Maintenance Yard (Key View 13-LRT)

Figure ES-12: View Simulation of the LRT Alternative at Floral Drive (Key View 9-LRT)

resources. In particular, the LRT and Freeway Tunnel Alternatives involve excavations using traditional methods, such as excavators and backhoes, as well as excavations using a TBM, which prevents access to the rock face and grinds the soil and rock. However, the size of the pieces of rock recovered from the TBM will vary from approximately silt to cobble size and is dependent on the type of TBM used during excavation for the portals and underground stations, fossil recovery would not be limited. To reduce impacts to paleontological resources that may be present in the areas proposed for grading and excavation for the Build Alternatives, Measure PAL 1 requires the preparation of a detailed Paleontological Mitigation Plan (PMP) for the Freeway Tunnel Alternative or Paleontological Resources Impact Mitigation Program (PRIMP) for the TSM/TDM, BRT, and LRT Alternatives during final design and implementation of the PMP or PRIMP during construction. Measure PAL-1 requires monitoring during construction, collection of fossils, documentation/recording of the fossils, and curation of the fossils in a permanent repository. Measure PAL-1 requires training of construction staff regarding procedures in the event fossils are encountered during construction.

Although construction would be a short-term activity, even with implementation of Measure PAL-1, depending on the type of TBM used, the loss of fossil remains and the fossil-bearing soil and rock formations from the tunnel boring would be a permanent, significant unavoidable impact of the LRT and Freeway Tunnel Alternatives based on the scientific significance of formations in the study area.

Cumulative Impacts

The Build Alternatives, when combined with other cumulative projects, would contribute to impacts that are not fully mitigated or offset and that were determined to contribute to unavoidable significant cumulative impacts to:

- **Visual (LRT Alternative only):** The LRT Alternative proposes an elevated track alignment and stations in unincorporated East Los Angeles, and the Eastside Transit Corridor proposes at-grade segments and stations in East Los Angeles and aerial segments and stations just to the east in the City of Monterey Park. Although it is anticipated that, to the extent feasible, the new features constructed as part of these projects would be visually compatible with the surrounding areas, it would still result in a large visual change to the area, and cumulative visual impacts would be significant and unavoidable.

Coordination with the Public and Other Agencies

Early and continuous coordination with the general public and public agencies is an essential part of the environmental process. It helps planners determine the necessary scope of environmental documentation and the level of analysis required and to identify potential impacts and avoidance, minimization, and/or mitigation measures and related environmental requirements. To date, Metro has conducted 92 community meetings, participated in six-sponsored community forums, and held over 200 briefings with community stakeholders. Metro and Caltrans are fully committed to an open and transparent process. The following describes the opportunities for public participation conducted for this project:

- **Scoping Process:** The scoping process for the SR 710 North Study was initiated with the preparation and distribution of a Notice of Preparation (NOP) and the publication of a Notice of Intent (NOI) in the Federal Register. The formal scoping process period was initiated on March 3, 2011, and ended on April 14, 2011. The NOP was posted at the State Clearinghouse (SCH No. 1982092310) and was circulated to public agencies and other interested parties in compliance with Section 15082 of the CEQA Guide-

lines on March 3, 2011. The NOI was published on March 3, 2011, in the Federal Register in compliance with Federal Regulation 40 CFR 1508.28. In addition to the NOP/NOI, eight scoping meetings were held as part of the scoping process.

- **SR 710 Conversation Series Meetings:** This series of public meetings held in early 2011 were intended to provide broad overviews of the history of the SR 710 North and the key steps in the environmental process. Each meeting was offered in a number of cities and communities in the overall study area.
- **Legislative and Municipal Government Meetings:** Briefings with elected officials representing State, federal, and local government were conducted throughout the study process. The objective was to keep officials apprised of major study milestones and to obtain their feedback regarding outreach to their constituencies.

Community Outreach Meeting in the Study Area

- **Stakeholder Outreach Advisory Committee (SOAC) Meetings:** The SOAC is composed of elected or appointed officials from the jurisdictions in the study area. The SOAC meetings were held approximately quarterly and were intended to provide updated information on the project engineering, the progress of the technical studies, and the public outreach activities.
- **Technical Advisory Committee (TAC) Meetings:** The TAC is composed of representatives from public works, engineering, and planning departments in the cities and other agencies in the study area. These meetings were typically held quarterly and were intended to provide updated information on the project engineering and environmental planning tasks, the project schedule, and to discuss issues and concerns.

Community Outreach Meeting in the Study Area

- **All Communities Convening (ACC) Information Sessions and Open House Meetings:** The ACC is composed of interested members of the general public. The ACC Information Sessions and Open House meetings were held in communities throughout the study area. The purpose of the meetings was to provide general information related to the Build Alternatives under consideration, alternatives withdrawn from consideration, and topics to be evaluated in the EIR/EIS. Attendees were offered opportunities to provide verbal and written comments at the meetings.
- **Community Liaison Council (CLC) Meetings:** The CLCs consisted of representation from each community in the study area to reflect the ethnic and cultural diversity among the communities as well as the diversity of interests of residents, local businesses, major employers, community leadership, etc. The role of this Council was to keep the project team informed on the success of outreach and to provide recommendations for outreach. Meetings were held with the CLC from April 2012 to August 2013.
- **Other Sources of Information Regarding the SR 710 North Study:** In addition to the meetings and public information/comment opportunities described above, Metro used social media platforms (Facebook and Twitter) and a project-specific page on their website for the SR 710 North Study to provide updated project information to all interested parties. These electronic information sources are

updated as appropriate to ensure that current project-related information is available.

Permits and Approvals

Depending on the Alternative, some or all of the permits, reviews, and approvals shown in Table ES-2 would be required for project construction and operation. (Table ES-2 is provided following the last page of Table ES-1 at the end of this Executive Summary.) The applicability of the permits, reviews, and approvals to each Build Alternative is also shown in Table ES-2.

Areas of Controversy and Unresolved Issues

Based on public input received during scoping in early 2011 as well as ongoing public outreach efforts, the following summary of public concerns is provided. These particular concerns and other comments received during scoping and outreach activities were considered during preparation of the EIR/EIS.

- **Purpose and Need**
  - Some parties have made assertions that the project need is not sufficiently defined or supported by data
  - Some parties have claimed the SR 710 North Study will invite trucks to travel through the project area for goods transport to/from the Ports of Los Angeles and Long Beach
- **Alternatives**
  - Keep all modal options on the table (TSM/TDM; surface, subsurface, and elevated structures; transit [bus and rail], freight management systems, advanced technologies, no build)
  - Need for a cost/benefit analysis
  - Cost of the Freeway Tunnel Alternative has been underestimated
  - Rationale for the single-bore design variation for the Freeway Tunnel Alternative
  - Alternatives analysis process identifying alternatives to be evaluated in the Draft EIR/EIS was flawed and biased toward freeway alternatives
  - Safety within the tunnels and at tunnel portals
  - Constructability of tunnels of this size and potential for machinery malfunction
  - Locations of the materials disposal site/sites for the LRT and Freeway Tunnel Alternatives
- **Environmental Impacts of the Alternatives**
  - Concerns regarding the environmental effects of each Build Alternative on the affected communities, the primary concerns of which have been traffic, noise, air quality, health risk, and effects on historic properties
  - Environmental justice concerns regarding the elevated section of the LRT in East Los Angeles
  - Effects on communities during construction

Caltrans and Metro are continuing to work with the affected communities to resolve concerns through the ongoing community participation framework for the SR 710 North Study.

As noted earlier, Table ES-1 is provided starting on the following page. Table ES-1 provides a brief comparison of the impacts associated with each of the Build Alternatives based on the environmental and technical studies conducted for the project. Table ES-1 also describes avoidance, minimization, and mitigation measures included in the Build Alternatives to address the adverse environmental impacts of those alternatives. The information in Table ES-1 is based on the analyses and other information documented in the Draft EIR/EIS and the technical studies in support of the Draft EIR/EIS for the SR 710 North Study.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
LAND USE				
• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 feet of the physical improvements • Temporary construction easements on approximately 16 parcels	• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 feet of the physical improvements • Temporary construction easements on approximately 36 parcels • Temporary occupancy of approximately 0.02 acre of land in Cascades Park and permanent incorporation of approximately 0.011 acre of land from Cascades Park	• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 feet of the physical improvements • Temporary construction easements on approximately 13 parcels • Temporary loss of approximately 240 parking spaces	• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 feet of the physical improvements • **Single-Bore:** Temporary construction easements on approximately 52 parcels • **Dual-Bore:** Temporary construction easements on approximately 47 parcels • Temporary loss of approximately 17 parking spaces	• **Cascades-1 – Temporary Construction Easements:** Return land in Cascades Park that would be occupied for temporary construction easements to a condition that is at least as good as that which existed prior to the project, and clearly sign temporary pedestrian detours prior to the intersections of Atlantic Boulevard and El Portal Place to avoid making pedestrians backtrack to get to a safe crossing.
• Acquisition of approximately 0.6 acre and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately 26 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 220 on-street parking spaces during all hours • Inconsistency with scope of the design concept for the project in the 2012 Regional Transportation Plan/Sustainable Communities Strategy and 2015 Federal Transportation Improvement Program • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • Two aerial easements related to bridge construction • Noise effects to approximately six parks and recreation resources	• Acquisition of approximately 0.3 acre and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately 1,029 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 114 on-street parking spaces during all hours • Inconsistency with scope of the design concept for the project in the 2012 Regional Transportation Plan/Sustainable Communities Strategy and 2015 Federal Transportation Improvement Program • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • Noise effects on approximately four parks and recreation resources	• Acquisition of approximately 18.0 acres and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately four on-street parking spaces • Inconsistency with scope of the design concept for the project in the 2012 Regional Transportation Plan/Sustainable Communities Strategy and 2015 Federal Transportation Improvement Program • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • Tunnel easements beneath approximately 183 parcels, permanent aerial easements above approximately 12 parcels, and permanent subsurface easement beneath approximately 1 parcel • Noise effects to approximately one park	• Acquisition of 1.5 acres and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Inconsistency with the scope of the design concept for the project in the 2012 Regional Transportation Plan/Sustainable Communities Strategy and 2015 Federal Transportation Improvement Program for the Freeway Tunnel Alternative single-bore design variation (the single-bore design variation would not provide the capacity for four lanes of traffic in each direction) and the non-toll dual-bore design variation • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra and City of South Pasadena General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • **Single-Bore:** Tunnel easements under approximately 324 parcels, footing easements on approximately 3 parcels, and subsurface easements beneath approximately 32 parcels • **Dual-Bore:** Tunnel easements under approximately 563 parcels, subsurface easements under approximately 41 parcels, footing easements on 3 parcels, and a maintenance easement on 1 parcel	• **Parks-1 – Compliance with the Public Park Preservation Act:** Provide compensation for the acquisition of land from Cascades Park. • **Cascades-2 – Permanent Incorporation of Land:** Replacement of the sidewalks, shrubs, and/or trees in Cascades Park after consultation with the City of Monterey Park. • **LU-1 – General Plans:** Request the applicable local jurisdictions to amend their General Plans and/or other local land use plans after the acquisition of land for the selected alternative to reflect the improvements in that Build Alternative. • **LU-2 – RTP/SCS and FTIP:** Coordinate with the Southern California Association of Governments on needed amendments to the next cycle of the RTP/SCS and FTIP to reflect the selected project.
GROWTH				
No impact. Although the SR 710 Build Alternatives will improve mobility and circulation, the study area is largely built out, and none of the Build Alternatives provide new access to undeveloped or underdeveloped areas. Therefore, the SR 710 North Study Project is not expected to result in unplanned growth in the study area.				No avoidance, minimization, and/or mitigation measures are required.
COMMUNITY IMPACTS				
Community Character and Cohesion				
• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 feet of the Build Alternatives • Minor temporary lane restrictions during construction	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 feet of the Build Alternatives • Temporary lane restrictions during construction	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 feet of the Build Alternatives • Temporary lane restrictions during construction • Overnight closures along the elevated segments • Displacement of approximately 15 businesses along Mednik Avenue in East Los Angeles	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 feet of the Build Alternatives • Temporary lane restrictions during construction • Temporary delays and detours for the traveling public at multiple locations in the study area during construction • Permanent approximately 0.6 acre easement	• **CI-1 – Property Acquisition:** All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970 as amended. • **T-1 –** Transportation Management Plan • **AQ-1 –** Fugitive Dust • **AQ-2 –** Equipment and Vehicle Emissions

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
			• Permanent acquisition of approximately 1.0 acre of land	• **AQ-3 –** Diesel Fuel Emissions and Sensitive Receptors • **N-1 –** Construction in State Right of Way • **N-2 –** Construction Outside State Right of Way • **N-4 –** Supply and Muck Trains • **N-5 –** Ground-Borne Noise and Vibration • **V-1 –** Vividness • **V-2 –** Intactness • **V-3 –** Unity • **V-4 –** Walls with Aesthetic Treatments • **V-5 –** Built Structures • **V-6 –** Landscaping • **V-7 –** Short-Term Visual
Relocation				
• Temporary construction easements on approximately 16 parcels • Creation of approximately 1,400 person-year jobs • Generate approximately $64.7 million (in 2010 dollars) in employment earnings	• Temporary construction easements on approximately 36 parcels • Creation of approximately 3,100 person-year jobs • Generate approximately $148.6 million (in 2010 dollars) in employment earnings	• Temporary construction easements on approximately 13 parcels • Creation of approximately 31,500 person-year jobs • Generate approximately $1.5 billion (in 2010 dollars) in employment earnings	**Single-Bore** • Temporary construction easements on approximately 52 parcels • Creation of approximately 41,100 person-year jobs • Generate $1.9 billion (in 2010 dollars) in employment earnings **Dual-Bore** • Temporary construction easements on approximately 47 parcels • Creation of approximately 73,700 person-year jobs • Generate approximately $3.5 billion (in 2010 dollars) in employment earnings	No avoidance, minimization, and/or mitigation measures are required.
• Displacement of 1 business with 6 employees on a leased State-owned parcel • 1 full parcel acquisition • Approximately 31 partial parcel acquisitions, none of which would result in the displacement of businesses or employees • Creation of approximately 300 person-year jobs • Generation of approximately $10.5 million per year (in 2010 dollars) in employment earnings • Loss of approximately $1,000 in annual property tax revenue and approximately $1,939 in sales tax revenue	• Approximately 45 partial parcel acquisitions • Creation of approximately 600 person-year jobs • Generation of approximately $19.6 million (in 2010 dollars) per year in employment earnings • Loss of approximately $2,111 in annual property tax revenue and approximately $1,939 in sales tax revenue	• Displacement of 1 business with 30 employees on a leased State-owned parcel • 58 full parcel acquisitions and approximately 11 partial parcel acquisitions, requiring the relocation of approximately 73 businesses and resulting in the displacement of approximately 645 employees • Creation of approximately 1,300 person-year jobs • Generation of approximately $45.4 million (in 2010 dollars) per year in employment earnings • Loss of approximately $50,885 in annual property tax revenue and approximately $75,425 in sales tax revenue	• Displacement of 1 business with 30 employees on a leased State-owned parcel (single-bore and dual-bore) • 1 full parcel acquisition, requiring the relocation of approximately 1 business and the displacement of approximately 5 employees (single-bore and dual-bore) • Approximately 2 and 3 partial parcel acquisitions (single-bore and dual-bore, respectively) • **Single-Bore** – Approximately 800 to 900 person-year jobs – Generation of approximately $28.6 million to $32.1 million (in 2010 dollars), respectively, per year in employment earnings • **Dual-Bore** – Approximately 1,000 to 1,200 person-year jobs – Generation of approximately $33.5 million to $41.2 million (in 2010 dollars), respectively, per year in employment earnings • Loss of approximately $1,042 in annual property tax revenue and no loss of sales tax revenue (single-bore and dual-bore)	• **CI-1 – Property Acquisition:** All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Act.
Environmental Justice				
None of the Build Alternatives would result in disproportionate impacts on environmental justice populations.	None of the Build Alternatives would result in disproportionate impacts on environmental justice populations.	None of the Build Alternatives would result in disproportionate impacts on environmental justice populations.	None of the Build Alternatives would result in disproportionate impacts on environmental justice populations.	• **CI-1 – Property Acquisition:** All property acquisition for the Build Alternatives will comply with the Uniform Act.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
UTILITIES AND EMERGENCY SERVICES				
All of the Build Alternatives would potentially result in temporary utility relocation and emergency services delays during construction.	All of the Build Alternatives would potentially result in temporary utility relocation and emergency services delays during construction.	All of the Build Alternatives would potentially result in temporary utility relocation and emergency services delays during construction.	All of the Build Alternatives would potentially result in temporary utility relocation and emergency services delays during construction.	No avoidance, minimization, and/or mitigation measures are required.
TRAFFIC AND TRANSPORTATION/PEDESTRIAN AND BICYCLE FACILITIES				
• Temporary closures of sidewalks, crosswalks, and bicycle facilities to protect pedestrians, bicyclists, and construction workers; Americans with Disabilities Act accessibility would be affected during those closures. • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Loss of some on-street parking spaces during minor street work	• Temporary closures of sidewalks, crosswalks, and bicycle facilities to protect pedestrians, bicyclists, and construction workers; Americans with Disabilities Act accessibility would be affected during those closures. • Lane restrictions that may impact access and circulation at approximately 24 individual locations (all from the TSM/TDM Alternative improvements) • Lane restrictions during off-peak hours at approximately 6 locations • Loss of some on-street parking spaces during minor street work	• Temporary closures of sidewalks, crosswalks, and bicycle facilities to protect pedestrians, bicyclists, and construction workers; Americans with Disabilities Act accessibility would be affected during those closures. • Lane restrictions that may impact access and circulation at approximately 29 locations (24 from the TSM/TDM Alternative improvements and 5 additional locations) • Lane restrictions during utility relocations and temporary road deck installation and removal • Delays from haul route disposal traffic • Weekend full road closures • Overnight closures where the elevated alignment would cross SR 60, SR 710/I-710, or other roads to accommodate placement of concrete barriers • Loss of on-street parking spaces	• Temporary closures of sidewalks, crosswalks, and bicycle facilities to protect pedestrians, bicyclists, and construction workers; Americans with Disabilities Act accessibility would be affected during those closures. • Lane restrictions that may impact access and circulation at approximately 24 individual locations (from the TSM/TDM Alternative improvements) • Delays at several locations in the vicinity of the south and north tunnel portals • Construction-related closures of freeway on- and off-ramps • **Single-Bore Temporary Closures:** Five on northbound SR 710, seven on southbound SR 710, and one on westbound I-210 • **Dual-Bore Temporary Closures:** Five on northbound SR 710, five on southbound SR 710, and two on westbound I-210 • Delays from haul route disposal traffic • Closure of on-street parking on the Green Street Bridge • Loss of some on-street parking spaces during minor street work	• **T-1 – Transportation Management Plan:** To address short term adverse transportation impacts during construction, the TMP would be implemented. • **T-2 – Pedestrian and Bicycle Facility Closures:** When sidewalks, crosswalks, and/or bicycle facilities are temporarily closed during construction, pedestrian and bicycle detours will be clearly signed.
In the Horizon Year (2035), compared to the No Build Alternative, the TSM/TDM Alternative would result in: • A minor increase in combined AM and PM peak-period regional area vehicle miles traveled • Slight improvement in combined AM and PM peak-period regional area vehicle hours traveled • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • No reduction in vehicle miles traveled on local arterials • Modest increase in the percent of long-distance trips using local arterials • No improvement in travel times • Third highest number of new linked transit trips • No change in transit mode split • Lowest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mile of high-frequency	In the Horizon Year (2035), compared to the No Build Alternative, the BRT Alternative would result in: • A minor increase in combined AM and PM peak-period regional area vehicle miles traveled • A reduction in combined AM and PM peak-period regional area vehicle hours traveled • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • Minor decrease in vehicle miles traveled on local arterials • Modest increase in the percent of long-distance trips using local arterials • No improvement in travel times • Second highest number of new linked transit trips • Minor increase in transit mode split • Greatest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mile of high-frequency	In the Horizon Year (2035), compared to the No Build Alternative, the LRT Alternative would result in: • A minor increase in combined AM and PM peak-period regional area vehicle miles traveled • A reduction in combined AM and PM peak-period regional area vehicle hours traveled • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • Modest increase in vehicle miles traveled on local arterials • Modest increase in the percent of long-distance trips using local arterials • Minor improvement in travel times • Greatest number of new linked transit trips • Minor increase in transit mode split • Greatest daily transit person trips crossing the east-west screenline • Minor change in percent of study area population and employment within 0.25 mile of high-	In the Horizon Year (2035), compared to the No Build Alternative, the Freeway Tunnel Alternative would result in: • The largest increase in combined AM and PM peak period regional area vehicle miles traveled • The greatest reduction in AM and PM peak period regional area vehicle hours traveled • The greatest increase in daily person throughput (trips) at the east-west screenline • The greatest increase in job accessibility • The greatest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • The greatest reduction in vehicle miles traveled on local arterials • Substantial reduction in the percent of long-distance trips using local arterials • Lowest number of new linked transit trips • No increase in transit mode split • Lowest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mile of high-frequency transit service • Adverse effects at approximately 6 to 11 intersections and on approximately 18 to 31 freeway segments, depending on the	No avoidance, minimization, and/or mitigation measures are required.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
transit service • Adverse effects at 18 intersections and on 8 freeway segments • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 220 on-street parking spaces during all hours of the day • Delays at intersections for pedestrians and bicyclists	transit service • Adverse effects at 13 intersections and on 13 freeway segments • Permanent loss of approximately 1,055 on-street parking spaces in the AM and PM peak periods and approximately 334 on-street parking spaces during all hours of the day • Delays at intersections for pedestrians and bicyclists	frequency transit service • Adverse effects at approximately 13 intersections and on approximately 17 freeway segments • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 89 on-street parking spaces during all hours of the day • Delays at intersections for pedestrians and bicyclists	design and operational variations • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 85 on-street parking spaces during all hours of the day • Delays at intersections for pedestrians and bicyclists • The greatest improvement in travel times	
VISUAL AND AESTHETICS				
• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderately low to moderate visual impacts due to construction activities	• **V-7 – Short-Term Visual Effects:** The final design will include features to minimize views of construction areas.
• Minor physical changes or visible impacts to the environment • A minimal increase in lighting in existing business and residential areas • Limited changes in glare from changes in traffic control cycles and additional travel lanes • Approximately seven noise barriers that may result in a low to high visual impact	• Minor new shade and shadow effects at new bus stops and signage • Low permanent visual impacts on key views • Approximately three noise barriers may result in a moderate to moderately high visual impact	• Moderately low to moderate permanent visual impacts on key views • Low permanent impacts related to light, glare, and shade and shadows	• Moderately low to moderate visual impacts on key views • Minimal vehicle headlight glare from new non-tunnel segments built below the existing grade level • Minimal shade and shadow impacts • Approximately five noise barriers for the dual-bore design variation may result in moderate to high visual impacts • Approximately three noise barriers for the single-bore design variation may result in moderate to high visual impacts	• **V-1 – Vividness:** Effects of the Build Alternatives related to a reduction in the vividness of views will be based on a number of measures in the final design. • **V-2 – Intactness:** Effects of the Build Alternatives related to a reduction in the intactness of views will be based on a number of measures in the final design. • **V-3 – Unity:** Effects of the Build Alternatives related to a reduction in the unity of views will be based on a number of measures in the final design. • **V-4 – Walls with Aesthetic Treatments:** Sound walls and retaining walls adjacent to viewer groups or within sensitive Key Views will be designed based on Caltrans Highway Design Manual standards, consideration of community input, and Metro design standards. • **V-5 – Built Structures:** Will be designed to blend with or enhance the surrounding areas. • **V-6 – Landscaping:** Different levels of visual impacts related to walls and berms and for screening views of project features will be addressed during final design.
CULTURAL RESOURCES				
• No adverse effect on the Segment of Route 66: West Huntington Drive and North Eastern Avenue; San Marino City Hall and Fire Station; Arroyo Seco Parkway Historic District (including the State-owned bridge at the Fair Oaks Avenue Overcrossing [53 0440]); Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue; Markham Place Historic District; Rialto Theater; Fair Hope Building; Segment of Route 66: West Huntington Drive/Fair Oaks Avenue; Segment of Route 66: West Huntington Drive/Fremont Avenue, Sequoyah School/Neighborhood Church (3 buildings: Children's Chapel, Nursery School, and Religious Education Building); and 270 South Orange Grove Boulevard	• No adverse effect based on compliance with Standard Conditions on El Jardin Del Encanto and Cascades Park, Old Pasadena Historic District, Glenarm Building and Electric Fountain, Rialto Theater, Fair Hope Building, and Oaklawn Waiting Station • No adverse effect on the Golden Gate Theater; Saint Alphonsus Church; Dr. Henry K. Kawamoto Office; Bekins Storage Co. Roof Sign; Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue; Segment of Route 66: East Colorado Boulevard; South Pasadena Middle School; Community Facilities Planners Building (aka Fair Oaks Professional Group); Raymond Hill Waiting Station; and Segment of Route 66: West Huntington Drive at foot of Fair Oaks Avenue, and War Memorial Building	• No adverse effect without Standard Conditions on 4777 East Cesar E. Chavez Avenue, Raymond Florist Historic District, Hospital Veterinary, Fair Hope Building, Rialto Theater, Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 N. Fremont Avenue • No adverse effect on the Glenarm Building and Electric Fountain, Oaklawn Waiting Station, War Memorial Building, South Pasadena Middle School, Raymond Hill Waiting Station, Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue, Arroyo Seco Parkway Historic District, 2020 Fremont Avenue, Otsungna Prehistoric Village Site, and Horatio Rust Site	• No adverse effect on Norton Simon Museum; Raymond-Summit Historic District; Herkimer Arms Apartment House; 270 South Orange Grove Boulevard; Ambassador West Cultural Landscape Historic District; Markham Place Historic District, Old Pasadena Historic District, Otsungna Prehistoric Village Site, and Horatio Rust Site. • No adverse effect on 42 historic properties above the tunnel segments in the Freeway Tunnel Alternative.	**BRT Alternative** • Jardin Del Encanto and Cascades Park: – Project Condition BRT-1 – Incorporate existing design features in the new medians and sidewalks – Project Condition BRT-2 – Incorporate in-kind plant materials to replace vegetation removed during construction • Old Pasadena Historic District, Rialto Theatre, Fair Hope Building, and Oaklawn Waiting Station: – Project Condition BRT-3 – Equipment Use – Use of equipment other than jackhammers to break up concrete – Project Condition BRT-4 – Vibration Management – Preconstruction Building Survey, Vibration Monitoring During Construction, and Vibration Monitoring Plan • Glenarm Building and Electric Fountain

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
				– Project Condition BRT-3 – Equipment Use – Project Condition BRT 5– Incorporate existing design features into the new medians and sidewalks. **LRT Alternative** • 4777 East Cesar E. Chavez Avenue, Raymond Florist Historic District, Hospital Veterinary, Fair Hope Building, Rialto Theatre, Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 North Fremont Avenue: – Project Condition LRT-1 – Public Outreach and community input; evaluation of existing condition of historic buildings and preconstruction crack survey, vibration and settlement monitoring and documentation during tunneling and excavation activities, implementation of additional preventive/corrective measures as needed, and Vibration Monitoring Plan including vibration instrumentation, monitors, and exceedance notification and reporting procedures – Project Condition LRT-2 – Vibration isolation systems – Incorporate available vibration-isolation systems that are most effective in reducing operational ground-borne noise and vibration into the final construction design • Otsungna Prehistoric Village Site and Horatio Rust Site: – CR-4 – Post Review Discovery and Monitoring Plan **Freeway Tunnel Alternative** (tunnel segment) • Otsungna Prehistoric Village Site and Horatio Rust Site – CR-4 – Post Review Discovery and Monitoring Plan
• Would potentially result in impacts to previously undocumented cultural materials or human remains.	• Would potentially result in impacts to previously undocumented cultural materials or human remains.	• Would potentially result in impacts to previously undocumented cultural materials or human remains.	• Would potentially result in impacts to previously undocumented cultural materials or human remains.	• **CR-1 –** Discovery of Cultural Resources • **CR-2 –** Discovery of Human Remains • **CR-3 –** Native American Monitors • **CR-4 –** Post-Review Discovery and Monitoring Plan • **CR-5 –** Cultural Awareness Training
HYDROLOGY AND FLOODPLAINS				
No encroachment within floodplains.	No encroachment within floodplains.	No encroachment within floodplains.	• Temporary construction impacts and potential erosion from clearing of land and vegetation. • No permanent impacts on floodplain values. • A nominal reduction of the floodplain boundaries of the Dorchester Channel and Laguna Regulating Basin, which would not result in an increase in the water surface elevation in the Laguna Regulating Basin and would result in only a minor increase in water surface elevation in Dorchester Channel (dual-bore design variation only).	No avoidance, minimization, and/or mitigation measures are required.
WATER QUALITY AND STORM WATER RUNOFF				
• Temporary disturbance of approximately 21 acres of soil during construction	• Temporary disturbance of approximately 35 acres of soil during construction	• Temporary disturbance of approximately 33 acres of soil during construction • Groundwater de-watering during construction	• Temporary disturbance of approximately 81 acres and 93 acres of soil, respectively, for the single-bore and dual-bore design variations during construction • Groundwater de-watering during construction	• **WQ-1 – National Pollutant Discharge Elimination:** Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ

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				• **WQ-2 – Dewatering:** Compliance with the requirements of Order No. R4-2013-0095 (NPDES No. CAG994004) for construction site dewatering. • **WQ-3 – Groundwater Monitoring:** A comprehensive investigation to establish a baseline for groundwater levels and quality where tunneling or excavation would occur. • **WQ-4 – Improvements in State-Owned Right of Way:** Compliance with the provisions of the NPDES Permit, Statewide Storm Water Permit, Waste Discharge Requirements (WDRs). • **WQ-5 – Improvements Outside State-Owned Right of Way:** Compliance with the Standard Urban Storm Water Mitigation Plan (SUSMP) prepared for the Los Angeles Regional Water Quality Control Board WDRs for Municipal Separate Storm Sewer System Order No. R4-2012-0175 • **WQ-6 – Improvements in State-Owned Right of Way:** A Caltrans-approved Design Pollution Prevention BMPs will be prepared. • **WQ-7 – Improvements in State-Owned Right of Way:** Caltrans-approved Treatment BMPs will be implemented.
• Permanent increase in impervious surface area of approximately 3.8 acres • Treatment of 76% of newly created or replaced impervious surface area storm water runoff within State-owned right of way	• Permanent increase in impervious surface area of approximately 1.2 acres • Treatment of 575% and 114%, respectively, of the new impervious surface area within and outside State-owned right of way	• Permanent increase in impervious surface area of approximately 16.5 acres • Treatment of 31% and 47%, respectively, of the new impervious surface area within and outside State-owned right of way	• Permanent increase in impervious surface area of approximately 1.7 acres and 13.5 acres, respectively, for the single-bore and dual-bore design variations • Treatment of 5,350% and 705%, respectively, of the net new impervious surface area for the single-bore and dual-bore design variations	No avoidance, minimization, and/or mitigation measures are required.
GEOLOGY, SOILS, SEISMIC, AND TOPOGRAPHY				
• Minor grading activities with no modification of existing topography • Low potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion and/or liquefaction • Low potential for soil settlement, collapse, and expansion • Improvements proposed in a Liquefaction Hazard Zone • Moderate erosion of surficial soils • Improvements that cross the active Raymond Fault and potentially active San Rafael Fault • Improvements in a potential dam inundation area	• Minor grading activities with no modification of existing topography • Low potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and/or landslides • Low potential for soil settlement, collapse, and expansion • Improvements in a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond Fault and potentially active San Rafael Fault	• Soil excavation and tunneling • Low to moderate potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and/or landslides • Low potential for soil settlement, collapse, expansion, and lateral spreading • Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond Fault and potentially active San Rafael Fault • Improvements in a potential dam inundation area • Slope instability • Low potential for small ground settlements above and adjacent to tunnel excavations	• Soil excavation and tunneling • Low to moderate potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides • Low potential for soil settlement, collapse, expansion, and lateral spreading • Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond Fault and potentially active San Rafael and Eagle Rock Faults • Improvements in a potential dam inundation area • Slope instability • Low potential for small ground settlements adjacent to tunnel excavations	• **GEO-1 – Final Geotechnical/Baseline Report:** Design level geotechnical/baseline reports will be prepared. • **GEO-2 – Quality Assurance/Quality Control Plan:** Comprehensive real time monitoring with geotechnical tunnel data management software and implementation of an observational approach to construction management will be implemented during construction of the LRT or Freeway Tunnel Alternatives. • **GEO-3 – Tunnel Design:** Measures to prevent effects from tunnel construction and operation will be included in the design-level geotechnical/baseline report and the project design and specifications. The Freeway Tunnel Alternative will be designed to Caltrans standards, and the LRT Alternative will be designed to Metro standards. A robust construction instrumentation and monitoring program will be implemented to monitor ground movements. • **GEO-4 – Tunnel Construction:** Pre-qualified contractor with experience with large, pressurized-face TBMs will be selected and excavation methods will be used that can limit ground movements.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
PALEONTOLOGY				
• Minor ground disturbance in areas with high sensitivity for paleontological resources. • During excavation and grading, fossils would be able to be recovered	• Minor ground disturbance in areas with high sensitivity for paleontological resources. • During excavation and grading, fossils would be able to be recovered	• Improvement located in areas with high sensitivity for paleontological resources • The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	• Located in area with high sensitivity for paleontological resources • The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	• **PAL-1 – Paleontological Mitigation Plan and Paleontological Resources Impact Mitigation Program:** A PMP or PRIMP is required that addresses monitoring and treatment of fossils.
HAZARDOUS WASTE AND MATERIALS				
• Four properties with known hazardous waste contamination are located adjacent to or within the TSM/TDM Alternative • Widening and/or demolition of bridges may encounter asbestos-containing materials	• Three properties with known hazardous waste contamination are located adjacent to the BRT Alternative • No bridge widening/demolition proposed	• Four properties with known hazardous waste contamination are located adjacent to or within the LRT Alternative • No bridge widening/demolition proposed • Bored tunnel will be water and gas tight, and the intrusion of hazardous materials/gas into the tunnel is not expected	• Two properties with known hazardous waste contamination are located adjacent to the Freeway Tunnel Alternative • Widening and/or demolition of existing bridges may encounter asbestos-containing materials • Bored tunnel will be water and gas tight and the intrusion of hazardous materials/gas into the tunnel is not expected	• **HW-1 – Striping and Pavement Markings:** Sampling, handling, treatment and disposal of striping and pavement markings will be conducted in accordance with applicable regulations. • **HW-2 – Transformers:** Transformer removal, required, removed and disposed of in accordance with applicable regulations. • **HW-3 – Lead Compliance Plan:** A Lead Compliance Plan will address the presence of aerially deposited lead (ADL) in the soils in the project area and the health and safety of construction workers. • **HW-4 – Aerially-Deposited Lead Investigation:** Sampling, handling, treatment and disposal ADL will be conducted consistent with applicable regulations, • **HW-5 – Demolition of Structures and Bridges:** Structures planned for demolition will be assessed for the possible presence of asbestos-containing materials (ACM), lead-based paint (LBP), and equipment containing chlorofluorocarbons (CFCs). • **HW-6 – SCAQMD Rule 1403:** Compliance with SCAQMD Rule 1403 during demolition of bridges and structures. • **HW-7 – Phase II Site Investigations:** Will be conducted to determine if special handling, treatment, or disposal provisions associated with hazardous wastes will be required. • **HW-8 – Soils Adjacent to the Railroad Right of Way:** Soils adjacent to railroad right of way will be sampled to determine whether they require special handling and disposal. • **HW-9 – Tunnel Construction Activities:** Tunnel spoils will be tested prior to removal off-site and disposed of at an appropriate landfill or designated site. • **HW-10 – Unknown Hazards:** Excavation and demolition activities will be monitored and if unknown hazards are encountered, characterization, treatment, and disposal will be consistent with applicable regulations.
AIR QUALITY				
• Short-term air quality impacts from construction emissions	• Short-term air quality impacts from construction emissions • The construction schedule for the TSM/TDM component would not overlap with the construction schedule for the BRT component; therefore, construction emissions would not be additive	• Short-term air quality impacts from construction emissions • The construction schedule for the TSM/TDM component would not overlap with the construction schedule for the LRT component; therefore, construction emissions would not be additive.	• Short-term air quality impacts from construction emissions • The construction schedule for the TSM/TDM component would not overlap with the construction schedule for the freeway tunnel; therefore, construction emissions would not be additive.	• **AQ-1 – Fugitive Dust:** Compliance with South Coast Air Quality Management District Rule 403. • **AQ-2 – Equipment and Vehicle Emissions:** Reduce vehicle and equipment emissions during all site preparation, grading, excavation, and construction. • **AQ-3 – Diesel Fuel Emissions and Sensitive Receptors:** Implement measures to reduce diesel fuel emissions near sensitive receptors. • **AQ-4 – Caltrans Standard Specifications for Construction:**

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TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
				Comply with Caltrans Standard Specifications for Construction (Sections 14-9.03 and 18 [Dust Control] and Section 39-3.06 [Asphalt Concrete Plant Emissions]). • **AQ-5 – Metro Green Construction Policy:** Comply with Metro's "Green Construction Policy."
• 2020 PM_{10} emissions higher than the 2020 No Build Alternative emissions • Criteria pollutant emissions higher than the 2035 No Build Alternative emissions, with the exception of reactive organic gases • 2035 diesel particulate matter plus diesel exhaust organic gases emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis	• Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis • Criteria pollutant emissions higher than the 2035 No Build Alternative emissions, with the exception of reactive organic gases • 2035 diesel particulate matter plus diesel exhaust organic gases emissions higher than the 2035 No Build Alternative emissions The operational air quality analysis for the BRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the BRT Alternative	• Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis • Criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of reactive organic gases • 2025 diesel particulate matter plus diesel exhaust organic gases emissions higher than the 2025 No Build Alternative emissions The operational air quality analysis for the LRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the LRT Alternative	**Single-Bore** • PM_{10} and $PM_{2.5}$ emissions higher than the 2025 and 2035 No Build Alternative emissions • Highest 24-hour and annual $PM_{2.5}$ and annual PM_{10} concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis **Dual-Bore** • 2025 criteria pollutant emissions higher than the 2025 No Build Alternative emissions, with the exception of reactive organic gases and carbon monoxide • 2035 criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of reactive organic gas emissions • PM_{10} 2035 emissions higher than the existing condition emissions • Highest 24-hour and annual $PM_{2.5}$ and annual PM_{10} concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Consistent with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis for the tolled operational variation The operational air quality analysis for the Freeway Tunnel Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the Freeway Tunnel Alternative	No avoidance, minimization, or mitigation measures are required.
NOISE				
• Temporary noise impacts from construction traffic and activity	• Temporary noise impacts from construction traffic and activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously.	• Temporary noise impacts from construction traffic and activity • Short-term ground-borne noise and vibration effects from tunnel boring construction activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously.	• Temporary noise impacts from construction traffic and activity • Short-term ground-borne noise and vibration effects from tunnel boring construction activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously.	• **N-1 – Construction in State Right of Way:** Within State-owned rights of way, noise will be controlled in conformance with Caltrans Standard Specifications Section 14 8.02, "Noise Control." • **N-2 – Construction Outside State Right of Way:** During construction outside State-owned rights of way, noise reduction/avoidance requirements in the applicable jurisdiction's Municipal Code and/or Noise Ordinance will be required. • **N-3 – Tunnel Boring Machine:** The Construction Contractor will be required to maintain machinery in good working order during all tunnel boring activities.

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TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
				• **N-4 – Supply and Muck Trains:** Specific minimization measures will be included in the Plans, Specifications, and Estimates (PS&E) if supply or muck trains are used to remove spoils: • **N-5 – Ground-Borne Noise and Vibration:** The Construction Contractor will be required to carry out construction activities for the LRT and Freeway Tunnel Alternatives in compliance with applicable federal, State and local noise and vibration guidance. No pile driving will be allowed during construction of the TSM/TDM and BRT Alternatives. • **N-6 – Grifols Vibration Study:** During PS&E for the LRT and Freeway Tunnel Alternatives, the Project Engineer will prepare a site-specific evaluation of potential airborne dust due to vibration associated with construction in the vicinity of the Grifols facility. The results of the evaluation and any specific measures to maintain International Organization for Standardization (ISO) standards will be included in the PS&E. No pile driving will be allowed during construction of the TSM/TDM Alternative.
• Noise levels at approximately 70 receptor locations that would approach or exceed the Noise Abatement Criteria as applicable to the land uses at each sensitive receptor location • Seven noise barriers were found to be reasonable and feasible	• Operational long-term traffic noise impacts • Noise levels at approximately 129 receptor locations that would approach or exceed Noise Abatement Criteria as applicable to the land uses at each receptor location • Three noise barriers were found to be reasonable and feasible for the BRT Alternative • Five noise barriers in the TSM/TDM Alternative would also be included in the BRT Alternative	• Long-term ground-borne noise during operation • Ground-borne vibration impacts to approximately 450 residential buildings and 1 commercial office building • With the daily operations of the light rail trains, prior to mitigation, approximately 12 receptors will experience a moderate impact while approximately 5 receptors will experience a severe noise impact as defined by Federal Transit Authority noise criteria. • Five noise barriers in the TSM/TDM Alternative would also be included in the LRT Alternative	• Operational long-term traffic noise impacts associated with traffic noise • The noise levels at approximately 66 receptor locations for the single-bore design variation and approximately 75 receptor locations for the dual-bore design variation would approach or exceed the Noise Abatement Criteria as applicable to the land uses at each sensitive receptor location • Four and six noise barriers were found to be reasonable and feasible for the single-bore and dual-bore design variations, respectively. • Five noise barriers in the TSM/TDM Alternative would also be included in the Freeway Tunnel Alternative	• **N-7 – Vibration Isolation Systems:** During final design of the LRT Alternative, additional field testing and analysis will be conducted for the specific identification of ground-borne noise impacts and will incorporate the vibration isolation system or systems to comply with FTA ground-borne noise level criteria. • Noise barriers as noted by alternative.
ENERGY				
• Construction would require approximately 33,600 billion British thermal units	• Construction would require approximately 55,300 billion British thermal units	• Construction would require approximately 422,000 billion British thermal units	• For the single-bore design variation, construction would require approximately 523,000 billion British thermal units • For the dual-bore design variation, construction would require approximately 926,000 billion British thermal units	• **E-1 – Construction Efficiency Plan:** As part of the PS&E phase, a construction efficiency plan will be prepared.
• Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	• Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	• Maintenance-related energy consumption would increase approximately 0.2% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in an approximately 0.7 %decrease from the 2035 baseline condition (No Build Alternative)	For the single-bore design variation: • Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 No Build Alternative • Operational energy consumption in the study area would result in an approximately 0.7 to 1.0 % increase compared to the 2035 No Build Alternative. For the dual-bore design variation: • Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 No Build Alternative. • Operational energy consumption in the study area would result in no change compared to the 2035 No Build Alternative.	No avoidance, minimization, and/or mitigation is required.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
NATURAL COMMUNITIES				
No temporary or permanent impacts on sensitive natural communities Temporary impacts to non-sensitive plant communities (0.3 acre of nonnative grassland and 0.5 acre of disturbed/developed) Permanent impacts to non-sensitive plant communities (less than 0.1 acre of nonnative woodlands and 0.7 acre of disturbed/developed)	No temporary or permanent impacts on sensitive natural communities Temporary impacts to non-sensitive plant communities (0.6 acre of disturbed/developed) Permanent impacts to non-sensitive plant communities (1.9 acres of nonnative grassland and 123.8 acres of disturbed/developed)	No temporary or permanent impacts on sensitive natural communities Temporary impacts to non-sensitive plant communities (2.1 acres of nonnative grassland, 8.0 acres of nonnative woodland, and 29.7 acres of disturbed/developed) Permanent impacts to non-sensitive plant communities (12.6 acres of nonnative grassland, 3.9 acres of nonnative woodland, and 93.6 acres of disturbed/developed)	The single-bore and dual-bore design variations would each result in permanent impacts to approximately 1.09 acres of wetland complex and would potentially result in indirect temporary impacts to nearby riparian habitats. The single-bore design variation would result in temporary impacts to non-sensitive plant communities (2.9 acres of nonnative grassland, less than 0.1 acre of nonnative woodland, and 53.4 acres of disturbed/developed) The dual-bore design variation would result in temporary impacts to non-sensitive plant communities (2.2 acres of nonnative grassland, 1.1 acres of nonnative woodland, and 51.7 acres of disturbed/developed) The single-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 31.6 acres of nonnative woodland, and 244.9 acres of disturbed/developed) The dual-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 32.4 acres of nonnative woodland, and 244.9 acres of disturbed/developed)	• **NC-1 – Riparian/Riverine Habitat Protection:** Environmentally Sensitive Area (ESA) fencing or other marker will be installed around any riparian or riverine habitats to be preserved. No grading or fill activities or structures will be authorized in marked areas. • **NC-2 – Construction Plan:** Nonsensitive upland habitat areas will be designated for equipment maintenance, staging, fueling, and other related activities. • **NC-3 – Compliance Monitoring:** The Construction Contractor will be required to have a qualified biologist monitor during construction in the vicinity of riparian and riverine areas. • **WQ-1 – National Pollutant Discharge Elimination:** Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ. • **IS-1 –** Weed Abatement Program • **WET**-1: Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit • **WET**-2: Obtain CDFW Streambed Alteration Agreement • **WET**-3: Obtain RWQCB Section 401 Water Quality Certification
WETLANDS AND OTHER WATERS				
No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	• The single-bore design variation would result in approximately 0.02 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. • The dual-bore design variation would result in approximately 0.2 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. • The single-bore design variation would result in approximately 0.06 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel • The dual-bore design variation would result in approximately 0.5 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel • The permanent impacts on the Laguna Channel would not impact the Arroyo Seco	• **WET-1 –** Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit • **WET-2 –** Obtain CDFW Streambed Alteration Agreement • **WET-3 –** Obtain RWQCB Section 401 Water Quality Certification • **NC-1:** Riparian/Riverine Habitat Protection • **NC-2:** Construction Plan • **NC-3 –** Compliance Monitoring • **WQ-1 –** National Pollutant Discharge Elimination • **WQ-2:** Dewatering • **WQ-3:** Groundwater Monitoring • **WQ-4:** Improvements in State-Owned Right of Way • **WQ-5:** Improvements Outside State-Owned Right of Way • **WQ-6:** Improvements in State-Owned Right of Way • **IS-1 –** Weed Abatement Program

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
PLANT SPECIES				
No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields)	No temporary direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields) The BRT Alternative would potentially result in removal of approximately 136 trees protected by local tree ordinances.	• No temporary or permanent direct or indirect impacts on Parish's gooseberry and slender mariposa-lily • Temporary impacts to approximately 8 trees within the State right of way not protected by a local ordinance • Temporary indirect impacts and exacerbate existing indirect permanent edge effects on a Coulter's goldfields population within approximately 250 feet of the permanent impact area for the LRT Alternative • Removal of approximately 21 trees protected by various local tree ordinances	• No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields) • Temporary impacts to approximately 36 trees in the City of Pasadena that are protected by the City's Trees and Tree Protection Ordinance • Potential permanent impacts to the Coulter's goldfields within the permanent impact area of the single-bore and dual-bore design variations • Potential permanent impacts to a Southern California black walnut tree that is approximately 4 feet outside the permanent impact area for the Freeway Tunnel Alternative • The single-bore and dual-bore design variations would result in removal of approximately 84 trees protected by local tree ordinances	• **PS-1 – Coulter's Goldfields:** Should the LRT Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the Biological Study Area (BSA) be unavailable, effects of the LRT Alternative on the Coulter's goldfields population will be addressed. • **PS-2 – Coulter's Goldfields:** Should the Freeway Tunnel Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the BSA be unavailable, the effects of the Freeway Tunnel Alternative on the Coulter's goldfields population will be addressed. • **PS-3 – Southern California Black Walnut:** Implement measures to address the project effects on the Southern California black walnut. • **PS-4 – Trees Protected by City and/or County Ordinances:** Avoid/minimize impacts to trees where feasible. If not feasible, obtain appropriate tree removal permits.
ANIMAL SPECIES				
• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Temporary indirect impacts through habitat loss if special-status bats begin using bridges (including the Garfield Avenue Bridge) proposed for demolition or widening as roosting habitat • Temporary and permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding and is suitable habitat for western spadefoot toad and San Bernardino ring-necked snake	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding, and is suitable habitat for western Spadefoot toad and San Bernardino ring-necked snake	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Indirect temporary impacts to riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities • Temporary impacts through habitat loss if special-status species bat populations begin using bridges proposed for removal as roosting habitat • Temporary and permanent impacts to nonnative woodlands that may contain eucalyptus trees with winter roosting aggregations of adult monarch butterflies	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Indirect temporary impacts to riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities • Temporary and permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding and is suitable habitat for western spadefoot toad and San Bernardino ring-necked snake • Temporary and permanent impacts to nonnative woodlands that may contain eucalyptus trees with winter roosting aggregations of adult monarch butterflies • Temporary impacts through habitat loss if special-status species bat populations begin using bridges proposed for removal as roosting habitat	• **AS-1 – Bats:** Due to the presence of marginally suitable roosting habitat, avoidance and minimization efforts will be implemented. • **AS-2 – Monarch Butterfly:** Avoidance and minimization measures in areas of potentially suitable habitat for winter roosting aggregations of monarch butterfly and the species' egg, caterpillar, and pupal stages will be implemented. • **AS-3 – Amphibians and Reptiles:** Avoidance and minimization measures in areas of potentially suitable habitat for coast range newt, western spadefoot, two-striped garter snake, western pond turtle, San Bernardino ring-necked snake, and South Coast garter snake species will be implemented. • **AS-4 – Other Special-Status Bird Avoidance and Minimization Measures:** Avoidance and minimization efforts for birds protected under California Fish and Game Code Sections 3503 and 3503.5, and the Migratory Bird Treaty Act (MBTA) will be implemented.
THREATENED AND ENDANGERED SPECIES				
Potential temporary indirect impacts through habitat loss to Townsend's big-eared bats if they are discovered using bridges proposed for widening as roosting habitat and indirect temporary impacts to foraging bats may occur from if nighttime construction activities take place.	Determined to have no direct or indirect temporary impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	• **NC-1 –** Riparian/Riverine Habitat Protection • **NC-2 –** Construction Plan • **NC-3 –** Compliance Monitoring • **AS-1 –** Bats
Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	No avoidance, minimization, and/or mitigation measures are required.

Table ES-1: Summary of Potential Environmental Impacts of the Build Alternatives and Measures Addressing Those Effects

TSM/TDM Alternative [1]	BRT Alternative [2]	LRT Alternative [3]	Freeway Tunnel Alternative [4]	Avoidance, Minimization, and Mitigation Measures
INVASIVE SPECIES				
All of the Build Alternatives would potentially result in impacts related to the spread of invasive species through construction activities.				• **IS-1 –** Weed Abatement Program
CUMULATIVE IMPACTS				
Visual/Aesthetics: No cumulative impact.	**Visual/Aesthetics:** No cumulative impact.	**Visual/Aesthetics:** Potential to contribute to an cumulative impact for the Eastside Phase II Transit Corridor Project	**Visual/Aesthetics:** No cumulative impact.	Measures V-1 through V-7, provided above under Visual and Aesthetics.
Animal Species: Potential to contribute to a cumulative impact on nesting or breeding birds under the Migratory Bird Treaty Act	**Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the Migratory Bird Treaty Act	**Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the Migratory Bird Treaty Act	**Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the Migratory Bird Treaty Act	Measure AS-4, provided above under Animal Species.
CLIMATE CHANGE				
Construction would result in approximately 1,650 metric tons of carbon dioxide equivalent emissions	Construction would result in approximately 210 metric tons of carbon dioxide equivalent emissions.	Construction would result in approximately 4930 metric tons of carbon dioxide equivalent emissions.	Construction of the single-bore and dual-bore design variations would result in approximately 26,345 and 48,490 metric tons of carbon dioxide equivalent emissions, respectively.	Measures AQ-1 through AQ-5, provided above under Air Quality.
Operation would result in small decreases in carbon dioxide emissions within the region when compared to No Build conditions.	Operation would result in small decreases in carbon dioxide emissions within the region when compared to No Build conditions.	Operation would result in small decreases in carbon dioxide emissions within the region when compared to No Build conditions.	With the exception of the Freeway Tunnel Alternative dual-bore no toll operational variation and the dual-bore no truck operational variation scenarios in 2035, the Freeway Tunnel Alternative would result in small decreases in carbon dioxide emissions within the region when compared to No Build conditions.	No measures are proposed.

[1] The impacts of the improvements in the TSM/TDM Alternative included in the BRT, LRT, and Freeway Tunnel Alternatives would also occur under those Build Alternatives.
[2] In addition to the impacts described for the BRT Alternative, the impacts of the improvements in the TSM/TDM Alternative included in the BRT Alternative would also occur under the BRT Alternative.
[3] In addition to the impacts described for the LRT Alternative, the impacts of the improvements in the TSM/TDM Alternative included in the LRT Alternative would also occur under the LRT Alternative.
[4] In addition to the impacts described for the Freeway Tunnel Alternative, the impacts of the improvements in the TSM/TDM Alternative included in the Freeway Tunnel Alternative would also occur under the Freeway Tunnel Alternative.

Table ES-2: Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (● indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
FEDERAL AGENCIES						
Federal Highway Administration (FHWA)	Approval for Modified Access Report to the Interstate System	Obtained prior to project approval.				●
	Final Air Quality Conformity Finding (23 USC 327)	Obtained prior to Final EIR/EIS.	●	●		●
	Major Project Operational Independence and Non-Concurrent Construction Determination	Obtained prior to Final EIR/EIS.				●
	Cost Estimate Review (only for FHWA projects over $500 million)	Obtained prior to Final EIR/EIS.				●
	Draft Project Management Plan	Obtained prior to Final EIR/EIS.				●
	Final Project Management Plan	Obtained no later than 90 days after approval of the Record of Decision.				●
Federal Transit Administration (FTA)	Final Air Quality Conformity Finding (23 USC 327)	Obtained prior to Final EIR/EIS.		●	●	
	New Starts Application Approval	Obtained prior to Final EIR/EIS.			●	
	Full Funding Grant Agreement	Obtained prior to completion of final design.			●	
	Small Starts Application Approval	Obtained prior to Final EIR/EIS.		●		
United States Army Corps of Engineers (USACE)	Section 404 Permit for filling or dredging waters of the United States	Obtained during final design.				●
STATE AGENCIES						
California Department of Fish and Wildlife (CDFW)	1602 Agreement for Streambed Alteration	Obtained during final design.				●
State Water Resources Control Board (SWRCB)	Section 402 National Pollutant Discharge Elimination System Permit (Construction Activity)	Obtained during final design.	●	●	●	●
	Section 402 National Pollutant Discharge Elimination System Permit (Caltrans National Pollutant Discharge Elimination System Permit)	Obtained during final design.				●
	Section 402 National Pollutant Discharge Elimination System Permit (Industrial Activities)	Obtained during final design.	●	●	●	
State Historic Preservation Officer (SHPO)	Concurrence with the determinations of eligibility	SHPO concurrence to be determined	●	●	●	●
	Concurrence on the Finding of Effects	Finding of Effect will be submitted to SHPO after identification of Preferred Alternative.	●	●	●	●
California Division of Occupational Safety and Health (Cal/OSHA)	Approval of construction permit	Obtained prior to construction.	●	●	●	●

Table ES-2: Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (● indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
Department of Toxic Substances Control (DTSC)l	Permits for disposal, treatment, and/or handling of hazardous materials encountered during excavation activities.	Obtained during final design.		●	●	●
REGIONAL AND/OR LOCAL AGENCIES AND UTILITIES						
County of Los Angeles Department of Public Works (LADPW)	Approval of encroachment permits	Prior to any construction that would affect LADPW facilities	●	●	●	●
	Approvals to relocate, protect-in-place, or remove LADPW facilities	Prior to any construction that would affect LADPW facilities	●	●	●	●
Regional Water Quality Control Board (RWQCB)	Section 401 Water Quality certification	Obtained during final design.				●
	Section 402 National Pollutant Discharge Elimination System (Groundwater Dewatering)	Obtained during final design.	●	●	●	●
	Approval of waste discharge requirements	Obtained during final design.	●	●	●	●
	Approval of encroachment permits	Obtained during final design.	●	●	●	●
Cities of Alhambra, Los Angeles, Pasadena, and South Pasadena	Approval of modifications to existing freeway agreements or new freeway agreements	Obtained prior to construction.				●
County of Los Angeles and the Cities of Alhambra, Los Angeles, Monterey Park, Pasadena , Rosemead, San Gabriel, San Marino, and South Pasadena	Approval of encroachment permits, street construction permits, street closures, detours, and associated improvements in the public right of way; and modifications or protection in-place of existing utility facilities	Obtained prior to construction.	●	●	●	●
Cities of Alhambra, Los Angeles, and Pasadena; County of Los Angeles Sanitation District; and County of Los Angeles Flood Control District	Approvals for discharges into drainage and sewer systems required under MS4 Permits related to groundwater dewatering, if groundwater contamination is present	Obtained prior to construction.			●	●
County of Los Angeles, and the Cities of Alhambra, Los Angeles, Monterey Park, Pasadena, and South Pasadena	Demolition permits	Obtained prior to demolition.	●	●	●	
City of Monterey Park	Section 4(f) consultation for Cascades Park	Obtained prior to the Final EIR/EIS.		●		
	Park Preservation Act consultation for Cascades Park	Obtained prior to the Final EIR/EIS.		●		

Table ES-2: Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (● indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
Utility Providers (electrical, water, storm drain, telecommunications, sanitary sewer, natural gas)	Approvals to relocate, protect in-place, or remove utility facilities	Prior to any construction activities that would affect utility facilities.	●	●	●	●
	Approval of encroachment permits	Prior to any construction activities that would affect utility facilities.	●	●	●	●
	Approval of connections to existing utility facilities	Prior to initiation of construction			●	●
	Approval of connections to existing utility facilities	Prior to initiation of operations			●	●
Union Pacific Railroad Company (UPRR)	Memorandum of Understanding and a Construction and Maintenance Agreement with the railroad	Prior to any construction within, above, or below railroad right of way.	●		●	●
Southern California Regional Rail Authority (SCRRA)	Approval of right-of-way encroachment permits	Prior to any construction above SCRRA railroad right of way.			●	●

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Executive Summary 1

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VOLUME II

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1. Proposed Project

1.1 Introduction

The California Department of Transportation (Caltrans), in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro) proposes transportation improvements to improve mobility and relieve congestion in the area between State Route 2 (SR 2) and Interstates 5, 10, 210 and 605 (I-5, I-10, I-210, and I-605, respectively) in east/northeast Los Angeles and the western San Gabriel Valley. The study area for the State Route 710 (SR 710) North Study as depicted on Figure 1-1 is approximately 100 square miles (sq mi) and generally bounded by I-210 on the north, I-605 on the east, I-10 on the south, and I-5 and SR 2 on the west. Caltrans is the lead agency under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

The SR-710 North Freeway Alternative (Tunnel) is included in the Southern California Association of Governments (SCAG) 2012–2035 Regional Transportation Plan/Sustainable Communities Strategy (2012 RTP/SCS), which was found to be conforming by the Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) on June 4, 2012. The project is also in the 2015 Federal Transportation Improvement Program (FTIP), which was found to be conforming by the FHWA/FTA on December 15, 2014, and Metro's 2009 Long Range Transportation Plan (LRTP). The Project is proposed to be funded entirely or in part by Measure R, a half-cent sales tax dedicated to transportation projects in Los Angeles County.

1.1.1 Existing Facility

Existing Interstate 710 (I-710) south of the interchange with I-10 has three general-purpose lanes in the northbound direction and three to four general-purpose lanes in the southbound direction. All the general-purpose lanes are 12 feet (ft) wide. Median and outside shoulders are provided; however, the shoulder widths are non-standard (i.e. less than the standard 10 ft width) in some segments. In the northbound direction, the median is 15 ft and the outside shoulder is 8 ft. In the southbound direction, the median has a total width of 30 ft between the edge of travel way and the median barrier/metal beam guard railing that separates the opposing traffic. The outside shoulder ranges from 8 to 10 ft.

Existing SR 710 north of the I-710/I-10/SR 710 interchange has two to three general-purpose lanes in both the northbound and southbound directions. All those general-purpose lanes are 12 ft wide. In the northbound direction, the paved median is 15 ft wide and the shoulder is 8 ft wide. In the southbound direction, the existing median is 30 ft wide with a barrier/metal beam guard railing separating the opposing lanes of traffic. Most of the southbound median area is gravel finished with a 6 ft wide paved section adjacent to the edge of the freeway. The existing 8 to 10 ft wide southbound shoulder is paved.

As the northbound SR 710 gets closer to its terminus at the Valley Boulevard exit, the lanes decrease to two lanes. At the northbound SR 710 off-ramp at Valley Boulevard, there are a left-turn lane, a center lane that can turn either left or right, and a right turn at this signalized intersection. A second signalized intersection at the southbound SR 710 on-ramp allows for traffic to use two left-turn lanes from westbound Valley Boulevard to enter the freeway in the southbound direction. A right-turn lane for eastbound Valley Boulevard traffic allows traffic to turn onto the southbound lanes of SR 710.

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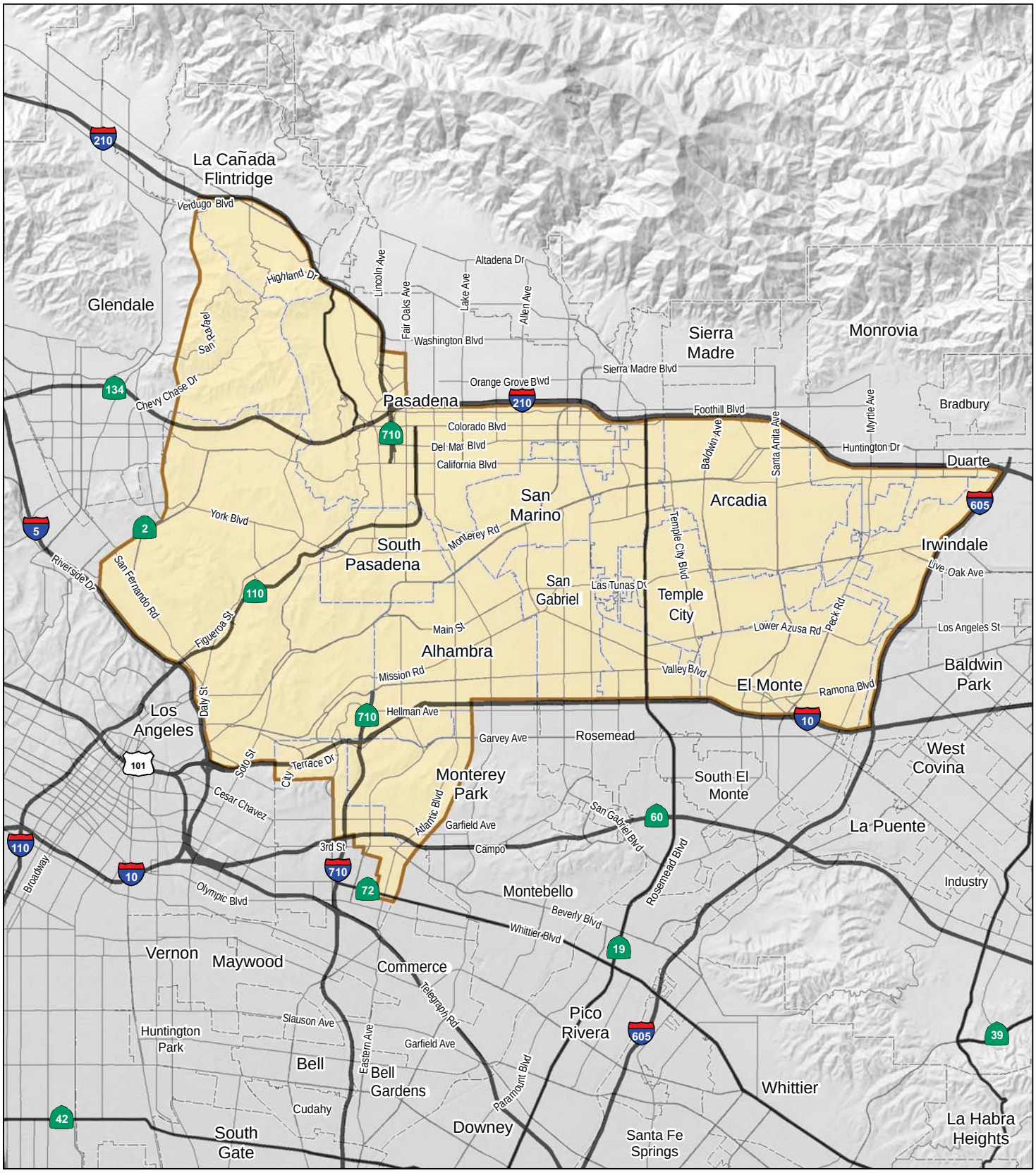

LEGEND

SR 710 North Study Area

FIGURE 1-1

N

0 1.25 2.5
MILES

SOURCE: ESRI (2008); LSA (2013)

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SR 710 North Study
Project Location

07-LA-710 (SR 710)
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Existing SR 710 south of the I-210/State Route 134 (SR 134) interchange has one to three lanes in the northbound direction and two lanes in the southbound direction. All general-purpose lanes are 12 ft wide. In the northbound direction, SR 710 begins as two ramps connecting from Pasadena Avenue near West Del Mar Boulevard. The outside shoulder is 8 ft and the median varies from 10–15 ft. In the southbound direction, the outside shoulder varies from 8–14 ft and the median is 36 ft. Just north of the SR 134/I-210 interchange, the number of lanes on SR 710 northbound expands to six 12 ft lanes, and includes a 10 ft outside shoulder and 15 ft median. In the southbound direction, SR 710 terminates at an off-ramp that connects to St. John Avenue just north of West Del Mar Boulevard, the number of lanes increases to four 12 ft lanes, and includes an 8–10 ft outside shoulder and 12–36 ft median.

In addition to SR 710 and I-710, the following Interstate and State highways are within or in the vicinity of the study area for the SR 710 North Study as shown on Figure 1-1:

- **Interstate 210:** I-210 extends southeast from its interchange with I-5 in northwestern Los Angeles County to its terminus in San Bernardino County, a distance of approximately 86 miles (mi). I-210 is aligned west-east along the northern boundary of the project study area as shown on Figure 1-1.
- **Interstate 10:** I-10 generally extends east and then southeast from its interchange with Highway 1 in Santa Monica to the California/Arizona border and then further east to Florida. I-10 is aligned west-east along the southern boundary of the project study area as shown on Figure 1-1.
- **Interstate 5:** I-5 extends north from the California/Mexico border to the California/Oregon border, a distance of approximately 800 mi. I-5 is aligned south-north along the southwest boundary of the project study area as shown on Figure 1-1.
- **Interstate 605:** I-605 extends northeast from State Route 22 (SR 22) in Seal Beach to its terminus at I-210 in Irwindale, a distance of approximately 27 mi. I-605 is aligned south-north along the eastern boundary of the project study area as shown on Figure 1-1.
- **State Route 2:** SR 2 extends northeast from its interchange with Lincoln Boulevard and I-10 in Santa Monica to its terminus at State Route 138 (SR 138) east of Wrightwood, a distance of approximately 87 mi. SR 2 is aligned south-north along the western boundary of the project study area as shown on Figure 1-1.
- **State Route 110:** State Route 110 (SR 110) extends northeast from United States Route 101 (US-101) to its terminus at Colorado Boulevard in Pasadena, a distance of approximately 9 mi. The northern segment of SR 110 is known as the historic Arroyo Seco Parkway. SR 110 is aligned south-north and extends across the central part of the project study area as shown on Figure 1-1.
- **State Route 19:** State Route 19 (SR 19) extends north from its intersection with Lakewood Boulevard and Del Amo Boulevard in Lakewood to its terminus at I-210 in Pasadena, a distance of approximately 21 mi. SR 19 is aligned south-north across the project study area as shown on Figure 1-1.
- **State Route 134 (SR 134):** SR 134 extends northeast from the US-101/State Route 170 (SR 170)/ SR 134 interchange in North Hollywood to the I-210/SR 710 interchange in Pasadena, a distance of approximately 13 mi. SR 134 is aligned west-east and extends across the northern part of the project study area as shown on Figure 1-1.

1.1.2 Background and History

The history of the planning efforts to complete the SR 710 corridor dates back to 1933 when Legislative Route 167, later renamed State Route 7 (SR 7), was defined to run from San Pedro east to Long Beach and north to the vicinity of Monterey Park. In 1959, the proposed northern limits of SR 7 were extended to the planned Foothill Freeway (which is now I-210). The part of the facility from Long Beach to the I-10 has been constructed and was incorporated in 1983 into the Interstate Highway System as I-710. From I-10 to Valley Boulevard (southern stub) and from the I-210 to the I-210/SR 710/SR 134 interchange (northern stub) were designated SR 710 in 1984.

Over the years, planning efforts continued for SR 710 to evaluate alternatives and address community and agency concerns, eventually leading to the issuance of a Record of Decision (ROD) in 1998 by the FHWA for a surface freeway. After litigation initiated by some of the affected communities, FHWA rescinded the ROD in 2003, citing changes in project circumstances such as funding uncertainty and the opening of the Metro Gold Line to Pasadena, and requiring a more thorough evaluation of the feasibility of a bored tunnel.

In 2006, Metro completed the feasibility assessment of extending SR 710 from Valley Boulevard to I-210. The feasibility evaluation was principally focused on deep subterranean bored or mined tunnel construction methods instead of the more environmentally intrusive shallow trench excavation or “cut-and-cover” tunnel methods. Three tunnel alignments were considered that would extend from the existing SR 710 in south Alhambra to the existing I-210. The assessment concluded that the tunnel concept was feasible to complete a freeway, and no fatal flaws were identified.

Between 2008 and 2010, a geotechnical feasibility study of a tunnel extending SR 710 was conducted. Based on requests from local communities, the study was to be guided by “route-neutral” principles. The route-neutral approach specified that no one route for the tunnel should be favored over another; therefore, all practicable routes for extending SR 710 were considered based on factual data. As part of the route-neutral concept, Caltrans and Metro identified five study zones to represent the corridors for extending SR 710. The geotechnical study was conducted to evaluate the geologic, groundwater, and seismic conditions to determine the viability of a tunnel option in each of the five zones considered. Field explorations and laboratory testing programs were conducted in each of the five tunnel zones. Geotechnical conditions such as geology, faults, seismicity, groundwater, contaminated materials, and potential for gassy conditions were studied in each zone. Based on the information collected and reviewed as part of the geotechnical study, tunneling is considered to be geotechnically feasible in all five zones.

In November 2008, Measure R (a half-cent sales tax dedicated to transportation projects in Los Angeles County) was approved by a two-thirds majority of county voters. Included in the Measure R plan is the commitment of $780 million to improve the connection between the SR 710 and I-210 freeways.

In June 2010, Metro (in coordination with Caltrans) authorized moving forward with an environmental review phase for the SR 710 North Study. The scoping process for the SR 710 North Study EIR/EIS was initiated with the preparation and distribution of a Notice of Preparation (NOP) and the publication of a Notice of Intent (NOI) on March 3, 2011 (Appendix I).

Many community briefing events were held to provide information and keep the public informed with the progress of the study. After the formal scoping process, project-specific professional committees and outreach teams (e.g., a Technical Advisory Committee [TAC] and Stakeholder Outreach Advisory Committee [SOAC]) were formed, and the SR 710 Alternatives Analysis phase of the North Study began. Starting in early 2011, a series of meetings was held to collect ideas, from which possible transit/non-transit suggestions were considered and discussed.

As discussed in the *Alternatives Analysis Report* (2012), a screening analysis was conducted to determine the alternatives to be carried forward for analysis in this Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The alternatives were screened in the following sequence:

a. **Preliminary Screening:** Preliminary screening was conducted on a large set of alternatives that were identified during a review of prior studies and public input received during the "710 Conversations" scoping process conducted by Metro and Caltrans in 2011. From that large set of alternatives, 42 alternatives representing a reasonable range of modes and alignments were selected for initial screening. Criteria used for the preliminary screening included the potential to accommodate regional north-south travel, reduce local street congestion, minimize community impacts, minimize the potential to encounter contaminated soil and groundwater, and accommodate ridership potential (for relevant modes). Within each travel mode, alternatives were evaluated against each other, and the most promising alternatives from each mode were selected for initial screening.

b. **Initial Screening:** The initial screening evaluated 42 alternatives carried forward from the preliminary screening based on the following project objectives: minimize travel time; improve connectivity and mobility; reduce congestion of freeway system; reduce congestion on local street system; increase transit ridership; minimize environmental and community impacts related to transportation; ensure consistency with goals and policies in the 2012–2035 RTP/SCS, the goals in Measure R, and the strategies for the San Gabriel Valley included in Metro's 2009 LRTP; and maximize the cost efficiency of public investments. Based on the results of the initial screening, which relied on available data and schematic representations of each alternative, the best performing alternatives in each transportation mode were carried forward into the secondary screening.

c. **Secondary Screening:** As a result of the initial screening, the *Alternatives Analysis Report* analyzed the following twelve alternatives (some with design variations): the No Build Alternative, a Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative, two Bus Rapid Transit (BRT) Alternatives, two Light Rail Transit (LRT) Alternatives, four Freeway Alternatives, and two Highway/Arterial Alternatives. For these alternatives, additional data were collected and more detailed analysis was conducted, including assessments of the impacts to land use and planning, the community, and the social and economic systems in the study area. Based on the more detailed analysis, five viable alternatives (No Build, TSM/TDM, BRT, LRT, and Freeway Tunnel) were carried forward for further evaluation in the Draft EIR/EIS.

1.2 Purpose and Need

1.2.1 Purpose of the Project

Due to the lack of continuous north-south transportation facilities in the study area, there is congestion on freeways, cut-through traffic that affects local streets, and poor transit operations in the study area. Therefore, the following project purpose has been established.

The purpose of the proposed action is to effectively and efficiently accommodate regional and local north-south travel demands in the study area of the western San Gabriel Valley and east/northeast Los Angeles, including the following considerations:

- Improve efficiency of the existing regional freeway and transit networks.
- Reduce congestion on local arterials adversely affected due to accommodating regional traffic volumes.
- Minimize environmental impacts related to mobile sources.

1.2.2 Need for the Project

The need for the project is described in detail in this section, based on consideration of the following factors:

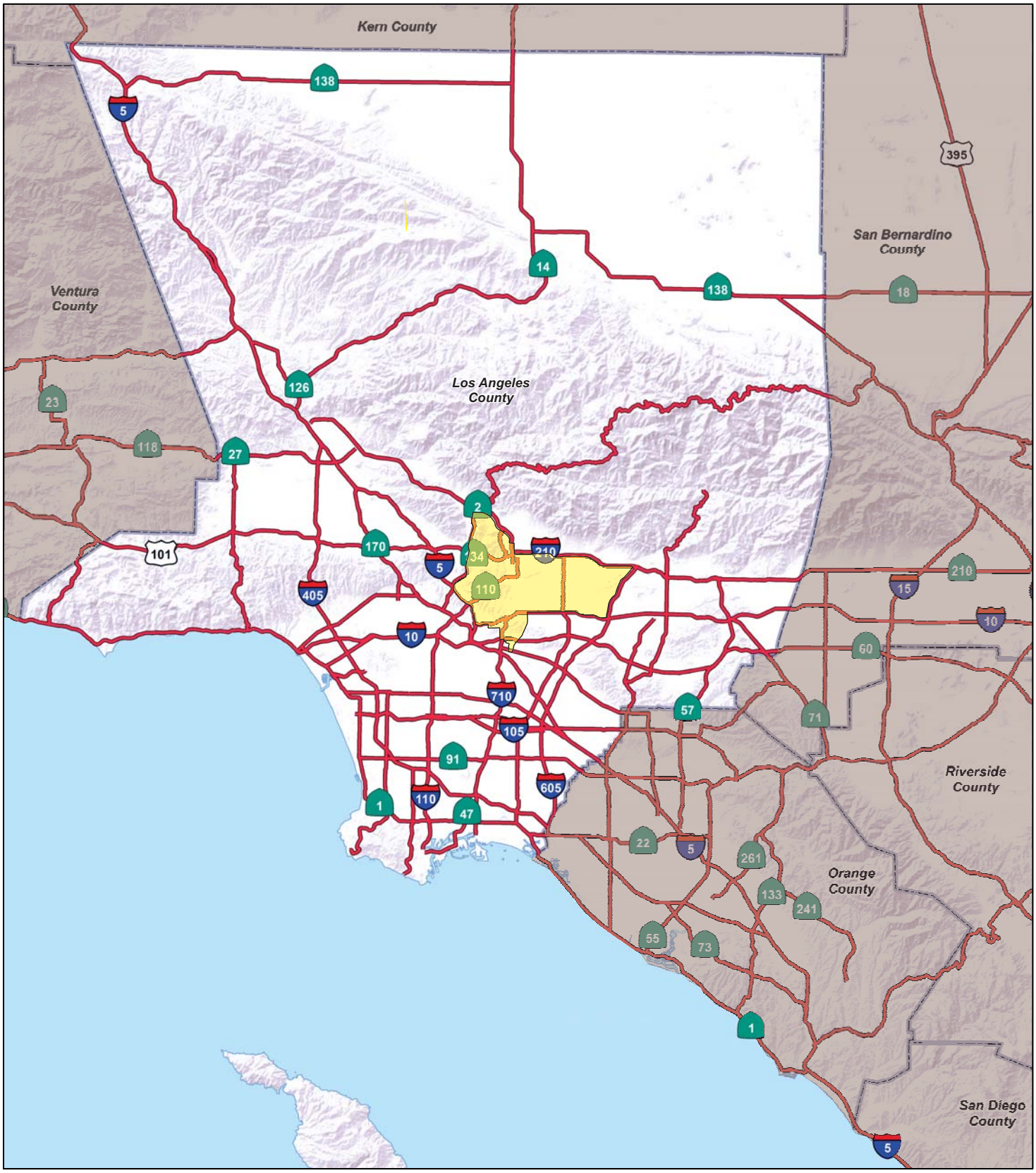
- Capacity, Transportation Demand, and Safety
- Social Demands or Economic Development
- Legislation
- Modal Interrelationships and System Linkages

1.2.2.1 Capacity, Transportation Demand, and Safety

Capacity and Transportation Demand

The study area includes all or parts of the Cities of Alhambra, Arcadia, Duarte, El Monte, Glendale, La Cañada Flintridge, Los Angeles, Monrovia, Montebello, Monterey Park, Pasadena, Rosemead, San Gabriel, San Marino, Sierra Madre, South Pasadena, and Temple City. It also includes several distinct neighborhoods, including El Sereno, Arroyo Seco, Cypress Park, Eagle Rock, Glassell Park, Highland Park, and Lincoln Heights within the City of Los Angeles and parts of several unincorporated communities, including Altadena, East Los Angeles, East Pasadena, East San Gabriel, La Crescenta-Montrose, Mayflower Village, North El Monte, and San Pasqual, in the western San Gabriel Valley and foothills.

The study area is centrally located within the extended urbanized area of Southern California, as illustrated on Figure 1-2. With few exceptions, the area from Santa Clarita in the north to San Clemente in the south (a distance of approximately 90 mi) is continuously urbanized. Physical features such as the San Gabriel Mountains and Angeles National Forest on the north and the Puente Hills and Cleveland National Forest on the south have concentrated urban activity between the Pacific Ocean and these physical constraints. This urbanized area functions as a single social and economic region, identified by the Census Bureau as the Los Angeles-Long Beach-Santa Ana Metropolitan Statistical Area (MSA).



LEGEND

SR 710 North Study Area

FIGURE 1-2

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SOURCE: ESRI (2008); LSA (2013)

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SR 710 North Study

Southern California Region

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Within this urbanized area, social and economic activity creates a great demand for travel between and among residential and employment centers. Greater Los Angeles is notable for its decentralized pattern of development, with 47 employment centers concentrating 10,000 jobs or more within 10 acres (ac) in Los Angeles and Orange Counties (Giuliano et al. 2007). As a result, travel patterns are complex, with people living in each part of the region and traveling to other parts of the region to go to work and to carry out other activities in their daily lives.

There are seven major east-west freeway routes and seven major north-south freeway routes in the central portion of the Los Angeles-Long Beach-Santa Ana MSA:

- Major East-West Freeway Routes
  - State Route 118 (SR 118)
  - US-101/State Route 134 (SR 134)/ I-210
  - I-10
  - State Route 60 (SR 60)
  - Interstate 105 (I-105)
  - State Route 91 (SR 91)
  - SR 22
- Major North-South Freeway Routes
  - Interstate 405 (I-405)
  - US-101/SR 170
  - I-5
  - SR 110
  - I-710/SR 710
  - I-605
  - State Route 57 (SR 57)

Of the seven north-south routes, four of them are located partially within the study area (I-5, SR 110, I-710/SR 710, and I-605), and two of these (SR 110 and I-710/SR 710) terminate within the study area without connecting to another freeway. As a result, a high volume of north-south regional travel demand is concentrated on a few freeways, or diverted to local streets within the study area. This effect is exacerbated by the overall southwest-northeast orientation of I-605, which makes it an unappealing route for traffic between the southern part of the region and the urbanized areas to the northwest in the San Fernando Valley, Santa Clarita Valley, and Arroyo-Verdugo region.

The lack of continuous north-south transportation facilities in the study area affects the overall efficiency of the larger regional transportation system, causing congestion on freeways in the study area, contributing to cut-through traffic that affects the local streets in the study area, and resulting in poor bus transit operations within the study area, due to congestion on the local arterial roads. Cut-through trips are vehicle trips that pass through residential areas without stopping or without at least one trip end in the residential area.

SCAG growth forecasts project out over a 20-year period. SCAG anticipates population, housing, and employment growth to occur through 2035, even though a large area of Los Angeles County is urbanized and close to being built out, especially in the SR 710 North Study area. In 2008, there were 9,778,000 residents and 4,340,000 people employed in the County. According to SCAG's 2012 RTP/SCS Growth Forecast (the most recent data available), the County's population is forecast to

increase to approximately 11,353,000 and employment is forecast to increase to approximately 4,827,000 by 2035, increases of approximately 16.1 percent and approximately 11.2 percent. In 2012, the study area had a population of approximately 0.95 million people and an employment base of approximately 389,000 jobs. By 2035, the study area is forecast to have a population of approximately 1.06 million people and an employment base of approximately 438,000 jobs, increases of approximately 11.6 percent and approximately 12.6 percent. As discussed below, this growth would continue to decrease the overall efficiency of the larger regional transportation system, increase freeway congestion and cut-through traffic on local streets in the study area, and decrease bus transit operation efficiency within the study area.

Regional Transportation System Performance

According to the 2012 *Annual Urban Mobility Report* (Texas Transportation Institute 2012), the Los Angeles-Long Beach-Santa Ana MSA ranks second (second worst) in the United States for total travel delay and total congestion cost, slightly behind New York-Newark NY-NJ-CT but almost 85 percent higher total travel delay and approximately 70 percent higher total congestion cost than the third worst metropolitan area, Chicago-IL-IN. The Los Angeles-Long Beach-Santa Ana MSA ranks first (worst) in travel time index (the ratio of travel time during congested conditions to free flow) for automobile travel. The urban area of the Los Angeles-Long Beach-Santa Ana MSA ranks second for yearly delay for auto commuters and congestion cost per auto commuter, third for excess fuel used per auto commuter, first (worst) in freeway travel time index (measuring the reliability of freeway travel), and fifth for delay per non-peak traveler.

Transit users in the region also experience travel delay. Most transit use in the region occurs on buses, which generally operate on the same streets as automobiles and suffer from the same congestion. According to June 2012 Metro ridership statistics, approximately 76 percent of daily system-wide transit boardings occur on buses. The average speed of these buses has decreased over the past two decades, eroding the benefits achieved through the introduction of Metro Rapid Bus routes in 2000. The average speed of all Metro bus routes increased from 16 miles per hour (mph) in 1992 to 18.5 mph in 2005 after the introduction of Metro Rapid Bus service, but it has since decreased to 17.1 mph due to increasing arterial congestion (Metro Congestion Management Program, 2010).

Travelers in the region are projected to experience continuing and worsening freeway and arterial congestion through 2035. The SCAG 2012 RTP/SCS regional travel demand model was validated for the study area to evaluate existing conditions (2012) and future (2035) transportation system performance within the study area and region. Total vehicle miles traveled (VMT) is a key transportation indicator that represents total miles traveled by vehicles across a particular study area or region. Total vehicle hours traveled (VHT) represents total hours traveled by these same vehicles.

The total daily north-south travel in the study area for Existing (2012), Opening Year (2020/2025), and Horizon Year (2035) conditions was quantified as the number of people traveling across the east-west screenline (shown on Figure 1-3) by automobile or transit. Table 1.1 summarizes the existing (2012), opening year (2020/2025), and horizon year (2035) daily and peak-period VHT and VMT for the study area and for the region. The opening year is defined as 2020 for the TSM/TDM and BRT Alternatives and as 2025 for the LRT and Freeway Tunnel

FIGURE 1-3

SR 710 North Study

East-West Screenline

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SOURCE: Transportation Technical Report (2014)

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TABLE 1.1:
Existing and Future System VMT, VHT, and Person Trips for the Study Area and Region

	Existing (2012)	No Build (2020)	No Build (2025)	No Build (2035)
Total Vehicular Travel Distance (miles)				
Daily VMT in the study area	24,150,000	24,275,000	24,560,000	25,120,000
Combined AM and PM Peak Period VMT in the study area	9,980,000	10,025,000	10,120,000	10,320,000
Daily VMT in the region	391,890,000	422,010,000	438,440,000	471,435,000
Combined AM and PM Peak Period VMT in the region	160,910,000	172,760,000	178,530,000	190,110,000
Total Vehicular Travel Time (hours)				
Daily VHT in the study area	660,000	667,000	681,000	706,000
Combined AM and PM Peak Period VHT in the study area	275,000	279,000	283,000	291,000
Daily VHT in the region	9,740,000	10,473,000	10,997,000	12,107,000
Combined AM and PM Peak Period VHT in the region	4,060,000	4,375,000	4,570,000	4,985,000
Daily Person Throughput (persons)				
Daily Person Trips across the East-West Screenline for Autos and Transit	3,029,000	3,090,000	3,133,000	3,210,000

Source: *Transportation Technical Report* (2014).
VHT = vehicle hours traveled
VMT = vehicle miles traveled

Alternatives. The TSM/TDM and BRT Alternatives can be constructed more quickly so they have an earlier opening year than the LRT and Freeway Tunnel Alternatives which would take longer to construct. As shown in Table 1.1, the daily regional, and peak-period VMT and VHT are projected to continue to increase between the years 2013 and 2035. The combined VHT and VMT is the sum of the AM (6:00 to 9:00) and PM (3:00 to 7:00) peak periods.

Study Area Freeway System

The freeways within the study area are often highly congested, resulting in travel delays. Many segments of the freeway network operate at or over capacity during peak periods. Table 1.2 presents data from Caltrans' 2008 State Highway Congestion Monitoring Program (HICOMP) report (the most recent data available) showing the hours that key freeway segments in the study area are congested on a typical weekday[1]. As Table 1.2 indicates, the 2008 peak hours of congestion span several hours each day, and the periods of congestion are expected to increase with the growth of the region.

TABLE 1.2:
Periods of Recurring Freeway Congestion (2008)

Freeway	Segment (Direction)	AM Peak Congestion Time	PM Peak Congestion Time
I-5	SR 134 to I-110 (southbound)	7:00–11:30	–
	I-10 to SR 2 (northbound)	9:00–noon	3:45–7:15
I-10	I-605 to I-710 (westbound)	6:00–10:45	–
	I-5 to I-605 (eastbound)	–	1:45–7:00
I-605	I-210 to I-10 (southbound)	7:30–9:30	–
I-210	I-210 to SR 2 (westbound)	8:15–9:30	–
	SR 134 to I-605 (eastbound)	–	3:15–6:15
SR 2	SR 134 to I-5 (southbound)	6:45–9:00	–

Source: Caltrans 2008 State Highway Congestion Monitoring Program (HICOMP).
Note: Caltrans 2008 HICOMP defines congestion as speeds less than 35 mph.

[1] 2008 was the last year of Caltrans developing the HICOMP.

Of the four north-south regional freeways that enter the study area (I-5, SR 110, I-710/SR 710, and I-605), only I-5 is continuous through the study area and oriented in a direction that serves the northern portion of the Los Angeles-Long Beach-Santa Ana MSA. As a result, I-5 carries a disproportionate share of regional trips. Analysis using the SCAG 2012 RTP/SCS travel demand model shows that over one-quarter of the traffic on I-5 between I-10 and SR 110 does not have an origin or destination between SR 710 and SR 134. In other words, much of the regional and inter- regional traffic on I-5 is using one of the most congested areas of the regional freeway network. Traffic that does not need to be on I-5 to reach its destination contributes to recurring delay on the I-5 freeway.

In addition to recurring delay during peak hours, speeds and delays on the freeways at the same time of day are often highly variable from day to day. Figure 1-4 displays an example of the speed variation on I-5, a major regional freeway at the edge of the study area. The figure shows that peak-hour (5:00 PM to 6:00 PM on Tuesdays, Wednesdays and Thursdays) speeds on I-5 between Washington Boulevard and SR 134 are highly variable and unpredictable within a single month (October 2013). For example, the speed approaching the segment between SR 60 and I-10 varied from over 65 mph to below 20 mph at the same time of day.

As a result of the unreliable and unpredictable travel conditions, travelers must build “buffer time” into their travel plans to allow for the possibility of longer-than-usual delays. Based on data from Caltrans’ Performance Monitoring System (PeMS), the time it takes to travel on I-5 from I-710 to SR 134 during the weekday peak varies from less than 15 minutes to more than 25 minutes. Even the average travel time on that segment of I-5 is approximately 53 percent higher than the travel time at the free-flow speed of 60 mph. Due to this speed variation, travelers need to allow a buffer of 97 percent of free-flow travel time to assure their arrival at their destination by a particular time.

The time required to make many north-south trips is exacerbated by the spacing between north-south freeways in the study area. Because of the approximate 12 mi spacing between north-south freeways (I-5 and I-605) on either side of the study area, many north-south trips must first travel east-west on the freeway system to reach a north-south freeway. The additional out-of-direction travel increases the required travel time in two ways. First, the actual distance traveled is longer than it might otherwise be, so travel time would be increased even under free-flow conditions.

Second, the additional travel on the east-west freeways degrades the operation of those freeways, so travel speeds are reduced beyond what they would otherwise be on those freeways.

Figure 1-5 illustrates these effects. The graphic highlights the length of a trip from two residential areas (East Los Angeles and El Monte) to an employment center in the study area (downtown Pasadena). The freeway travel distance from each residential area to the employment center is at least twice the direct, straight line distance. The result is that travelers are spending unnecessary time, traveling unnecessary distances, and increasing congestion on the regional freeway network.

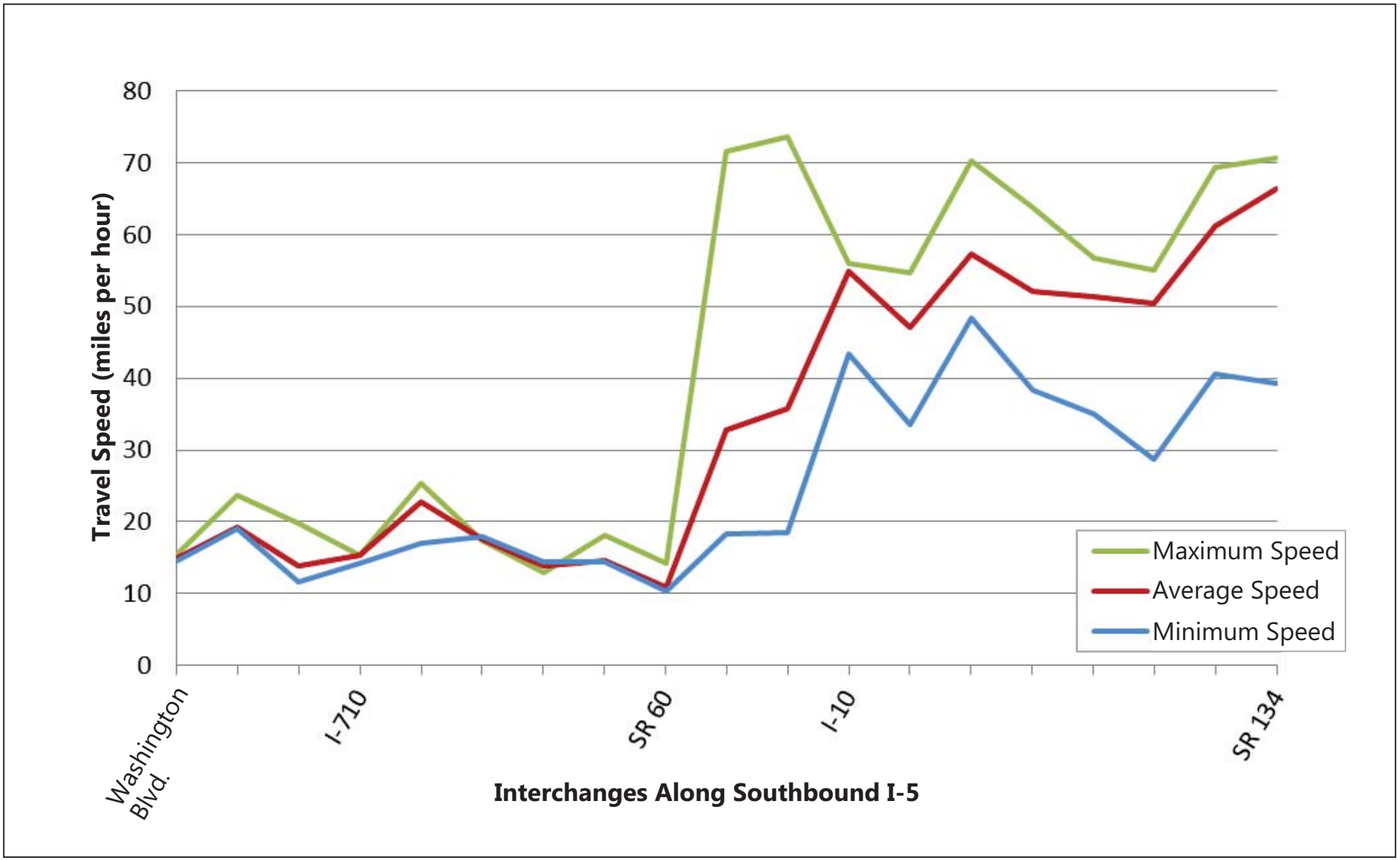

FIGURE 1-4

SR 710 North Study

PM Peak Hour Speed Variations on I-5 Southbound

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SOURCE: Alternatives Analysis Report (CH2M HILL, October 2013)

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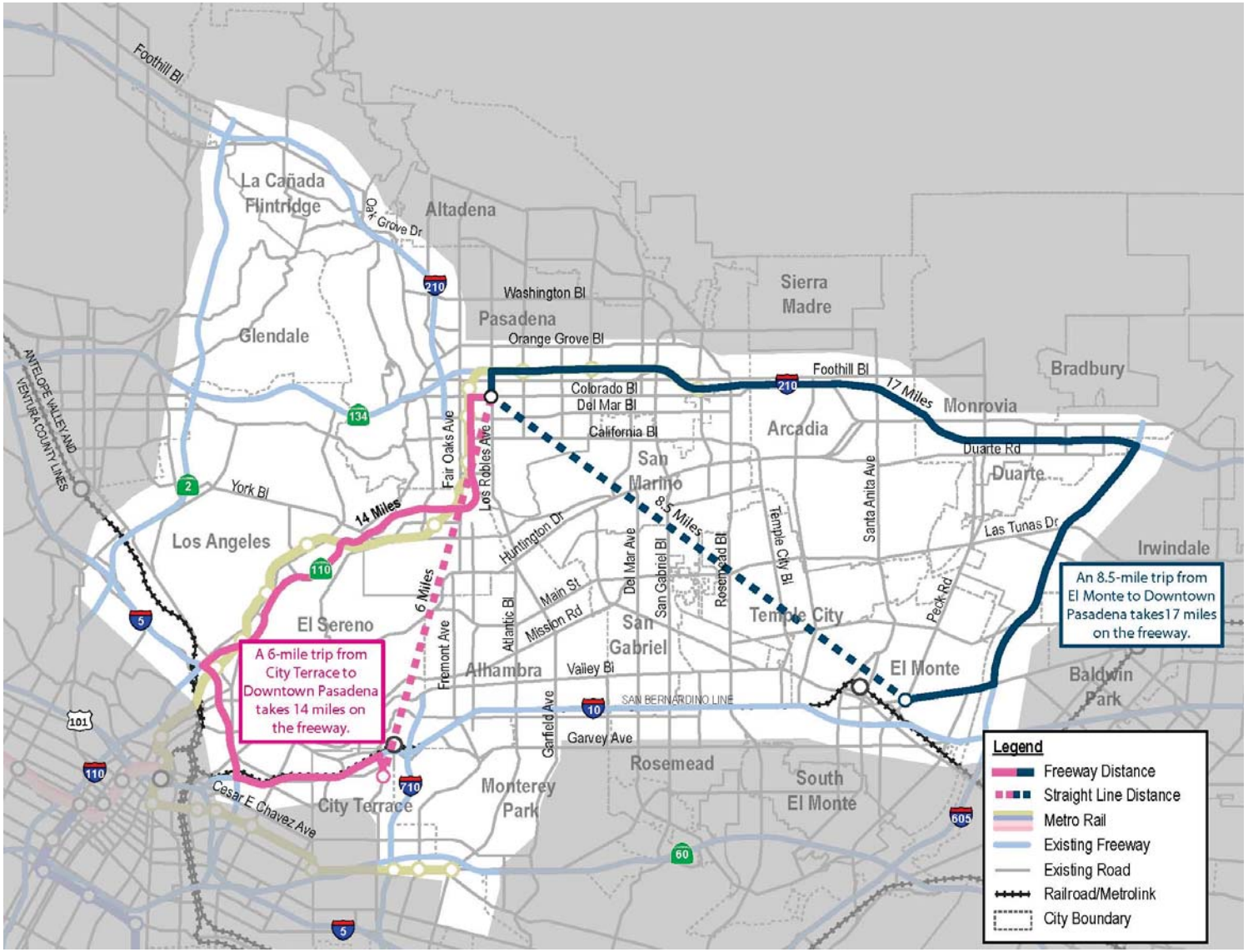

FIGURE 1-5

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SOURCE: CH2M HILL (December 2012)

SR 710 North Study
Out-of-Direction Travel

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The *Mobility Performance Report* (MPR) prepared by Caltrans is the annual traffic congestion report that provides system performance information based on data collected every day of the year, 24 hours/day, by automated vehicle detector stations deployed on urban-area freeways. The 2011 MPR (the most recent data available) lists the top 10 bottlenecks in the AM and PM periods in the Counties of Los Angeles and Ventura (Caltrans District 7) (see Tables 1.3 and 1.4). Of the top 10 bottleneck locations in each period, two bottlenecks in the AM period and three in the PM period are in or near the SR 710 North Study area. According to the January 2014 *Mile Marker: A Caltrans Performance Report*, I-5 is the most congested freeway in the State.

TABLE 1.3:
Top Ten AM Period Bottlenecks in Los Angeles and Ventura Counties in 2011

Rank	County	City	Freeway	Dir	CA Post Mile	Approximate Location	Average Vehicle Hours of Delay	Average Duration (hours)	% of Days Active
1	LA	Los Angeles	I-710	S	R15.26	Magnolia Boulevard	2,392	2.8	86
2	LA	Los Angeles	US-101	S	19.8	Louise Avenue	1,730	2.3	93
3	LA	Los Angeles	I-110	N	21.36	Washington Boulevard	1,525	3.2	100
4	LA	Los Angeles	I-405	S	33.04	Sunset Boulevard	1,599	1.8	71
5	LA	Los Angeles	I-10	W	R7.81	Robertson Boulevard	1,185	1.7	95
6	LA	Downey	I-5	N	8.86	Paramount Boulevard	1,044	1.5	78
7	LA	Downey	I-5	N	8.41	Lakewood Boulevard	848	1.3	90
8	**LA**	**Los Angeles**	**SR 60**	**W**	**0.45**	**Soto Street**	**955**	**2.7**	**78**
9	LA	Los Angeles	I-110	N	19.16	Vernon Avenue	793	1.3	92
10	**LA**	**Los Angeles**	**I-5**	**N**	**15.14**	**Calzona Street**	**738**	**3.1**	**96**

Source: California Department of Transportation, *Mobility Performance Report* (2011).
Note: Indicates AM period bottlenecks in the SR 710 North Study Area.

TABLE 1.4:
Top Ten PM Period Bottlenecks in Los Angeles and Ventura Counties in 2011

Rank	County	City	Freeway	Dir	CA Post Mile	Approximate Location	Average Vehicle Hours of Delay	Average Duration (hours)	% of Days Active
1	**LA**	**Commerce**	**I-5**	**S**	**11.3**	**Malt Avenue**	**2,357**	**3.1**	**100**
2	LA	Montebello	SR 60	E	R7.91	Paramount Boulevard	1,786	3.4	94
3	LA	Diamond Bar	SR 60	E	R22.94	Brea Canyon Road	1,999	3.2	80
4	LA	Diamond Bar	SR 57	N	R3.4	Pathfinder Road	1,609	3.8	98
5	**LA**	**La Puente**	**I-605**	**N**	**R19.502**	**Valley Boulevard**	**1,374**	**3.6**	**98**
6	LA	Long Beach	I-405	S	0.11	North of I-605	1,353	2.6	94
7	LA	Los Angeles	I-405	N	29.16	National Boulevard	1,861	4.0	65
8	**LA**	**El Monte**	**I-10**	**E**	**30.69**	**Durfee Avenue**	**1,225**	**2.2**	**95**
9	LA	Carson	I-405	S	11.82	South of Del Amo Boulevard	1,246	2.6	92
10	LA	Downey	I-605	S	R9.75	North of I-5	1,101	3.5	100

Source: California Department of Transportation, *Mobility Performance Report* (2011).
Note: Indicates PM period bottlenecks in the SR 710 North Study Area.

Tables 1.5 and 1.6 are a summary of the existing (2013) and future (2035) traffic volumes on the nine freeways in the study area and provide ranges of daily and peak-hour traffic volumes. Average daily traffic (ADT) is for both directions, while the peak-hour volumes are shown for the peak direction only. The volume ranges are relatively large because of the length of the freeways (approximately 7 to 37 mi). As shown in Tables 1.5 and 1.6, the traffic volumes are generally predicted to increase between the years 2013 and 2035.

TABLE 1.5:
Existing Conditions (2013) Freeway Volumes

Freeway	Limits	Volume		
		ADT[1]	AM Peak[2]	PM Peak[2]
I-5	Between I-710 and SR 134	87,000-285,000	3,800–10,400	5,300–12,700
I-10	Between I-5 and I-605	114,000–237,000	4,900–8,900	4,900–10,200
I-210	Between I-5 and I-605	55,000–281,000	1,800–11,100	2,400–13,900
I-605	Between SR 60 and I-210	102,000-251,000	3,700–9,600	2,200–9,800
I-710/SR 710[3]	Between I-5 and Valley Boulevard	43,000–205,000	2,200–10,200	3,000–9,900
SR 2	Between I-5 and I-210	45,000–162,000	2,600–9,200	2,300–8,700
SR 60	Between I-5 and I-605	109,000–267,000	5,800–10,800	4,600–12,800
SR 110	Between I-5 and Fair Oaks Avenue	37,000–191,000	1,300–11,200	1,600–7,100
SR 134	Between I-5 and I-210/SR 710	93,000–224,000	4,300–8,900	3,500–8,300

Source: *Transportation Technical Report* (2014).
[1] Both directions.
[2] Peak direction only.
[3] SR 710 between I-10 and Valley Boulevard.

TABLE 1.6:
Future (2035) No-Build Freeway Volumes

Freeway	Limits	Volume		
		ADT[1]	AM Peak[2]	PM Peak[2]
I-5	Between I-710 and SR 134	91,000–290,000	3,900–10,500	4,900–12,800
I-10	Between I-5 and I-605	123,000–260,000	6,100–10,100	4,800–10,900
I-210	Between I-5 and I-605	63,000–288,000	4,300–11,100	2,500–14,300
I-605	Between SR 60 and I-210	107,000–256,000	3,900–9,800	2,600–9,900
I-710/SR 710[3]	Between I-5 and Valley Boulevard	45,000–230,000	2,300–11,400	3,100–11,300
SR 2	Between I-5 and I-210	45,000–162,000	2,500–9,100	2,300–8,600
SR 60	Between I-5 and I-605	113,000–265,000	5,900–11,000	4,900–12,500
SR 110	Between I-5 and Fair Oaks Avenue	39,000–193,000	1,300–11,100	1,700–7,000
SR 134	Between I-5 and I-210/SR 710	93,000–239,000	4,200–9,400	3,600–8,900

Source: *Transportation Technical Report* (2014).
[1] Both directions
[2] Peak direction only
[3] SR 710 between I-10 and Valley Boulevard

Even with the implementation of other planned transportation improvements, increasing travel demands would exceed freeway system capacity, and traffic operations on the already congested freeway network in the study area would continue to decline. Freeway traffic flow can be defined in terms of level of service (LOS). There are six defined LOS, ranging from LOS A to LOS F. For freeways, LOS A represents free traffic flow with low traffic volumes and high speeds, and LOS F represents traffic volumes that exceed the facility's capacity and result in forced flow operations at low speeds, as shown on Figure 1-6.

Tables 1.7 and 1.8 present an overview of the existing and future LOS for the nine study area freeways. As shown in these tables, I-5 has the highest percentage of LOS E and F segments, while SR 110 (north of I-5) has the lowest. Between 2013 and 2035, traffic volumes are generally projected to increase, and LOS is worse for 2035 conditions.

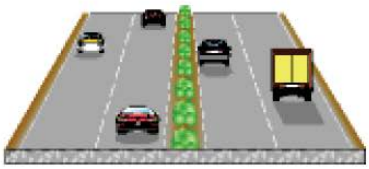
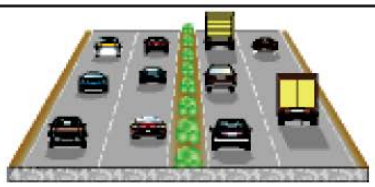
Level of Service	Flow Conditions	Operating Speed (mph)	Technical Descriptions
A		70	Highest quality of service. Traffic flows freely with little or no restrictions on speed or maneuverability. **No delays**
B		70	Traffic is stable and flows freely. The ability to maneuver in traffic is only slightly restricted. **No delays**
C		67	Few restrictions on speed. Freedom to maneuver is restricted. Drivers must be more careful making lane changes. **Minimal delays**
D		62	Speeds decline slightly and density increases. Freedom to maneuver is noticeably limited. **Minimal delays**
E		53	Vehicles are closely spaced, with little room to maneuver. Driver comfort is poor. **Significant delays**
F		<53	Very congested traffic with traffic jams, especially in areas where vehicles have to merge. **Considerable delays**

FIGURE 1-6

SR 710 North Study

Level of Service for Freeways

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Caltrans; 2000 HCM, Levels of Service for Freeways

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TABLE 1.7:
Existing Conditions (2013) Freeway LOS

Freeway	Limits	No. of Segments[1]	Percentage[2] of Segments					
			LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	94	0%	0%	6%	30%	30%	34%
I-10	Between I-5 and I-605	75	2%	9%	37%	25%	13%	15%
I-210	Between I-5 and I-605	175	4%	23%	30%	22%	7%	14%
I-605	Between SR 60 and I-210	34	0%	12%	37%	26%	12%	13%
I-710/SR 710[3]	Between I-5 and Valley Boulevard	31	3%	15%	24%	23%	15%	21%
SR 2	Between I-5 and I-210	41	20%	41%	16%	11%	6%	6%
SR 60	Between I-5 and I-605	66	0%	14%	32%	23%	14%	17%
SR 110	Between I-5 and Fair Oaks Avenue	38	9%	37%	32%	16%	4%	3%
SR 134	Between I-5 and I-210/SR 710	52	0%	8%	50%	32%	7%	4%

Source: *Transportation Technical Report* (2014).
1 Both directions
2 Both directions, both peak periods
3 SR 710 between I-10 and Valley Boulevard

TABLE 1.8:
Future (2035) No-Build Freeway LOS

Freeway	Limits	No. of Segments[1]	Percentage[2] of Segments					
			LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	94	0%	1%	7%	22%	29%	42%
I-10	Between I-5 and I-605	75	2%	5%	29%	31%	15%	17%
I-210	Between I-5 and I-605	175	3%	22%	27%	23%	10%	15%
I-605	Between SR 60 and I-210	34	0%	15%	31%	26%	12%	16%
I-710/SR 710[3]	Between I-5 and Valley Boulevard	31	2%	15%	24%	18%	10%	32%
SR 2	Between I-5 and I-210	41	16%	40%	21%	11%	6%	6%
SR 60	Between I-5 and I-605	66	0%	11%	32%	26%	12%	20%
SR 110	Between I-5 and Fair Oaks Avenue	38	9%	36%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/SR 710	52	0%	3%	47%	36%	12%	3%

Source: *Transportation Technical Report* (2014).
1 Both directions
2 Both directions, both peak periods
3 SR 710 between I-10 and Valley Boulevard

Figure 1-7 shows average PM peak-period travel speeds on freeways in and around the study area based on 2008 data from the 2012 RTP/SCS. As shown, those travels speeds are below 34 mph on a number of the freeway segments in the study area and the surrounding areas. By 2035, the number of freeway segments operating at less than 34 mph in the PM peak period will increase, with more segments operating at 24 mph or less than in 2008, as shown on Figure 1-8.

One way to quantify the degree to which mobility is constrained in the north-south direction compared to the east-west direction is to compare the volume/capacity (v/c) ratios of freeways in each of those directions. The total volume of traffic on the freeways at select locations compared to the total capacity of the freeways at those locations represents the v/c ratio for traffic in that direction. According to analysis with the SCAG RTP/SCS travel demand model, the v/c ratio for traffic on north-south freeways is more than 10 percent greater than that for east-west freeways during the PM peak period.

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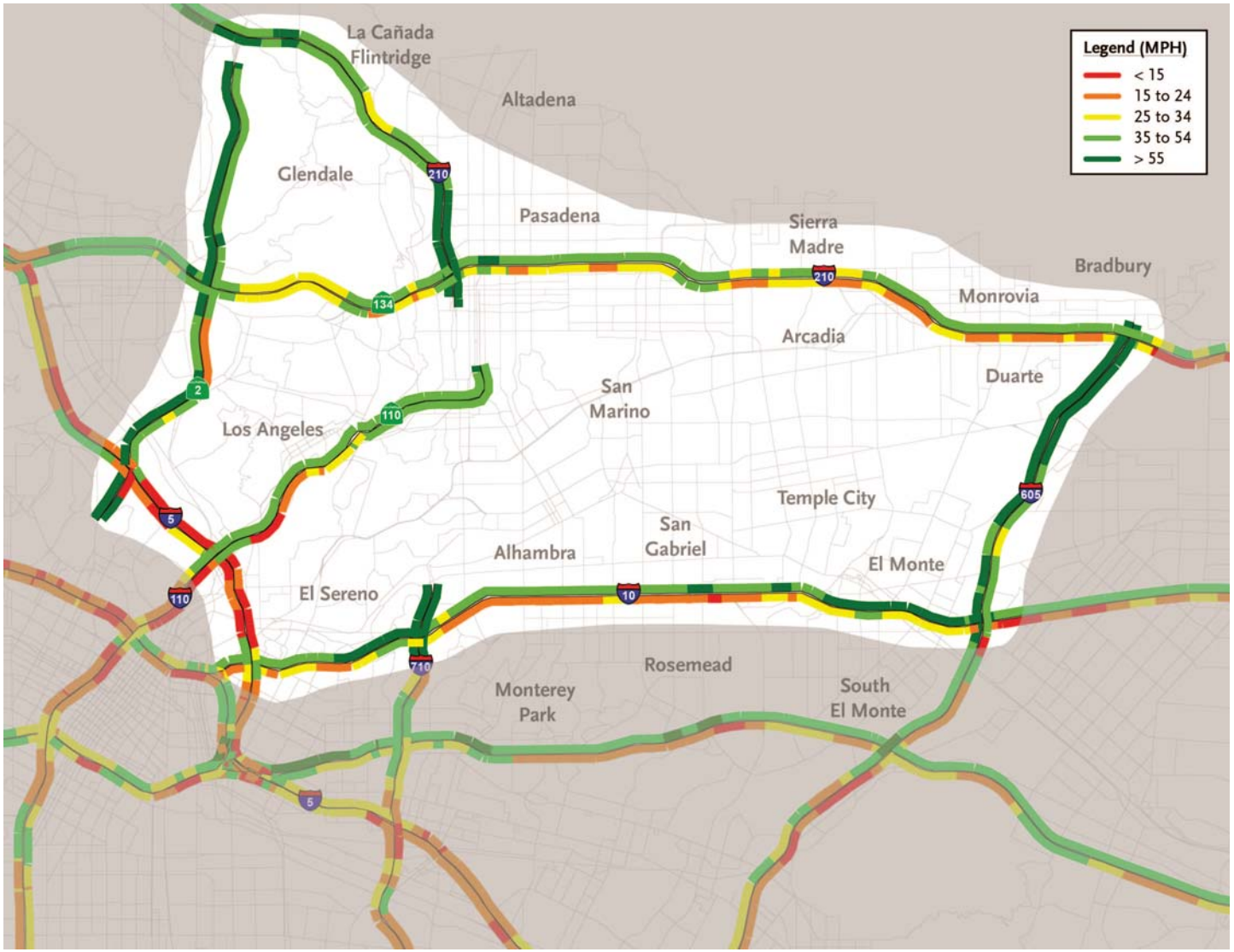

FIGURE 1-7

N

SR 710 North Study

Year 2008 Average PM Speeds

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: 2012 RTP

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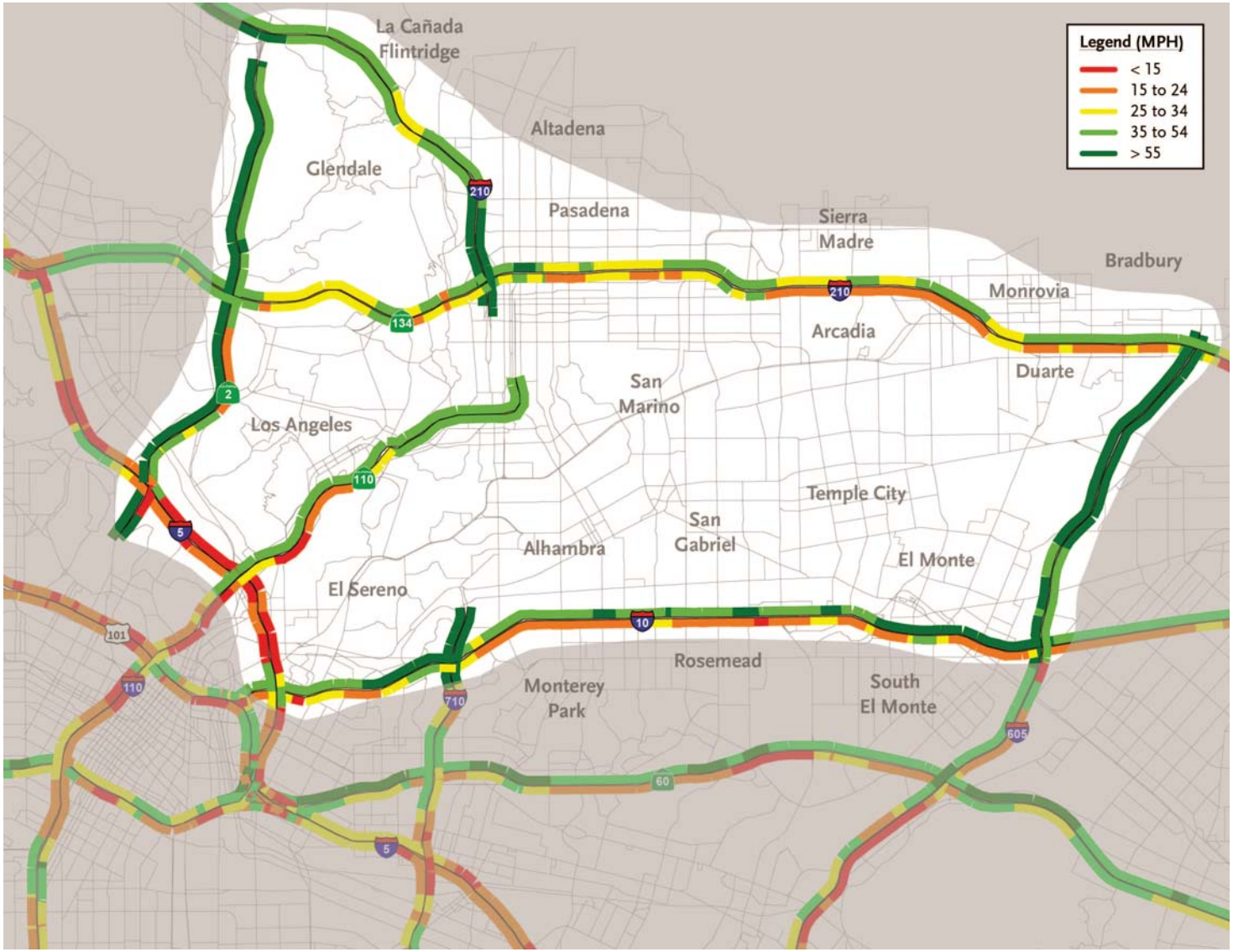

FIGURE 1-8

N

SR 710 North Study

Year 2035 Average PM Speeds

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: 2012 RTP

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Local Street System

One result of the distances between freeways and the congestion on the freeway system is that travelers use local streets in the study area to complete their regional trips. The high volume of cut-through traffic in the study area plays a major role in contributing to arterial congestion.

Congestion on local streets can be measured by intersection traffic flow defined by LOS. For intersections, LOS A represents very short delays (less than 10 seconds per vehicle) and LOS F represents high delays (more than 80 seconds per vehicle), as shown on Figures 1-9 and 1-10.

Table 1.9 summarizes the existing (2013) and future (2020, 2025, and 2035) No Build intersection operations on 156 local streets in the study area. As shown in Table 1.9, delay is projected to increase at 124 of the intersections in the morning peak hour and 128 of the intersections in the afternoon peak hour. LOS is projected to degrade at 35 of the intersections in the morning peak hour and at 34 of the intersections in the afternoon peak hour. (Intersections operating at or forecast to operate at LOS E or F are shown in **bold** text.) In the morning peak hour, 7 of the intersections currently operate at LOS E and none operate at LOS F. In the afternoon peak hour, 12 of the intersections currently operate at LOS E and 6 operate at LOS F. By 2035, the number of intersections operating at LOS E is projected to increase from 7 to 13 for the morning peak hour and from 12 to 15 for the afternoon peak hour. The number of intersections operating at LOS F is projected to increase from 0 to 5 for the morning peak hour and from 6 to 11 for the afternoon peak hour.

The high volume of cut-through traffic in the study area contributes to the arterial congestion in the study area. Figure 1-11 illustrates the roadway segments that cross the east-west screenline (shown on Figure 1-3) that were used to calculate the number of north-south cut-through trips in the study area. As shown in Table 1.10, in 2012, approximately 7.0 percent of the AM peak period, 12.4 percent of the PM peak period, and 10.5 percent of the daily trips on selected arterials are cut-through trips. In 2035, cut-through trips are projected to increase to approximately 7.5 percent in the AM peak period, 13.7 percent in the PM peak period, and 11.5 percent for the daily trips. There are projected increases in cut-through traffic even with the implementation of multiple highway and transit projects in the region to improve mobility, including the Gold Line Foothill and Eastside extension, Exposition Light Rail Line Phase II, Purple Line Westside Subway extension, Regional Connector, I-5 improvements north and south of downtown Los Angeles, managed lanes on SR 110 and I-10, and construction of high-occupancy vehicle (HOV) lanes on I-405.

Within the study area, higher traffic volumes are observed on north-south arterials than on east-west arterials. Figure 1-12 presents the 2012 ADT volumes on the study area's major arterials, based on modeled data. Throughout the study area, four-lane north-south arterials such as Fremont Avenue, Atlantic Boulevard, Garfield Avenue, San Gabriel Boulevard, and Rosemead Boulevard (SR 19) all have segments that carry over 35,000 vehicles per day. In contrast, only Huntington Drive, a six-lane arterial, carries that volume of traffic in the east-west direction. As shown in Table 1.10, the volume of vehicles traveling on the north-south study area freeway and arterial systems is projected to increase between the years 2012 and 2035.

As with the study area freeways, v/c ratios on north-south roadways for the local roadway network were compared to those on east-west roadways. As shown in Table 1.11, the v/c ratios for traffic on north-south roadways is about 25 percent greater than that for east-west roadways during the PM peak period.

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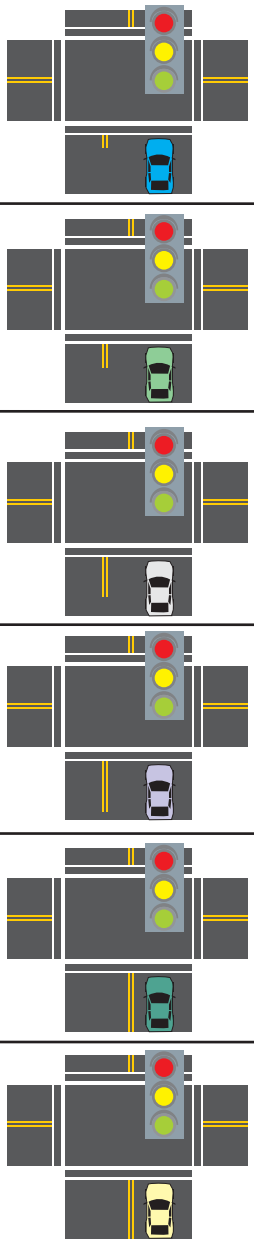
Level of Service	Delay per Vehicle (seconds)
A	≤10
B	11-20
C	21-35
D	36-55
E	56-80
F	>80



Factors Affecting LOS of Signalized Intersections

Traffic Signal Conditions:
- Signal Coordination
- Cycle Length
- Protected left turn
- Timing
- Pre-timed or traffic activated signal
- Etc.

Geometric Conditions:
- Left- and right-turn lanes
- Number of lanes
- Etc.

Traffic Conditions:
- Percent of truck traffic
- Number of pedestrians
- Etc.

FIGURE 1-9

SR 710 North Study

Level of Service for Signalized Intersections

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Caltrans; 2000 HCM, Exhibit 16-2, Levels of Service for Signalized Intersections

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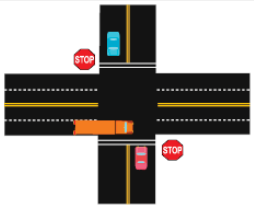
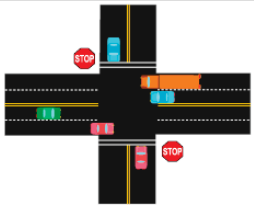
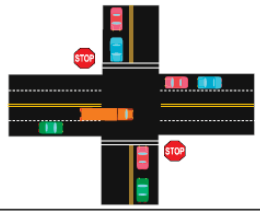
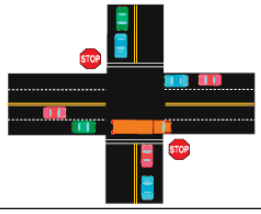
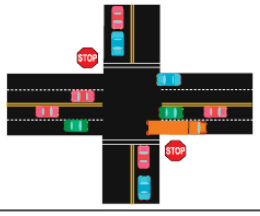
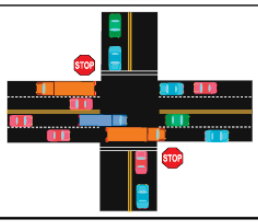
Level of Service	Flow Conditions	Delay per Vehicle (seconds)	Technical Descriptions
A		≤10	Very short delays
B		11-15	Short delays
C		16-25	Minimal delays
D		26-35	Minimal delays
E		36-50	Significant delays
F		>50	Considerable delays

FIGURE 1-10

SR 710 North Study

Level of Service for Two-Way Stop Controlled Intersections

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Caltrans; 2000 HCM, Exhibit 17-2, Levels of Service for TWSC Intersections

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TABLE 1.9:
2013 and 2035 Intersection Level of Service

No.	Intersection (All are signalized unless otherwise noted.)	Existing (2013)				No Build (2020)				No Build (2025)				No Build (2035)			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS
1	Atlantic Blvd/Glendon Way	49.4	D	18.3	B	64.1	E	19.2	B	70.3	E	20.4	C	77.1	E	22.6	C
2	Atlantic Blvd/Main St	39.4	D	44.1	D	39.7	D	44.2	D	41.0	D	44.8	D	42.6	D	46.2	D
3	Atlantic Blvd/Mission Rd	32.9	C	54.2	D	36.7	D	67.1	E	38.0	D	65.8	E	39.7	D	67.4	E
4	Atlantic Blvd/Valley Blvd	42.8	D	51.0	D	43.8	D	57.8	E	46.7	D	58.1	E	47.7	D	57.1	E
5	Fremont Ave/Commonwealth Ave	19.7	B	29.9	C	20.7	C	30.0	C	21.1	C	31.1	C	21.4	C	32.1	C
6	Fremont Ave/Concord Ave	11.2	B	14.9	B	11.4	B	13.2	B	11.8	B	13.3	B	13.3	B	13.6	B
7	Fremont Ave/Hellman Ave	33.7	C	40.5	D	36.7	D	40.8	D	39.7	D	43.2	D	48.2	D	48.0	D
8	Fremont Ave/Main St	25.3	C	32.5	C	27.3	C	33.8	C	27.3	C	35.1	D	27.9	C	36.8	D
9	Fremont Ave/Mission Rd	45.9	D	59.6	E	47.5	D	65.6	E	49.1	D	65.2	E	51.2	D	69.8	E
10	Fremont Ave/Norwood Ave (unsignalized)	44.3	E	773.1	F	51.4	F	OVF	F	58.2	F	OVF	F	71.6	F	OVF	F
11	Fremont Ave/Poplar Blvd	9.9	A	8.8	A	10.6	B	8.9	A	10.5	B	8.9	A	10.5	B	7.4	A
12	Fremont Ave/Valley Blvd	43.8	D	46.4	D	45.5	D	47.9	D	45.3	D	48.8	D	48.5	D	51.2	D
13	Garfield Ave/Glendon Way	16.5	B	15.4	B	17.5	B	15.7	B	18.1	B	16.4	B	19.2	B	17.6	B
14	Garfield Ave/Main St	30.9	C	45.0	D	30.9	C	52.3	D	30.8	C	52.3	D	31.2	C	51.7	D
15	Garfield Ave/Mission Rd	40.4	D	60.5	E	49.2	D	65.1	E	53.2	D	67.8	E	55.5	E	72.7	E
16	Garfield Ave/Norwood Pl (unsignalized)	10.2	B	9.1	A	10.5	B	9.3	A	10.6	B	9.4	A	10.7	B	9.7	A
17	Garfield Ave/Valley Blvd	38.8	D	44.7	D	40.6	D	49.3	D	42.1	D	50.5	D	43.6	D	51.3	D
18	Huntington Dr/Main St	0.9	A	0.6	A	1.0	A	0.6	A	0.7	A	0.6	A	0.7	A	0.7	A
19	SR 710 NB Off-Ramp/Valley Blvd	28.5	C	12.8	B	29.5	C	15.5	B	32.0	C	18.0	B	33.5	C	17.2	B
20	SR 710 SB On-Ramp/Valley Blvd	48.4	D	75.5	E	50.6	D	89.0	F	69.5	E	158.5	F	51.7	D	95.3	F
21	Baldwin Ave/Foothill Blvd	20.0	C	28.7	C	18.4	B	30.1	C	19.1	B	30.2	C	19.6	B	29.2	C
22	Baldwin Ave/Huntington Dr	38.4	D	47.7	D	38.4	D	52.7	D	39.1	D	54.7	D	39.6	D	55.9	E
23	Santa Anita Ave/Duarte Rd	22.0	C	23.2	C	22.7	C	22.2	C	24.3	C	23.0	C	28.3	C	23.6	C
24	Santa Anita Ave/Live Oak Ave	30.5	C	33.2	C	31.4	C	33.3	C	31.8	C	33.6	C	32.1	C	33.5	C
25	Sunset Blvd/Huntington Dr	53.1	D	53.0	D	57.2	E	58.2	E	58.7	E	59.2	E	62.4	E	62.0	E
26	I-605 NB Ramps/Ramona Blvd	25.8	C	53.3	D	33.6	C	48.5	D	34.3	C	48.4	D	36.5	D	43.0	D
27	Atlantic Blvd/Beverly Blvd	28.8	C	45.3	D	30.3	C	47.5	D	30.7	C	47.9	D	32.1	C	50.6	D
28	Atlantic Blvd/Pomona Blvd	35.4	D	65.0	E	36.8	D	51.3	D	37.1	D	52.5	D	37.5	D	54.9	D
29	Atlantic Blvd/Whittier Blvd	24.2	C	30.4	C	25.8	C	33.4	C	26.3	C	34.5	C	27.3	C	39.5	D
30	Campus Rd/Ramona Blvd	27.3	C	20.1	C	27.9	C	19.8	B	28.0	C	19.9	B	29.7	C	20.0	C
31	Rosemead Blvd/California Blvd	25.7	C	30.6	C	26.0	C	30.1	C	26.4	C	30.2	C	27.6	C	32.1	C
32	Rosemead Blvd/Colorado Blvd	27.8	C	70.0	E	30.8	C	87.9	F	31.4	C	96.0	F	38.8	D	116.5	F
33	Baldwin Ave/Valley Blvd	32.6	C	38.5	D	35.0	C	44.7	D	35.5	D	45.3	D	36.5	D	47.1	D
34	Durfee Ave/Valley Blvd	50.9	D	70.5	E	63.2	E	86.9	F	70.7	E	93.1	F	76.2	E	111.1	F
35	Peck Rd/Garvey Ave	16.1	B	17.0	B	16.6	B	19.5	B	18.6	B	20.1	C	19.8	B	21.9	C
36	Peck Rd/I-10 EB Ramps	Free				Free				Free				Free			
37	Peck Rd/Lower Azusa Rd	49.8	D	69.9	E	55.4	E	80.3	F	57.0	E	82.2	F	60.9	E	84.5	F

TABLE 1.9:
2013 and 2035 Intersection Level of Service

No.	Intersection (All are signalized unless otherwise noted.)	Existing (2013)				No Build (2020)				No Build (2025)				No Build (2035)			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS
38	Peck Rd/Valley Blvd	34.7	C	42.8	D	38.2	D	48.2	D	38.7	D	50.0	D	39.4	D	53.2	D
39	Santa Anita Ave/I-10 EB Ramps	16.2	B	26.0	C	16.7	B	24.6	C	16.9	B	25.0	C	17.2	B	25.5	C
40	Santa Anita Ave/Lower Azusa Rd	55.7	E	66.1	E	61.6	E	70.0	E	63.6	E	71.0	E	66.8	E	73.6	E
41	Santa Anita Ave/Valley Blvd	37.4	D	36.6	D	40.4	D	41.2	D	43.9	D	41.6	D	45.4	D	42.0	D
42	Tyler Ave/Valley Blvd	13.2	B	14.5	B	13.8	B	17.5	B	13.9	B	17.5	B	14.1	B	17.6	B
43	Valley Blvd/Garvey Ave	22.5	C	32.7	C	23.3	C	37.1	D	23.5	C	37.7	D	24.2	C	41.3	D
44	Harvey Dr/Wilson Ave	25.1	C	30.1	C	29.1	C	31.9	C	29.6	C	31.9	C	29.2	C	31.2	C
45	Myrtle Ave/Longden Ave	16.4	B	33.1	C	17.9	B	38.7	D	18.1	B	39.8	D	18.1	B	42.0	D
46	Peck Rd/Myrtle Ave/Live Oak Ave	27.3	C	40.3	D	27.4	C	40.6	D	27.7	C	40.8	D	28.3	C	40.7	D
47	Angeles Crest Hwy/Foothill Blvd	14.0	B	12.4	B	13.7	B	13.5	B	13.8	B	13.5	B	13.7	B	13.6	B
48	Gould Ave/Foothill Blvd	20.4	C	25.3	C	21.1	C	25.6	C	21.6	C	25.6	C	21.7	C	25.9	C
49	I-210 EB Ramps/Berkshire Pl (unsignalized)	25.7	D	14.2	B	15.5	C	13.1	B	18.5	C	13.1	B	15.3	C	13.0	B
50	I-210 EB Ramps/Foothill Blvd	Free				Free				Free				Free			
51	I-210 WB Ramps/Berkshire Pl (unsignalized)	22.3	C	12.1	B	19.1	C	11.9	B	19.3	C	12.1	B	18.5	C	12.2	B
52	I-210 WB Ramps/Foothill Blvd	12.5	B	11.3	B	13.3	B	12.6	B	15.4	B	12.7	B	16.2	B	12.7	B
53	Ocean View Blvd/Foothill Blvd	23.1	C	24.2	C	23.5	C	24.0	C	23.9	C	24.7	C	27.0	C	28.3	C
54	SR 2 Ramps/Foothill Blvd	9.2	A	9.5	A	12.4	B	20.7	C	12.2	B	20.9	C	12.1	B	23.5	C
55	Verdugo Blvd/Foothill Blvd	20.7	C	21.4	C	20.9	C	21.4	C	21.1	C	21.2	C	21.6	C	21.5	C
56	Ave 20/Broadway	20.3	C	15.9	B	19.6	B	16.5	B	19.6	B	16.7	B	20.4	C	16.8	B
57	Ave 64/York Blvd	23.6	C	24.4	C	22.1	C	24.4	C	22.3	C	24.7	C	23.1	C	25.2	C
58	Broadway/Colorado Blvd	12.8	B	106.2	F	14.7	B	124.0	F	15.2	B	132.9	F	14.9	B	160.1	F
59	Collis Ave/Huntington Dr	30.9	C	21.5	C	38.3	D	18.6	B	44.3	D	18.8	B	49.2	D	18.9	B
60	Concord Ave/Alhambra Ave (unsignalized)	26.5	D	57.9	F	32.4	D	72.9	F	34.2	D	100.1	F	40.8	E	113.2	F
61	Daly St/Broadway	52.2	D	29.6	C	77.5	E	36.5	D	82.4	F	37.8	D	88.2	F	38.3	D
62	Eagle Rock Blvd/SR 2 Ramps	41.5	D	40.0	D	34.5	C	37.7	D	34.3	C	37.9	D	36.6	D	37.8	D
63	Eagle Rock Blvd/Verdugo Rd/Ave 40	29.6	C	43.6	D	31.6	C	49.0	D	31.4	C	50.8	D	30.6	C	50.0	D
64	Eagle Rock Blvd/York Blvd	15.3	B	20.2	C	15.3	B	20.4	C	15.4	B	20.5	C	15.7	B	20.6	C
65	Eastern Ave/Huntington Dr	26.0	C	118.2	F	26.7	C	122.9	F	27.6	C	138.0	F	28.1	C	165.0	F
66	Figueroa St/Ave 26	46.8	D	33.6	C	47.1	D	36.2	D	52.3	D	36.2	D	53.4	D	38.3	D
67	Figueroa St/Colorado Blvd	29.6	C	15.9	B	31.3	C	16.8	B	33.1	C	16.7	B	36.4	D	17.0	B
68	Figueroa St/SR 134 EB Ramps	1.0	A	1.0	A	1.0	A	1.0	A	1.0	A	1.0	A	1.0	A	1.0	A
69	Figueroa St/SR 134 WB Ramps (unsignalized)	44.9	E	38.8	E	19.5	C	40.0	E	19.9	C	38.3	E	20.2	C	44.3	E
70	Figueroa St/York Blvd	24.0	C	22.4	C	25.7	C	24.8	C	25.6	C	25.1	C	26.2	C	25.1	C
71	Griffin Ave/Broadway	18.3	B	18.6	B	18.0	B	19.8	B	18.2	B	20.1	C	18.8	B	20.3	C
72	Huntington Dr/Monterey Rd	45.1	D	33.6	C	51.8	D	32.7	C	54.2	D	32.9	C	53.7	D	33.4	C
73	Marengo St/Mission Rd	40.3	D	44.1	D	35.3	D	43.6	D	37.5	D	46.1	D	36.8	D	46.1	D
74	Pasadena Ave/Broadway	68.0	E	22.9	C	148.7	F	25.3	C	173.2	F	26.2	C	192.9	F	25.4	C

TABLE 1.9:
2013 and 2035 Intersection Level of Service

No.	Intersection (All are signalized unless otherwise noted.)	Existing (2013)				No Build (2020)				No Build (2025)				No Build (2035)			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS
75	San Pasqual Ave/York Blvd	13.2	B	13.0	B	13.5	B	12.9	B	13.5	B	13.1	B	15.1	B	15.6	B
76	Soto St/Marengo St	15.6	B	12.2	B	15.7	B	12.4	B	16.0	B	12.6	B	17.1	B	12.8	B
77	Myrtle Ave/Duarte Rd	49.6	D	48.1	D	47.2	D	50.7	D	47.5	D	50.1	D	48.6	D	49.2	D
78	Myrtle Ave/I-210 EB Ramps	23.9	C	29.3	C	27.6	C	36.0	D	27.6	C	35.4	D	27.5	C	38.0	D
79	Atlantic Blvd/Cesar Chavez Ave	31.8	C	50.0	D	33.4	C	49.1	D	33.9	C	50.3	D	35.3	D	54.3	D
80	Atlantic Blvd/Garvey Ave	34.0	C	50.6	D	36.7	D	54.5	D	38.3	D	56.3	E	41.7	D	61.7	E
81	Atlantic Blvd/SR 60 EB Ramps	10.1	B	11.7	B	10.3	B	14.9	B	10.2	B	14.9	B	10.5	B	15.2	B
82	Atlantic Blvd/SR 60 WB Ramps	13.2	B	11.8	B	14.3	B	16.0	B	15.2	B	16.0	B	17.4	B	17.4	B
83	McDonnell Ave/Corporate Center Dr/Floral Dr	21.0	C	21.1	C	22.6	C	20.5	C	22.6	C	21.1	C	22.7	C	22.9	C
84	Arroyo Seco Pkwy/California Blvd	24.8	C	28.0	C	25.8	C	29.0	C	29.0	C	28.7	C	31.4	C	29.9	C
85	Arroyo Seco Pkwy/Colorado Blvd	15.8	B	18.0	B	15.5	B	17.5	B	15.7	B	17.6	B	15.5	B	18.1	B
86	Arroyo Seco Pkwy/Del Mar Blvd	23.9	C	26.9	C	23.2	C	26.1	C	23.5	C	26.3	C	23.9	C	27.1	C
87	Fair Oaks Ave/California Blvd	28.6	C	29.8	C	29.0	C	31.1	C	29.1	C	31.2	C	31.4	C	32.0	C
88	Fair Oaks Ave/Corson St (I-210 EB Off-Ramp)	21.8	C	18.7	B	13.6	B	19.3	B	14.0	B	19.4	B	14.4	B	19.4	B
89	Fair Oaks Ave/Del Mar Blvd	26.5	C	29.0	C	26.8	C	29.1	C	27.7	C	30.0	C	26.8	C	31.3	C
90	Fair Oaks Ave/Maple St (I-210 WB On-Ramp)	22.1	C	23.6	C	20.9	C	24.0	C	21.1	C	23.9	C	21.0	C	24.2	C
91	Fair Oaks Ave/Mountain St	12.9	B	12.2	B	12.8	B	12.3	B	12.9	B	12.3	B	12.9	B	12.3	B
92	Fair Oaks Ave/Orange Grove Blvd	30.9	C	26.1	C	31.2	C	27.7	C	31.3	C	27.8	C	31.4	C	27.7	C
93	Fair Oaks Ave/Raymond Hill Rd	9.3	A	8.7	A	9.7	A	9.8	A	9.2	A	10.8	B	8.9	A	10.3	B
94	Fair Oaks Ave/Walnut St	23.5	C	26.1	C	23.2	C	24.1	C	23.1	C	24.2	C	23.3	C	24.9	C
95	Hill Ave/Corson St (I-210 EB Off-Ramp)	30.6	C	33.5	C	28.0	C	31.7	C	28.5	C	31.2	C	30.1	C	31.4	C
96	Hill Ave/Maple St (I-210 WB On-Ramp)	38.6	D	19.1	B	25.9	C	26.1	C	26.2	C	23.1	C	26.0	C	28.4	C
97	I-210 EB Ramps/Mountain St (unsignalized)	36.0	E	22.1	C	28.6	D	21.2	C	27.5	D	19.7	C	38.8	E	21.3	C
98	I-210 WB Ramps/Mountain St (unsignalized)	15.7	C	21.4	C	12.8	B	20.2	C	15.8	C	19.6	C	15.0	C	19.9	C
99	Lake Ave/Corson St (I-210 EB Off-Ramp)	17.2	B	19.9	B	17.2	B	19.8	B	17.3	B	20.0	C	17.5	B	20.6	C
100	Lake Ave/Maple St (I-210 WB On-Ramp)	40.0	D	23.0	C	40.0	D	24.0	C	46.3	D	24.9	C	46.3	D	25.1	C
101	Lincoln Ave/Orange Grove Blvd	12.2	B	12.4	B	13.0	B	12.8	B	12.8	B	12.7	B	13.3	B	12.7	B
102	Los Robles Ave/Colorado Blvd	13.4	B	14.6	B	13.0	B	15.2	B	13.6	B	15.4	B	13.8	B	15.7	B
103	Los Robles Ave/Walnut St	13.9	B	15.0	B	14.4	B	18.1	B	14.0	B	19.1	B	14.6	B	23.0	C
104	Marengo Ave/Colorado Blvd	17.4	B	20.1	C	17.9	B	19.5	B	17.8	B	19.6	B	17.9	B	19.9	B
105	Marengo St/Corson St (I-210 EB Ramps)	16.0	B	16.5	B	20.2	C	15.2	B	20.3	C	15.3	B	17.4	B	15.3	B
106	Marengo St/Maple St (I-210 WB Ramps)	23.7	C	25.6	C	25.8	C	34.8	C	25.0	C	36.6	D	25.5	C	36.5	D
107	Orange Grove Blvd/Colorado Blvd	19.1	B	17.3	B	19.9	B	17.7	B	19.7	B	17.8	B	19.7	B	17.8	B
108	Orange Grove Blvd/Walnut St	6.2	A	7.6	A	5.9	A	7.4	A	6.0	A	7.4	A	6.1	A	7.4	A
109	St. John Ave/California Blvd	27.2	C	21.1	C	27.3	C	20.8	C	27.0	C	21.2	C	28.8	C	22.0	C
110	St. John Ave/Colorado Blvd	12.2	B	13.0	B	12.7	B	12.7	B	12.3	B	12.9	B	12.7	B	13.1	B
111	St. John Ave/Del Mar Blvd	8.6	A	9.0	A	8.4	A	8.7	A	8.6	A	8.7	A	8.4	A	8.9	A

TABLE 1.9:
2013 and 2035 Intersection Level of Service

No.	Intersection (All are signalized unless otherwise noted.)	Existing (2013)				No Build (2020)				No Build (2025)				No Build (2035)			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS
112	San Rafael Ave/SR 134 EB Ramps	2.9	A	3.4	A	3.4	A	10.6	B	5.6	A	10.6	B	26.8	C	46.1	D
113	San Rafael Ave/SR 134 WB Ramps	13.7	B	13.2	B	14.5	B	13.4	B	14.5	B	13.4	B	14.9	B	16.0	B
114	Sierra Madre Blvd/Del Mar Blvd	28.5	C	34.9	C	29.5	C	32.4	C	30.5	C	33.8	C	33.7	C	34.3	C
115	Rosemead Blvd/Lower Azusa Rd	27.9	C	24.1	C	28.3	C	24.3	C	27.2	C	24.3	C	26.5	C	25.3	C
116	Rosemead Blvd/Marshall St	30.6	C	43.4	D	31.2	C	44.1	D	33.2	C	45.3	D	35.4	D	48.1	D
117	Rosemead Blvd/Mission Dr	47.7	D	50.3	D	43.7	D	51.0	D	44.8	D	51.4	D	45.5	D	50.3	D
118	Rosemead Blvd/Valley Blvd	50.3	D	55.7	E	51.1	D	55.8	E	53.9	D	55.9	E	56.4	E	56.0	E
119	Temple City Blvd/Valley Blvd	57.0	E	56.5	E	64.4	E	59.9	E	66.2	E	61.5	E	67.4	E	63.2	E
120	Walnut Grove Ave/Mission Dr	13.9	B	14.4	B	14.1	B	14.3	B	14.5	B	14.5	B	13.7	B	14.1	B
121	Walnut Grove Ave/Valley Blvd	16.6	B	19.6	B	19.4	B	21.8	C	20.0	B	23.2	C	20.7	C	25.7	C
122	Del Mar Ave/Mission Rd	53.7	D	49.2	D	82.8	F	61.3	E	98.2	F	62.6	E	97.3	F	66.7	E
123	Del Mar Ave/Valley Blvd	33.5	C	46.8	D	34.7	C	52.6	D	35.8	D	53.4	D	41.4	D	68.5	E
124	Rosemead Blvd/Huntington Dr	31.7	C	48.6	D	32.4	C	50.4	D	33.0	C	51.2	D	34.6	C	53.2	D
125	San Gabriel Blvd/Las Tunas Dr	45.4	D	98.5	F	54.5	D	96.9	F	56.9	E	98.8	F	58.3	E	103.0	F
126	San Gabriel Blvd/Marshall St	41.9	D	33.1	C	45.8	D	34.5	C	45.9	D	36.1	D	118.1	F	79.2	E
127	San Gabriel Blvd/Mission Rd	25.6	C	26.3	C	25.8	C	25.6	C	27.4	C	25.1	C	27.6	C	25.3	C
128	San Gabriel Blvd/Valley Blvd	37.2	D	51.9	D	37.6	D	58.1	E	38.2	D	58.8	E	49.7	D	77.3	E
129	Walnut Grove Ave/Broadway	15.6	B	25.2	C	15.2	B	27.7	C	15.6	B	28.7	C	15.6	B	29.6	C
130	Atlantic Blvd/Garfield Ave	26.6	C	26.2	C	27.5	C	26.5	C	27.4	C	26.4	C	27.4	C	26.7	C
131	Atlantic Blvd/Huntington Dr	56.5	E	86.7	F	57.7	E	85.0	F	61.2	E	89.2	F	60.0	E	96.6	F
132	Del Mar Ave/Huntington Dr	25.9	C	26.6	C	27.1	C	27.1	C	27.9	C	27.6	C	30.0	C	28.4	C
133	El Molino Ave/Huntington Dr (unsignalized)	32.0	D	17.4	C	34.6	D	17.6	C	37.3	E	17.8	C	39.8	E	18.7	C
134	Garfield Ave/Huntington Dr	15.8	B	15.1	B	17.6	B	15.4	B	17.9	B	15.5	B	16.5	B	15.3	B
135	Oak Knoll Ave/Huntington Dr	17.1	B	11.8	B	16.4	B	11.8	B	17.1	B	12.0	B	18.1	B	12.2	B
136	San Gabriel Blvd/Huntington Dr	50.9	D	47.3	D	49.6	D	48.4	D	51.0	D	49.7	D	53.7	D	52.4	D
137	San Marino Ave/Huntington Dr	41.4	D	36.5	D	44.7	D	36.6	D	47.4	D	37.3	D	52.3	D	39.4	D
138	Virginia Rd/Huntington Dr	30.7	C	30.6	C	32.9	C	31.9	C	34.3	C	32.9	C	35.1	D	32.8	C
139	Fair Oaks Ave/Huntington Dr	18.3	B	21.2	C	18.5	B	21.0	C	18.7	B	21.3	C	19.2	B	21.6	C
140	Fair Oaks Ave/Mission St	39.7	D	43.9	D	39.4	D	40.9	D	37.1	D	42.8	D	38.7	D	42.7	D
141	Fair Oaks Ave/Monterey Rd	17.7	B	21.5	C	18.2	B	22.0	C	18.1	B	21.9	C	18.3	B	22.5	C
142	Fair Oaks Ave/SR 110 NB Off-Ramp	9.6	A	18.0	B	4.5	A	10.5	B	4.6	A	10.2	B	7.1	A	17.6	B
143	Fair Oaks Ave/SR 110 SB On-Ramps	15.0	B	14.5	B	11.6	B	12.5	B	11.9	B	12.7	B	14.5	B	14.3	B
144	Fremont Ave/Alhambra Rd	34.4	C	37.9	D	39.8	D	43.1	D	41.9	D	43.7	D	46.4	D	44.2	D
145	Fremont Ave/Huntington Dr	44.1	D	68.5	E	44.1	D	79.5	E	47.5	D	79.7	E	48.8	D	83.3	F
146	Fremont Ave/Monterey Rd	15.3	B	17.5	B	16.0	B	18.3	B	16.3	B	18.3	B	16.5	B	18.7	B
147	Pasadena Ave/Monterey Rd	17.6	B	18.6	B	17.5	B	18.8	B	17.5	B	18.8	B	17.7	B	18.8	B
148	Rosemead Blvd/Las Tunas Dr	33.3	C	38.7	D	35.7	D	40.9	D	35.7	D	41.1	D	36.3	D	40.3	D

TABLE 1.9:
2013 and 2035 Intersection Level of Service

No.	Intersection (All are signalized unless otherwise noted.)	Existing (2013)				No Build (2020)				No Build (2025)				No Build (2035)			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS	Delay (sec/v)	LOS
149	Fremont Ave/Montezuma Ave	20.2	C	21.7	C	51.1	D	23.2	C	53.4	D	23.9	C	21.8	C	24.3	C
150	Marengo Ave/Main St	15.1	B	16.5	B	15.1	B	16.2	B	15.6	B	16.4	B	16.4	B	16.8	B
151	Marengo Ave/Mission Rd	19.0	B	22.4	C	20.6	C	27.7	C	20.8	C	26.8	C	22.1	C	27.1	C
152	Marengo Ave/Valley Blvd	38.2	D	34.9	C	35.5	D	36.8	D	36.6	D	38.1	D	46.8	D	40.7	D
153	Mednik Ave/Cesar Chavez Ave	11.9	B	16.2	B	11.3	B	17.3	B	12.7	B	18.0	B	13.5	B	20.3	C
154	Mednik Ave/First St	14.1	B	13.8	B	13.9	B	13.7	B	15.6	B	13.9	B	18.0	B	14.0	B
155	Mednik Ave/Floral Dr	11.4	B	13.9	B	12.5	B	14.9	B	12.6	B	15.6	B	12.6	B	17.8	B
156	Eagle Rock Blvd/Colorado Blvd	14.9	B	15.3	B	14.8	B	15.4	B	15.0	B	15.5	B	15.4	B	15.7	B

Source: *Transportation Technical Report* (2014).
Ave = Avenue
Blvd = Boulevard
Dr = Drive
EB = eastbound
Free = Unsignalized intersection with free movements. Delay and LOS are not reported.
Hwy = Highway
I-10 = Interstate 10
I-210 = Interstate 210
I-605 = Interstate 605
LOS = level of service
NB = northbound
OVF = overflow delay
Pkwy = Parkway
Pl = Place
Rd = Road
SB = southbound
SR 2 = State Route 2
SR 60 = State Route 60
SR 110 = State Route 110
SR 134 = State Route 134
SR 710 = State Route 710
St = Street
sec/v = seconds per vehicle
WB = westbound

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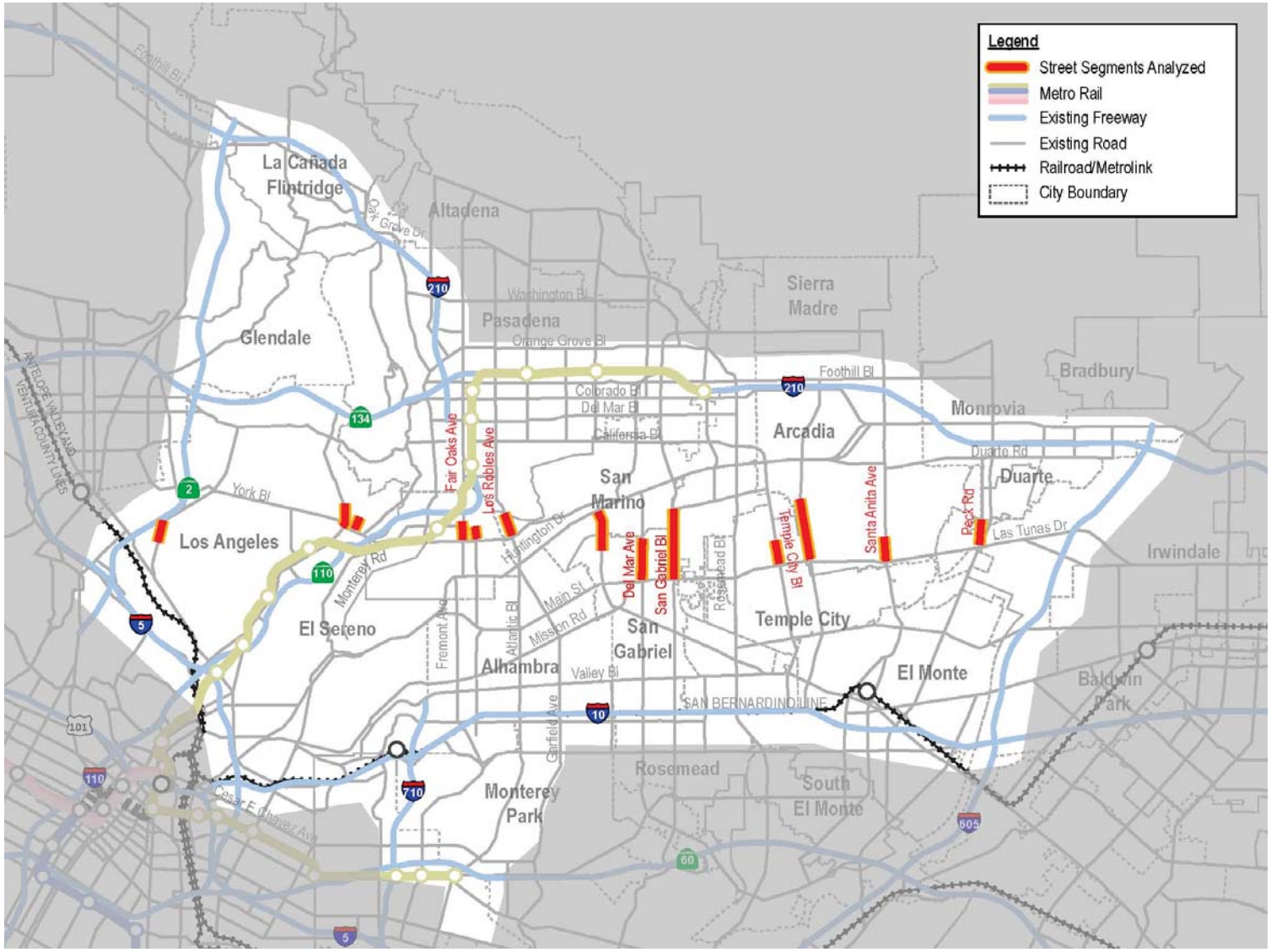

FIGURE 1-11

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MILES

SOURCE: Transportation Technical Report (2014)

SR 710 North Study

Study Area Street Segments Analyzed for Cut-Through Traffic

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

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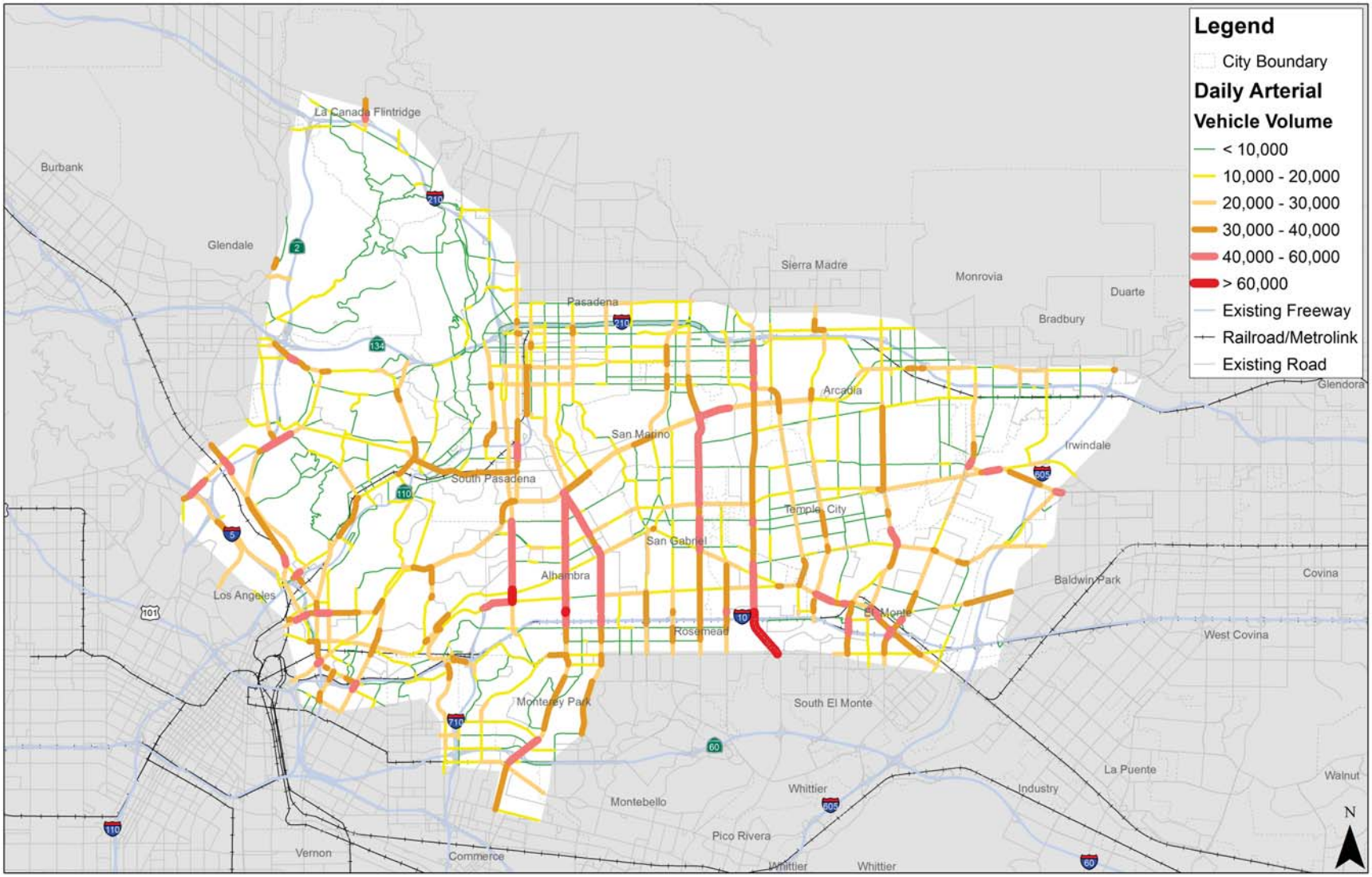

FIGURE 1-12

N

SR 710 North Study

Year 2012 Arterial Traffic Volumes

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: CH2M HILL (2014)

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TABLE 1.10:
Existing and Future Arterial Usage in the Study Area

	Existing (2012)	No Build (2020)	No Build (2025)	No Build (2035)
Volume (Vehicle Trips) Served				
Daily North-South Volume on Arterials	835,000	853,000	864,000	881,000
Daily North-South Volume on Freeways	1,036,000	1,015,000	1,023,000	1,042,000
Traffic Diversion to Local Arterials				
Daily Study Area VMT on Arterials	7,645,000	7,810,000	7,945,000	8,180,000
Use of Local Arterials for Long Trips				
PM Peak Period Percent Cut-Through	12.4%	14.2%	13.9%	13.7%

Source: *Transportation Technical Report* (2014).

TABLE 1.11:
Volume/Capacity Ratio by Direction of Travel

	All Roadways (PM Peak)		Freeway Only (PM Peak)		Arterials Only (PM Peak)	
	2012	2035	2012	2035	2012	2035
East-West Traffic (e.g., I-10, California Boulevard)	0.62	0.62	0.89	0.88	0.37	0.39
North-South Traffic (e.g., I-5, Rosemead Boulevard)	0.57	0.58	0.84	0.83	0.47	0.49
Difference	***-8.2%***	***-7.7%***	***-5.4%***	***-5.6%***	***24.6%***	***24.5%***

Source: *Transportation Technical Report* (2014).

Transit System in Study Area

In general, transit travel in the study area is affected by the same congestion on the roadway network that affects automobile travel. This is because most transit trips within the study area are made via a bus system, which operates on the local roadway network. According to the Metro transit model, approximately 79 percent of transit trips in the study area were made via bus in 2006, 20 percent were made via light rail (the Metro Gold Line), and less than 1 percent were made via commuter rail (Metrolink).

Table 1.12 summarizes the existing and future regional transit demand. Table 1.12 demonstrates that regional transit ridership is projected to increase between 2012 and 2035. In addition, the daily transit mode share in the study area for the existing year (2012) is approximately 3.5 percent, but by 2035 it would be approximately 4.2 percent. Transit mode split is a ratio of transit trips to total person trips. A higher mode split for transit indicates an increase in transit trips and transit ridership relative to other modes. By 2035, north-south transit throughput in the study area, defined as the volume of transit person trips crossing the east-west screenline, is anticipated to increase by almost 40 percent (from 150,000 to 209,000 daily trips).

As part of the Los Angeles County Congestion Management Program (CMP), transit speeds on a selected number of bus routes have been monitored for two decades (Metro 2010). Since 1992, the average speed of Metro Route 260, which travels through the study area on Fair Oaks Avenue and Atlantic Boulevard, has decreased from 14.8 mph to 11.6 mph.

Transit service in the study area experiences the same variability in travel time that automobile travel experiences. A bus trip from the Gold Line Atlantic Station to the Fair Oaks Avenue/Colorado Boulevard intersection, a distance of approximately 9.3 mi, takes up to 48 minutes in the peak period (approximately 60 percent longer than during uncongested periods) (LA Metro Route 260 Schedule 2011).

TABLE 1.12:
Existing and Future Transit Usage in the Study Area

	Existing (2012)	No Build (2020)	No Build (2025)	No Build (2035)
Transit Mode Share				
Study Area Mode Share	3.5%	3.9%	3.9%	4.2%
North-South Transit Throughput				
Daily North-South Person Trips	150,000	172,000	183,000	209,000
Transit Accessibility				
Percentage of study area and population and employment located within ¼ mile of a transit stop with high frequency	80.8%	80.3%	80.3%	80.6%

Source: *Transportation Technical Report* (2014).

As a result of slow transit speeds due to congested roadways, relatively short distances can take a long time to traverse by transit. Figure 1-13 illustrates the amount of time to travel by transit from various parts of the study area to the employment center in downtown Pasadena. Based on peak-hour transit headways and travel times, it can take residents of the communities of El Sereno, Alhambra, San Gabriel, and Rosemead approximately 60 minutes or more to get to downtown Pasadena by transit, even though all these communities are within approximately 7.5 mi of Pasadena. (These times do not include the time to walk from home to the transit stop, but they do include time waiting for the transit vehicle to arrive.)

As shown in Table 1.12, transit accessibility in the study area is high with approximately 80 percent of the employment of population centers in the study area located within 0.25 mi from a high-frequency transit stop.

1.2.2.2 Social Demands or Economic Development

2012–2035 Regional Transportation Plan/Sustainable Communities Strategy and Federal Transportation Improvement Program

SCAG's 2012–2035 RTP/SCS: Towards a Sustainable Future is a long-range plan that identifies multimodal regional transportation needs and investments through 2035 in Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. The 2012 RTP/SCS is SCAG's long-range transportation plan that is developed and updated every 4 years. The 2012 RTP/SCS provides a vision for transportation investments throughout the region. Using growth forecasts and economic trends that project out over a 20-year period, the 2012 RTP/SCS considers the role of transportation in the broader context of economic, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address mobility needs. The SCS is a newly required element of the RTP that integrates land use and transportation strategies to comply with the federal Clean Air Act and to achieve California Air Resources Board (CARB) emissions reduction targets.

The vision for the 2012–2035 RTP/SCS includes three key principles:

1. **Mobility:** Improve mobility by protecting, maximizing the productivity of, and strategically expanding the region's transportation system.
2. **Economy:** Provide economic benefits and create jobs through infrastructure investments.

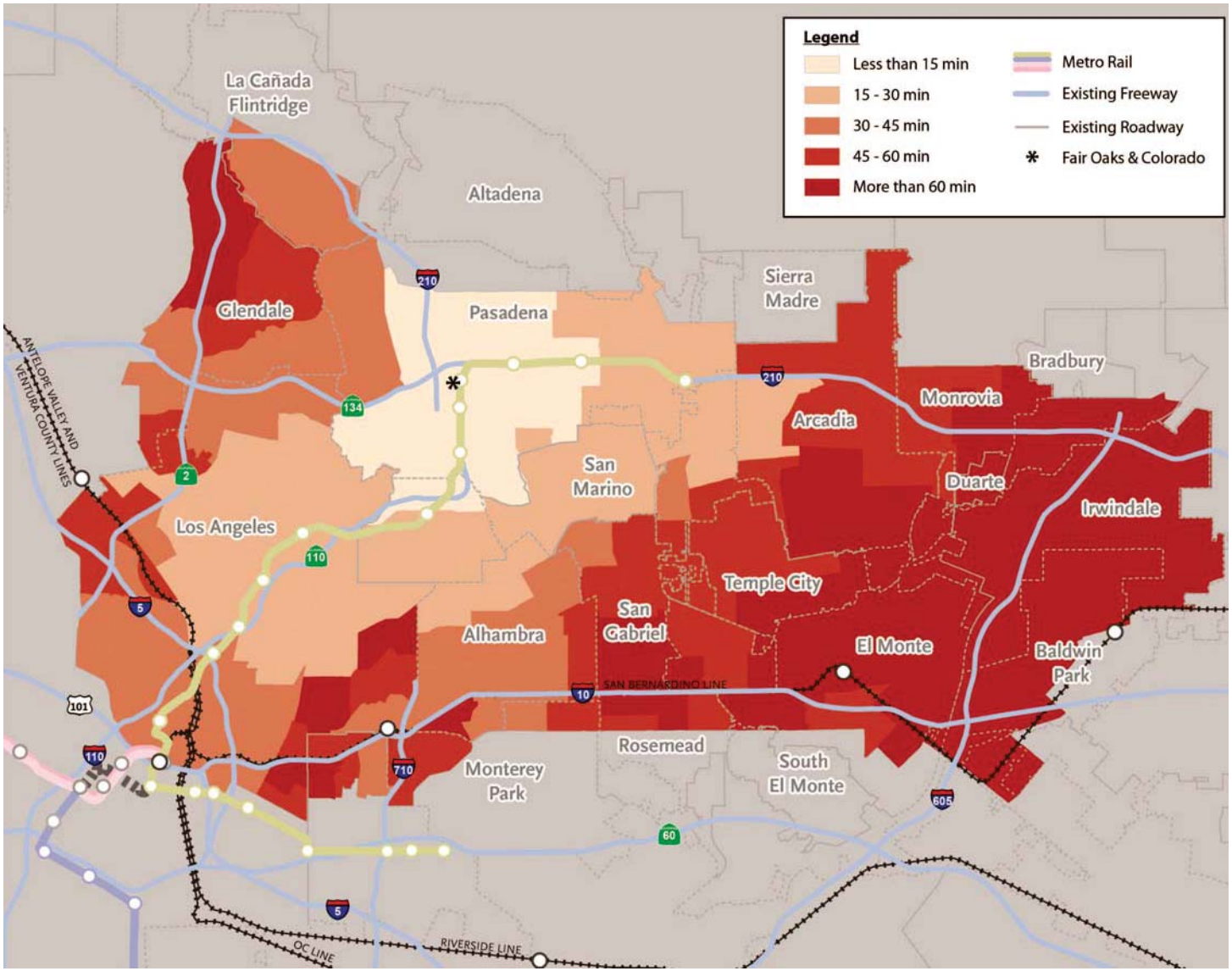

FIGURE 1-13

SR 710 North Study

Transit Travel Time (in Minutes) to Downtown Pasadena

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Alternatives Analysis Report (CH2M HILL, December 2012)

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3. **Sustainability:** Provide public health benefits by reducing pollutant emissions and expanding the transit network and opportunities for active transportation.

The 2012 RTP states the following:

> *"SR-710 North Extension (tunnel) (alignment TBD). 4 toll lanes in each direction in tunnel."*

SCAG's FTIP includes all transportation projects proposed over a 6-year period for the SCAG region. The FTIP is prepared to implement projects and programs listed in the RTP/SCS. In the SCAG region, a biennial FTIP update is produced on an even-year cycle. The projects listed in the FTIP include highway improvements, transit, rail and bus facilities, HOV lanes, signal synchronization, intersection improvements, freeway ramps, etc.

The project is described in the 2015 FTIP (Project ID: 18790) as:

> *"Route 710: Study to perform alternative analysis, engineering and environmental studies to close 710 Freeway gap."*

The SR 710 North Freeway Alternative (Tunnel) is included in the SCAG 2012 RTP/SCS and 2015 FTIP. As noted above, the SR 710 North Freeway (Tunnel) is listed as one of the major highway completion projects planned for the region in the RTP/SCS. With completion of the freeway, transit, and active transportation improvements identified in the RTP/SCS, the SCAG region would meet federal air quality requirements. The forecasted revenues in the RTP/SCS financial plan include toll revenues from the SR 710 freeway tunnel.

The tolled operational variation of the Freeway Tunnel Alternative dual-bore design variation is consistent with the scope of the design concept of the RTP and FTIP. Therefore, the tolled operational variation of the Freeway Tunnel Alternative dual-bore design variation is in conformance with the SIP. Because the other Build Alternatives are not listed in the RTP and the FTIP, the RTP and FTIP would need to be amended to include whichever of those Build Alternatives is selected as the preferred alternative, if any, and to delete the existing SR 710 North project description.

All of the Build Alternatives would comply with the applicable SCAQMD requirements.

Long Range Transportation Plan

Metro's 2009 LRTP takes a three-decade look ahead to identify transportation options to improve mobility, stimulate the local economy, and create jobs. The LRTP includes expansion of the rail system, investment in the bus system, and improvements to the highway system. The LRTP also invests in many other programs, including arterial capacity and speed improvements, transit operations, highway maintenance, bicycle and pedestrian improvements, carpool programs, and transit services for the disabled. The SR 710 freeway tunnel is included in Metro's LRTP.

1.2.2.3 Legislation

Measure R

Measure R, a one-half-cent sales tax dedicated to transportation projects in Los Angeles County was approved by a two-thirds majority of Los Angeles County voters in November 2008, and the tax took effect in July 2009. Over 30 years, Measure R is projected to generate $40 billion for mobility

improvement programs. The goals of Measure R focus on reducing congestion, improving traffic flow, improving mobility, and increasing accessibility to public transportation. Included in the Measure R plan is the commitment of $780 million for improvement to SR 710.

Other Relevant State Legislation

In addition to Measure R, the following are recent legislation or actions of local jurisdictions in the Study Area that could affect the alternatives under consideration:

- **Senate Bill (SB) 86:** SB 86 (also referred to as the Roberti Bill) was enacted in 1979 and established laws to govern the sale of specified surplus property owned by State agencies.
- **Assembly Bill (AB) 751:** Approved by Governor Brown on October 3, 2011, AB 751 repeals provisions allowing Caltrans to build freeway segments within Metro jurisdiction without first securing a freeway agreement with affected local jurisdictions.
- **Senate Bill (SB) 416:** Approved by Governor Brown on October 3, 2013, SB 416 revised the laws governing the sale of specified surplus property owned by State agencies to give priority of purchase to current or former tenants; regulate the selling price; require proceeds to be used for funding projects in Pasadena, South Pasadena, Alhambra, La Cañada Flintridge, and the 90032 Zip Code; and that Alternative F-6 from the Alternatives Analysis, a freeway consisting of surface and depressed segments that would follow a similar alignment to the "Meridian Variation" approved in the Record of Decision in 1998, no longer be deemed feasible.
- **Senate Bill 743**: Approved by Governor Brown on September 27, 2013, SB 743 creates a process to change the way that transportation impacts are analyzed under CEQA. It requires the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to provide an alternative to LOS for evaluating transportation impacts. Particularly within areas served by transit, those alternative criteria must "…promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." Measurements of transportation impacts may include vehicle miles traveled, vehicle miles traveled per capita, automobile trip generation rates, or automobile trips generated.

1.2.2.4 Modal Interrelationships and System Linkages

Public Transit

Public transportation in Los Angeles County is provided by Metro, Foothill Transit, the Los Angeles Department of Transportation (LADOT), and various municipal transit lines. Metro provides local bus service (Metro Local), limited-stop bus service (Metro Limited, Metro Express, and Metro Rapid), and subway and light rail service (Metro Rail) in the study area. Metro operates 7 bus routes from the study area to downtown Los Angeles, 15 bus routes that provide east-to-west service in the study area, and 25 bus routes that provide north-to-south service in the study area. Metro Rail service in the study area is provided via the Gold Line, a 19.7 mi light rail line that connects Pasadena and East Los Angeles with Union Station in Downtown Los Angeles. The Gold Line provides service to 15 stations in Pasadena, South Pasadena, Highland Park, Arroyo Seco (Mount Washington), Lincoln Heights, and East Los Angeles, as well as 6 additional stations in parts of Los Angeles that are outside the study area.

Freeway Network

There are seven major north-south freeway routes (I-405, US-101/SR 170, I-5, SR 110, I-710/SR 710, I-605, and SR 57) in the central portion of the Los Angeles-Long Beach-Santa Ana MSA. Of these seven, four are located partially within the study area (I-5, SR 110, I-710/SR 710, and I-605), and two (SR 110 and I-710) terminate within the study area without connecting to another freeway. As a result, a high percentage of the north-south regional travel demand is concentrated on a few freeways, or diverted to local streets within the study area. This effect is exacerbated by the overall southwest-northeast orientation of I-605, which makes it an unappealing route for traffic between the southern part of the region and the urbanized areas to the northwest in the San Fernando Valley, the Santa Clarita Valley, and the Arroyo-Verdugo region. The lack of continuous north-south transportation facilities in the study area affects the overall efficiency of the larger regional transportation system, causing congestion on freeways in the study area, contributing to cut-through traffic that affects the local streets in the study area, and resulting in poor transit operations within the study area.

1.2.2.5 Environmental Factors

Growth within the Southern California region, the County of Los Angeles and the study area has resulted in dramatic increases in population and changes to land use patterns since the 1950s. Population growth increased by an annual average growth rate of approximately 2.9 percent between 1960 and 1990 and approximately 1.2 percent between 1990 and 2010. During this period of growth, vehicle use increased substantially, resulting in traffic congestion on the regional freeway system and local roadway network. Increased traffic congestion throughout the region and study area has contributed to increased noise levels proximate to freeways and roadways and elevated ambient air pollution levels (including greenhouse gases), as documented in the Program EIR for the 2012 RTP/SCS, prepared by the SCAG. As discussed earlier, by 2035, Los Angeles County's population is forecast to increase by approximately 16.1 percent and employment is forecast to increase by approximately 11.2 percent. By 2035, the study area population is forecast to increase by approximately 11.6 percent and its employment base by approximately 12.6 percent. This growth would continue to decrease the overall efficiency of the larger regional transportation system, increase freeway congestion and cut-through traffic on local streets in the study area, and decrease bus transit operation efficiency within the study area. These system degradations would exacerbate the existing congestion in the County as well as community and environmental effects related to mobile sources.

1.3 Independent Utility and Logical Termini

FHWA regulations (23 Code of Federal Regulations [CFR] 771.111 [f]) require that the action evaluated:

1. Connect logical termini and be of sufficient length to address environmental matters on a broad scope;
2. Have independent utility or independent significance (be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made); and
3. Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements.

Part of the assessment of independent utility and logical termini is related to the project purpose and need. As described earlier, the purpose of the proposed action is to effectively and efficiently accommodate regional and local north-south travel demands in the study area of the western San Gabriel Valley and east/northeast Los Angeles, including the following considerations:

- Improve efficiency of the existing regional freeway and transit networks.
- Reduce congestion on local arterials adversely affected due to accommodating regional traffic volumes.
- Minimize environmental impacts related to mobile sources.

The need for the project was described earlier in this section based on capacity and transportation demand, social demands or economic development, and modal interrelationships and system linkages.

The ability of the Build Alternatives to comply with the FHWA regulations regarding logical termini and independent utility, as evaluated based on the FHWA Environmental Review Toolkit (http://environment.fhwa.dot.gov/projdev/tdmtermini.asp, accessed May 13, 2013) and the project purpose and need, is described in the following sections.

1.3.1 Logical Termini

The FHWA Environmental Review Toolkit defines logical termini for project development as "…rational end points for a transportation improvement, and have rational end points for a review of the environmental impacts…" Defining logical termini for a project is based on the project purpose and need and may result in a problem of segmentation if the identified transportation need extends throughout an entire corridor but environmental issues and transportation need are discussed for only a segment of that corridor.

The improvements in the Build Alternatives provide for logical termini and do not result in segmentation, as follows:

- **TSM/TDM Alternative:** The improvements in the TSM/TDM Alternative are generally limited to modest improvements at existing intersections and other individual locations throughout the study area. Those improvements are not within or along a single alignment and, as a result, would not be considered to have termini as used in the context of describing linear transportation facilities such as roads. As a result, the concept of logical termini is not relevant when describing the physical improvements in the TSM/TDM Alternative. Nonetheless, the improvements in the TSM/TDM Alternative meet the project purpose described above, provide some capacity improvements, and address some transportation demand in the study area. As a result, although the TSM/TDM Alternative does not have specific individual logical termini, it is not inconsistent with the concept of logical termini.
- **BRT Alternative:** The BRT Alternative includes bus lanes and bus services in a north-south corridor extending from Whittier Boulevard, south of I-10, north to the northern part of the City of Pasadena, south of SR 210. The alignment of the BRT Alternative provides north-south access to and from a substantial part of the study area as well as connections to extensive existing bus and light rail services in both the north-south and east-west directions. The termini of that alignment are rational end points, connect to other transit services, and serve major origins and destinations. The employment areas (e.g., downtown Pasadena) and educational institutions

(California Institute of Technology and Pasadena City College) at the north end of the corridor are logical transit destinations for the largely residential areas to the south. The termini also connect with the Metro Gold Line and Metro Rapid Route 720 (the highest ridership Metro Rapid route). As described in detail in Section 3.5, Traffic and Transportation, Pedestrian and Bicycle Facilities, the BRT Alternative would meet some of the transportation demand in the study area and would provide benefits to the traveling public consistent with the project purpose and need. Because it would provide connections to existing bus and rail services in the study area, those connection points are logical termini for the BRT Alternative.

In addition, the physical improvements along that alignment and the bus services proposed along that alignment define a project that allows for appropriate evaluation of the potential environmental impacts of both the alignment and the bus services in that part of the study area. As a result, the BRT Alternative has logical termini.

- **LRT Alternative:** The LRT Alternative includes an approximately 7.5 mi long light rail facility and light rail services in a north-south corridor extending from the Mednik Station on the south to the Fillmore Station on the north (both those stations provide direct connections to the existing Gold Line). The alignment of the LRT Alternative provides north-south access to and from a substantial part of the study area as well as connections to extensive existing bus and light rail services in both the north-south and east-west directions. The employment areas at the north end of the corridor (e.g., Pasadena) are a logical transit destination for the largely residential areas to the south. The East Los Angeles Civic Center and Edward R. Roybal Comprehensive Health Center at the south end are also logical transit destinations. The termini also connect with the Metro Gold Line at both ends. As described in detail in Section 3.5, the LRT Alternative would meet some of the transportation demand in the study area and would provide benefits to the traveling public consistent with the project purpose and need. Because it would provide connections to existing bus and rail services in the study area, those connection points are logical termini for the LRT Alternative.

  In summary, the termini of the alignment of the LRT Alternative are rational end points, connecting to other transit services and serving major origins and destinations. The physical improvements along that alignment and the light rail services proposed along that alignment define a project that allows for appropriate evaluation of the potential environmental impacts of both the alignment and the bus services in that part of the study area. As a result, the LRT Alternative meets the definition of logical termini and is of sufficient length to address environmental matters in the project study area on a broad scope.

- **Freeway Tunnel Alternative:** The alignment of the Freeway Tunnel Alternative extends approximately 6.3 mi between I-10 on the south and SR 210 on the north, traversing the Cities of South Pasadena and Pasadena. That alignment provides for direct connections to east-west travel routes (I-10 and SR 210) and north-south travel routes (I-710 and SR 210) as well as providing travelers direct connections between those routes on a limited access freeway. The termini directly connect with existing freeways. Traffic volumes are high on these connecting freeways (up to 281,000 vehicles per day on I-210, and 267,000 vehicles per day on SR 60, as reported in Table 1.5). These connecting freeways are independent sources of travel demand. As described in detail in Section 3.5, the Freeway Tunnel Alternative would meet transportation demand in the study area for a direct travel route between I-10 and I-210 through South Pasadena and Pasadena and would provide benefits to the traveling public consistent with the

project purpose and need. Because it would provide connections to existing freeways in the study area, those connection points are logical termini for the Freeway Tunnel Alternative.

In summary, the termini of the alignment of the Freeway Tunnel Alternative are rational end points, connecting to other major transportation facilities and providing access to major origins and destinations in and around the study area. The physical improvements proposed along that alignment define a project that allows for appropriate evaluation of the potential environmental impacts of that alignment in that part of the study area. As a result, the Freeway Tunnel Alternative meets the definition of logical termini and is of sufficient length to address environmental matters in the project study area on a broad scope.

1.3.2 Independent Utility

The FHWA Toolkit defines "…independent utility or independent significance…" to "…be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made…" The FHWA Toolkit further requires that proposed transportation improvements "…not restrict consideration of alternatives for other reasonably foreseeable transportation improvements…" The Build Alternatives would have independent utility and would not result in restrictions on other reasonable foreseeable transportation improvements as follows:

- **TSM/TDM Alternative:** The modest improvements in the TSM/TDM Alternative would be useable and would be a reasonable expenditure even if other transportation improvements are not implemented. Consistent with the project purpose and need described above, the improvements in the TSM/TDM Alternative would provide direct benefits to the traveling public. No other transportation improvements are needed for the TSM/TDM Alternative improvements to be useable and to meet the project purpose and need, as follows:
  - Intersection improvements will reduce delay at individual intersections regardless of other local or regional transportation projects.
  - The Intelligent Transportation Systems (ITS) improvements (traffic signal upgrades and synchronization, transit signal prioritization, changeable message signs [CMS], and detection systems) will provide incremental benefits that are independent of other capital transportation improvements.
  - The expanded bus service can be implemented incrementally and will provide increased transit service for existing and future users.

  In summary, the improvements in the TSM/TDM Alternative would have independent utility, would be usable, and would be a reasonable expenditure even if no other transportation improvements are implemented in the study area.
- **BRT Alternative:** The BRT Alternative includes bus lanes, bus stop facilities, and increased bus services in the study area as well as the improvements in the TSM/TDM Alternative. Those improvements would be useable and would represent a reasonable expenditure even if other transportation improvements are not implemented. Consistent with the project purpose and need described above, the improvements in the BRT Alternative would provide direct benefits to the traveling public. No other transportation improvements are needed for the BRT Alternative improvements to be useable and to meet the project purpose and need. Specifically, the BRT Alternative improvements will reduce travel time for transit users and encourage shifts from private vehicles to transit, thereby reducing congestion. These

improvements to surface street operations would be achieved even if the BRT Alternative improvements were implemented on their own.

In summary, the improvements in the BRT Alternative would have independent utility, would be useable, and would be a reasonable expenditure even if no other transportation improvements are implemented in the study area.

- **LRT Alternative:** The LRT Alternative includes rail tracks, stations, and support facilities and light rail service as well as the improvements in the TSM/TDM Alternative. Those improvements would be useable and would represent a reasonable expenditure even if other transportation improvements are not implemented. Consistent with the project purpose and need described above, the improvements in the LRT Alternative would provide direct benefits to the traveling public. No other transportation improvements are needed for the LRT Alternative improvements to be useable and to meet the project purpose and need. Specifically, the LRT Alternative improvements will provide reduced travel time for transit users and more direct transit routes. The LRT Alternative will also encourage shifts from private vehicles to transit, thereby reducing congestion. These improvements to surface street operations would be achieved even if the LRT Alternative was implemented on its own.

  In summary, the improvements in the LRT Alternative would have independent utility, would be useable, and would be a reasonable expenditure even if no other transportation improvements are implemented in the study area.

- **Freeway Tunnel Alternative:** The Freeway Tunnel Alternative includes the freeway facility and ramps/interchanges at existing freeway facilities as well as the improvements in the TSM/TDM Alternative. Those improvements would be useable and would represent a reasonable expenditure even if other transportation improvements are not implemented. Consistent with the project purpose and need described above, the improvements in the Freeway Tunnel Alternative would provide direct benefits to the traveling public. No other transportation improvements are needed for the Freeway Tunnel Alternative improvements to be useable and to meet the project purpose and need. Specifically, the Freeway Tunnel Alternative improvements will reduce congestion on local streets and some parallel freeways (e.g., I-5 and SR 2) by shifting traffic to a new route. These benefits will be achieved by users of both the new tunnel and other existing routes. These improvements to surface street and freeway operations would be achieved even if the Freeway Tunnel Alternative improvements were implemented on their own.

  In summary, the improvements in the Freeway Tunnel Alternative would have independent utility, would be useable, and would be a reasonable expenditure even if no other transportation improvements are implemented in the study area.

1.3.3 Consideration of Other Alternatives

The third criterion in 23 CFR 771.111(f) requires that the action evaluated not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. The improvements in the Build Alternatives would not restrict consideration of other reasonably foreseeable transportation improvements as follows:

- **TSM/TDM Alternative:** The improvements in the TSM/TDM Alternative would generally be limited to modest improvements at existing intersections and other individual locations throughout the study area. Those improvements would be designed, constructed, and operated consistent with the applicable jurisdiction's requirements. Other reasonably foreseeable transportation improvements such as improved signalization, addition of turn lanes, road widenings, or increased bus/rail transit service could be accommodated in the areas where the TSM/TDM Alternative improvements would be located and would not be precluded by those improvements. As a result, the improvements in the TSM/TDM Alternative would not restrict consideration of other reasonably foreseeable transportation improvements in the study area.
- **BRT Alternative:** The BRT Alternative includes bus lanes and bus services in a north-south corridor extending from Whittier Boulevard, south of I-10, north to the northern part of the City of Pasadena, south of SR 210. The alignment of the BRT Alternative provides north-south access to and from a substantial part of the study area as well as connections to extensive existing bus and light rail services in both the north-south and east-west directions. Other reasonably foreseeable transportation improvements such as improved signalization, addition of turn lanes, road widenings, or increased bus/rail transit service could be accommodated in the areas where the BRT Alternative physical improvements and bus services would be located and would not be precluded by those improvements. As a result, the improvements in the BRT Alternative would not restrict consideration of other reasonably foreseeable transportation improvements in the study area.
- **LRT Alternative:** The LRT Alternative includes an approximately 7.5 mi long light rail facility and light rail services in a north-south corridor extending from the Mednik Station on the south to the Fillmore Station on the north (both those stations provide direct connections to the existing Gold Line), with several intermediate stations located along the rail alignment. Other reasonably foreseeable transportation improvements such as improved signalization, addition of turn lanes, road widenings, or increased bus service could be accommodated in the areas where the LRT Alternative physical improvements and rail services would be located and would not be precluded by those improvements. The LRT Alternative could preclude implementation of tracks for other light rail services in the area. However, the existing light rail system in this part of Los Angeles County and planned expansions of that system are based on consideration of overall demand for light rail services over that entire service area and not just the study area for the SR 710 North Study. Because the proposed LRT Alternative is consistent with the rest of the existing and planned regional light rail system, it would not preclude other improvements to that regional light rail system. As a result, the improvements in the LRT Alternative would not restrict consideration of other reasonably foreseeable transportation improvements in the study area.
- **Freeway Tunnel Alternative:** The alignment of the Freeway Tunnel Alternative extends approximately 6.3 mi between I-10 on the south and SR 210 on the north and would provide for direct connections to east-west travel routes (I-10 and SR 210) and north-south travel routes (I-710 and SR 210) as well as providing travelers direct connections between those routes on a limited access freeway. Other reasonably foreseeable transportation improvements such as improvements to other freeways in the study area, improved signalization, addition of turn lanes, road widenings, or increased bus/rail services could generally be accommodated and would not be precluded by the Freeway Tunnel Alternative improvements. The Freeway Tunnel Alternative could preclude other transportation facilities along the same alignment in the study area such as an at-grade light rail alignment, freeway, or arterial. However, there are no known

reasonably foreseeable transportation improvements that propose those types of transportation facilities along the alignment of the Freeway Tunnel Alternative. As a result, the improvements in the Freeway Tunnel Alternative would not restrict consideration of other reasonably foreseeable transportation improvements in the study area.

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2. Project Alternatives

2.1 Project Description

This section describes the proposed action and the alternatives developed to meet the purpose and need of the project, while avoiding or minimizing environmental impacts. The alternatives are the No Build Alternative, the Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative, the Bus Rapid Transit (BRT) Alternative, the Light Rail Transit (LRT) Alternative, and the Freeway Tunnel Alternative.

The project is located in east/northeast Los Angeles and the western San Gabriel Valley in the area between State Route 2 (SR 2) and Interstates 5, 10, 210 and 605 (I-5, I-10, I-210, and I-605, respectively). The purpose of the proposed action is to effectively and efficiently accommodate regional and local north-south travel demands in the study area of the western San Gabriel Valley and east/northeast Los Angeles, including the following considerations:

- Improve efficiency of the existing regional freeway and transit networks.
- Reduce congestion on local arterials adversely affected due to accommodating regional traffic volumes.
- Minimize environmental impacts related to mobile sources.

2.2 Alternatives

2.2.1 Project Alternatives

The proposed alternatives include the No Build Alternative, the TSM/TDM Alternative, the BRT Alternative, the LRT Alternative, and the Freeway Tunnel Alternative. As discussed in the *Alternatives Analysis (AA) Report* (December 2012), a screening analysis was conducted to determine the alternatives to be carried forward for analysis in this Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The screening of alternatives followed a three-step sequential process: preliminary screening, initial screening, and secondary screening. Additional detail regarding each of these steps is provided later in Section 2.5, Alternatives Considered but Eliminated from Further Discussion.

Based on the findings of the *AA Report*, the rationale for carrying the five project alternatives forward is as follows:

- **No Build Alternative:** Under the National Environmental Policy Act (NEPA), 40 Code of Federal Regulations (CFR) Section 1502.14(d) requires analysis of the alternative of no action. Section 15126.6(e)(1) of the California Environmental Quality Act (CEQA) Guidelines requires that a “no project” alternative be evaluated to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. Therefore, the No Build Alternative was carried forward for analysis in this EIR/EIS.
- **TSM/TDM Alternative:** 23 CFR Section 450.320 requires that a TSM/TDM Alternative be considered on all proposed major highway projects in urban areas with a population of over 200,000 people. Therefore, the TSM/TDM Alternative was carried forward for analysis in this EIR/EIS.

- **BRT Alternative:** Of the BRT alternatives analyzed in the secondary screening process, the BRT Alternative carried forward in the EIR/EIS (referred to as BRT-6 in the *AA Report*) performed slightly better at increasing access to high frequency transit service and increasing north-south transit patronage compared to the other BRT alternatives analyzed. In addition, that selected BRT Alternative could be implemented with no or limited right of way (ROW) acquisition and would also have a smaller potential impact on sensitive habitat. Therefore, Alternative BRT-6 was carried forward for analysis in this EIR/EIS.
- **LRT Alternative:** Among the LRT alternatives analyzed in the secondary screening process, the LRT Alternative carried forward in the EIR/EIS (referred to as LRT-4A/B in the *AA Report*) would require less property acquisition and would result in fewer impacts to historic period properties and communities facilities than the other LRT alternatives analyzed. Therefore, Alternative LRT-4A/B was carried forward for analysis in this EIR/EIS.
- **Freeway Tunnel Alternative:** Among the freeway alternatives analyzed in the secondary screening process, the freeway alternative carried forward for analysis in this EIR/EIS (referred to as F-7 in the *AA Report*) would minimize travel times, improve connectivity and mobility, and reduce congestion on local streets. In addition, compared to the other freeway alternatives, F-7 would require substantially less property acquisition and would impact fewer historic period properties and community facilities. Therefore, Alternative F-7 was carried forward for analysis in this EIR/EIS.

The TSM/TDM Alternative improvements would also be constructed as part of the BRT, LRT, and Freeway Tunnel Alternatives. Because of physical constraints, some of the TSM/TDM Alternative improvements would not be constructed with the Build Alternatives. These exceptions are discussed under each of the Build Alternatives provided later in this chapter. The structures and ROW costs are included in these estimates.

Because of the wide range of Build Alternatives, they do not share many common design features and are discussed separately below.

2.2.2 No Build Alternative

The No Build Alternative does not include improvements associated with Build Alternatives identified within the SR 710 North study area. For several environmental topics (i.e., traffic, air quality, noise, and energy), the No Build condition used for analysis purposes includes improvements identified separately in the Federal Transportation Improvement Program (FTIP), as listed in the Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), Measure R, and the funded part of the Los Angeles County Metropolitan Transportation Authority's (Metro) 2009 Long Range Transportation Plan (LRTP). The Opening Year and Horizon Year traffic forecasting for the No Build Alternative includes projects/planned improvements through 2035 that are contained in the FTIP, RTP, Measure R and the LRTP. The projects included in the No Build Alternative are illustrated and described on Figure 2-1 and in Table 2.1, respectively. These projects have been, or are being evaluated separately.

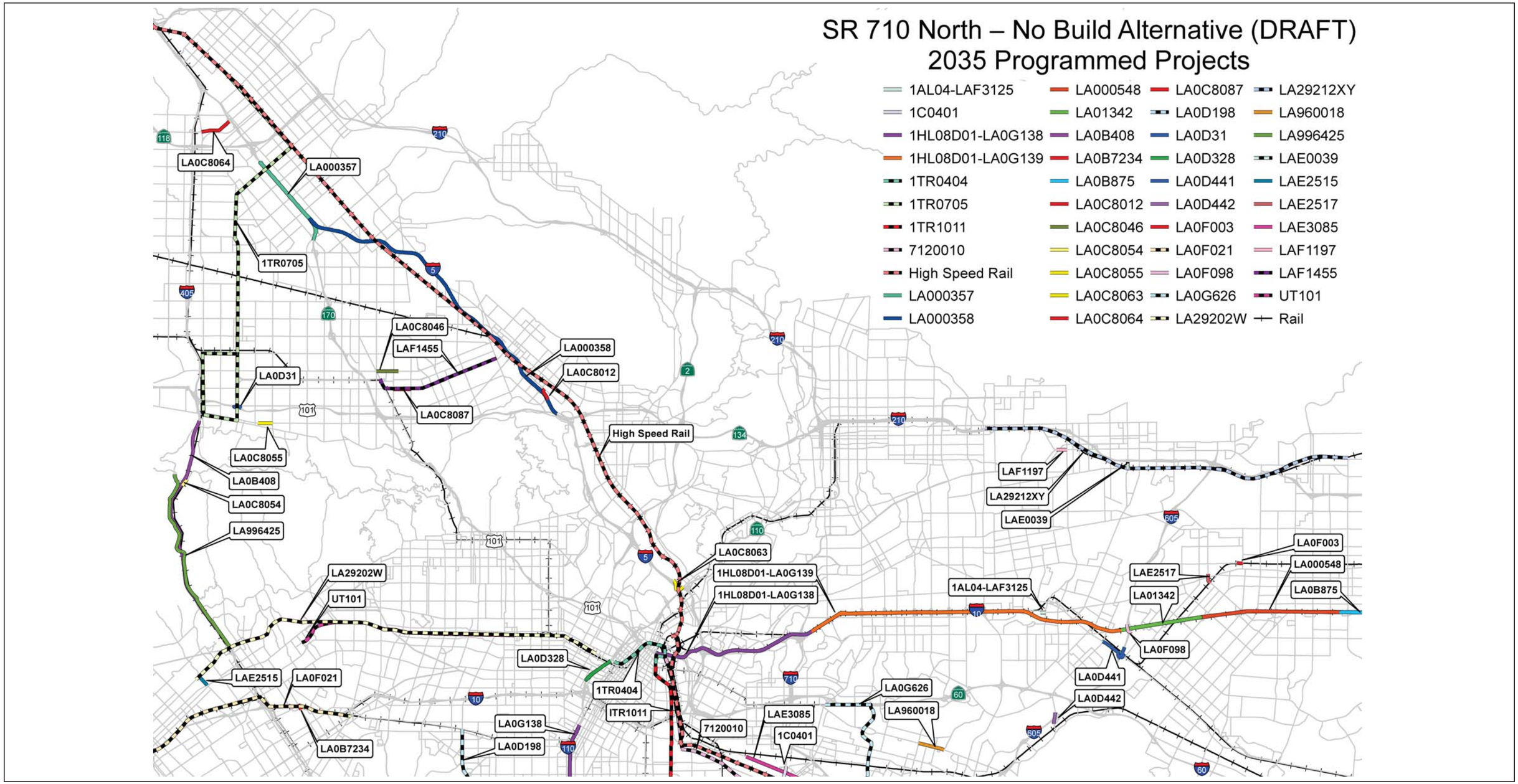

FIGURE 2-1

NOT TO SCALE

SOURCE: CH2M HILL (2013)

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SR 710 North Study

No Build Alternative

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TABLE 2.1:
Projects Included in the Traffic Modeling for the No Build Alternative

RTP ID	Project Name	Description	Anticipated Completion Date
1C0401	I-710 Corridor Project	The project would improve I-710 in Los Angeles County between Ocean Boulevard and SR 60. Major features include widening I-710 up to 10 general-purpose lanes (5 lanes in each direction), modernizing and reconfiguring I-405, SR 91 and a portion of the I-5 interchanges with I-710, modernizing and reconfiguring most local arterial interchanges along I-710, and providing a separated four-lane freight corridor to be used by conventional or zero-emission trucks.	2030
1TR0404	Regional Connector Transit Corridor	The Metro Regional Connector Project would provide light-rail in tunnels and would extend from the Metro Gold Line Little Tokyo/Arts District Station to the 7th Street/Metro Center Station in downtown Los Angeles, allowing passengers to transfer to Blue, Expo, Red, and Purple Lines, bypassing Union Station.	2020
1TR1004	Eastside Transit Corridor Phase 2 – Metro Gold Line Eastside Extension	The project would connect with and extend the Gold Line Eastside Extension light rail line, which runs between Union Station in downtown Los Angeles and Pomona and Atlantic Boulevards in East Los Angeles, to communities farther east. The project's goals include improving mobility in the study area and planning for future growth in a sustainable manner. Metro is leading this study effort in conjunction with the FTA.	2035
HSR	California High Speed Rail Project	The project would develop an 800 mi statewide system of high-speed trains from Southern to Northern California, potentially crossing the I-710 between Washington Boulevard and Bandini Boulevard and just north of Washington Boulevard.	2034
LA000357	I-5 Improvement Project between SR 118 to SR 170	The project is constructing an HOV lane in each direction on I-5 between the Hollywood Freeway (SR 170) and SR 118, a distance of 6.8 mi (3.4 mi in each direction). The project is also widening four undercrossings, replacing sections of pavement, and building a direct HOV connector at the I-5/SR 170 interchange. A direct HOV connector allows for freeway-to-freeway transfers without exiting the carpool lane.	2012
LA000358	I-5 Improvement Project between SR 134 to SR 170	1. The project would construct four segments of improvements on I-5 between SR 134 and SR 170 as follows: Western Avenue Interchange, realignment of the northbound I-5 Western Avenue on- and off-ramps. 2. SR 134 to Magnolia Boulevard: Addition of one HOV lane in each direction. 3. Magnolia Boulevard to Buena Vista Street: Addition of HOV lanes, Empire Avenue interchange modification, railroad realignment and relocation, Burbank Boulevard bridge reconstruction, and on- and off-ramp modifications. 4. SR 170 to Buena Vista Street: Addition of one HOV lane in each direction and pavement replacement.	2014

TABLE 2.1:
Projects Included in the Traffic Modeling for the No Build Alternative

RTP ID	Project Name	Description	Anticipated Completion Date
LA000548	San Bernardino Freeway (I-10) add one HOV Lane from I-605 to SR 57/71 and I-210 Puente to Citrus Segment	The project would construct one HOV lane in each direction on I-10 between I-605 and the SR 57/SR 71/I-210 interchange in three different segments. This segment of the project would construct one HOV lane in each direction on I-10 between Puento and Citrus Avenue.	2018
LA01342	San Bernardino Freeway (I-10) add One HOV Lane from I-605 to SR 57/71 and I-210 I-605 to Puente Segment	The project would construct one HOV lane in each direction on I-10 between I-605 and the SR 57/SR 71/I-210 interchange in three difference segments. This segment of the project would construct one HOV lane in each direction on I-10 between I-605 to Puente Avenue.	2014
LA0B408	I-405 Sepulveda Pass Improvements Project	This project would add a 10 mi HOV lane and improve supporting infrastructure such as ramps, bridges and sound walls on I-405 while widening lanes from the I-10 to US-101.	2018
LA0B7234	Overland Avenue Bridge Widening Project	This project would widen the west side of the Overland Avenue Bridge over I-10 from the National Boulevard/I-10 westbound ramps to National Boulevard/National Place to add one lane.	2012
LA0B875	San Bernardino Freeway (I-10) add one HOV Lane from I-605 to SR 57/71 and I-210 Citrus to SR 57/I-210 Segment	The project would construct one HOV lane in each direction on I-10 between I-605 and the SR 57/SR 71/I-210 interchange in three different segments. This segment of the project would construct one HOV lane in each direction on I-10 between Citrus Avenue and SR 57/I-210.	2018
LA0C8046	Burbank Boulevard Widening, Lankershim Boulevard to Cleon Avenue	The project would consist of the widening of a 0.6 mi stretch of Burbank Boulevard from Lankershim Boulevard to Cleon Avenue to add an additional through-lane in each direction. The road would be restriped to include two lanes for through traffic, a left-turn lane, and a parking lane in each direction.	2016
LA0C8054	Skirball Center Drive Widening Project	The project would widen and restripe Skirball Center Drive from I-405 to Mulholland Drive to provide an additional southbound lane.	2012
LA0C8055	Moorpark Street Widening, Woodman Avenue to Murietta Avenue	The project would widen an approximately 0.25 mi stretch of Moorpark Street from Mammoth Avenue to Colbath Avenue to accommodate an additional through lane in each direction and reconfigured left-turn lanes.	2012
LA0C8063	Riverside Drive Bridge and Grade Separation Replacement Project	The City of Los Angeles proposes to replace the existing Riverside Drive Bridge over the Los Angeles River and Riverside Drive Viaduct/Grade Separation Structure with an integrated two-lane, standard-curvature bridge and grade separation structure.	2016

TABLE 2.1:
Projects Included in the Traffic Modeling for the No Build Alternative

RTP ID	Project Name	Description	Anticipated Completion Date
LA0C8064	San Fernando Mission Boulevard Widening	The project would widen San Fernando Mission Boulevard from one to two lanes in each direction between Sepulveda Boulevard and I-5.	2012
LA0C8087	Magnolia Boulevard Widening	The project would widen Magnolia Boulevard from one to two lanes in each direction from Cahuenga Boulevard to Vineland Avenue.	2012
LA0D198	Crenshaw/LAX Transit Corridor	This project is an 8.5 mi light-rail line that would run between the Expo Line on Exposition Boulevard and the Metro Green Line.	2016
LA0D31	US-101/Van Nuys Boulevard Interchange Improvement Project	The project would construct one additional lane for the northbound and southbound off-ramps at the US-101/Van Nuys Boulevard interchange.	2016
LA0D328	I-110 Widening and Rehabilitation Project	The project limits extend on I-110 from a 0.5 mi south of Washington Boulevard to north of Wilshire Boulevard, and include West 6th and 8th Streets, and Olympic, Pico, and Venice Boulevards. The project widened lanes in both directions, widened bridge structures and ramps, realigned and reconstructed ramps, added merge and auxiliary lanes and a concrete median barrier, and improved the I-110/I-10 interchange connector.	2012
LA0D441	Riverside Drive Bridge and Grade Separation Replacement Project	Reconfiguration of Valley Boulevard on- and off-ramps to I-605 to improve mobility, circulation, and to relieve the current congestion at Valley Boulevard. Includes: right turn from Valley Boulevard onto the existing southbound on-ramp, construct dual westbound to southbound lanes to southbound on-ramp, and reconstruct entire southbound on-ramp, improvements at Valley/Temple/northbound I-605 off-ramp intersection, and widen eastbound Valley Boulevard to three lanes in advance of the southbound ramps.	2016
LA0D442	Peck Road Bridge over SR 605	The project would widen the existing two-lane Peck Road Bridge over SR 605 to accommodate four lanes (two lanes in each direction).	2016
LA0F003	Los Angeles Street at Big Dalton Wash	The project involved widening the north side of the Los Angeles Street bridge at Big Dalton Wash. The project would widen the two-lane bridge to four lanes.	2014
LA0F021	Exposition Transit Corridor, Phase 2	The project would expand the Metro Rail System by extending it westward to Santa Monica from the Metro Expo Line Culver City Station and would run along the old Pacific Electric Exposition right of way to 4th Street and Colorado Avenue in downtown Santa Monica. The 6.6 mi second phase would include seven new stations and would connect Santa Monica by rail to Downtown Los Angeles, Pasadena, San Fernando Valley, South Bay, and Long Beach.	2016
LA0G138	I-10 and I-110 HOT Lanes	This project proposes conversion of HOV lanes to HOT lanes on I-10 from Alameda Street to I-605 and on I-110 from 182 Street/Artesia Transit Center to Adams Boulevard in Los Angeles County.	2012
LA0G139	I-10 HOT Lanes	This project would expand the capacity of the I-10 HOT lane. The project includes restriping the existing lanes to add an additional (second) HOT lane on I-10 from Santa Anita Avenue to I-710 in the westbound direction and from I-710 to Baldwin Avenue in the eastbound direction.	2012

TABLE 2.1:
Projects Included in the Traffic Modeling for the No Build Alternative

RTP ID	Project Name	Description	Anticipated Completion Date
LA29202W	Wilshire Boulevard Bus Rapid Transit Project – Phases I and II	The project would consist of a 12.5 mi corridor with a 7.7 mi peak-period bus lane on Wilshire Boulevard within the City and County of Los Angeles from Valencia Street to the City of Santa Monica. Phase I includes street widening, curb lane repaving/reconstruction, improved traffic signal timing and bus signal priority. Phase II includes enhanced shelters and landscaping, street repair/reconstruction, concrete bus pads, and park-and-ride facilities.	2014
LA29212XY	Metro Gold Line Foothill Extension	The proposed extension consists of two phases. The first phase would continue from Sierra Madre Villa in Pasadena east over 11 mi, with stops in the Cities of Arcadia, Duarte, Irwindale, and Monrovia, and two stops in Azusa.	2016
LA960018	Beverly Boulevard Widening Project from Montebello Drive to Rea Drive	The project would widen Beverly Boulevard from four to six lanes from Montebello Boulevard to west of Rea Drive.	2014
LA996425	Sepulveda Boulevard Bike Lane and Intersection Improvement Project	The proposed project includes widening in spot locations along Sepulveda Boulevard to: (1) add northbound and southbound right-turn pockets at Wilshire Boulevard, (2) lengthen the northbound left-turn pocket at Moraga Drive, (3) lengthen the southbound right-turn lane at the I-405 southbound on-ramp (I-405 overpass north of Getty Center Drive), (4) install bike lanes between Skirball Center Drive and Bel Air Crest Road, (5) add a northbound right-turn lane at Skirball Center Drive, and (6) add a third southbound through lane on the approach to Skirball Center Drive.	2012
LAE0039	Gold Line Transit Plaza	This project involves the design and construction of a transit plaza adjacent to the Gold Line Arcadia Station. The transit plaza would include hardscape, softscape, street furniture (e.g., benches, trash receptacles and lighting fixtures), way-finding signage, and public art features.	2012
LAE2515	Bundy Drive Widening between Wilshire Boulevard and Santa Monica Boulevard	The project would widen Bundy Drive from two to four lanes between Wilshire Boulevard and Santa Monica Boulevard.	2014
LAE2517	Main Avenue Widening	The project would widen Maine Avenue Bogart Avenue and Ramona Boulevard to add one through lane, one right-turn lane, and one left-turn lane.	2014
LAE3085	Washington Boulevard Improvement Project	Widen and reconstruct Washington Boulevard (from two lanes to three lanes in each direction) from the western City boundary at Vernon (350 ft west of Indiana Street) to I-5 at Telegraph Road. The project would also increase turn radius and medians, upgrade traffic signals and street lighting, and improve sidewalks.	2014
LAF1197	Huntington Drive Capacity Improvements Project	The project includes the addition of one through lane and turn lanes, and the reconstruction of the median along Huntington Drive from Colorado Place to Santa Anita.	2014
LAF1455	Cross-Town Transit Connector and Service Expansion	The project would involve the acquisition of two CNG buses to implement new local transit service between the North Hollywood Red Line Station and Downtown Burbank.	2016

TABLE 2.1:
Projects Included in the Traffic Modeling for the No Build Alternative

RTP ID	Project Name	Description	Anticipated Completion Date
UT101	Metro Purple Line Westside Subway Extension	The project would extend the Metro Purple Line from the current terminus at Wilshire/Western westward for 9 mi to Century City, and would include seven new stations. Segment 1 of the project is from Wilshire/Western to La Cienega and Segment 2 is from La Cienega to Century City.	2023
WSATC	West Santa Ana Transit Corridor	This project provides for the development of a grade-separated transit corridor from the Los Angeles County line to downtown Los Angeles.	2030

CNG = compressed natural gas

2.2.3 Build Alternatives

Due to existing constraints and limitations in the project study area, such as surrounding land uses and limited ROW, design exceptions would be sought by the appropriate agency if a Build Alternative is selected for implementation. Design exceptions of proposed non-standard features would require approval once a Preferred Alternative is selected. Design exceptions for the Freeway Tunnel Alternative would be reviewed and approved by the California Department of Transportation (Caltrans) and, potentially, the Federal Highway Administration (FHWA). Design exceptions for the LRT Alternative would be reviewed and approved by Metro. Design exceptions for the BRT Alternative would be reviewed and approved by Metro for the bus design features and by the local jurisdictions for where street improvements are proposed. Design exceptions for the improvements in the TSM/TDM Alternative would be reviewed and approved by the local jurisdictions where street improvements are proposed.

In addition to the improvements described in the following sections, the Opening Year and Horizon Year traffic forecasting for all the Build Alternatives also include the projects/planned improvements through 2035 that are contained in the FTIP, RTP/SCS, Measure R, and the funded part of the Metro LRTP.

2.2.3.1 TSM/TDM Alternative

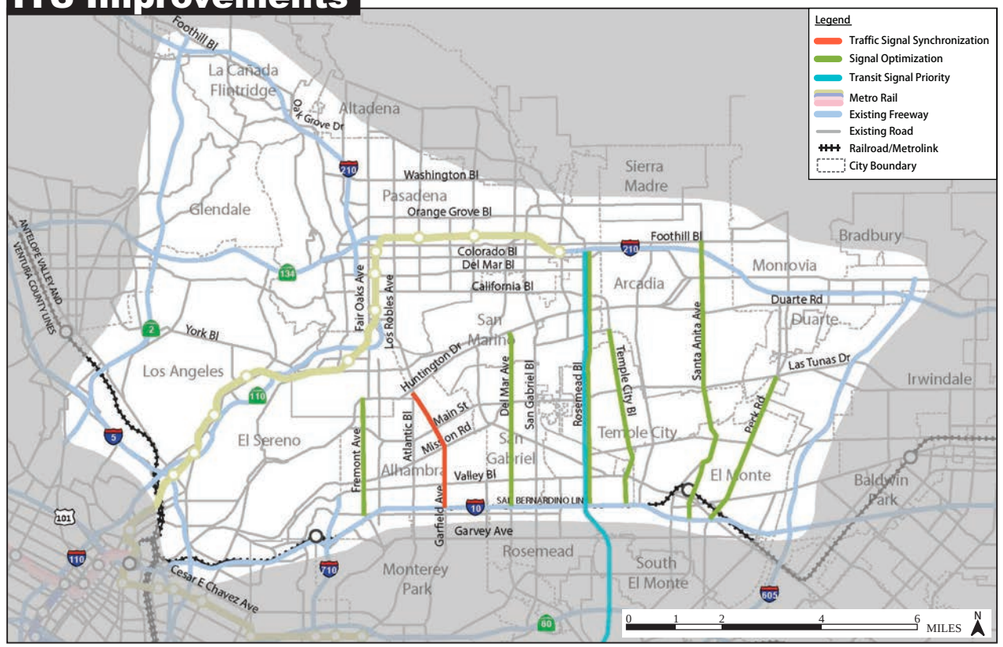
The TSM/TDM Alternative consists of strategies and improvements to increase efficiency and capacity for all modes in the transportation system with lower capital cost investments and/or lower potential impacts. The TSM/TDM Alternative is designed to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. Components of the TSM/TDM Alternative are shown on Figure 2-2.

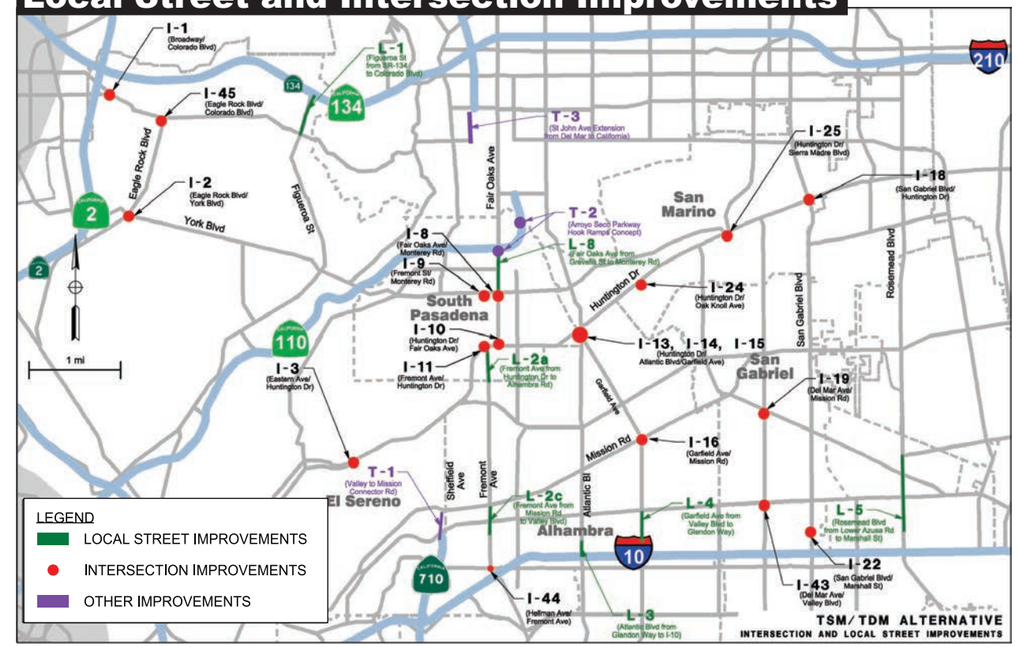
The TSM/TDM Alternative is being evaluated as a stand-alone alternative. Improvements included in the TSM/TDM Alternative have also been incorporated into the other Build Alternatives. The components of the TSM/TDM Alternative that are incorporated into the other Build Alternatives are described under each alternative.

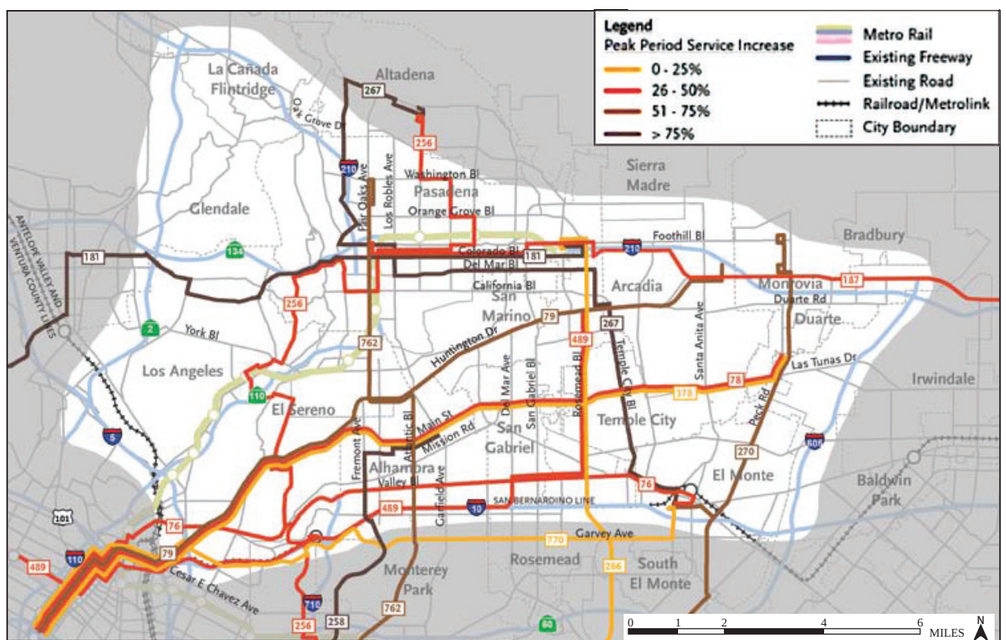
Transportation System Management

TSM strategies increase the efficiency of existing facilities (i.e., TSM strategies are actions that increase the number of vehicle trips a facility can carry without increasing the number of through lanes). TSM also encourages automobile, public and private transit, ridesharing programs, and bicycle and pedestrian improvements as elements of a unified urban transportation system. Modal alternatives integrate multiple forms of transportation modes, such as pedestrian, bicycle, automobile, rail, and mass transit. TSM strategies include Intelligent Transportation Systems (ITS), local street and intersection improvements, and Active Traffic Management (ATM):

- **ITS Improvements:** ITS improvements include traffic signal upgrades, synchronization and transit prioritization, arterial changeable message signs (CMS), and arterial video and speed data collection systems. The TSM/TDM Alternative includes signal optimization on corridors with signal coordination hardware already installed by Metro's Traffic Signal Synchronization Program (TSSP). These corridors include Del Mar Avenue, Rosemead Boulevard, Temple City Boulevard, Santa Anita Avenue, Fair Oaks Avenue, Fremont Avenue, and Peck Road. The only remaining major north-south corridor in the San Gabriel Valley in which TSSP has not been







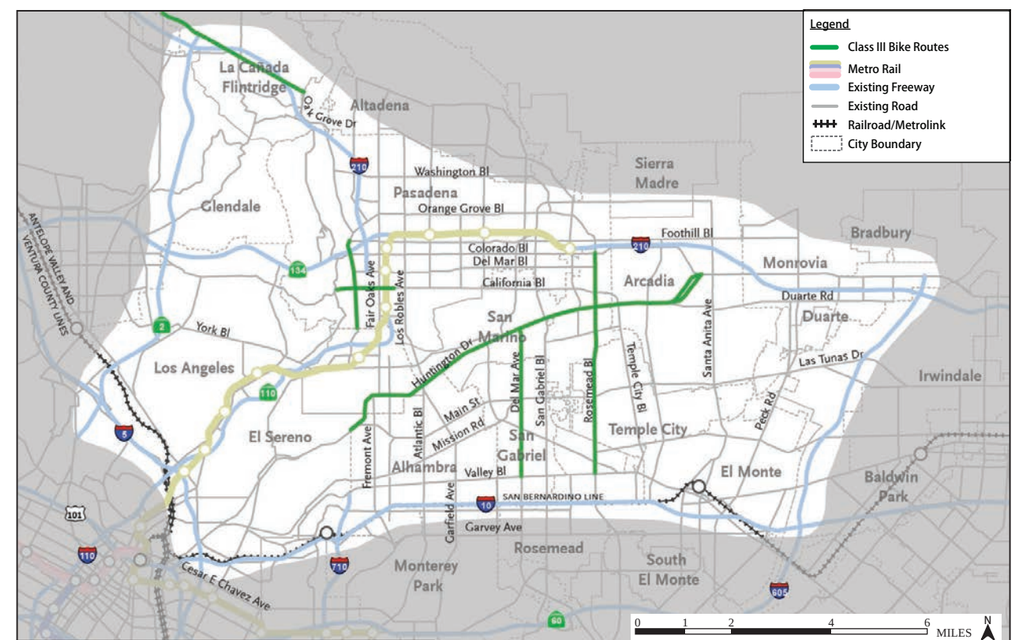


FIGURE 2-2

SR 710 North Study

TSM/TDM Alternative

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implemented is Garfield Avenue; therefore, TSSP on this corridor is included in the TSM/TDM Alternative. The locations are shown in Table 2.2. The following provides a further explanation of the ITS elements listed above.

TABLE 2.2:
TSM/TDM Alternative Elements

ID No.	Description	Location
Intelligent Transportation System Improvements		
ITS-1	Transit Signal Priority	Rosemead Boulevard (from Foothill Boulevard to Del Amo Boulevard)
ITS-2	Install Video Detection System on SR 110	SR 110 north of US 101
ITS-3	Install Video Detection System at Intersections	At key locations in study area
ITS-4	Arterial Speed Data Collection	On key north/south arterials
ITS-5	Install Arterial CMS	At key locations in study area
ITS-6	Traffic Signal Synchronization on Garfield Avenue	Huntington Drive to I-10
ITS-7	Signal optimization on Del Mar Avenue	Huntington Drive to I-10
ITS-8	Signal optimization on Rosemead Boulevard	Foothill Boulevard to I-10
ITS-9	Signal optimization on Temple City Boulevard	Duarte Road to I-10
ITS-10	Signal optimization on Santa Anita Avenue	Foothill Boulevard to I-10
ITS-11	Signal optimization on Peck Road	Live Oak Avenue to I-10
ITS-12	Signal optimization on Fremont Avenue	Huntington Drive to I-10

  - Traffic signal upgrades include turn arrows, vehicle and/or bicycle detection, pedestrian countdown timers, and incorporation into a regional management traffic center for real-time monitoring of traffic and updating of signal timing.
  - Synchronization is accomplished through signal coordination to optimize travel times and reduce delay.
  - Transit signal prioritization includes adjusting signal times for transit vehicles to optimize travel times for public transit riders.
  - Arterial CMS are used to alert travelers about unusual road conditions, special event traffic, accident detours, and other incidents.
  - Video and speed data collection include cameras and other vehicle detection systems that are connected to a central monitoring location, allowing for faster detection and response to traffic incidents and other unusual traffic conditions.

- **Local Street and Intersection Improvements:** The local street and intersection improvements are within the Cities of Los Angeles, Pasadena, South Pasadena, Alhambra, San Gabriel, Rosemead, and San Marino. Table 2.3 outlines the locations of the proposed improvements to local streets, intersections, and freeway ramps as well as two new local roadways.
- **Active Traffic Management:** ATM technology and strategies are also included in the TSM/TDM Alternative. The major elements of ATM are arterial speed data collection and CMS. Data on arterial speeds would be collected and distributed through Los Angeles County's Information Exchange Network (IEN). Many technologies are available for speed data collection or the data could be purchased from a third-party provider. Travel time data collected through this effort could be provided to navigation system providers for distribution to the traveling public. In addition, arterial CMS or "trailblazer" message signs would be installed at key locations to make travel time and other traffic data available to the public.

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
Local Street Improvements			
L-1	Figueroa Street from SR 134 to Colorado Boulevard	City of Los Angeles (Eagle Rock)	• Add a dedicated right-turn lane from NB Figueroa Street to the EB SR 134 on-ramp. • Add an additional merging lane to the EB SR 134 on-ramp from Figueroa Street, a dedicated right-turn lane from the EB SR 134/Figueroa Street off-ramp to NB Figueroa Street. • Add a dedicated right-turn lane from NB Figueroa Street to the WB SR 134 on-ramp. • Restriping.
L-2a	Fremont Avenue from Huntington Drive to Alhambra Road	City of South Pasadena	• Convert existing dedicated left-turn lanes along Fremont Avenue between Oneonta Knoll Street and approximately 150 ft north of the Fremont Avenue/Alhambra Road intersection into a reversible directional lane that would be reversed between the NB and SB directions to accommodate peak traffic flows. • Add a merging lane on northbound Fremont Avenue just north of the Fremont Avenue/Alhambra Road intersection. • Modify the intersections of Fremont Avenue/Oneonta Knoll Street, Fremont Avenue/Beech Street, Fremont Avenue/Maple Street, and Fremont Avenue/Elmpark Street to prohibit left-turn movements to and from Oneonta Knoll Street, Beech Street, Maple Street, and Elmpark Street by adding pork chop median islands. • Convert the dedicated right turn lane from NB Fremont Avenue to EB Huntington Drive into a shared through right-turn lane from NB Fremont Avenue. • Convert the dedicated SB right-turn lane at Fremont Avenue/Huntington Drive to a shared through right-turn lane. • Add a merging lane on SB Fremont Avenue just south of Huntington Drive. • Widen the west side of Fremont Avenue south of Huntington Drive. • Restripe adjacent lanes accordingly.
L-2c	Fremont Avenue from Mission Road to Valley Boulevard	City of Alhambra	• Remove raised median along Fremont Avenue between Valley Boulevard and Mission Road to extend NB and SB left-turn pockets at Mission Road and Valley Boulevard, respectively. • Restripe adjacent lanes accordingly.
L-3	Atlantic Boulevard from Glendon Way to I-10	City of Alhambra	• Add a dedicated right-turn lane on SB Atlantic Boulevard from Glendon Way to the WB I-10 on-ramp. • Modify the intersections of Atlantic Boulevard/Glendon Way and Atlantic Boulevard/Norwood Place by adding pork chop islands to prohibit left-turn movements to and from Glendon Way and Norwood Place, respectively. • Convert one of the existing NB through lanes on Atlantic Boulevard into a shared through-right turn lane at Glendon Way. • Convert the existing center lane, including left-turn pockets on Atlantic Boulevard between Valley Boulevard and Glendon Way into a reversible directional lane that would be reversed between the NB and SB directions to accommodate peak traffic flows. • Convert one of the existing SB through lanes on Atlantic Boulevard into a shared through right-turn lane at Glendon Way. • Add a merging lane on NB Atlantic Boulevard just north of

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
			Glendon Way. • Remove a portion of the raised median on Atlantic Boulevard south of Glendon Way. • Restripe adjacent lanes accordingly.
L-4	Garfield Avenue from Valley Boulevard to Glendon Way	City of Alhambra	• Add a reversible directional lane on Garfield Avenue that would be reversed between the NB and SB directions to accommodate peak traffic flows. • Add a dedicated right-turn lane on SB Garfield Avenue from Glendon Way to the WB I-10 on-ramp. • Modify the intersections of Garfield Avenue/Glendon Way and Garfield Avenue/Norwood Place by adding pork chop islands to prohibit left-turn movements to and from Glendon Way and Norwood Place, respectively. • Move the raised median and replace the NB left-turn lane on Garfield Avenue, south of Glendon Way, with a SB merge lane. • Restripe adjacent lanes accordingly.
L-5	Rosemead Boulevard from Lower Azusa Road to Marshall Street	City of Rosemead	• Widen outside through lane in each direction on Rosemead Boulevard between Lower Azusa Road and Marshall Street. • Add a dedicated right-turn lane from EB Marshall Street to SB Rosemead Boulevard.
L-8	Fair Oaks Avenue from Grevelia Street to Monterey Road	City of South Pasadena	• Convert existing dedicated left-turn lanes and median area along Fair Oaks Avenue between Monterey Road and Grevelia Street into a reversible directional lane that would be reversed between the NB and SB directions to accommodate peak traffic flows and prohibit left-turn movements from Fair Oaks Avenue to Oxley Street, El Centro Street, Mission Street, and Hope Street as well as left-turn movements from SB Fair Oaks Avenue to EB Monterey Road. • Convert the existing NB and SB outside lanes on Fair Oaks Avenue at Oxley Street, El Centro Street, Mission Street, and Hope Street intersections to shared through right-turn lanes. • Convert the NB left-turn lane and NB through left lane on Fair Oaks Avenue at the Grevelia Street intersection to two through lanes. • Add one SB through lane on Fair Oaks Avenue at Grevelia Street and eliminate parking on the west side of Fair Oaks Avenue south of Grevelia Street. • Restripe adjacent lanes accordingly.
Intersection Improvements			
I-1	West Broadway/ Colorado Boulevard	City of Los Angeles (Eagle Rock)	• Eliminate the left-turn pocket from EB Colorado Boulevard to Lockhaven Avenue by extending the raised median.
I-2	Eagle Rock Boulevard/ York Boulevard	City of Los Angeles (Eagle Rock)	• Add a second dedicated right-turn lane from NB Eagle Rock Boulevard to EB York Boulevard • Add a dedicated right-turn lane from WB York Boulevard to NB Eagle Rock Boulevard • Add a dedicated left-turn lane from EB York Boulevard to NB Eagle Rock Boulevard.
I-3	Eastern Avenue/ Huntington Drive	City of Los Angeles (El Sereno)	• Add a second left-turn lane from WB Huntington Drive to SB Eastern Avenue. • Add a dedicated left-turn lane from SB El Sereno Avenue to EB Huntington Drive. • Add a dedicated right-turn lane from NB Eastern Avenue to EB Huntington Drive. • Add a left turn from Eastern Avenue.

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
I-8	Fair Oaks Avenue/ Monterey Road	City of South Pasadena	• Convert the outer southbound through lane on Fair Oaks Avenue at Monterey Road into a shared through right-turn lane. • Extend the median island on Monterey Road west of Fair Oaks Avenue to restrict WB left turns at the Chase Bank driveway. • Extend NB left-turn pocket on Fair Oaks Avenue south of Monterey Road. • Implement adaptive traffic signal control. • Implement signal coordination. • Refer to Arterial L-8 of this table for improvements and modifications north of Monterey Road. • Restripe adjacent lanes accordingly.
I-9	Fremont Avenue/ Monterey Road	City of South Pasadena	• Add a second through lane in the NB direction on Fremont Avenue through the Fremont Avenue/Monterey Road intersection. • Widen the existing dedicated right-turn lane from SB Fremont Avenue to WB Monterey Road.
I-10	Huntington Drive/Fair Oaks Avenue	City of South Pasadena	• Remove a portion of landscaped median and add a third SB left-turn lane on Fair Oaks Avenue at Huntington Drive. • Relocate the existing crosswalk that crosses Huntington Drive farther west within the intersection. • Widen the outer WB through lane on Huntington Drive through the intersection. • Realign and restripe the existing crosswalks (3) across Fair Oaks Avenue. • Restripe adjacent lanes accordingly.
I-11	Fremont Avenue/ Huntington Drive	City of South Pasadena	• Convert a shared EB through right-turn lane on Huntington Drive at Fremont Avenue to a through lane and a right-turn lane. • Add a second WB left-turn lane on Huntington Drive. • Add a merging lane on SB Fremont Avenue just south of Huntington Drive. • Convert NB and SB exclusive right-turn lanes on Fremont Avenue to through right-turn lanes. • Modify the gore area on Huntington Drive, west of Fremont Avenue, and realign the westbound lanes (3). • Refer to Arterial L-2a of this table for improvements and modifications south of Huntington Drive. • Restripe adjacent lanes accordingly.
I-13	Huntington Drive/ Garfield Avenue	Cities of Alhambra/South Pasadena/San Marino	• Convert a shared through right-turn lane on EB Huntington Drive to a dedicated right-turn lane. • Widen Garfield Avenue to add a SB shared through right-turn lane at the approach to Huntington Drive. • Widen to add SB through right-turn lane on Garfield Avenue at Huntington Drive. • Widen Garfield Avenue to add a SB dedicated right-turn lane at Atlantic Boulevard. • Convert EB through lane on Huntington Drive to a dedicated left-turn lane at Garfield Avenue. • Restripe adjacent lanes accordingly.
I-14	Huntington Drive/ Atlantic Boulevard	Cities of Alhambra/South Pasadena/San Marino	• Refer to Intersection I-13 of this table for improvements and modifications.
I-15	Atlantic Boulevard/ Garfield Avenue	Cities of Alhambra/South Pasadena/San Marino	• Refer to Intersection I-13 of this table for improvements and modifications.

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
I-16	Garfield Avenue/Mission Road	City of Alhambra	• Widen the roadway bridge to add a dedicated NB right-turn lane at Mission Road. • Widen the roadway to add a dedicated SB right-turn lane at Mission Road. • Extend the northbound left-turn pocket storage on Garfield Avenue south of Mission Road. • Permanently remove three (3) on-street parking spaces on southbound Garfield Avenue north of Mission Road and one (1) off-street parking space (El Ranchero parking lot on the northwest corner.) • Restripe adjacent lanes accordingly.
I-18	San Gabriel Boulevard/ Huntington Drive	City of San Marino/ Unincorporated Los Angeles County (East Pasadena/East San Gabriel)	• Remove a portion of the median to accommodate a second EB left-turn lane at San Gabriel Boulevard. • Restripe adjacent lanes accordingly.
I-19	Del Mar Avenue/Mission Road	City of San Gabriel	• Add dedicated left-turn lanes for both directions of Mission Road at Del Mar Avenue. • Modify WB El Monte Street to prohibit left-turn movements to Del Mar Avenue. • Add one additional through lane in each direction on Del Mar Avenue through the intersection. • Upgrade traffic signal heads to 12-inch heads. • Permanent loss of 3 parking lot spaces and 10 on-street parking spaces. Del Mar Avenue heading north of Mission Road has a permanent loss of 3 on-street parking spaces. Property at southeast corner of Del Mar Avenue and Mission Road has permanent loss of 3 parking lot spaces as a result of reconfiguration. El Monte Street east of Del Mar Avenue has permanent loss of 1 on-street parking space. Mission Road WB east of Del Mar Avenue has permanent loss of 6 on-street parking spaces. • Restripe adjacent lanes accordingly.
I-22	San Gabriel Boulevard/ Marshall Street	City of San Gabriel	• Widen San Gabriel Boulevard to widen and realign NB lanes slightly east. • Add an additional SB through lane on San Gabriel Boulevard. Modify the existing median area on San Gabriel Boulevard south of Marshall Street. • Convert the existing dedicated right-turn lane from WB Marshall Street to San Gabriel Boulevard into a shared turn lane that would accommodate both right- and left-turn movements onto San Gabriel Boulevard. • Restripe adjacent lanes accordingly.
I-24	Huntington Drive/Oak Knoll Avenue	City of San Marino	• Add one additional through lane on EB Huntington Drive through the Huntington Drive/Oak Knoll Avenue intersection. • Convert the existing diagonal parking stalls along EB Huntington Drive between Oak Knoll Avenue and Chelsea Road into parallel parking stalls. • Remove 11 on-street parking stalls on Huntington Drive. • Permanent loss of 11 EB on-street parking spaces on the south side of Huntington Drive east of Oak Knoll Drive.
I-25	Huntington Drive/San Marino Avenue	City of San Marino	• Add one additional through lane on EB and WB Huntington Drive through the Huntington Drive/Sierra Madre Avenue intersection. • Convert the existing diagonal parking stalls along eastbound Huntington Drive between Westhaven Road and Ridgeway

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
			Road and westbound Huntington Drive between Kenilworth Avenue and Ridgeway Road into parallel parking stalls. • Remove 11 on-street parking stalls on Huntington Drive. • Permanent loss of 11 EB on-street parking spaces on the south side of Huntington Drive west of Sierra Madre Boulevard.
I-43	Del Mar Avenue/Valley Boulevard	City of San Gabriel	• Add a dedicated SB right-turn lane on Del Mar Avenue. • Extend green time for NB and SB through movements. • Add an additional NB merge lane on Del Mar Avenue north of Valley Boulevard. • Extend green time for the EB and WB left-turn phase. • Restripe adjacent lanes accordingly.
I-44	Hellman Avenue/ Fremont Avenue	City of Alhambra	• Remove existing median to add a through lane on NB Fremont Avenue between I-10 and Hellman Avenue. • Convert the existing shared through NB right-turn lane on Fremont Avenue to a dedicated right-turn lane. • Restripe adjacent lanes accordingly.
I-45	Eagle Rock Boulevard/ Colorado Boulevard	City of Los Angeles (Eagle Rock)	• Lengthen the existing left-turn pocket from WB Colorado Boulevard to SB Eagle Rock Boulevard. • Modify WB left-turn pocket on Colorado Boulevard.
Other Road Improvements			
T-1	Valley Boulevard to Mission Road Connector Road	Cities of Alhambra/Los Angeles (El Sereno)	• Construct a new connector road between Valley Boulevard and Mission Road. • Modify the Valley Boulevard/SR 710 on- and off-ramps. Realign the NB off-ramp approximately 40 ft west to allow the approach to be at a 90-degree angle from Valley Boulevard and aligning with the new connector road. Move the SB on-ramp approximately 215 ft east, adjacent to the NB off-ramp at Valley Boulevard. • Add a roundabout at the intersection of the new connector road and Alhambra Avenue–Mission Road. • Add a NB through lane as well as convert the existing left-right shared lane to a through-left shared lane. • Provide a roadway underpass crossing beneath the UPRR corridor. • Restripe adjacent lanes accordingly. • Construct a temporary shoofly track to construct the roadway underpass at the UPRR corridor.
T-2	SR 110/Fair Oaks Avenue Hook Ramps	Cities of South Pasadena/Pasadena	• Modify the alignment of the existing SB off-ramp at State Street to accommodate the addition of a one-lane SB on-ramp at State Street. • Widen the existing SR 110 NB off-ramp at Fair Oaks Avenue and add two lanes to convert the existing through left and through right lanes to two left lanes, one through, and a through-right lane. • Eliminate the two NB left-turn lanes at the SR 110 SB on-ramp at Fair Oaks Avenue and provide a SB right-turn lane with greater turning radius to eastbound State Street leading to the new SR 110 SB on-ramp. • Add a third SB through lane on Fair Oaks Avenue from State Street through the Fair Oaks Avenue/Grevelia Street intersection. • Restripe and widen EB lanes on Grevelia Street east of the Fair Oaks Avenue intersection. • Add one NB lane and convert the outer NB lane to an exclusive right-turn lane along Fair Oaks Avenue south of State Street.

TABLE 2.3:
Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location	Proposed Improvement/Modification
			• Terminate EB Grevelia Street at Mound Avenue, providing driveway access to the existing parking lot at the southwest corner of Fair Oaks Avenue and Grevelia Street. • Restripe adjacent lanes accordingly. • For improvements and modifications south of Grevelia Street, refer to Arterial L-8 of this table.
T-3	St. John Avenue Extension between Del Mar Boulevard and California Boulevard	City of Pasadena	• Extend St. John Avenue from Del Mar Boulevard to California Boulevard. • Construct a 14 ft wide through lane and add two traffic signals on southbound St. John Avenue. • Construct new intersections between the St. John Avenue extension at Waverly Drive, Bellevue Drive, and Palmetto Drive. • Modify the SB SR 710 off-ramp to California Boulevard.

Transportation Demand Management

TDM strategies focus on regional means of reducing the number of vehicle trips and vehicle miles traveled as well as increasing vehicle occupancy. TDM strategies facilitate higher vehicle occupancy or reduce traffic congestion by expanding the traveler's transportation options in terms of travel method, travel time, travel route, travel costs, and the quality and convenience of the travel experience. The TDM strategies include reducing the demand for travel during peak periods, reducing the use of motor vehicles, shifting the use of motor vehicles to uncongested times of the day, encouraging rideshare and transit use, eliminating trips (i.e., telecommuting), and improved transportation options. The TDM strategies associated with the TSM/TDM Alternative include expanded bus service, bus service improvements, and bicycle improvements:

Expanded Bus Service and Bus Service Improvements: Transit service improvements included in the TSM/TDM Alternative are summarized in Tables 2.4 and 2.5 and are illustrated on Figure 2-2. The transit service improvements enhance bus headways between 10 and 30 minutes during the peak hour and between 15 and 60 minutes during the off-peak period. Some of the bus service enhancements almost double existing bus service.

- **Bicycle Facility Improvements:** The bicycle facility improvements include on-street Class III bicycle facilities that support access to transit facilities through the study area and expansion of bicycle parking facilities at existing Metro Gold Line stations. Proposed bicycle facility improvements are outlined in Table 2.5.

Components of the TSM/TDM Alternative

Landscaping

Landscaping removed within Caltrans ROW would be replaced to the extent feasible. Landscaping removed outside of State-owned ROW would be replaced, as feasible, in coordination with the applicable local jurisdiction.

Bridges

The TSM/TDM Alternative would require widening of the Garfield Avenue Bridge. In addition, a new bridge would be constructed for the SR 710 connector road to Mission Road underpass crossing beneath the Union Pacific Railroad (UPRR) corridor.

TABLE 2.4:
Transit Refinements in the TSM/TDM Alternative

Bus Route	Operator	Route Type	Route Description	Existing Headways		Enhanced Headways	
				Peak	Off-Peak	Peak	Off-Peak
70	Metro	Local	From Downtown Los Angeles to El Monte via Garvey Ave	10–12	15	10	15
770	Metro	Rapid	From Downtown Los Angeles to El Monte via Garvey Ave/Cesar Chavez Ave	10–13	15	10	15
76	Metro	Local	From Downtown Los Angeles to El Monte via Valley Blvd	12–15	16	10	15
78	Metro	Local	From Downtown Los Angeles to Irwindale via Las Tunas Dr	10–20	16–40	10	15
378	Metro	Limited	From Downtown Los Angeles to Irwindale via Las Tunas Dr	18–23	–	20	30
79	Metro	Local	From Downtown Los Angeles to Santa Anita via Huntington Dr	20–30	40–45	15	30
180	Metro	Local	From Hollywood to Altadena via Los Feliz/Colorado Blvd	30	30–32	15	30
181	Metro	Local	From Hollywood to Pasadena via Los Feliz/Colorado Blvd	30	30–32	15	30
256	Metro	Local	From Commerce to Altadena via Hill Ave/Avenue 64/Eastern Ave	45	45	30	40
258	Metro	Local	From Paramount to Alhambra via Fremont Ave/Eastern Ave	48	45–55	20	30
260	Metro	Local	From Compton to Altadena via Fair Oaks Ave/Atlantic Blvd	16–20	24–60	15	30
762	Metro	Rapid	From Compton to Altadena via Atlantic Blvd	25	30–60	15	30
266	Metro	Local	From Lakewood to Pasadena via Rosemead Blvd/Lakewood Blvd	30–35	40–45	15	30
267	Metro	Local	From El Monte to Pasadena via Temple City Blvd/Del Mar Blvd	30	30	15	30
485	Metro	Express	From Union Station to Altadena via Fremont/Lake Ave	40	60	30	60
487	Metro	Express	From Westlake to El Monte via Santa Anita Ave/Sierra Madre Blvd/San Gabriel Blvd	18–30	45	15	30
489	Metro	Express	From Westlake to East San Gabriel via Rosemead Blvd	18–20	–	15	–
270	Metro	Local	From Norwalk to Monrovia via Workman Mill/Peck Rd	40–60	60	30	60
780	Metro	Rapid	From West Los Angeles to Pasadena via Fairfax Ave/ Hollywood Blvd/Colorado Blvd	10–15	22–25	10	20
187	Foothill	Local	From Pasadena to Montclair via Colorado Blvd/Huntington Dr/Foothill Blvd	20	20	15	15

TABLE 2.5:
Active Transportation and Bus Enhancements of the TSM/TDM Alternative

ID No.	Description	Location
Bus Service Improvements		
Bus-1	Additional bus service	See Table 2.4 and Figure 2-2
Bus-2	Bus stop enhancements	Along the routes listed in Table 2.4
Bicycle Facility Improvements		
Bike-1	Rosemead Blvd bike route (Class III)	Colorado Blvd to Valley Blvd (through Los Angeles County, Temple City, Rosemead)
Bike-2	Del Mar Ave bike route (Class III)	Huntington Dr to Valley Blvd (through San Marino, San Gabriel)
Bike-3	Huntington Dr bike route (Class III)	Mission Rd to Santa Anita Ave (through the City of Los Angeles, South Pasadena, San Marino, Alhambra, Los Angeles County, Arcadia)
Bike-4	Foothill Blvd bike route (Class III)	In La Cañada Flintridge
Bike-5	Orange Grove bike route (Class III)	Walnut St to Columbia St (in Pasadena)
Bike-6	California Blvd bike route (Class III)	Grand Ave to Marengo Ave (in Pasadena)
Bike-7	Add bike parking at transit stations	Metro Gold Line stations
Bike-8	Improve bicycle detection at existing intersections	Along bike routes in study area

Utilities

The TSM/TDM Alternative would require the relocation or protection in-place of various utilities as outlined in Table 2.6. A complete list of utilities is provided in Table 3.46 of Section 3.4, Utilities/Emergency Services.

TABLE 2.6:
TSM/TDM Utility Relocations and Protections In-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
Alhambra Utilities Department	Alhambra	4" ClP water	Would be protected in-place during construction
		12" VCP sewer (ABAND)	Would be protected in-place during construction
		8" VCP	Would be protected in-place during construction
		12" UNK (ABAND)	Would be protected in-place during construction
AT&T	Alhambra	2 Overhead Telecommunication	Would be relocated with power pole
	Eagle Rock	1 Overhead Telecommunication	Would be relocated with power pole
	El Sereno	1 Overhead Telecommunication	Would be relocated with power pole
	Pasadena	1 Overhead Telecommunication	Would be relocated with another pole
	Rosemead	12 Overhead Telecommunication	Would be relocated with power pole
	San Gabriel	2 Power Poles	Would be relocated to fit within proposed sidewalk
		4 Overhead Telecommunication	Would be relocated with power pole
	South Pasadena	2 Overhead Telecommunication	Would be relocated with power pole
Los Angeles Department of Water and Power	Eagle Rock	1 Power Pole	Would be relocated to fit within proposed sidewalk
		1 Overhead Electric	Would be relocated with power pole
	El Sereno	2 Power Poles	Would be relocated to fit within proposed sidewalk
		2 Overhead Electric	Would be relocated with power pole
Metropolitan Water District	Alhambra	60" Water	Would be protected in-place during construction
City of Pasadena Power Department	Pasadena	3 Power Poles	Would be relocated to fit within proposed sidewalk
		3 Overhead Electric	Would be relocated with power pole
Southern California Edison	Alhambra	4 Power Poles	Would be relocated to fit within proposed sidewalk
		4 Overhead Electric	Would be relocated with power pole
	Rosemead	4 Power Poles	Would be relocated to fit within proposed sidewalk
		11 Overhead Electric	Would be relocated with power pole
	San Gabriel	2 Power Poles	Would be relocated to fit within proposed sidewalk
		2 Overhead Electric	Would be relocated with power pole
	South Pasadena	1 Power Pole	Would be relocated to fit within proposed sidewalk
		1 Overhead Electric	Would be relocated with power pole
Time Warner Cable	Alhambra	1 Overhead Telecommunications	Would be relocated with power pole

Source: *Community Impact Assessment* (2014).
ABAND = abandoned
CIP = cast-iron pipe
VCP = vitrified clay pipe

Non-Motorized and Pedestrian Facilities (Active Transportation)

The TSM/TDM Alternative includes modifications to existing arterial streets and intersections, and freeway on- and off-ramps as shown in Table 2.3. It also includes enhancements to bus stops and the addition of several segments of on-street bike lanes as shown in Tables 2.4 and 2.5. Existing pedestrian and bicycle facilities along arterials, at intersections, and at freeway on- and off-ramps would be either protected in-place during construction of the TSM/TDM Alternative improvements or would be replaced in kind at the completion of the construction of those improvements. Any such improvements would be constructed to current Americans with Disabilities Act (ADA) standards for curb ramps and sidewalks. Improvements to the bus stops would also be constructed to ADA standards as feasible based on available public ROW to accommodate those types of improvements.

Specific improvements/changes in pedestrian and bicycle facilities under the TSM/TDM Alternative would include:

- On arterials and at intersections, the TSM/TDM improvements would accommodate pedestrians and would comply with ADA requirements.
- Class III bikeways would be accommodated, but Class I and Class II bike lanes would not be accommodated, due to limited lane widths.
- On St. John Avenue from California Boulevard to Del Mar Boulevard, the proposed improvements are within State-owned ROW (freeway mainline only) and would provide for pedestrian access.
- At the Valley Boulevard connector road and T-2 hook ramps, the proposed improvements within the State-owned ROW (freeway mainline and off-ramps) would not provide pedestrian or bikeway access beyond what is currently allowed for emergency access in the Caltrans *Highway Design Manual* and *Standard Plans*.

Drainage Facilities

Existing catch basins affected by roadway widening or ramp improvements would be relocated to the new curb and gutter. The proposed T-1 improvement would include new gutters and catch basins that would direct roadway flows to the Dorchester Avenue storm drain.

Storm Water Treatment

A biofiltration swale is proposed at the State Route 110 (SR 110) southbound on-ramp at State Street as part of the SR 110/Fair Oaks Avenue Hook Ramps (Other Road Improvement T-2). Tree box filters are proposed as part of the Valley Boulevard to Mission Road Connector Road (Other Road Improvement T-1) and the SR 110/Fair Oaks Avenue Hook Ramps (Other Road Improvement T-2); the intersection improvements at San Gabriel Boulevard/Marshall Street (Intersection Improvement I-22), SR 710 northbound off-ramp/Valley Boulevard (Intersection Improvement I-5), Huntington Drive/Fair Oaks Avenue (Intersection Improvement I-10), and Del Mar Avenue/Mission Road (Intersection Improvement I-19); and the local street improvements at Rosemead Boulevard from Lower Azusa Road to Marshall Street (Local Street Improvement L-5).

Catch basin screens and filter inserts are proposed at new inlet locations as part of the St. John Avenue Extension between Del Mar Boulevard and California Boulevard (Other Road Improvement T-3); the intersection improvements at Garfield Avenue/Mission Road (Intersection Improvement I-16); and the local street improvements at Rosemead Boulevard from Lower Azusa Road to Marshall Street (Local Street Improvement L-5).

Retaining Walls

Retaining walls would be installed at the bridge for the SR 710 underpass beneath the UPRR corridor. In addition, retaining walls would be built for the hook ramp improvements, at the northbound SR 110 off-ramp at Fair Oaks Avenue, and along the southbound SR 110 south of the State Street on-ramp and adjacent to State Street.

Noise Barriers

Preliminary abatement measures proposed for the TSM/TDM Alternative include seven noise barriers: two for Local Street Improvement L-3, one for Local Street Improvement L-5, two for Other Road Improvement T-1, and two for Other Road Improvement T-2, as follows:

- L3/TSM/TDM Alternative Noise Barrier (TNB) No. 1 is a recommended barrier along the perimeter of the private swimming pool area at the Atlantic Riviera Apartments, located at 1417 South Atlantic Boulevard.
- L3/TNB No. 2 is a recommended barrier along the private property line of 1721 South Atlantic Boulevard.
- L5/TNB No. 1 is a recommended barrier along the private property line of 3955 Rosemead Boulevard.
- T1/TNB No. 1 is a recommended barrier along the Caltrans ROW/private property line along the northbound side of SR 710 south of Valley Boulevard.
- T1/TNB No. 2 is a recommended barrier along the edge of shoulder on the southbound side of SR 710 south of Valley Boulevard.
- T2/TNB No. 1 is a recommended barrier along the Caltrans ROW/private property line along the northbound side of SR-110.
- T2/TNB No. 2 is a recommended barrier along the edge of shoulder on the southbound side of SR-110 and would range in height from 12 to 20 ft.

The analyzed noise barriers are shown on Figure 3.14-3 in Appendix N, Noise Tables and Figures. The final locations, heights, and lengths of noise barriers for the TSM/TDM Alternative would be determined during final design.

Property Acquisitions

The TSM/TDM Alternative would require the permanent acquisition of full and partial parcels of land that would be permanently incorporated into the transportation improvements in this Alternative as summarized in Table 2.7. The improvements in the TSM/TDM Alternative are not expected to require any permanent easements.

TABLE 2.7:
Summary of Permanent Acquisitions for the TSM/TDM Alternative

Type of Permanent Acquisition	Number of Parcels
Full parcel acquisition	1
Partial parcel acquisition	31
Aerial easement	0
Surface easement	0
Permanent tunnel easement	0
Permanent underground easement	0

Source: *Community Impact Assessment* (2014).

Ramp Metering

It is anticipated that the southbound SR 110 on-ramp at Fair Oaks Avenue (Other Road Improvement T-2) would require ramp metering because it is a downhill ramp leading to a relatively short weaving section, with a signal directly upstream. Thus, the ramp metering is

recommended to enhance the operation of the ramp connection to the mainline freeway. In general, ramp metering reduces congestion by controlling traffic coming onto the freeway and reducing friction. By doing so, ramp metering helps to maintain more consistent freeway throughput, uses the capacity of the freeway more efficiently, and improves safety. Caltrans Deputy Directive 35 (DD-35) and Ramp Metering Design Manual specifically notes that "Caltrans is committed to using ramp metering as an effective traffic management strategy to maintain an efficient freeway system and protect the investment made in constructing freeways by keeping them operating at or near capacity." Caltrans' Ramp Metering Policy Procedures state that "…projects which propose the modification of an existing interchange or the construction of a new interchange…should include provisions for ramp meters."

Construction Activities

Grading and Excavation

Many of the improvements included in the TSM/TDM Alternative, such as video detection systems, enhanced bus service, and bike routes, do not involve ground disturbance. However, other improvements (e.g., the installation of CMS and additional bus stops as well as the local street and intersection improvements) may require ground disturbance for their implementation. Excavation and construction for the local street and intersection improvements involve multiple components that vary in degree of ground disturbance. Examples of these components include changes to signs and lane striping; rehabilitation of traffic signals; removal of medians; and installation of new medians, sidewalks, pavement, noise barriers, and overhead cantilever signs for the reversible lanes. Anticipated depth of excavation for these components ranges from zero to approximately 10 ft. The majority of improvements within the TSM/TDM Alternative include one or more of these components. In addition to these smaller-scale components, a few improvements in this Alternative include more substantial changes such as new alignments for roads, on-ramps, and off-ramps. These larger-scale changes involve greater levels of ground disturbance with excavation that may reach depths of up to approximately 45 ft.

Traditional excavation equipment (e.g., scrapers, trackhoes, bulldozers) would be used for most components that involve ground disturbance. For signal poles, cast-in-drilled-hole (CIDH) piles that are up to approximately 30 inches in diameter would be used, and the shafts for these piles would be drilled up to approximately 10 ft deep using a drill rig equipped with an auger. No pile driving would be allowed during construction of the TSM/TDM Alternative.

Construction Staging and Phasing

Construction staging describes the steps taken to construct project improvements in a logical and effective order with minimal disruption to traffic and the adjacent community. The intent of construction staging is to mobilize work crews and materials and construct improvements in a progression that minimizes the need for multiple periods of construction in one area. Construction staging can include, but not be limited to, how and when utility relocations and modifications are implemented; how lane, ramp, and street closures are integrated with the construction of improvements in those areas; and the concurrent use of multiple work crews in different areas.

Construction phasing identifies project components that would be designed and implemented in discrete phases as a project is constructed over time. Typically, phased improvements build on earlier improvements. For example, if a freeway is proposed to be widened to add one general-

purpose lane and one high-occupancy vehicle (HOV) lane in each direction, the freeway could be widened first to add the HOV lanes and then, as demand increases, the general-purpose lanes could be constructed at a later date. Phasing plans typically focus on identifying meaningful transportation improvements that would provide timely benefits to travelers. To be most effective, phased improvements should have independent utility and not depend on other transportation improvements to provide benefits to travelers.

As shown earlier on Figure 2-2 and in Tables 2.2 through 2.5, the TSM/TDM Alternative includes discrete improvements across the project area. Some of those improvements would require temporarily shifting or closing travel lanes to provide space to construct the improvements. Each improvement would be staged to minimize the disruption to traffic and maximize the effectiveness of the construction activities. However, because these are discrete improvements, they can be designed and implemented in any order without any specific overall phasing. For example, the ITS improvements listed in Table 2.2 could be implemented individually and are not dependent on other TSM/TDM improvements being in place. The ITS improvements would require coordination and integration with existing ITS improvements at the intersections or cross streets in the vicinity of the ITS improvements to maximize the effectiveness of those improvements.

A majority of the TSM/TDM improvements were designed within the existing right-of-way, which is consistent with the approach for this alternative. Minor street improvements, such as adding turning lanes or through lanes may require street widening, raised median removal, and restriping. It is anticipated that these types of improvements would result in minimal construction related impacts and require minimal import and/or export of material.

Other TSM/TDM improvements, such as T-1 (Valley Boulevard to Mission Road Connector Road), T-2 (SR 110/Fair Oaks Avenue Hook Ramps), and T-3 (St. John Avenue Extension between Del Mar Boulevard and California Boulevard and also I-16's (Garfield Avenue/Mission Road) bridge widening would require more construction effort than other TSM/TDM locations. T-1 would be constructed within Caltrans property and it is anticipated that sufficient space would be available on this property for staging and storage of equipment and materials. Other Road Improvement T-1 would require a temporary shoofly track in order to construct the Valley Boulevard to Mission Road Connector Road underpass at the UPRR corridor. The shoofly (temporary) track would take approximately 30 days to construct and 15 days to remove, and would remain in place approximately 12 months. It is anticipated that the proposed roundabout of T-1 at Mission Road would be constructed in two stages. Roadway excavation would be reused where possible within the roadway right-of-way, and any excess material can be hauled away along the southbound SR 710 and eastbound I-10 to an existing Class I landfill and/or sold to a soil broker.

Other Road Improvement T-2 would require widening of the existing SR 110 northbound off ramp at Fair Oaks Ave and a retaining wall would be placed along the outside shoulder of the ramp. Construction in this area may require night or weekend closures along the off ramp. Similarly, the relocated SR 110 southbound off and ramp at State Street and the proposed on SR 110 SB on ramp from State Street may require a weekend or night closure of the ramps during construction. Excavated material would be reused within the state right-of-way where possible, and any excess material can be hauled away to an existing Class I landfill and/or sold to a soil broker.

Improvement T-3 proposed the extension of St John Ave from Del Mar Blvd to California Ave. A majority of this work would be completed within Caltrans ROW and it is anticipated that sufficient space is available for storage of equipment and materials within Caltrans property. Additional space beyond the ROW boundary needed for construction is minimal and will be acquired as temporary construction easement (TCE). Excavated material would be reused within the roadway right-of-way where possible, and any excess material can be hauled away along the northbound SR 710 and eastbound I-210 to an existing Class I landfill and/or sold to a soil broker.

Bridge widening for Improvement I-16 would require removing part of the existing structure, followed by construction of the widened portion and lastly connecting the existing structure and widening with a concrete closure pour. Minimal excavation and imported material is anticipated at this location. As shown in Table 2.3, the majority of the improvements in the TSM/TDM Alternative would require some temporary closures of travel lanes, but only a few would require detours to minimize delays to the traveling public in those areas. Most of these closures and delays would be limited in duration (hours or days).

Temporary Construction Easements

Temporary construction easements (TCEs) are areas outside the permanent ROW that would be needed during construction of improvements adjacent to the TCEs. TCEs can be needed to provide space for constructing walls along the ROW, extending major drainage facilities and culverts, utility relocations and modifications, and widening bridges. TCEs may also be used to provide temporary access to a construction area or temporary storage for construction equipment and/or materials. Any land used as a TCE during construction would be returned to its original or better condition prior to the return of that land to the original owner after completion of the construction activities requiring that TCE.

The majority of the improvements in the TSM/TDM Alternative are anticipated to be constructed within existing publicly owned ROWs. It is anticipated that the TSM/TDM Alternative would require TCEs for the construction of improvements where there is not sufficient room within the public ROWs to accommodate the construction activities and/or storage of materials or equipment for those improvements. No permanent project features would be constructed within the boundaries of the TCEs used during construction of the TSM/TDM Alternative.

Cost

The TSM/TDM Alternative is estimated to cost approximately $105 million. This estimate includes all components of the TSM/TDM Alternative, including ITS improvements, local street improvements, ATM technology, bicycle improvements, and expanded bus service.

Schedule

The construction of the improvements in the TSM/TDM Alternative is expected to take approximately 2 years to complete.

2.2.3.2 BRT Alternative

The BRT Alternative would provide high-speed, high-frequency bus service through a combination of new, dedicated bus lanes and mixed-flow traffic lanes to key destinations between East Los Angeles and Pasadena. The proposed route length is approximately 12 miles (mi). Figure 2-3a illustrates the BRT Alternative.

The BRT Alternative includes the BRT trunk line arterial street and station improvements, frequent bus service, new bus feeder services, and enhanced connecting bus services. Buses are expected to operate every 10 minutes during peak hours and every 20 minutes during off-peak hours. The BRT service would generally replace, within the study area, the existing Metro Route 762 service. The approximately 12 mi route would begin at Atlantic Boulevard and Whittier Boulevard to the south, follow Atlantic Boulevard, Huntington Drive, Fair Oaks Avenue, and Del Mar Boulevard, and end with a terminal loop in Pasadena to the north. Buses operating in the corridor would be given transit signal priority from a baseline transit signal priority project that would be implemented separately by Metro.

Where feasible, buses would run in dedicated bus lanes adjacent to the curb, either in one direction or both directions, during peak periods. The new dedicated bus lanes would generally be created within the existing street ROWs through a variety of methods that include restriping the roadway, restricting on-street parking during peak periods, or narrowing medians, planted parkways, and sidewalks. Buses would share existing lanes with other traffic in cases where there is not enough ROW. The exclusive lanes would be limited to buses and right-turning traffic during AM and PM peak hours only. At other times of day, the exclusive lanes would be available for mixed-flow traffic and/or on-street parking use.

The BRT service would include 60 ft articulated buses with three doors, and would have the latest fare collection technology such as on-board smart card (transit access pass [TAP] card) readers to reduce dwell times at stations.

Specific project features of the BRT Alternative are discussed in detail below.

Components of the BRT Alternative

Bus Stops

A total of 17 BRT stations with amenities would be placed on average at approximately 0.8 mi intervals at major activity centers and cross streets. Typical station amenities would include new shelters, branding elements, seating, wind screens, leaning rails, variable message signs (next bus information), lighting, bus waiting signals, trash receptacles, and stop markers.

Some of these stops will be combined with existing stops, while in some cases, new stops for BRT would be provided directly adjacent to existing local stops on the same side of the street. The BRT stops would be provided at the following 17 locations:

- Atlantic Boulevard at Whittier Boulevard
- Atlantic Boulevard between Pomona Boulevard and Beverly Boulevard
- Atlantic Boulevard at Cesar Chavez Avenue/Riggin Street
- Atlantic Boulevard at Garvey Avenue
- Atlantic Boulevard at Valley Boulevard

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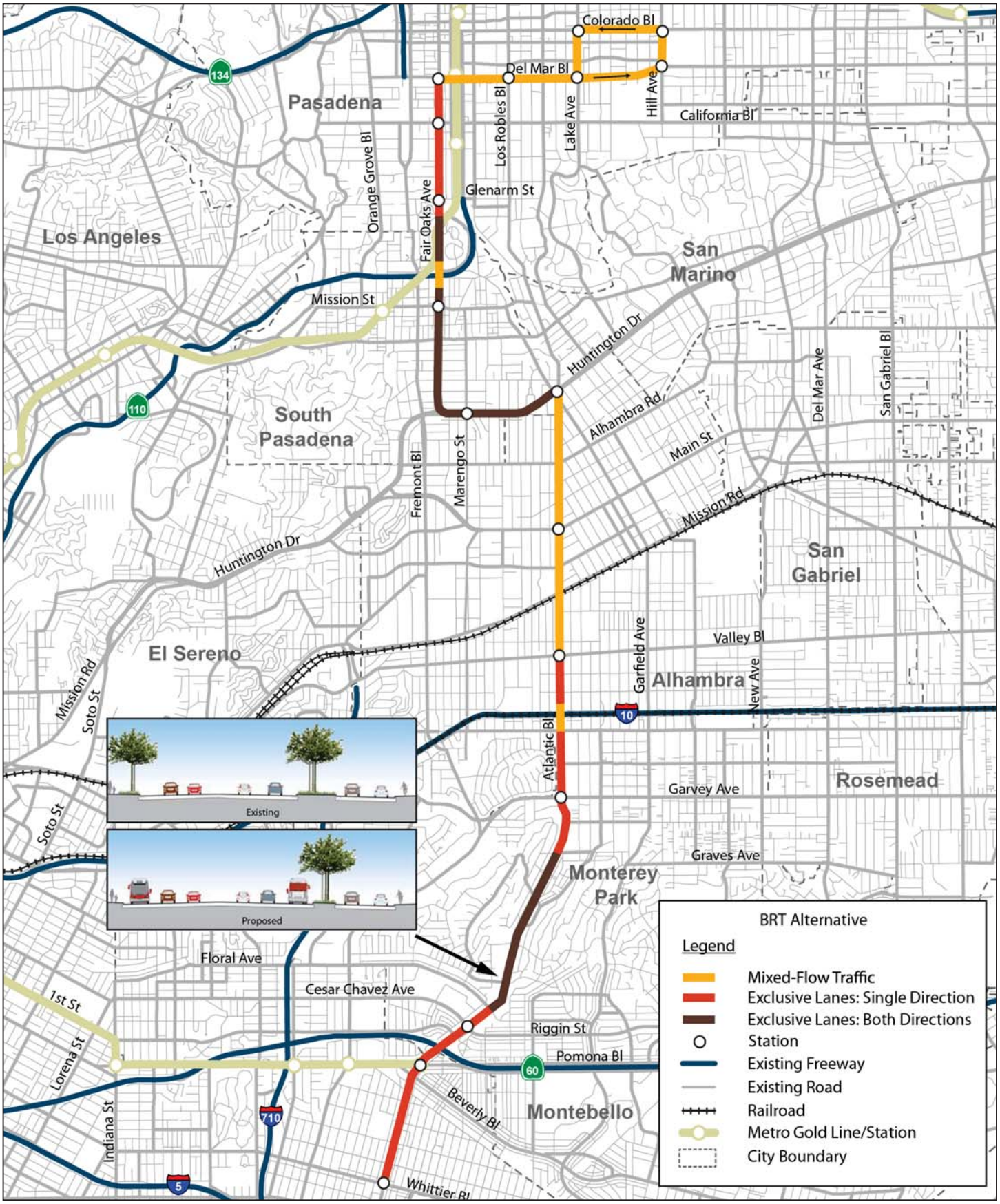

FIGURE 2-3a

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SOURCE: CH2M HILL (2013)

SR 710 North Study

BRT Alternative

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- Atlantic Boulevard at Main Street
- Huntington Drive at Garfield Avenue
- Huntington Drive at Marengo Avenue
- Fair Oaks Avenue at Mission Street
- Fair Oaks Avenue at Glenarm Street
- Fair Oaks Avenue at California Boulevard
- Fair Oaks Avenue at Del Mar Boulevard
- Del Mar Boulevard at Los Robles Avenue
- Del Mar Boulevard at Lake Avenue
- Del Mar Boulevard at Hill Avenue (single direction only)
- Colorado Boulevard at Hill Avenue (single direction only)
- Colorado Boulevard at Lake Avenue (single direction only)

Street Improvements

Street widening would be required to accommodate the bus lanes and to add turn lanes or bus queue jump lanes approaching intersections. Below are locations of the proposed street widenings:

- **Atlantic Boulevard:** Between Whittier Boulevard and Hellman Avenue, between Glendon Way and Shorb Street, and between San Marino Avenue and Front Street
- **Huntington Drive:** Between Garfield Avenue and Fair Oaks Avenue
- **Fair Oaks Avenue:** Between Huntington Drive and Grevelia Street, between State Street and Columbia Street, and between State Street/Grace Terrace and Del Mar Boulevard

Bridges

The BRT alternative would not require widening or modification of any bridge structures. However, restriping of the travel lanes on bridges would be required at Atlantic Boulevard over the Alameda Corridor, Fair Oaks Avenue over SR 110, and Fair Oaks Avenue over the Metro Gold Line.

Bus Feeder Routes

Additionally, the BRT Alternative would include bus feeder routes that would connect additional destinations with the BRT mainline. Two bus feeder routes are proposed: (1) one that would run along Colorado Boulevard, Rosemead Boulevard, and Valley Boulevard to the El Monte transit station; and (2) another bus feeder route that would travel from Atlantic Boulevard near the Gold Line station to the Metrolink stations in the Cities of Commerce and Montebello via Beverly Boulevard and Garfield Avenue. In addition, other existing bus services in the study area would be increased in frequency and/or span of service. Figure 2-3b illustrates the bus feeder service proposed with the LRT Alternative.

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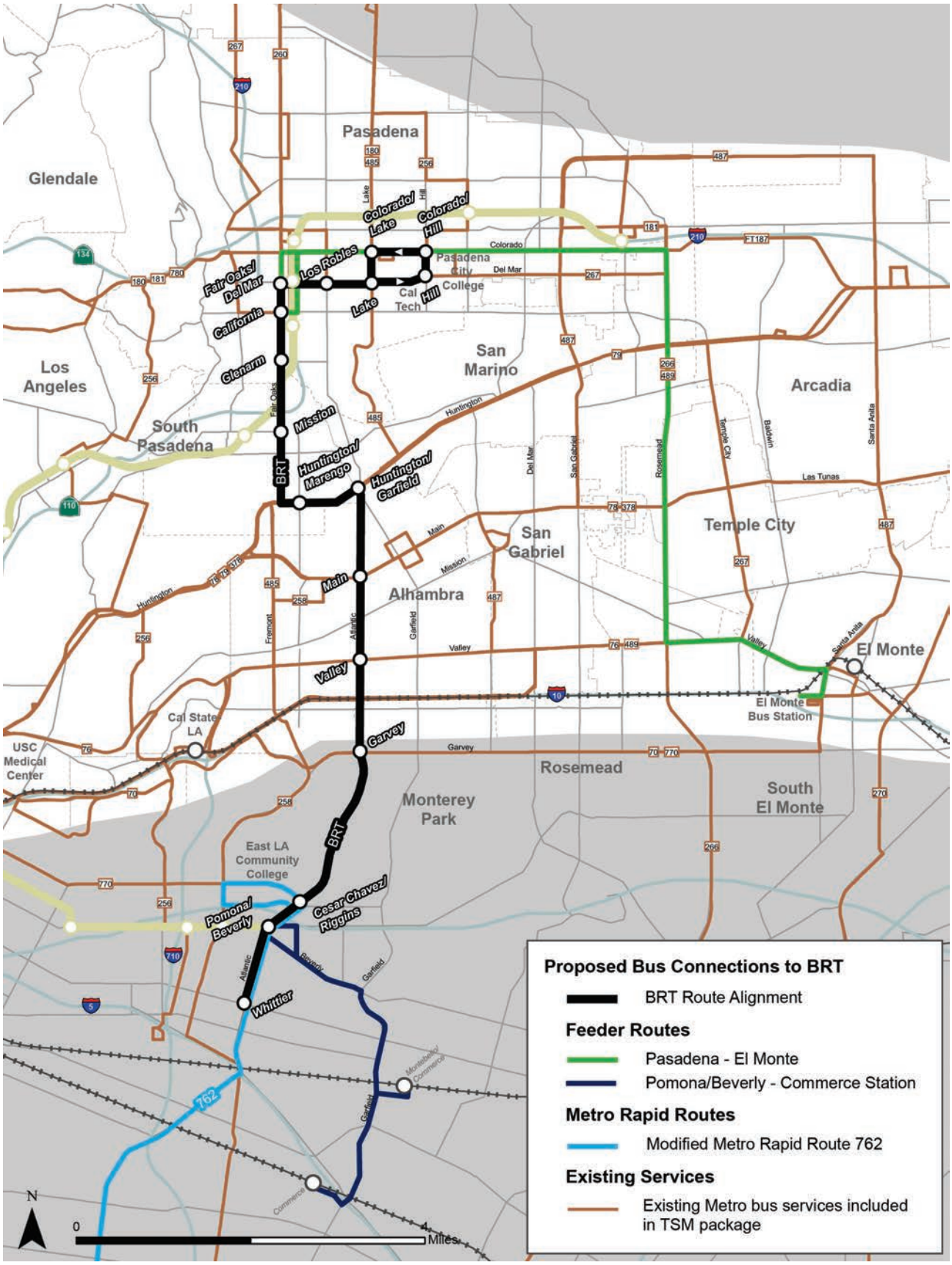

FIGURE 2-3b

SR 710 North Study

Proposed Bus Feeder Routes for BRT Alternative

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SOURCE: CH2M HILL (2014)

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Landscaping

The BRT Alternative would preserve existing landscaping on streets, including trees and other forms of vegetation, as much as possible. Landscaping removed outside of State-owned ROW would be provided, as feasible, in coordination with the applicable local jurisdiction. At constrained locations where larger diameter trees are not feasible, low groundcover, shrubs or smaller trees would be provided.

Utilities

Table 2.8 outlines the proposed utility relocations and those utilities that would be protected in-place. The list of utilities affected by the BRT Alternative is preliminary based on current design plans and may be modified during final design.

TABLE 2.8:
BRT Alternative Utility Relocations

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
AT&T	Alhambra	1 Overhead Telecom	Would be relocated with pole
	East Los Angeles	1 Overhead Fiber	Would be relocated with pole
		4 Overhead Telecom	Would be relocated with pole
	Monterey Park	2 Overhead Telecoms	Would be relocated with pole
	South Pasadena	2 Overhead Telecoms	Would be relocated with pole
Southern California Edison	Alhambra	3 Power Poles	Would be relocated to fit within proposed sidewalk
		1 Overhead Electric	Would be relocated with pole
	East Los Angeles	9 Power Poles	Would be relocated to fit within proposed sidewalk
		5 Overhead Electric	Would be relocated with pole
	Monterey Park	3 Power Poles	Would be relocated to fit within proposed sidewalk
		2 Overhead Electric	Would be relocated with pole
	South Pasadena	2 Power Poles	Would be relocated to fit within proposed sidewalk
		2 Overhead Electric	Would be relocated with pole
Time Warner Cable	South Pasadena	2 Overhead Telecom	Would be relocated with pole
Verizon Wireless	East Los Angeles	1 Overhead Telecom	Would be relocated with pole
XO Communication	East Los Angeles	1 Overhead Telecom	Would be relocated with pole

Source: *Community Impact Assessment* (2014).

Non-Motorized and Pedestrian Facilities

The BRT Alternative includes modifications to existing arterial streets and intersections and freeway on- and off-ramps and the construction of bus lanes and bus stations. Existing pedestrian and bicycle facilities along arterials, at intersections, and at freeway on- and off-ramps would be either protected in-place during construction of the BRT Alternative improvements or would be replaced in kind at the completion of the construction of those improvements. Any such improvements would be constructed to current ADA standards for curb ramps and sidewalks. The bus stations would be constructed to ADA standards as feasible based on available public ROW to accommodate those types of improvements.

Specific improvements and changes in pedestrian and bicycle facilities under the BRT Alternative would include:

- Bicyclists would be allowed to ride in the peak-period bus lanes at all times. Proper signage would be provided and would read “Bike OK.” During the a.m. and p.m. peak periods, bicycles would share the bus lane with buses and right-turning vehicles near intersections or at driveways. Outside of peak hours, bicyclists would share the outside general traffic lane with other vehicular traffic.

- ADA-compliant curb ramps and sidewalks would be provided where street modifications are proposed under the BRT Alternative.
- ADA-compliant tree grates at tree wells would be provided.
- Bike racks and/or lockers could be provided at the BRT stations if desired by the local jurisdictions and if they can be accommodated within the public ROW.
- The BRT Alternative would result in improved connectivity to the Metro Gold Line and many other points of interest along the BRT Alternative alignment for pedestrians and bicyclists.
- In areas with the bus lanes, the BRT Alternative would reduce sidewalk widths to a minimum of 8 ft at bus stops and a minimum of 6 ft elsewhere.
- The bus lanes on Atlantic Boulevard, Huntington Drive, and Fair Oaks Avenue would increase the lengths of pedestrian crosswalks at many locations.

Drainage Facilities

Widening of roadways to accommodate the proposed BRT Alternative would require the relocation of existing gutters and catch basins to the new curb.

Storm Water Treatment

Tree box filters are proposed at new catch basins along the BRT alignment where the sidewalk width is at least 7 ft wide, as required to meet ADA standards. Catch basin screens and curb inlet filters are proposed along the BRT alignment at locations with a new inlet where the sidewalk is less than 7 ft. A biofiltration swale is proposed within Caltrans ROW where the BRT alignment crosses SR 60.

Retaining Walls

Two retaining walls are proposed with the BRT Alternative to minimize impacts to the existing residential streets immediately adjacent to Atlantic Boulevard. One wall is located along the eastern edge of the proposed sidewalk on Atlantic Boulevard, between Repetto Drive and Sevilla Street, and the second wall would be located on the northwest corner of Atlantic Boulevard and Brightwood Street.

Noise Barriers

Preliminary abatement measures proposed for the BRT Alternative includes three noise barriers as follows:

- BRT Alternative Noise Barrier (BNB) No. 1 is a recommended barrier along the private property line of the multifamily residential use along Atlantic Boulevard and De La Fuente Street.
- BNB No. 3 is a recommended barrier along the private property line of the multifamily residential use along Atlantic Boulevard and De La Fuente Street.
- BNB No. 5 is a recommended barrier along the private property line at the northeast corner of Atlantic Boulevard and San Marino Avenue.

These noise barriers are shown on Figure 3.14-4 in Appendix N. The final heights, lengths, and locations of noise barriers for the BRT Alternative would be determined during final design. Four

noise barriers proposed for the TSM/TDM Alternative would also be included in the BRT Alternative.

Property Acquisitions

The BRT Alternative would require the permanent partial acquisition of parcels of land that would be incorporated into the transportation improvements in this Alternative as summarized in Table 2.9. The improvements in the BRT Alternative are not expected to require any permanent easements.

TABLE 2.9:
Summary of Permanent Acquisitions for the BRT Alternative

Type of Permanent Acquisition	Number of Parcels
Full parcel acquisition	0
Partial parcel acquisition	45
Aerial easement	0
Surface easement	0
Permanent tunnel easement	0
Permanent underground easement	0

Source: *Community Impact Assessment* (2014).

TSM/TDM Components

The TSM/TDM Alternative improvements would also be constructed as part of the BRT Alternative. These improvements would provide the additional enhancements to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. All of the road improvements identified in Table 2.3 would be implemented with the BRT Alternative, with the exception of Local Street Improvement L-8 (Fair Oaks Avenue from Grevelia Street to Monterey Road) and the reversible lane component of Local Street Improvement L-3 (Atlantic Boulevard from Glendon Way to I-10). Additionally, enhancements to Route 762 identified in Table 2.4 would not be implemented with the BRT Alternative.

There are locations along the alignment of the BRT Alternative that overlay or cross areas that would also be improved under the TSM/TDM Alternative. All the improvements at those locations would be designed to ensure the effective operation of the BRT Alternative facilities and services in conjunction with the applicable TSM/TDM Alternative improvements. For example, ITS improvements under the TSM/TDM Alternative along or crossing the BRT Alternative alignment would be designed and implemented to compliment and support the transportation facilities and services in the BRT Alternative so as to maximize the benefits of those improvements for the traveling public.

Construction Activities

Grading and Excavation

Ground disturbance involved in the BRT Alternative is minimal and mainly concentrated in existing public ROW. These improvements include widening roadways, pavement, and sidewalk reconstruction, modifications to the SR 60/Atlantic Boulevard interchange, and installation of ancillary structures (e.g., traffic signs, power poles, small retaining walls, and noise barriers). Bus shelters constructed at the new bus stops would involve deeper excavation. Anticipated ground disturbance for their installation involves an approximately 3 ft diameter drilled shaft that may extend up to approximately 20 ft below the original ground surface.

Where roadways would be widened (e.g., along Atlantic Boulevard, Huntington Drive, and Fair Oaks Avenue), existing surface materials (landscaping, pavement, crushed rock, etc.) would be excavated to allow placement of the new pavement section. Similarly, for sidewalk reconstruction, existing material would be removed and replaced.

The proposed modification for the ramps at the I-710/SR 60 interchange does not include much change in the vertical profile from the existing alignments. As such, ground disturbance in this area would be minimal and possibly similar to that for widening the roadways.

The installation of smaller features, including traffic signal poles, traffic signs, electrical power poles, light poles, small retaining walls, and drainage facilities would occur in various places along the approximately 12 mi route. These features are similar to those included in the TSM/TDM Alternative improvements and would likely have similar levels of ground disturbance. Excavation for this Alternative would use traditional excavation equipment (e.g., scrapers, trackhoes, bulldozers) as well as construction of CIDH piles. No pile driving would be allowed during construction of the BRT Alternative.

Construction Staging and Phasing

As shown earlier on Figure 2-3 and as discussed above, the BRT Alternative includes the provision of high-speed, high-frequency bus service on a system of proposed dedicated bus and existing mixed-flow lanes. Seventeen BRT stations with amenities would be provided at major activity centers and cross streets. Construction areas required for these improvements would result in temporarily shifting or closing travel lanes. Each improvement would be staged to minimize the disruption to traffic and maximize the effectiveness of the construction activities. The construction staging and sequencing concepts for the BRT Alternative improvements are described briefly below.

Roadway and Station Improvements

The roadway and station improvements in the BRT Alternative are anticipated to be constructed in three primary construction stages:

1. Street widening and other modifications to provide for the dedicated bus lanes
2. Construction of the BRT Alternative stations
3. Widening and other intersection improvements to join the street widening and align the dedicated bus lanes and other travel lanes at and across intersections

Within each of those overall construction stages, preliminary construction staging of the improvements is expected to include some or all of the following:

- Restriping the existing travel lanes and/or intersections to shift traffic away from an active construction area, including providing for the same number of through lanes as in the existing condition, where feasible, based on the available ROW
- Installation of temporary traffic control devices and closure of the active construction area to traffic, including appropriate temporary traffic control, directional, and informational signing

- Provision of temporary pedestrian walkways and detours and temporary bicycle detours, including appropriate temporary traffic control, directional, and informational signing
- Modification and relocation of utilities and street lights, and modification of storm drain catch basins as needed
- Modification of existing traffic signals and signing
- Construction of new road pavement, curbs, and sidewalks, including striping and appropriate permanent traffic control, directional, and informational signing
- Construction and installation of the BRT station amenities including appropriate informational signing
- Re-opening the construction area to vehicles, pedestrians, and bicyclists

Most of these general staging activities would occur all along the alignment of the BRT Alternative as the improvements along each segment are constructed. It is anticipated that improvements would be constructed on one side of the street and when those improvements are complete, the improvements on the other side of the street would be constructed. As a result, the staging activities described above would apply as the improvements on the first side of the street are constructed, and then again as the improvements on the other side of the street are constructed. It is anticipated that these types of improvements would result in minimal construction-related impacts and would require minimal import and/or export of material. Excess material resulting from these improvements would be reused on site to the extent feasible, and any remaining material would be transported to a Class I landfill and/or sold to a soil broker.

Traffic Signal Modifications

The existing traffic signal equipment at signalized intersections would be modified where the roadways are widened, intersections are modified, or where stations in the BRT Alternative would conflict with the existing signal equipment. This would include replacing, relocating, and/or upgrading the existing traffic signal equipment.

Street Lighting Modifications

The existing street light poles and the supporting electrical facilities along Atlantic Boulevard and Fair Oaks Avenue would need to be modified where widening of those streets would occur under the BRT Alternative. The modifications to the existing street lighting would generally be staged after the installation of temporary traffic control devices on the roadway, placement of temporary lighting, and closure of the active construction area to traffic.

Temporary Construction Easements

The majority of the improvements in the BRT Alternative are anticipated to be constructed within existing publicly owned ROWs. However, it is anticipated that the BRT Alternative would require TCEs where there is not sufficient room within the public ROWs to accommodate the construction activities and/or storage of materials or equipment for those improvements. Any land used as a TCE during construction of improvements under the BRT Alternative would be returned to its original or better condition prior to the return of that land to its original owner following completion of the construction activities requiring that TCE. No permanent project

features would be constructed within the boundaries of the TCEs used during construction of the BRT Alternative.

Cost

The total estimated cost of the BRT Alternative is approximately $241 million. Of that total, the cost of the TSM/TDM improvements that would be constructed with the BRT Alternative is estimated to be approximately $102 million. The structures and ROW costs are included in these estimates. This cost includes the vehicles, stations, roadway, structures, and ROW costs for the BRT.

Schedule

The construction of the improvements in the BRT Alternative is expected to take approximately 2 years to complete.

2.2.3.3 LRT Alternative

The LRT Alternative would include a passenger rail line that is operated along a dedicated guideway similar to other Metro light rail lines. The LRT alignment is approximately 7.5 mi long, with 3 mi of aerial segments and 4.5 mi of bored tunnel segments. Figure 2-4 illustrates the LRT Alternative.

The LRT Alternative would begin at an aerial station on Mednik Avenue adjacent to the existing East Los Angeles Civic Center Station on the Metro Gold Line (Eastside Extension). The alignment would remain elevated as it travels north on Mednik Avenue, west on Floral Drive, north across Corporate Center Drive, and then along the west side of I-710, primarily in Caltrans ROW, to a station adjacent to California State University, Los Angeles (Cal State LA). The alignment would descend into a tunnel south of Valley Boulevard and travel northeast to Fremont Avenue, north under Fremont Avenue, and easterly to Fair Oaks Avenue. The alignment would then cross under SR 110 and end at an underground station beneath Raymond Avenue adjacent to the existing Fillmore Station on the Metro Gold Line in Pasadena.

Two approximately 20 ft diameter tunnels (one in each direction) are expected to be constructed with cross passages connecting the tunnels to allow for emergency access. The LRT tunnels are expected to be constructed using tunnel boring machines (TBMs) except for at the portal and the stations, which would be constructed using the cut-and-cover construction method. The depth of the bored tunnel would vary from approximately 20 to 90 ft below ground surface (bgs) measured from the crown (top) of the tunnel. The depth would be shallower near the construction portal. The cut-and-cover tunnel would vary from 5 to 20 ft bgs. The vertical and horizontal alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.

Components of the LRT Alternative

Stations

Seven stations would be located along the LRT alignment:

- Mednik Station would be located at Mednik Avenue in East Los Angeles
- Floral Station at Floral Drive in Monterey Park
- Cal State LA Station at Cal State LA in Los Angeles
- Alhambra Station at Fremont Avenue in Alhambra
- Huntington Station at Huntington Drive in South Pasadena

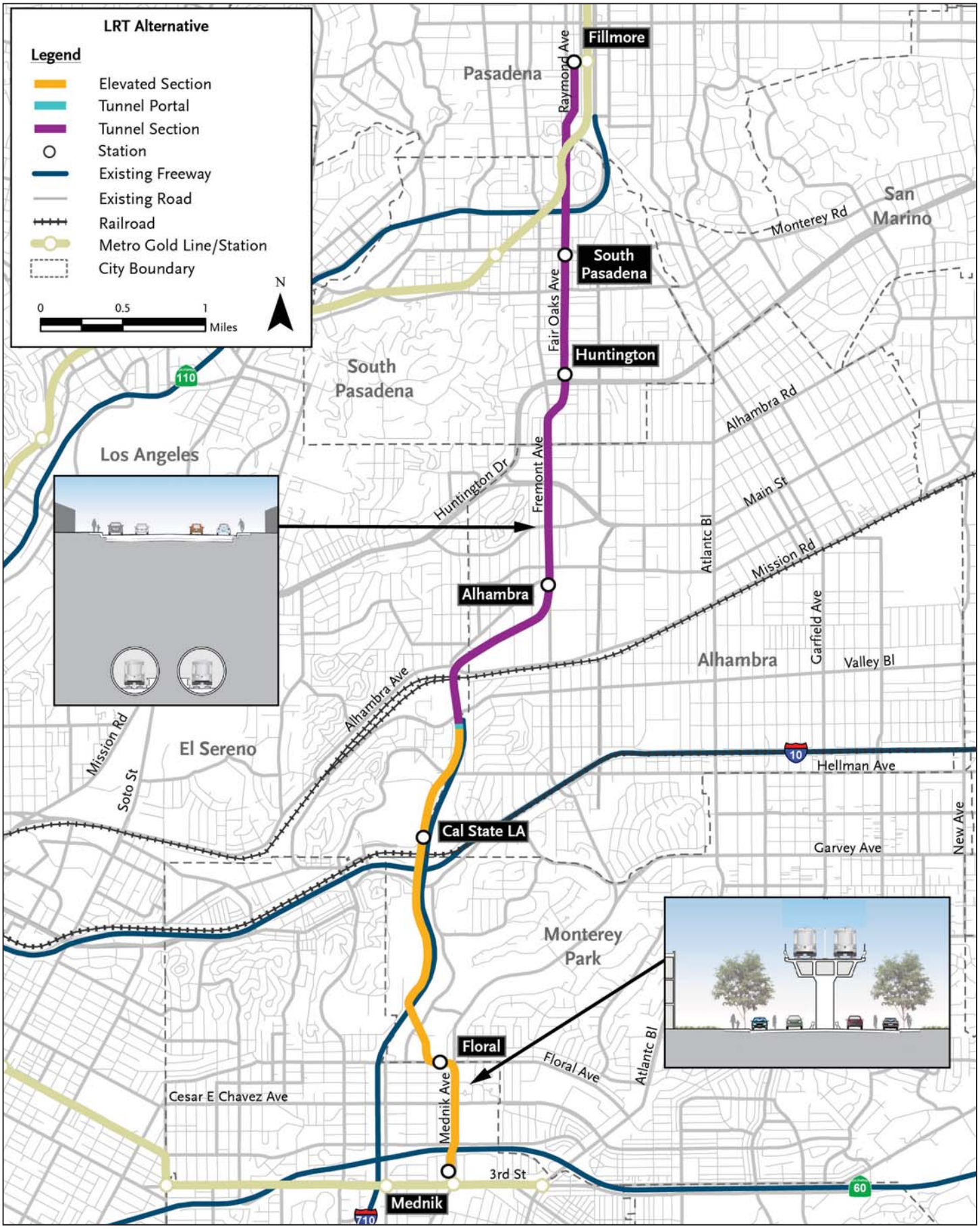

FIGURE 2-4a

SR 710 North Study

LRT Alternative

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SOURCE: AECOM (2013)

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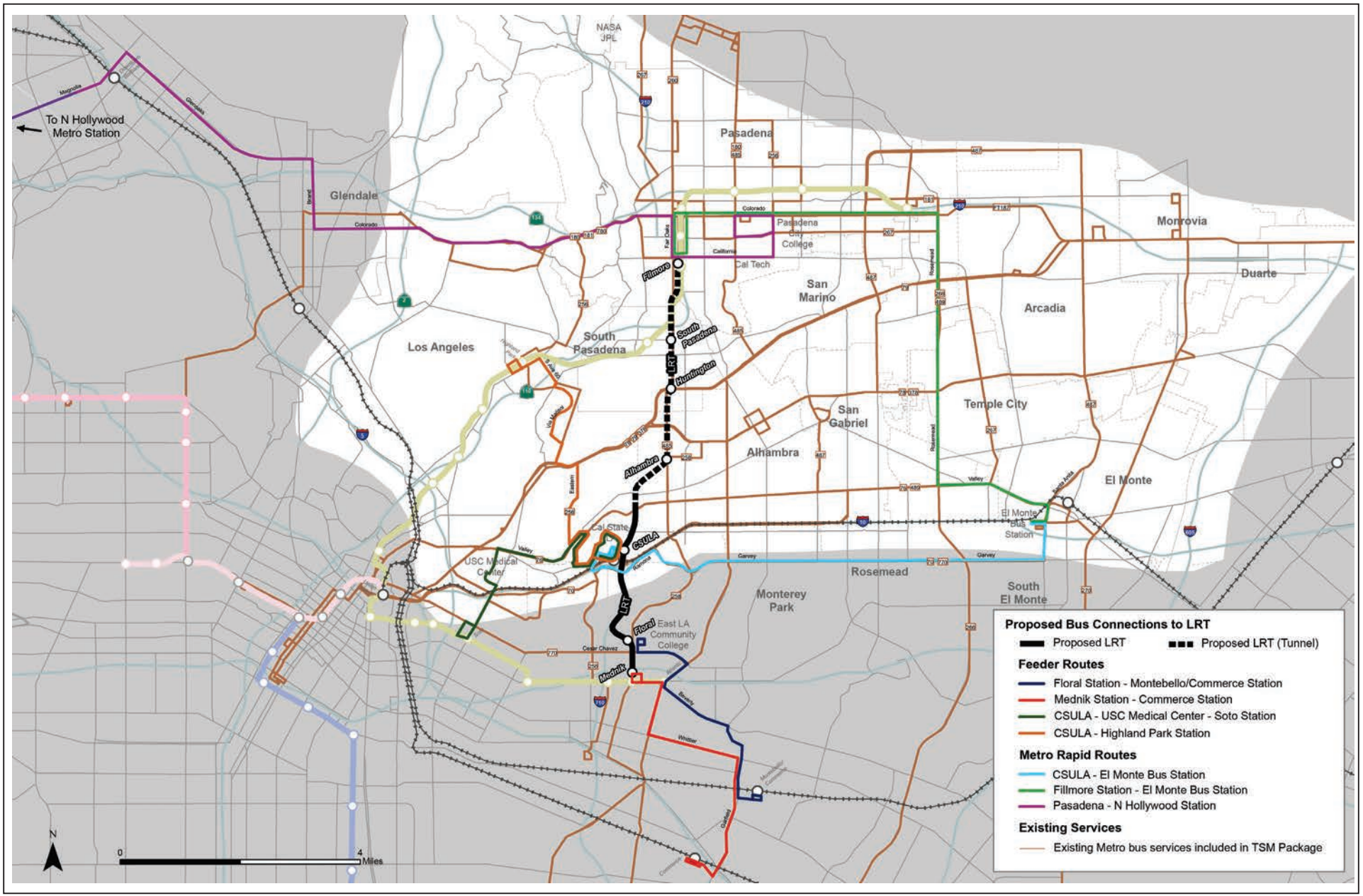

FIGURE 2-4b

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SR 710 North Study

Proposed Bus Feeder Routes for LRT Alternative

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SOURCE: CH2M HILL (2014)

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- South Pasadena Station at Mission Street in South Pasadena
- Fillmore Station at Fillmore Street in Pasadena.
- The Alhambra Station, the Huntington Station, the South Pasadena Station, and the Fillmore Station would be underground stations. The Huntington Station excavation would also include an underground crossover and the Fillmore Station would include underground tail tracks at the northernmost end of the alignment. New park-and-ride facilities would be provided at all of the proposed stations except for the Mednik Avenue, Cal State LA, and Fillmore Street stations.

Maintenance Yard

A maintenance yard to clean, maintain, and store light rail vehicles would be located on both sides of Valley Boulevard at the terminus of SR 710. A track spur from the LRT mainline to the maintenance yard would cross above Valley Boulevard.

Bus Feeder Service

Two bus feeder services would be provided as part of the LRT Alternative. One would run from the Commerce Station on the Orange County Metrolink line and the Montebello Station on the Riverside Metrolink line to the Floral Station, via East Los Angeles College. The other would run from the El Monte Bus Station to the Fillmore Station via Rosemead and Colorado Boulevards. In addition, other existing bus services in the study area, such as the El Sol shuttle, would be increased in frequency and/or span of service. Figure 2-4a illustrates the bus feeder service proposed with the LRT Alternative.

Bridges

The LRT Alternative would require new aerial bridges over the entire elevated alignment, which includes bridges over SR 60 at Mednik Avenue, I-710 north of Floral Drive, the I-710/I-10 interchange, I-10S (El Monte Busway), and SR 710 at Hellman Avenue.

Ventilation System

The ventilation system would maintain the air velocity and temperature within the tunnel and underground stations at a comfortable level for passengers and staff. During normal operation, the air velocity in the tunnel is determined by the piston action of the trains traveling through the tunnels.

For maintenance operations, the emergency ventilation system can be used to provide the required air flow in the tunnels in the event of a fire, tunnel air velocity would be maintained between 150 and 2,200 ft per minute but no less than the critical velocity, which is the air velocity that controls the direction in which smoke travels.

If a fire were to occur on a train, the operator would attempt to reach the nearest station. If the train reaches the station, exhaust fans could be used to ventilate the station. As a result of the exhaust fans being activated, the pressure level in the station would be reduced. To compensate for the pressure differential between the station and the ambient air, fresh air would flow through the tunnel openings and evacuation paths into the station. Fresh air flowing through the evacuation paths would prevent the spread of smoke into the evacuation paths. As a result, the lower 8.2 ft of the evacuation path would be clear of smoke.

If a burning train is not able to reach the nearest station, it has to stop inside a tunnel. In this case, the overhead trackway exhaust inside the stations cannot be used to exhaust the smoke. The emergency ventilation would be maintained in the paths of evacuation and would be designed to keep the shortest evacuation path free of smoke in a situation like this. Jet fans at the ceiling of the tunnels and station fans are used to create an airflow directed to the longer evacuation path. This way a short path is available for self-rescue and the smoke would flow into the long part of the tunnel until it reaches the exhaust dampers and is drawn into the exhaust duct.

Communication and Surveillance System

The communication system for the LRT includes numerous components that detect, transmit receive, display, store and manage information related to the safe operation of the LRT system. Components of the communication system include the following;

- **Rail Operation Center (ROC):** This is the main control center for all rail lines operated by Metro. Currently, the ROC is located at Imperial Highway and Wilmington Avenue. The ROC would be upgraded to include monitoring equipment for all the communications systems associated with the LRT Alternative.
- **Cable Transmission System:** Provides high speed data transport system including all network data, voice and video traffic between the ROC and the stations and maintenance yard.
- **Telephone System:** Includes digital phones system used in stations and cross passage.
- **Transit Passenger Information System:** Provides live and prerecorded announcements on the public address system and visual message signs in the paid and unpaid passenger station areas.
- **Closed Circuit Television System:** Provides visual surveillance of station areas, cross passages and tunnel portals for safety, security, revenue protection and anticrime and antiterrorist monitoring.
- **Intrusion Detection and Controlled Access System:** Provides access control and/or intrusion detection for designated doors in the stations.
- **Fire Alarm Detection System:** Provides intelligent fire alarm and detection equipment and systems.
- **Gas Detection and Alarm System:** Provides a gas detection and alarm system that monitors for dangerous gas concentration levels in stations and cross passages.
- **Seismic Detection System:** Provides system for detecting recording and transmitting alarms of seismic events at each tunnel station.
- **Tunnel Portal Surveillance and Alarm System:** System that detects persons entering the tunnels at the portals in order to warn train operators and ROC of unauthorized entry.

Emergency Egress

The tunnel would include emergency evacuation for pedestrians. A walkway running the entire longitudinal length of each tunnel bore is necessary to provide passengers access to cross passages or stations in the event of an emergency. In the event of a stalled train on fire in a

tunnel, passengers will evacuate the train and use the emergency walkway to reach the nearest appropriate cross passage, during which time they will be provided a tenable environment via the emergency ventilation system. The cross passage provides passengers access to the non-incident bore where they can either walk to the nearest station or be picked up by a rescue train. The emergency walkway and cross passages are designed to be ADA accessible.

In the event of a train fire in a station, the platform will be evacuated as quickly as possible, and the fire suppression and emergency ventilation systems will be activated promptly.
The concourse level will be used as a point of safety for evacuating passengers because the emergency ventilation system will draw enough air in through the station entrance to keep the smoke out of it.

Emergency Response Systems

An approved Emergency Response Plan for tunnel operations would be prepared during final design, in coordination with the applicable agencies, including the Los Angeles County Sheriff, the State Fire Marshal, and local fire agencies. A fire detection and suppression system and standpipe for fire department use would be provided in the tunnel. These systems, along with the ventilation and communications/surveillance systems, would work together in an emergency response situation. If possible, a train that is on fire will continue to the nearest station to facilitate evacuation and utilize the fixed fire suppression equipment in the station. If the train cannot continue to the nearest station, it will be evacuated in coordination with the ventilation system and local authorities as defined in the emergency response plan.

The station emergency response plan will also be coordinated with the appropriate authorities. Each station will have a local control panel that is able to visually display the emergency response procedure and serve as a command center for first responders.

Emergency fire suppression systems are being rapidly improved, and new devices and techniques may become available prior to tunnel construction. If available, innovative, state-of-the-art technical equipment would be considered.

Traction Power Supply System

The LRT Alternative would include a traction power supply and distribution system that would provide electricity to run the LRT trains. The traction power supply and distribution system would be designed to requirements listed in Metro Design Criteria Section 7/Electrical. This system includes three elements: Traction Power Substations (TPSS), a direct current (DC) power distribution system, and an overhead contact system (OCS).

TPSS would convert the alternating current (AC) power provided by the local utility to DC power for distribution to trains via the OCS. Preliminary placement of TPSS units has been identified at the following locations:

- Northeast corner of the planned park-and-ride lot for the Floral Drive station
- West side of I-710 south of I-10
- North side of Valley Boulevard at the LRT maintenance yard
- Underground at the Alhambra Station
- Underground at the Huntington Station

- Underground at the South Pasadena Station
- Underground just south of the Fillmore Station

The DC power distribution system connects the OCS to the TPSS through a system of cables. The OCS would consist of a set of two copper wires supported by steel poles mounted on the aerial guideway or suspended from the tunnel ceiling. OCS poles would be spaced along the LRT guideway, between or adjacent to the tracks, at a typical spacing of 150 ft.

Special Trackwork

Four double crossovers would be constructed as part of the LRT Alternative. Double crossovers allow trains to: switch from the northbound track to the southbound track or vice versa; reverse direction at the ends of the alignment; or, in case single-track operations are required, go around a disabled train. The proposed locations of the double crossovers are as follows:

- North of the proposed Mednik Station, approximately 750 ft north of 1st Street
- North of the proposed Cal State LA Station
- North of the proposed Huntington Station
- On the tail tracks north of the proposed new Fillmore Station

In addition, a pair of turnouts (switches) would be located on the southbound track immediately north of Hellman Avenue to provide access to the lead tracks into the maintenance yard. A single crossover approximately 400 ft south of Hellman Avenue would allow a train to switch from the northbound track to the southbound track to access the maintenance yard.

Street/Freeway Improvements

The following improvements to local streets and freeways are included in the LRT Alternative:

- A Class II bicycle lane would be provided on Mednik Avenue between First Street and Floral Drive.
  - Mednik Avenue would be permanently reduced to one lane in each direction in this area.
  - Left turn lanes would be maintained at all signalized intersections. Existing on-street parking would be maintained.
- Realigning SR 710 northbound off-ramp to be adjacent to southbound on-ramp, reducing the existing two intersections at Valley Boulevard/SR 710 to one signalized intersection.

Landscaping

Landscaping is recommended in the proposed median in Mednik Avenue, as feasible, in coordination with the local jurisdiction.

Utility Relocation/Protection-in-Place

The LRT Alternative would require the relocation or protection-in-place of various utilities, as outlined in Table 2.10. The list of utilities affected by the LRT Alternative is preliminary based on current design plans and may be modified during final design.

TABLE 2.10:
LRT Alternative Utility Relocations and Protections In-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
AT&T	Alhambra	2" Telephone Conduit	Would be relocated east of Fremont Avenue and may require an easement
	El Sereno	14" Telephone Conduit	Would be protected in-place during construction
	Monterey Park	7" Telephone Conduit	Would be relocated south of Corporate Center Drive
	Pasadena	1–4" Telephone Conduit	Would be relocated east or west of Raymond Avenue and may require an easement
California Water Service	East Los Angeles	8" Water Line	Would be relocated east or west of proposed bent along Mednik Avenue
	East Los Angeles	2" Water Line (2 locations)	Would be relocated north or south of proposed bent
Charter Communications	Pasadena	1–4" TV Conduit	Would be relocated north or south of Fillmore Street and may require an easement
City of Alhambra	Alhambra	15" Sewer	Would be relocated east or west of Fremont Avenue and may require an easement
	Alhambra	8" Water	Would be relocated east or west of Fremont Avenue and may require an easement
	Alhambra	12" Water	Would be relocated east or west of Fremont Avenue and may require an easement
City of Los Angeles – Bureau of Sanitation	El Sereno	8" Sewer (ABAND) (1 location)	Would be protected in-place during construction
	El Sereno	8" Sewer (3 locations)	Would be protected in-place during construction
City of Monterey Park	Monterey Park	10" VCP Sewer	Would be protected in-place during construction
City of Pasadena	Pasadena	16" Sewer	Would be relocated east or west of Raymond Avenue and may require an easement
	Pasadena	24" Sewer	Would be relocated east or west of Raymond Avenue and may require an easement
	Pasadena	8" Sewer	Would be relocated north or south of Fillmore Street and may require an easement
City of Pasadena – Power Department	Pasadena	Underground Electric Line (2 locations)	Would be relocated east or west of Raymond Avenue and may require an easement
	Pasadena	Underground Electric Line (2 locations)	Would be relocated north of Fillmore Street and may require an easement
City of Pasadena – Water Department	Pasadena	4" Water	Would be protected in-place during construction
	Pasadena	16" Water	Would be relocated east of Raymond Avenue and may require an easement
	Pasadena	6" Water	Would be relocated north or south of Fillmore Street and may require an easement
City of South Pasadena	South Pasadena	8" Water (3 locations)	Would be relocated east or west of Fair Oaks Avenue
	South Pasadena	8" Sewer	Would be protected in-place during construction
	South Pasadena	6" Water	Would be relocated north or south of Mission Street, and may require an easement
	South Pasadena	6" Water	Would be relocated north or south of Spruce Street
	South Pasadena	16" Sewer	Would be protected in-place during construction
	South Pasadena	4"Water	Would be relocated west of Fair Oaks Avenue and may require an easement
	South Pasadena	4"Water	Would be relocated east or west of Fair Oaks Avenue
	South Pasadena	8" Sewer	Would be relocated east or west of Fair Oaks Avenue and may require an easement
	South Pasadena	6" Water	Would be relocated west of Fair Oaks Avenue and may require an easement
Crown Castle	South Pasadena	Fiber-Optic	Would be relocated west of Fair Oaks Avenue and may require an easement
	South Pasadena	Fiber-Optic	Would be protected in-place during construction
	South Pasadena	Fiber-Optic	Would be relocated west of Mission Street and may require an easement
Los Angeles County Sanitation District	East Los Angeles	8" sewer	Would be protected in-place during construction
	East Los Angeles	8" sewer	Would be relocated north or south of proposed bent along Fisher Street

TABLE 2.10:
LRT Alternative Utility Relocations and Protections In-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
Los Angeles Department of Water and Power	El Sereno	2 Overhead Electric Lines	Would be relocated with pole
	El Sereno	3 Power Poles	Would be relocated north or south of Valley Boulevard to fit within proposed bridge
	El Sereno	4" Water	Would be protected in-place during construction
	El Sereno	8" Water	Would be protected in-place during construction
Level 3 Communications	Pasadena	(2) 4-1.5" Fiber-Optic	Would be relocated north of Fillmore Street and may require an easement
	Pasadena	(2) 4-1.5" Fiber-Optic	Would be protected in-place during construction
Southern California Edison	Alhambra	Underground Street Light	Would be relocated east of Fremont Avenue and may require an easement
	Alhambra	Underground Conduit	Would be protected in-place during construction
Southern California Gas	Alhambra	2" Natural Gas Line	Would be relocated east of Fremont Avenue and may require an easement
	East Los Angeles	4" Natural Gas Line	Would be relocated east or west of proposed bent along Mednik Avenue
	East Los Angeles	4" Natural Gas Line	Would be relocated north or south of proposed bent along Dozier Street
	El Sereno	4" Natural Gas Line (ABAND)	Would be relocated east or west of Charnwood Avenue
	El Sereno	4" Natural Gas Line	Would be protected in-place during construction
	El Sereno	3" Natural Gas Line	Would be protected in-place during construction
	South Pasadena	6" Natural Gas Line	Would be protected in-place during construction
	South Pasadena	3" Natural Gas Line	Would be relocated west of Fair Oaks Avenue and may require an easement
	Pasadena	12" Natural Gas Line	Would be relocated east or west of Raymond Avenue and may require an easement
Verizon Wireless	East Los Angeles	4" Fiber-Optic Conduit	Would be relocated east or west of proposed bent along Mednik Avenue

Source: *Community Impact Assessment* (2014).
ABAND = abandoned
VCP = vitrified clay pipe

Non-Motorized and Pedestrian Facilities

The LRT Alternative includes modifications to existing arterial streets, intersections, and freeway on- and off-ramps, and the construction of light rail tracks and stations. Existing pedestrian and bicycle facilities along arterials, at intersections, and at freeway on- and off-ramps would be either protected in-place during construction of the LRT Alternative improvements or would be replaced in kind at the completion of construction of those improvements. Any such improvements would be constructed to current ADA standards for curb ramps and sidewalks.

The stations for the LRT Alternative would be constructed to ADA standards. Specific improvements to non-motorized and pedestrian facilities include:

- Restriping of Mednik Avenue between First Street and Floral Drive to provide a new Class II bicycle lane;
- Providing new ADA-compliant sidewalks on the north and south sides of Valley Boulevard between the existing SR 710 northbound off-ramp (to be removed) and the southbound on-ramp (there is no existing sidewalk on the north side, and there currently is a non-ADA compliant sidewalk on the south side);

- Providing a pedestrian plaza between the proposed underground Fillmore Station and the existing at-grade Fillmore Station; and
- Providing a new sidewalk on Circle Drive that connects the Cal State LA Station to the existing El Monte Busway/Metrolink Station.

Drainage Facilities

The LRT Alternative includes the installation of deck drains near each column on the elevated train decks. A pipe inside the column drains water down to the street below. With the tunnel portion of the LRT Alternative, a pump would be installed at the lowest point of the tunnel, to pump out any fire sprinkler or seepage water to the proposed storage tank located in the maintenance yard. The wash or fire water would be tested then hauled away and properly disposed of consistent with federal and State regulations. In the train yard, underdrains are proposed under each track, and swales, catch basins, and pipes are proposed to collect and treat surface runoff within the train yard. This water would be collected and drained to the Dorchester Channel.

Storm Water Treatment

Best Management Practices (BMPs) are only proposed in areas outside the tunnel. Most of the LRT alignment outside the tunnel is on an elevated track above steep terrain, where BMPs are infeasible. Four biofiltration swales are proposed where the LRT alignment is within Caltrans ROW near the I-710/I-10 interchange. Tree box filters are proposed at multiple locations along the LRT alignment. Catch basin screens and filter inserts are proposed at new inlet locations along the LRT alignment. Within the rail yard, bioretention facilities are proposed for the parking lot areas, and media filters are proposed to treat the ballast areas.

Retaining Walls

Retaining walls would be provided at the following locations:

- South of the I-10/I-710 interchange
- Cal State LA Station
- Maintenance yard

Noise Barriers

No noise barriers are proposed for the LRT Alternative. Four noise barriers proposed for the TSM/TDM Alternative would be included in the LRT Alternative.

Property Acquisitions

The LRT Alternative would require the permanent acquisition of full and partial parcels of land that would be permanently incorporated into the transportation improvements in this Alternative as summarized in Table 2.11. The improvements in the LRT Alternative are also expected to require permanent easements as shown in Table 2.11.

TSM/TDM Components

The TSM/TDM Alternative improvements would also be constructed as part of the LRT Alternative. These improvements would provide the additional enhancements to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. The only component of the TSM/TDM Alternative

TABLE 2.11:
Summary of Permanent Acquisitions and Easements for the LRT Alternative

Type of Permanent Acquisition	Number of Parcels
Full parcel acquisition	58
Partial parcel acquisition	11
Aerial easement	12
Subsurface easement	1
Permanent tunnel easement	182

Source: *Community Impact Assessment* (2014).

improvements that would not be constructed with the LRT Alternative is Other Road Improvement T-1 (Valley Boulevard to Mission Road Connector Road) because it would conflict with the LRT Alternative maintenance yard near Mission Road.

There are locations along the alignment of the LRT Alternative that overlay or cross areas that would also be improved under the TSM/TDM Alternative. All the improvements at those locations would be designed to ensure the effective operation of the LRT Alternative facilities in conjunction with the applicable TSM/TDM Alternative improvements. For example, ITS improvements under the TSM/TDM Alternative along or crossing the LRT Alternative alignment would be designed and implemented to compliment and support the transportation facilities and services in the LRT Alternative to maximize the benefits of those improvements to the traveling public.

Construction Activities

Grading and Excavation

Grading and excavation for the LRT Alternative can be divided into two general categories based on the methods, equipment, and section of the alignment: (1) construction of rail stations and the bored tunnel section, and (2) the cut-and-cover tunnel at the portal and other improvements.

Current design plans indicate that bored tunnel sections of the LRT Alternative would be excavated using pressurized-face TBMs. A TBM has a rotating cutterhead at the front of the machine that excavates soil and rock as it is advanced through the ground. The excavated materials are typically removed from the tunnel by rail cars or a continuous conveyor system and taken to the construction portal. As the TBM advances, positive face control can be maintained to address ground loss at the face of the excavation, and a precast concrete tunnel lining system is installed, providing immediate support of the ground. Cross passages are anticipated to be excavated using the sequential excavation method (SEM) from within the tunnels excavated by the TBMs. In the SEM, tunnel excavation and support is typically performed in a series of drifts, depending on the anticipated ground conditions, which are sequenced to develop successively larger openings until the design profile is achieved. As the SEM excavation is taking place, the appropriate ground support measures are also installed to maintain stability of the excavation.

Other tunneling methods are feasible and may be evaluated in future phases; however, it is not anticipated that open face shields or the SEM would be used to advance the main running tunnels.

Most of the aerial section would be supported by CIDH columns that are approximately 8 to 12 ft in diameter. For these columns, a drill rig equipped with an auger would drill a shaft approximately 100 to 125 ft below the ground surface. The columns may extend deeper depending on the final load calculations and properties of the subsurface material. After the shaft is drilled and the soil and rock removed, the shaft would be filled with reinforcement and concrete. In a few areas, the aerial section would be supported by mechanically stabilized earth (MSE) instead of columns.

Traditional excavation equipment (e.g., scrapers, trackhoes, bulldozers) would be used during development of the underground rail stations and associated parking structures, the portal to the bored tunnel, and other improvements listed below. Cut-and-cover construction at rail stations, and at the tunnel portal would be excavated from the surface to the depth of the bored tunnel, and would generally be constructed with minimal surrounding surface settlements by using appropriate support of excavation systems. Other areas of the LRT Alternative would involve ground disturbance to varying depths in order to implement their respective improvements. These improvements include:

- Widening Mednik Avenue by 20 ft between First Street and Floral Drive;
- Replacing the slope on the north side of Floral Drive with a retaining wall;
- Installing retaining walls and grading the area for the maintenance yard;
- Relocating the SR 710 northbound off-ramp to Valley Boulevard; and
- Constructing an embankment and an MSE wall to support the rail line along the I-710 ROW south of the I-10/I-710 interchange and the Cal State LA Station.

Disposal Sites and Haul Routes

Construction of the tunnel segments (i.e., bored and cut-and-cover) and the underground stations for the LRT Alternative would generate excess excavated material that cannot be reused within the project limits. That excess material is proposed to be disposed of at two former rock quarries (the Manning and Olive Pits) in the City of Irwindale. These pits have been previously environmentally cleared and licensed to accept clean soil from construction projects. The Manning Pit, 37 acres (ac) of which are owned by the City of Irwindale, is at Vincent Avenue and Arrow Highway and has a total capacity of 5 million cubic yards. The Manning Pit is accessible by both rail and truck. A 3.35 ac parcel of railroad ROW along 4th street (adjacent to and east of the Manning Pit) could be used to offload soil from incoming rail cars. The 187 ac Olive Pit is at Olive Street and Azusa Canyon Road and has a total capacity of 50 million cubic yards. The Olive Pit is accessible only by truck via East Arrow Highway and Vincent Avenue. Other Class I landfills and/or sale to a soil broker are other options for disposal of excavated materials.

As shown on Figure 2-5, the preliminary routes for hauling that excavated material from the LRT Alternative tunneling would include segments on Fair Oaks Avenue (from the South Pasadena and Fillmore Station sites) and Fremont Avenue (from the Huntington and Alhambra Station sites), on Arrow Highway and Live Oak Avenue (to/from I-605 at the disposal end of the haul trips), and on Azusa Canyon Road (to access the Olive Pit) and Vincent Avenue (to access the Manning Pit). Those haul routes would be used only during construction of the LRT Alternative tunnel segments and underground stations.

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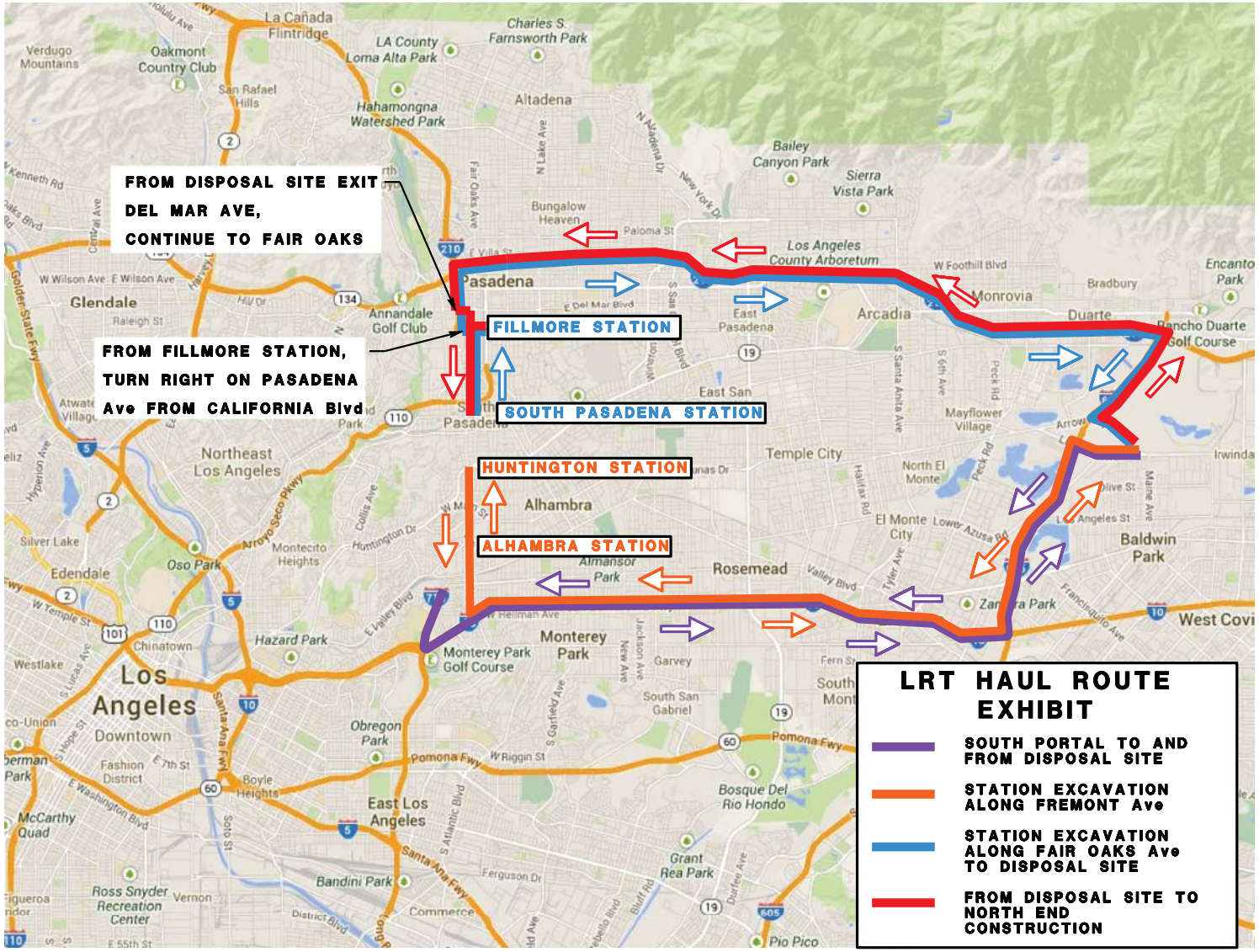

FIGURE 2-5

SR 710 North Study

Haul Route for the LRT Alternative

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Aerial Image © Google Earth, 2014. Annotation by CH2M HILL, 2014

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If the LRT tunnel is expected to pass through potentially contaminated soil or groundwater, the Contractor would be required to set up an area at the construction portal to sample and classify the excavated material as it is excavated. A sampling and analysis plan would be required so that the excavated material is classified properly and the correct handling methods and disposal sites are selected. Excavated material that is determined to be hazardous and cannot be taken to the Manning or Olive Pits would be transported to a landfill certified for accepting hazardous waste appropriate for the waste encountered.

Additives such as foams, polymers, or bentonite may be used during TBM excavation to condition the soil. These additives or soil conditioners would be required to be non-toxic and biodegradable and when used in accordance with manufacturer's recommendations are not expected to contribute to special disposal requirements specifically as a result of the additives.

Water, including construction water, groundwater, and wet-weather flows, must also be sampled. If necessary, the water can be treated at the construction portal areas by the Contractor prior to discharge into the sewers. The Contractor would be required to have basic water treatment capabilities at the construction site. If the water cannot be treated to meet sewer discharge requirements or if the volume of water for disposal exceeds the discharge permit's capacity, it may need to be transported to an off-site disposal location. Disposal of all materials would need to meet all federal, State, and local regulations where applicable.

Construction Staging and Phasing

As shown earlier on Figure 2-4 and as discussed in Section 2.2.5, the LRT Alternative includes a passenger rail operated on a dedicated guideway with approximately 3 mi of aerial segments and approximately 4.5 mi of bored tunnel segments. There would be two bored tunnels, one for each of the LRT Alternative tracks. The LRT Alternative includes aerial and underground stations.

Each improvement would be staged to minimize the disruption to traffic and maximize the effectiveness of the construction activities. Preliminary construction staging of the LRT Alternative has been organized into the following components:

- Roadway improvements (including traffic signal modifications, and traffic control, directional, and information signing)
  - Where the elevated alignment crosses SR 60, I-710 or other roadways, overnight closures would be required for placement of K-rail adjacent to the median or construction of falsework. Other than these overnight closures, the roadways below the aerial alignment would remain open during construction of the elevated alignment. The falsework would be designed so there are no vertical clearance issues for vehicles passing under the falsework.
  - During construction of the elevated LRT alignment in the ROW for the I-710 and SR 710 ROW, occasional short (a few hours at most) closures of the outside southbound lane would be necessary to transport equipment and material to the construction area.
  - During construction of the Cal State LA Station, Circle Drive would be the access route for construction equipment and materials and may be blocked occasionally as equipment is transported to the construction area.

  - On Valley Boulevard, columns would be constructed in the #1 eastbound lane to support falsework for the bridge deck, which would require shifting the eastbound lanes on Valley Boulevard to the south.

- Utility relocations, protection in-place, and removal
- Boring of the tunnels
  - A construction portal would be excavated at the south end of the bored tunnel alignment to launch the TBMs. The portal would be excavated first by installing support of excavation walls around the perimeter of the planned excavation and then excavating the soil or rock within those walls, employing groundwater control measures where necessary. This south portal would eventually become a portion of the cut-and-cover tunnel. During bored tunnel excavation, it is expected that the Contractor would use this area for laydown to support construction operations.
  - It is anticipated that the LRT tunnels would be excavated using two pressurized-face TBMs launched from the south portal, and these tunnels are expected to be lined with a water and gasket-tight or pre-cast concrete segmental liner as the TBMs pass. With this approach, the south portal would be the main staging area for the launch of the TBMs and tunneling equipment, and the TBMs would be removed from the Fillmore Station excavation. Cross passages between the two tunnels would likely be excavated using the SEM; these cross passages would be excavated from within the LRT tunnels after the main bores have been excavated. Where necessary, ground treatment and pre-support would be installed depending on the ground type at each cross passage and would be implemented prior to excavation of the cross passages. A cast-in-place concrete lining with water and gas proofing where necessary would be installed in the cross passages after excavation is complete.
  - It is anticipated that the excavated material from the excavation of the tunnels would be removed from the south portal. Excavated material may need to be stockpiled at the construction staging areas if it is too wet from the tunneling operations to transport. Refer to the section on disposal sites and haul routes for more information about the disposal of excavated material.
  - Tunnel boring operations and muck handling could potentially occur 24 hours per day, 7 days per week.
  - After the TBMs pass each of the two active fault zones during excavation of the bored tunnels, oversized vaults would be constructed from within the tunnel in the areas of the fault crossings for each tunnel bore. This would require excavating a diameter slightly larger than that already excavated by the TBMs and supporting the ground with a robust cast-in-place concrete final lining. The oversized tunnel section is expected to be able to accommodate the anticipated movement from fault offset. Other methods to accommodate fault offset are also feasible and may be further evaluated during final design.
- Typical construction of the underground stations and support facilities for the tunnels
  - After utility relocations, the underground stations would be excavated from the top down, first by installing support of excavation walls around the perimeter of the

planned excavation and then excavating the soil or rock within those walls, employing groundwater control measures where necessary.

  - The stations would be located in local streets, and therefore temporary decking would typically be required to allow for traffic over the excavations.
  - It is anticipated that the underground stations would be excavated prior to the TBM reaching each station location.
  - The construction sequence for the final station structure would include construction of the foundation base slab, followed by the installation of exterior walls and any interior column elements. Slabs are poured as the columns and intermediate floor and roof wall pours progress. Construction of portal structures would involve placement of concrete inverts, walls, and walkways. Station entrance locations are generally used as access points to the underground station during the construction process. Exterior entrances would be constructed after the station structure has been completed.

- Installation of track and tunnel systems. Direct fixation track consisting of steel rail attached to reinforced concrete plinth pads would be used on the alignment's aerial and underground sections. Gaps between the plinth pads would allow for drainage and cable runs.
- Construction of the elevated rail alignment and stations

During construction of the Floral Station:

- Parking would be temporarily prohibited on Floral Drive between Dangler Avenue and Mednik Avenue to allow the traffic lanes to be shifted to accommodate construction of the station; and
- The sidewalk on the north side of Floral Drive between Dangler Avenue and Mednik Avenue would be temporarily closed.

For all underground stations:

- Utility relocations would require daytime lane and sidewalk closures on weekdays. In most cases, at most one lane and one sidewalk would be closed at the same time.
- Drilling of piles to support the temporary roadway deck and the installation of the support excavation walls for the station would require daytime closures of one lane and possibly adjacent sidewalks. Cross streets may also be affected (e.g., Mission at Fair Oaks, California at Raymond, and the southbound right-turn lane from Fair Oaks to Huntington).
- Excavation of the first 10 to 15 ft of the station would be done without decking and would be conducted primarily in the evening and weekends, to the extent feasible.
- The installation of the roadway deck could require multiple consecutive weekend (Friday night to Monday morning) full road closures. Cross streets may also be affected (e.g., Mission at Fair Oaks, California at Raymond, and the southbound right turn lane from Fair Oaks to Huntington). The duration/sequencing of deck installation would be affected by engineering requirements and public input.
- The deck would be in place with all lanes open for traffic at most times.

- Removal of the deck when the station construction is complete could require full road closures similar to those during installation of the deck.

Laydown and storage areas during construction would be located at the portal area on Valley Boulevard and at each station location.

Temporary Construction Easements

The majority of the improvements in the LRT Alternative are anticipated to be constructed within existing publicly owned ROW. However, it is anticipated that the LRT Alternative would require TCEs where there is not sufficient room within the public ROWs to accommodate the construction activities and/or storage of materials or equipment for those improvements. Any land used as a TCE during construction of improvements under the LRT Alternative would be returned to its original or better condition prior to the return of that land to the original owner after completion of the construction activities requiring that TCE. No permanent project features would be constructed within the boundaries of the TCEs used for the construction of the LRT Alternative.

Cost

The total estimated cost of the LRT Alternative is approximately $2,420 million. Of that total, the cost of the TSM/TDM improvements that would be constructed with the LRT Alternative are estimated to be approximately $52 million. The structures and ROW costs are included in these estimates.

Schedule

The construction of the improvements in the LRT Alternative is expected to take approximately 6 years to complete.

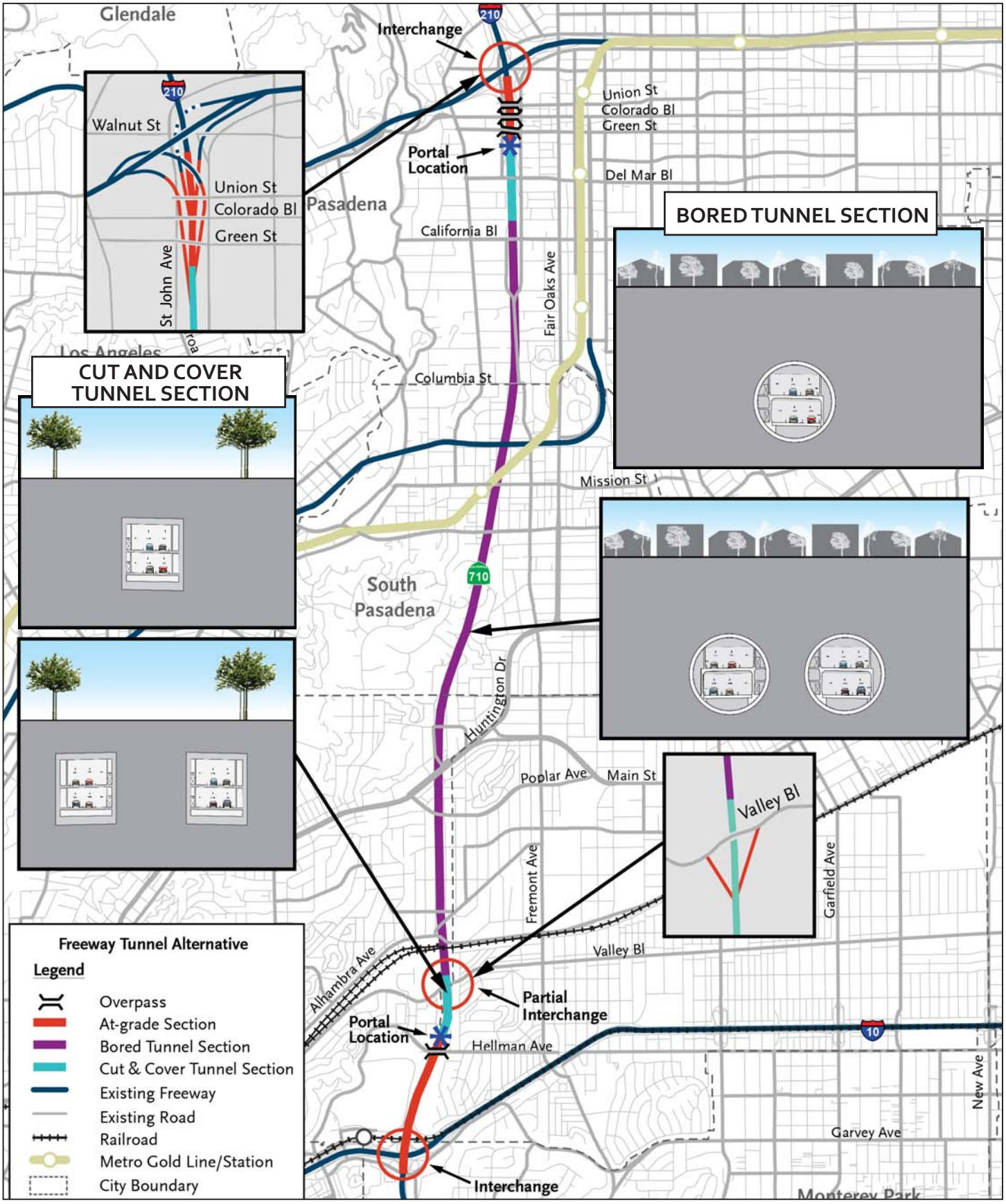
2.2.3.4 Freeway Tunnel Alternative

The alignment for the Freeway Tunnel Alternative starts at the existing southern stub of SR 710 in Alhambra, north of I-10, and connects to the existing northern stub of SR 710, south of the I-210/ State Route 134 (SR 134) interchange in Pasadena.

Design Variations

The Freeway Tunnel Alternative includes two design variations that relate to the number of tunnels constructed (i.e., dual-bore and single-bore). The dual-bore design variation includes two tunnels that independently convey northbound and southbound vehicles. The single-bore design variation includes one tunnel that carries both northbound and southbound vehicles. Figure 2-6 illustrates the dual-bore and single-bore tunnel design variations for the Freeway Tunnel Alternative. Each of these design variations is described below.

- **Dual-Bore Tunnel:** The dual-bore tunnel variation is approximately 6.3 mi long, with approximately 4.2 mi of bored tunnel, 0.7 mi of cut-and-cover tunnel, and 1.4 mi of at-grade segments. The dual-bore tunnel variation would consist of two side-by-side tunnels (one northbound, one southbound), each tunnel of which would have two levels. Each tunnel would consist of two lanes of traffic on each level, traveling in one direction, for a total of four lanes in each tunnel. The easterly tunnel would be constructed for northbound traffic, and the westerly tunnel would be constructed for southbound traffic. Each bored tunnel would have an excavated diameter of approximately 60 ft. Vehicle cross passages would be provided



NOTE: Tunnel cross sections are illustrative and not to scale.

FIGURE 2-6

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SOURCE: CH2M HILL (2013)

SR 710 North Study
Freeway Tunnel Alternative
Single and Dual Bore
07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

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throughout this tunnel design variation that would connect one tunnel to the other tunnel for use in an emergency situation. Figure 2-7 illustrates the dual-bore tunnel design variation cross section.

Short segments of cut-and-cover tunnels would be located at the south and north termini to provide access via portals to the bored tunnels. The portal at the southern terminus would be located south of Valley Boulevard. The portal at the northern terminus would be located north of Del Mar Boulevard. No intermediate interchanges are planned for the tunnel.

- **Single-Bore Tunnel:** The single-bore tunnel design variation is also approximately 6.3 mi long, with 4.2 mi of bored tunnel, 0.7 mi of cut-and-cover tunnel, and 1.4 mi of at-grade segments. This tunnel design variation would consist of a single, two-level, bored tunnel with two lanes on each level. The northbound traffic would use the two lanes on the upper level, and the southbound traffic would use the two lanes on the lower level. The single-bore tunnel would provide a total of four travel lanes. The single bore tunnel would also have an excavated diameter of approximately 60 ft. The single-bore tunnel would be in the same location as the northbound tunnel in the dual-bore tunnel design variation. Figure 2-8 illustrates the single-bore tunnel design variation cross section.

The approximate depth of full-range bored tunnel for the Freeway Tunnel Alternative with the single-bore and dual-bore design variations is approximately 20 to 280 ft bgs measured from the crown (top) of the tunnel. The depth would be shallower near the north and south construction portals. The majority of the underground segment of the freeway would be constructed using a TBM while the remaining segments would be constructed using the cut-and-cover construction method. The cut-and-cover tunnel segment at the south portal would be up to approximately 5 to 60 ft deep bgs to the top of the tunnel. The cut-and-cover tunnel segment at the north portal would be up to approximately 0 to 30 ft bgs to the top of the tunnel. The vertical and horizontal alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.

Operational Variations

Operational variations have been identified for the Freeway Tunnel Alternative, as described below. It should be noted that vehicles carrying flammable or hazardous materials would be restricted from using the tunnel under all operational variations.

- **Freeway Tunnel Alternative without Tolls:** This operational variation would be considered for only the dual-bore tunnel design variation. The facility would operate as a freeway with lanes open to all vehicles.
- **Freeway Tunnel Alternative with Trucks Excluded:** This operational variation would be considered for the dual-bore tunnel design variation only. The facility would operate as a freeway; however, trucks would be excluded from using the tunnel. This operational variation would be considered for the dual-bore tunnel design variation only. Signs would be provided along I-210, SR 134, I-710, SR 710, and I-10 to provide advance notice of the truck restriction.
- **Freeway Tunnel Alternative with Tolls:** This operational variation would be considered for both the dual- and single-bore tunnel design variations described above. All vehicles using the tunnel(s) would be tolled.

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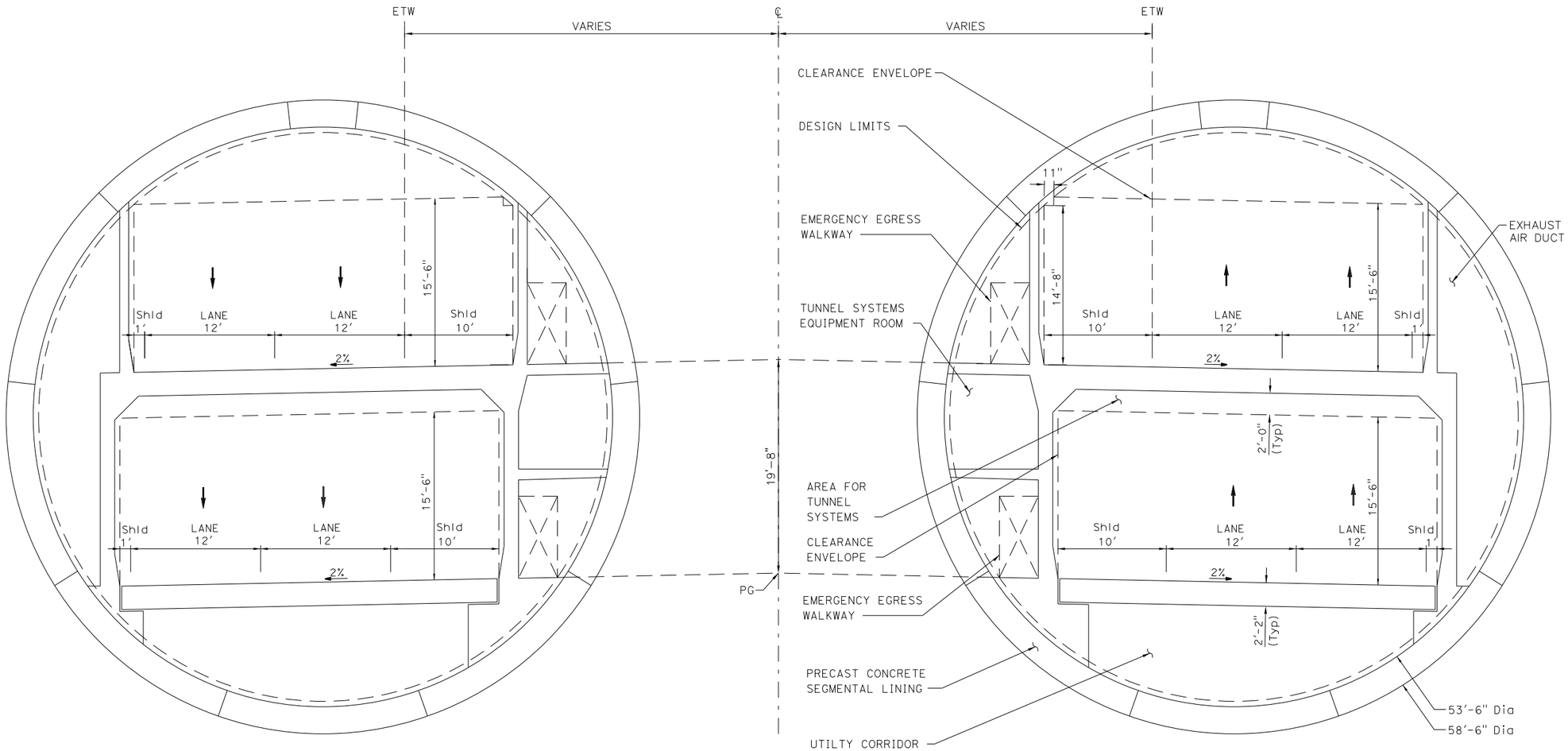

FIGURE 2-7

NOTE: Dimensions are approximate and will be refined during final design.

SR 710 North Study

Freeway Tunnel Alternative
Dual Bore Cross Section

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: CH2M HILL (2014)

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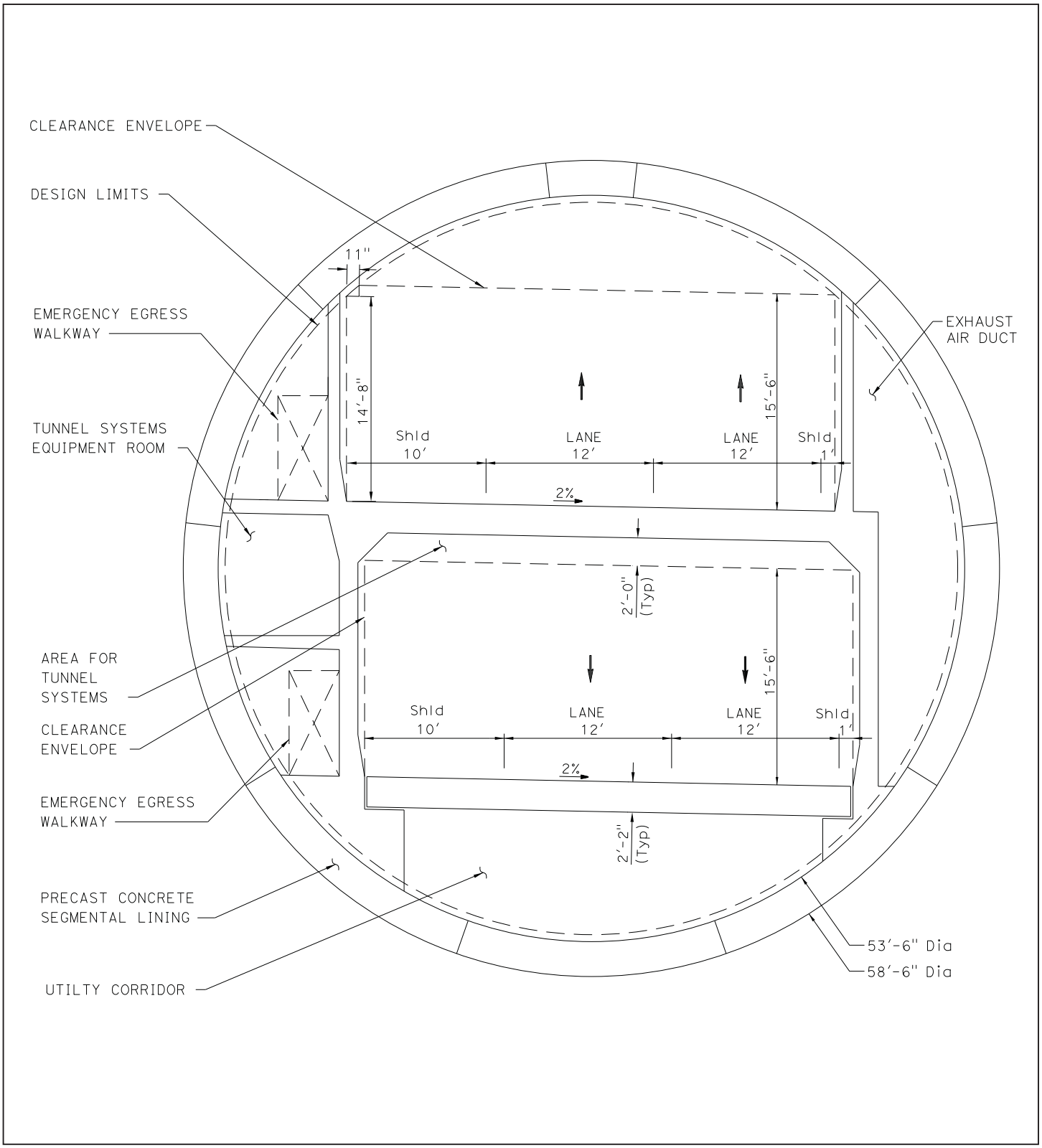

FIGURE 2-8

NOTE: Dimensions are approximate and will be refined during final design.

SR 710 North Study
Freeway Tunnel Alternative
Single Bore Cross Section
07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: CH2M HILL (2014)

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- **Freeway Tunnel Alternative with Tolls and Trucks Excluded:** This operational variation would be considered for the single-bore tunnel design variation only. The facility would operate as a freeway and all vehicles would be tolled. Trucks would be excluded from using the tunnel. Signs would be provided along I-210, SR 134, I-710, SR 710, and I-10 to provide advance notice of the truck restriction.
- **Freeway Tunnel Alternative with Toll and Express Bus:** This operational variation would be considered for the single-bore tunnel design variation only. The single-bore tunnel would operate as a tolled facility and include an Express Bus component. The Express Bus would be allowed in any of the travel lanes in the tunnel; no bus-restricted or exclusive lanes would be provided.

  The proposed Express Bus route would start at the Commerce Station on the Orange County Metrolink line, and then serve the Montebello Station on the Riverside Metrolink line and East Los Angeles College before entering I-710 at Floral Drive. The bus would travel north to Pasadena via the proposed freeway tunnel, making a loop serving Pasadena City College, the California Institute of Technology, and downtown Pasadena before re-entering the freeway and making the reverse trip.

Toll/no toll operational variations were considered because of the potential for tolled operations to improve the financial feasibility of a freeway tunnel. Truck/no truck operational variations were considered because of the potential for restricting use by trucks to address community concerns regarding the attraction of trucks to the tunnel because the tunnel would provide a connection between the I-10 and I-210. Scenarios without tolls are not feasible for the single-bore design variation because the traffic demand would exceed the capacity of the tunnel, which would result in queues in the tunnel. A freeway tunnel with express bus operational variation was considered because of the potential for this variation to improve the performance of the overall regional transit system, decrease north-south transit travel times through the study area, and attract additional transit ridership. Some combinations of variations involving express buses and/or truck prohibitions were evaluated for only the single- or dual-bore tunnel variations. To limit redundant analysis, only the single-bore or dual-bore variation with the best performance and fewest impacts was evaluated.

Components of the Freeway Tunnel Alternative

Street Improvements

Both the single- and dual-bore design variations propose to extend St. John Avenue from Del Mar Boulevard to California Boulevard. In addition, both variations would widen Pasadena Avenue to include a new lane from the proposed northbound SR 710 off-ramp at Pasadena Avenue to Colorado Boulevard.

Bridges

The dual-bore tunnel design variation would require widening of the Ramona Boulevard Undercrossing bridge and the SR 710/I-10 bridge.

Both the single- and dual-bore tunnel design variations would require demolition and replacement of the Hellman Avenue overcrossing and the Green Street overcrossing. The Del Mar Boulevard overcrossing would be demolished and replaced with an at-grade road for both design variations. In addition, a new bridge would be constructed at the Laguna Regulating Basin and a new overpass bridge would be constructed at Valley Boulevard for both the single- and dual-bore tunnel design variations.

Ventilation System

Proposed components of the ventilation system for the Freeway Tunnel Alternative include air scrubbers, two exhaust fans at each portal, an exhaust duct along the entire length of the tunnel, and jet fans located exclusively within the traffic area of the cut-and-cover tunnel. The design is a longitudinal ventilation (using jet fans) and smoke extraction by dampers that are connected to tunnel length ducts, which eliminate the need for intermediate vent shafts. There would be ventilation shafts located at each end of the tunnel, and jet fans would be provided to control the longitudinal velocity of the air flow. The ventilation system would have sufficient redundancy such that the system would still perform adequately even if one of the fans becomes inoperable.

At the south portal, an approximately 50 ft high ventilation structure would be integrated with the Operations and Maintenance Building (OMC) building. At the north portal, two locations for the ventilation structures are being considered. The first option would be an approximately 50 ft high ventilation structure located at the SR 710/SR 134 interchange. The second option would be four 50 ft high ventilation structures located at the SR 710/Colorado Boulevard interchange.

During normal operation, the tunnel ventilation system's primary function is to maintain fresh airflow through the tunnel and reduce the level of harmful gases released to the surrounding environment, specifically particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and particulate matter less than 10 microns in diameter (PM_{10}) particles.

The tunnel ventilation system is designed to remove smoke and harmful gases during a tunnel fire. In case of fire, the fire detection system would be capable of locating the fire, and the smoke would be extracted by dampers located within the tunnel. Smoke in the traffic area would be extracted via two open dampers next to the fire location into the exhaust duct, by using exhaust fans located in the portal ventilation building. The design also includes a Fixed Fire Fighting System (FFFS) that works in conjunction with the ventilation system to control smoke and gases during a fire. This would maintain an acceptable environment for the evacuation of motorists and for the safe entry into the tunnel by first responders.

Operations and Maintenance Building

The tunnel would be managed from either of two OMCs that are located at the portal buildings. In addition to this redundant configuration at the tunnel, the design could include the capability for all OMC functions to be implemented from a remote facility, such as a Caltrans regional traffic management center.

The OMC functions to monitor and control the entire tunnel as well as the approach roadways. The layout consists of a control room with a video wall, several operator consoles, and a supervisor console.

In addition to the control room itself, other supporting rooms are recommended such as a computer equipment room, crisis management room, visitor gallery, and provisions for 24/7 staffing.

Communication and Surveillance System

Communication systems enable the communication for the tunnel motorists and for tunnel operators as well as for the emergency services. It functions to enable people to communicate

in case of emergency and to instruct and guide them to exit dangerous areas. It consists of the telephone system for emergency and maintenance purposes, the radio system for radio frequency and voice communication inside the tunnel and of a public address system (PA) for announcements to tunnel drivers in case of emergency. A Supervisory Control and Data Acquisition (SCADA) system would be provided for all 24-hour monitoring and control of systems and equipment within the tunnels, portals and portal buildings.

Traffic systems would be provided for detecting, monitoring, and controlling traffic within the tunnels, at the portals, and on the approach roadways. Detection would be implemented through video and acoustic analytics to provide real-time volumes and incident detection. Detected traffic data would be collected, processed, and historized to assist traffic management and planning. Traffic control would allow the tunnel operator to manage lane or tunnel closures through activation of signs and gates. Traffic detection and control systems for the tunnel would be integrated with the Caltrans regional traffic management systems.

Communication and surveillance systems are being rapidly improved and new devices and techniques may become available prior to tunnel construction. If available, innovative, state-of-the-art technical equipment would be considered.

Emergency Systems

Emergency Egress

The tunnel would include emergency evacuation for pedestrians and suppression systems. A walkway running the entire longitudinal length of the tunnel is necessary to provide passengers access to an egress location in the event of an emergency. Fire walls rated at 2 hours adjacent to the motorway, would separate pedestrian emergency access paths from vehicles in the tunnel, and would provide protection from fire. Access to the emergency ADA accessible pedestrian walkways would be provided along each roadway level, consistent with National Fire Protection Association (NFPA) 502. In the event of an emergency, pedestrians would be able to enter the walkways and would be directed to another location in the tunnel where tenable conditions would be maintained by the emergency ventilation system. Additionally, emergency vehicle cross passages are expected to be provided along the dual-bore design variation at a spacing of approximately 3,000 ft; these would enable movement of vehicles from one tunnel bore to the other. The emergency walkways would be pressurized to prevent smoke from entering the walkways.

Emergency Response Systems

An approved Emergency Response Plan for tunnel operations would be prepared in coordination with the applicable agencies, including the California Highway Patrol, the State Fire Marshall, and local fire agencies.

Fire detection and suppression systems would be provided in the tunnel by one approximately 92,000-gallon (gal) tank located in the O&M building at the north portal. The tank would consist of an approximately 30,000 gal Fire Hose System that would store potable water from the City of Pasadena and an approximately 62,000 gal Deluge Foam System. During a fire, the system could be used for discharge of water first, followed by discharge of foam for a specified period, and then followed by water until manually shut off. The sequence of water and foam can be adjusted by the operator. These systems, along

with the ventilation and communications/surveillance systems and the OMC building operations, would work together in an emergency response situation.

Emergency fire suppression systems are being rapidly improved and new devices and techniques may become available prior to tunnel construction. If available, innovative, state-of-the-art technical equipment would be considered.

A closed-circuit television (CCTV) system with automatic video detection capability would be provided for general supervision of traffic conditions within the tunnel. Video detection would identify wrong-way driving, smoke, debris on the roadway, and other hazards. The detection system would be linked to the fire alarm control panels (FACPs) to trigger alarms in case of smoke detection inside the tunnel. In the emergency walkways, fixed-view cameras would be installed and mounted for monitoring pedestrian evacuation.

For traffic surveillance purposes, color pan-tilt-zoom (PTZ) cameras would be mounted inside the tunnel near emergency exits and outside the tunnel. For incident detection purposes, color, fixed-view cameras would be mounted inside the tunnel.

An acoustic tunnel monitoring system would be provided in the tunnel. Junction boxes with integrated microphones would be mounted on the tunnel wall at the CCTV locations. The microphone signals would be transmitted to a centralized computer that would detect anomalous sounds such as a vehicle collision, squealing tires, or load spills. An alarm would then be generated and transmitted to the OMC for the tunnel operator to evaluate the situation.

Electrical Substation

An electrical substation is proposed to deliver temporary power to the tunnel boring machine during construction and permanent power for tunnel operations after construction is complete. The location of the substation would be coordinated with the Los Angeles and Pasadena Departments of Water and Power.

Landscaping

All existing planting that is removed or disturbed due to construction would be replaced following Caltrans Replacement Planting Policy and Procedure, to the extent feasible. Landscaping would be provided at the south and north portals, cut-and-cover tunnel sections, and within disturbed soil areas.

Utilities

The Freeway Tunnel Alternative would require the relocation or protection in-place of various dry utilities as outlined in Tables 2.12 and 2.13. The list of utilities affected by the Freeway Tunnel Alternative is preliminary based on current design plans and may be modified during final design.

TABLE 2.12:
Freeway Tunnel Alternative Single-Bore Design Variation Utility Relocations and Protections-in-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
AT&T	El Sereno	Buried Cable	Would be relocated east or west of SR 710
	El Sereno	3” Crossover (2 locations)	Would be relocated east or west of SR 710
	El Sereno	Conduit (2 locations)	Would be relocated east or west of SR 710
	El Sereno	2.5” Crossover	Would be relocated east or west of SR 710
	El Sereno	4-3.5” Duct	Would be relocated east or west of SR 710
	El Sereno	12”, 8”	Would be protected in place during construction
	El Sereno	4 Overhead Telephone Lines	Would be relocated outside of Valley Boulevard
	El Sereno	Overhead Telephone Line	Would be relocated east or west of SR 710
	Pasadena	1 Paper Pipe	Would be relocated east or west of SR 710
	Pasadena	27 Duct	Would be relocated outside of Green Street
	Pasadena	12-4” TRD	Would be relocated outside of Colorado Street
	Pasadena	Underground Telephone Line	Would be relocated east or west of SR 710
	Pasadena	Underground Telephone Line (3 locations)	Would be relocated outside of I 210
Caltrans	El Sereno	Electric Conduit (8 locations)	Would be relocated east or west of SR 710
	El Sereno	Electric Conduit	Would be relocated outside of ramp to Valley Boulevard
	Pasadena	Street Light (3 locations)	Would be relocated east or west of SR 710
City of Alhambra	Alhambra	8” Sewer	Would be relocated to temporary bridge for utilities
City of Los Angeles – Bureau of Sanitation	El Sereno	8” Clay Pipe (Casing)	Would be relocated
	El Sereno	8” VCP Sewer (ABAND)	Would be relocated
	El Sereno	12” VCP Sewer	Would be relocated
	El Sereno	8” Sewer (3 locations)	Would be protected in place during construction
	El Sereno	8” (ABAND) Sewer (4 locations)	Would be protected in place during construction
	El Sereno	8 “ VCP Sewer	Would be relocated east or west of SR 710
	El Sereno	12 “ to 8 “ Sewer	Would be protected in place during construction
	El Sereno	12” Sewer	Would be protected in place during construction
Los Angeles Department of Water and Power	El Sereno	Underground Electric Conduit (2 locations)	Would be relocated to temporary bridge for utilities
	El Sereno	Underground Electric Conduit	Would be protected in place during construction
	El Sereno	Overhead Electric Line (4 locations)	Would be relocated outside of Valley Boulevard
	El Sereno	Street light (3 locations)	Would be protected in place during construction
	El Sereno	Overhead Electric Line	Would be relocated outside of southbound SR 710
	El Sereno	Overhead Electric Line	Would be relocated west of SR 710
	El Sereno	Power Pole	Would be relocated outside Valley Boulevard
	El Sereno	Power Pole	Would be relocated
	El Sereno	8” Water Line (ABAND)	Would be relocated to temporary bridge for utilities
	El Sereno	6” CIP Water	Would be relocated
	El Sereno	4” CIP Water	Would be relocated
	El Sereno	8” Water Line (3 locations)	Would be protected in place during construction
Level 3 Communications	Pasadena	4-1.50” HDPE in 12” Black Steel Pipe Casing	Would be relocated outside of Colorado Boulevard
Metropolitan Water District of Southern California	El Sereno	60” Water Line (2 locations)	Would be relocated
City of Pasadena	Pasadena	8” Sewer (2 locations)	Would be relocated to temporary bridge for utilities
	Pasadena	12” Sewer	Would be relocated to temporary bridge for utilities
	Pasadena	9” VCP Sewer	Would be relocated outside of Del Mar Boulevard
	Pasadena	8” VCP Sewer	Would be relocated outside of St. John Avenue
	Pasadena	8” Sewer	Would be relocated outside of St. John Avenue
	Pasadena	8” VCP Sewer	Would be relocated outside of Green Street
	Pasadena	8” VCP Sewer	Would be relocated outside of Colorado Boulevard

TABLE 2.12:
Freeway Tunnel Alternative Single-Bore Design Variation Utility Relocations and Protections-in-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
City of Pasadena Power Department	Pasadena	Overhead Electric Line (2 locations)	Would be relocated to fit proposed St. John Avenue
	Pasadena	Underground Electric Line (2 locations)	Would be relocated to temporary bridge for utilities
	Pasadena	Overhead Electric Line	Would be relocated outside of I 210 on-ramp
	Pasadena	Street Light	Would be relocated outside of Del Mar Boulevard
	Pasadena	4-4”	Would be relocated outside of Del Mar Boulevard
	Pasadena	Street Light	Would be relocated outside of St. John Avenue
	Pasadena	4-3.5” VT	Would be relocated outside of St. John Avenue
	Pasadena	Street Light (2 locations)	Would be relocated outside of Green Street
	Pasadena	Underground Electric Line (2 locations)	Would be relocated east or west of SR 710, outside of work area
	Pasadena	6-3.5”	Would be relocated outside of Green Street
	Pasadena	Street Light	Would be relocated outside of Colorado Boulevard
	Pasadena	7-3.5”	Would be relocated outside of Colorado Boulevard
	Pasadena	Street Lights (2 locations)	Would be relocated outside of Union Street
	Pasadena	Power Pole	Would be relocated east or west of southbound I-210
	Pasadena	Underground Electric Line	Would be relocated east or west of southbound I 210
City of Pasadena Water Department	Pasadena	6” CIP Water Line	Would be relocated outside of Del Mar Boulevard
	Pasadena	8” CIP Water Line	Would be protected in place during construction
	Pasadena	12” CIP Water Line	Would be relocated east or west of St. John Avenue
	Pasadena	16” STL Water Line	Would be relocated outside of Green Street
	Pasadena	12” STL Water Line	Would be relocated outside of Green Street
	Pasadena	10” CIP Water	Would be relocated outside of Colorado Boulevard
	Pasadena	12” CIP Water	Would be relocated outside of Colorado Boulevard
Southern California Gas	El Sereno	2” Natural Gas Line	Would be protected in place
	El Sereno	4” Natural Gas Line	Would be relocated to temporary bridge for utilities
	El Sereno	3” to 4” Natural Gas Line	Would be protected in place during construction
	El Sereno	2” Natural Gas Line	Would be protected in place during construction
	Pasadena	6” M w/10” Casing Natural Gas Line	Would be relocated outside of Colorado Boulevard
	Pasadena	2” Natural Gas Line	Would be relocated outside of St. John Avenue

Source: *Community Impact Assessment* (2014).
ABAND = abandoned
CIP = cast-iron pipe
HDPE = high-density polyethylene
MH = manhole
STL = Steel
VCP = vitrified clay pipe
VP = vitrified pipe
VT = vitrified tile

TABLE 2.13:
Freeway Tunnel Alternative Dual-Bore Design Variation Utility Relocations and Protections-in-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
AT&T	El Sereno	3" Crossovers (2 locations)	Would be relocated east or west of SR 710
		2.5 " Crossover	Would be relocated east or west of SR 710
		Buried Cable	Would be relocated east or west of SR 710
		4-3.5" Telephone Duct	Would be relocated to temporary bridge for utilities
		Underground Telephone Line	Would be relocated outside of SR 710
		12", 8"	Would be protected in-place during construction
		Overhead Telephone Lines (4 locations)	Would be relocated north or south of Valley Boulevard
		Overhead Telephone Line	Would be relocated outside of SR 710
	Monterey Park/ El Sereno	(1.5"–1.4") Telephone Duct (5 locations)	Would be relocated west of southbound SR 710
	Pasadena	Pipe	Would be relocated to temporary bridge for utilities
		27 Duct	Would be relocated outside of Green Street
		Underground Telephone Lines (2 locations)	Would be relocated outside of SR 710
		Underground Telephone Lines (3 locations)	Would be relocated west of southbound I-210
California Department of Transportation	El Sereno	Street Light	Would be relocated west of southbound SR 710
		1"–2" Conduit	Would be relocated to southbound SR 710 on-ramp
		Conduits (14 locations)	Would be relocated east or west of SR 710
		Conduit	Would be relocated west of Valley Boulevard ramp
	Pasadena	Street Light (3 locations)	Would be relocated east of or outside of SR 710
City of Alhambra	Alhambra	8" Sewer	Would be relocated to temporary bridge for utilities
City of Los Angeles, Bureau of Sanitation	El Sereno	8" Clay Pipe Sewer	Would be relocated east or west of SR 710, outside of work area
		8" VCP Sewer (ABAND)	Would be relocated
		12" VCP Sewer	Would be relocated
		8" Sewer (3 locations)	Would be protected in-place during construction
		12" VCP to 8" VCP Sewer	Would be protected in-place during construction
		8" Sewer	Would be relocated
		8" (ABAND) (4 locations)	Would be protected in-place during construction
		12" Sewer	Would be protected in-place during construction
City of Pasadena	Pasadena	8" Sewer (2 locations)	Would be relocated to temporary bridge for utilities
		12" Sewer	Would be relocated to temporary bridge for utilities
		9" VCP	Would be relocated outside of Del Mar Boulevard
		8" VCP	Would be relocated outside of St. John Avenue
		8" Sewer	Would be relocated outside of St. John Avenue
		8" VCP Sewer	Would be relocated outside of Green Street
City of Pasadena Power Department	Pasadena	Overhead Electric Line	Would be relocated to fit proposed St. John Avenue
		Underground Electric Line (2 locations)	Would be relocated to temporary bridge for utilities
		Overhead Electric Line	Would be relocated
		Street Light	Would be relocated outside of Del Mar Boulevard
		4-4"	Would be relocated outside of Del Mar Boulevard
		Street Light	Would be relocated outside of St. John Avenue
		4-3.5" VT	Would be relocated outside of St. John Avenue
		Overhead Electric Line	Would be relocated outside of St. John Avenue
		Underground Electric Line	Would be relocated outside of work area
		Street Lights (2 locations)	Would be relocated outside of Green Street
		6-3.5"	Would be relocated outside of Green Street
		Power Pole	Would be relocated with power pole
		Street Light (2 locations)	Would be relocated outside of work area
City of Pasadena Water Department	Pasadena	8" Water	Would be protected in-place during construction
		6" CIP Water Line	Would be relocated outside of Del Mar Boulevard
		12" CIP Water Line	Would be relocated outside of St. John Avenue
		16" STL Water	Would be relocated outside of Green Street
		12" STL Water	Would be relocated outside of Green Street

TABLE 2.13:
Freeway Tunnel Alternative Dual-Bore Design Variation Utility Relocations and Protections-in-Place

Utility Provider	City/Community	Description of Facility	Project Effect (Relocation or Protection-in-Place)
Los Angeles Department of Water and Power	El Sereno	Underground Electric Line (2 locations)	Would be relocated to temporary bridge for utilities
		Overhead Electric Line	Would be relocated west of southbound SR 710
		Underground Electric Line	Would be protected in-place during construction
		Overhead Electric Line (5 locations)	Would be relocated outside of Valley Boulevard
		Power Pole	Would be relocated
		Street Light (3 locations)	Would be protected in-place during construction
		Overhead Electric Line	Would be relocated outside of southbound SR 710
		8” Water Line (ABAND)	Would be relocated outside of Hellman Avenue
		6” CIP Water Line	Would be relocated
		4” CIP Water Line	Would be relocated
		8” Water Line (3 locations)	Would be protected in-place during construction
Metropolitan Water District of Southern California	El Sereno	60” Water Line (2 locations)	Would be relocated
Southern California Gas	El Sereno	4” Natural Gas Line	Would be relocated north or south of Hellman Avenue, outside of work area
		2” Natural Gas Line	Would be protected in-place during construction
		3” to 4” Natural Gas Line	Would be protected in-place during construction
		2” Natural Gas Line	Would be protected in-place during construction
	Pasadena	2” Natural Gas Line	Would be relocated outside of St. John Avenue

Source: *Community Impact Assessment* (2014).
ABAND = abandoned
CIP = cast iron pipe
VCP = vitrified clay pipe
VT = vitrified tile

Non-Motorized and Pedestrian Facilities (Active Transportation)

The Freeway Tunnel Alternative includes modifications to existing arterial streets and intersections, freeway on- and off-ramps, and the construction of new freeway and freeway tunnel facilities. Existing pedestrian and bicycle facilities along arterials, at intersections, and at freeway on- and off-ramps would be either protected in-place during construction of the Freeway Tunnel Alternative improvements or would be replaced in kind at the completion of the construction of those improvements. Any such improvements would be constructed to current ADA standards for curb ramps and sidewalks.

Specific improvements/changes in pedestrian and bicycle facilities under the Freeway Tunnel Alternative would include:

- The St. John Avenue extension would require the realignment of St. John Avenue and the widening of that street at Del Mar Boulevard. This would result in a slightly wider pedestrian crossing on the north side of Del Mar Boulevard and would add a pedestrian crossing on the south side of Del Mar Boulevard and a new sidewalk on the west side of the St. John Avenue extension from Del Mar Boulevard to California Boulevard. The existing bike path along St. John Avenue may be extended from Del Mar Boulevard to California Boulevard.
- The existing sidewalk on the west side of Pasadena Avenue between Green Street and Colorado Boulevard would be moved farther west to accommodate a new lane from the northbound Pasadena Avenue off-ramp.

- The existing crosswalk along the north and south sides of Green Street and across Pasadena Avenue would be lengthened as a result of the new lane from the northbound Pasadena Avenue off-ramp.
- For the dual-bore variation only, the existing crosswalk on the north and south sides of Green Street at St. John Avenue would be lengthened to accommodate a southbound SR 710 on-ramp from St. John Avenue.
- For the dual-bore variation only, the existing crosswalk on the south side of Colorado Boulevard at St. John Avenue would be lengthened to accommodate a new lane.
- St. John Avenue would be lengthened to accommodate a new lane.
- A new sidewalk would be provided on westbound Valley Boulevard between the SR 710 northbound off-ramp and the SR 710 southbound on-ramp at Valley Boulevard

Drainage Facilities

The Freeway Tunnel Alternative dual-bore and single-bore design variations would include numerous drainage improvements, including the following facilities. This Alternative would encroach horizontally on the maintenance road on the west side of the Laguna Regulating Basin. The roadway would be constructed on a bridge to minimize effects to the Basin. A new entrance and pull-out area from the I-10/I-710 Connector would be installed. Drainage associated with the southerly cut-and-cover section of the Freeway Tunnel Alternative would be conveyed via a series of pipes to a proposed pump station near Valley Boulevard. The pump station would convey runoff to the Dorchester Channel.

A sump pump would be constructed at the low point of the tunnel to collect fire sprinkler and seepage water inside the tunnel. This water would be conveyed via pipe to a storage tank located under the parking lot for the O&M Center, north of Valley Boulevard. There is a separate storm water drainage system located outside of the north portal that would need modifications. The wash or fire water would be tested and properly hauled away and disposed of consistent with federal and State regulations. The existing pump station and storage chamber south of Del Mar Boulevard would be relocated north of Del Mar Boulevard. Water from the storage chamber would be conveyed via a reinforced concrete pipe to the existing pipe in Del Mar Boulevard.

The dual-bore design variation of the Freeway Tunnel Alternative would relocate segments of the Dorchester Channel north and south of Hellman Avenue. The affected segments of the existing reinforced concrete channel would be replaced with a double reinforced concrete box along the original channel alignment. The single-bore design variation would not affect these segments of the Dorchester Channel.

Storm Water Treatment

Four biofiltration swales and eight gross solid removal devices (GSRDs) at two locations are proposed for the dual-bore design variation of the Freeway Tunnel Alternative. BMPs are only proposed in areas outside the tunnel. Biofiltration swales are proposed to be located in the SR 710 North to I-10 East loop ramp at the south portal and adjacent to northbound SR 710 at the Laguna Regulating Basin. Two treatment systems consisting of a pump station, GSRDs, and a biofiltration swale are proposed adjacent to southbound SR 710 at Valley Boulevard and adjacent to northbound SR 710 at the north portal near Pasadena Avenue. The pump stations

would be designed such that the lower flows would be treated by the BMPs and larger flows would bypass the BMPs.

Three biofiltration swales and GSRDs are proposed for the single-bore design variation of the Freeway Tunnel Alternative. A biofiltration swale is proposed to be located adjacent to northbound SR 710 at the Laguna Regulating Basin. Two treatment systems consisting of a pump station, a GSRDs, and a biofiltration swale are proposed adjacent to southbound SR 710 at Valley Boulevard and adjacent to northbound SR 710 at the north portal near Pasadena Avenue. The pump stations would be designed such that the lower flows would be treated by the BMPs and larger flows would bypass the BMPs.

Retaining Walls

Retaining walls are proposed to limit ROW needs along the freeway alignment and near the tunnel portal areas for the segments of the freeway leading to and from the cut-and-cover tunnels.

Noise Barriers

Preliminary abatement measures proposed for the Freeway Tunnel Alternative include 6 noise barriers. Of these, 4 are feasible and reasonable for both the single-bore and dual-bore design variations while an additional two are feasible and reasonable for only the dual-bore design variation.

- **Single-Bore and Dual-Bore Design Variations**
  - Freeway Tunnel Alternative Noise Barrier (FTNB) No. 5 is a recommended barrier along the Caltrans ROW/private property line on the east side of SR 710 between Hellman Avenue and Valley Boulevard.
  - FTNB No. 7 is a recommended barrier along the Caltrans ROW/private property line on the west side of SR 710, south of Valley Boulevard.
  - FTNB No. 8 is a recommended barrier along the Caltrans ROW/private property line on the west side of SR 710, south of Valley Boulevard.
  - FTNB No. 10 is a recommended barrier along the Caltrans ROW/private property line at the northeast quadrant of the I-210 and SR 134 interchange for both the single-bore and dual bore design variations.
- **Dual-Bore Design Variation Only**
  - FTNB No. 6D is a recommended barrier along the edge of shoulder of the SR 710 Valley Boulevard southbound on-ramp.
  - FTNB No. 9 is a recommended barrier along the private property line of the restaurant at the corner of Pasadena Avenue and Colorado Boulevard.

The analyzed noise barriers for the single-bore and dual-bore design variations of the Freeway Tunnel Alternative are shown on Figures 3.14-6 and 3.14-9, respectively, in Appendix N. The final locations, heights, and lengths of noise barriers for the Freeway Tunnel Alternative would be determined during final design. Four noise barriers proposed for the TSM/TDM Alternative would also be included in the Freeway Tunnel Alternative.

Property Acquisitions

The design variations of the Freeway Tunnel Alternative would require the permanent acquisition of full and partial parcels of land that would be permanently incorporated into the transportation improvements in this alternative as summarized in Table 2.14. The improvements in the Freeway Tunnel Alternative are also expected to require permanent easements as shown in Table 2.14.

TABLE 2.14:
Summary of Permanent Acquisitions for the Design Variations of the Freeway Tunnel Alternative

Type of Permanent Acquisition	Number of Parcels
Dual-Bore Design Variation	
Full parcel acquisition	1
Partial parcel acquisition	3
Aerial easement	0
Subsurface easement	41
Permanent tunnel easement	563
Permanent footing[1] easement	3
Permanent maintenance easement[2]	2
Single-Bore Design Variation	
Full parcel acquisition	1
Partial parcel acquisition	2
Aerial easement	0
Subsurface easement	32
Permanent tunnel easement	324
Permanent footing[1] easement	3

Source: *Community Impact Assessment* (2014).

[1] This easement is required to accommodate structural foundations beneath the number of parcels listed in the table.

[2] These easements are required to permit ongoing inspection and maintenance of the transportation improvements above these parcels.

Ramp Metering

It is anticipated that ramp metering would be needed at the southbound SR 710 on-ramp at Valley Boulevard and the southbound SR 710 on-ramp at St. John Avenue. Ramp metering is recommended at these locations to enhance the operation of the ramp connection to the mainline freeway.

TSM/TDM Components

The TSM/TDM Alternative improvements would also be constructed as part of the Freeway Tunnel Alternative, including either the dual-bore or single-bore design variations. These improvements would provide the additional enhancements to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. The only components of the TSM/TDM Alternative improvements that would not be constructed with the Freeway Tunnel Alternative would be Other Road Improvement T-1 (Valley Boulevard to Mission Road Connector) and Other Road Improvement T-3 (St. John Extension between Del Mar Boulevard and California Boulevard).

There are locations along the alignment of the Freeway Tunnel Alternative that overlay or cross areas that would also be improved under the TSM/TDM Alternative. All the improvements at those locations would be designed to ensure the effective operation of the Freeway Tunnel

Alternative facilities and services in conjunction with the applicable TSM/TDM Alternative improvements. For example, ITS improvements under the TSM/TDM Alternative along or crossing the Freeway Tunnel Alternative alignment would be designed and implemented to compliment and support the transportation facilities and services in the Freeway Tunnel Alternative so as to maximize the benefits of those improvements for the traveling public.

Construction Activities

Grading and Excavation

Excavation and ground disturbance for the Freeway Tunnel Alternative may also be grouped into three categories based on the methods, equipment, and section, including: (1) the central bored tunnel section, (2) cut-and-cover tunnels at the north and south portals, and (3) other modifications. Current design plans indicate that the bored tunnel section of the Freeway Tunnel Alternative would be excavated using a pressurized-face TBM. Please refer to the description of TBM operation provided in the LRT discussion above.

Emergency vehicle cross passages are anticipated to be excavated using the SEM from within the tunnels excavated by the TBMs. Please refer to the description of SEM operation provided in the LRT discussion above.

Cut-and-cover tunnels, located in the north and south portal areas of the bored tunnel would be constructed to allow vehicles to reach the depth of the bored tunnel from the at-grade portion of the freeway. These cut-and-cover tunnels would be excavated from the surface to the depth of the bored tunnel using traditional excavation equipment (e.g., scrapers, trackhoes, and bulldozers) and can generally be constructed with minimal surrounding surface settlements by using appropriate support of excavation systems.

Other elements of the Freeway Tunnel Alternative would also use traditional excavation methods and equipment for their development; however, the level of ground disturbance would be less extensive than for the cut-and-cover tunnels. These improvements include modifications to surface streets (e.g., Hellman Avenue, Del Mar Boulevard, St. John Avenue, and Valley Boulevard), on-ramps and off-ramps to and from SR 710, and the interchanges with I-10, I-210, and SR 134. In addition, CIDH piles would be used for new signs.

Disposal Sites and Haul Routes

Construction of the bored and cut-and cover tunnel segments of both design variations of the Freeway Tunnel Alternative would generate excess excavated soil and other materials that cannot be reused within the project limits. That material is proposed to be disposed of at the Manning and Olive Pits in Irwindale. The locations and capacities of those pits for accepting excess soils were described earlier in the discussion of the generation of excess soils during tunneling for the LRT Alternative. Other Class I landfills and/or sale to a soil broker are also options for disposing of the excavated material.

As shown on Figure 2-9, the preliminary route for hauling excavated material generated at the south tunnel portal and at the north tunnel portal would be via the existing SR 710. Haul trucks would enter SR 710 without traveling on local streets. The preliminary route at the disposal end of the trip under both design variations includes Live Oak Canyon and Arrow Highway (to/from I-605 at the disposal end of the haul trips), and Azusa Canyon Road (to access the Olive Pit) and Vincent Avenue (to access the Manning Pit).

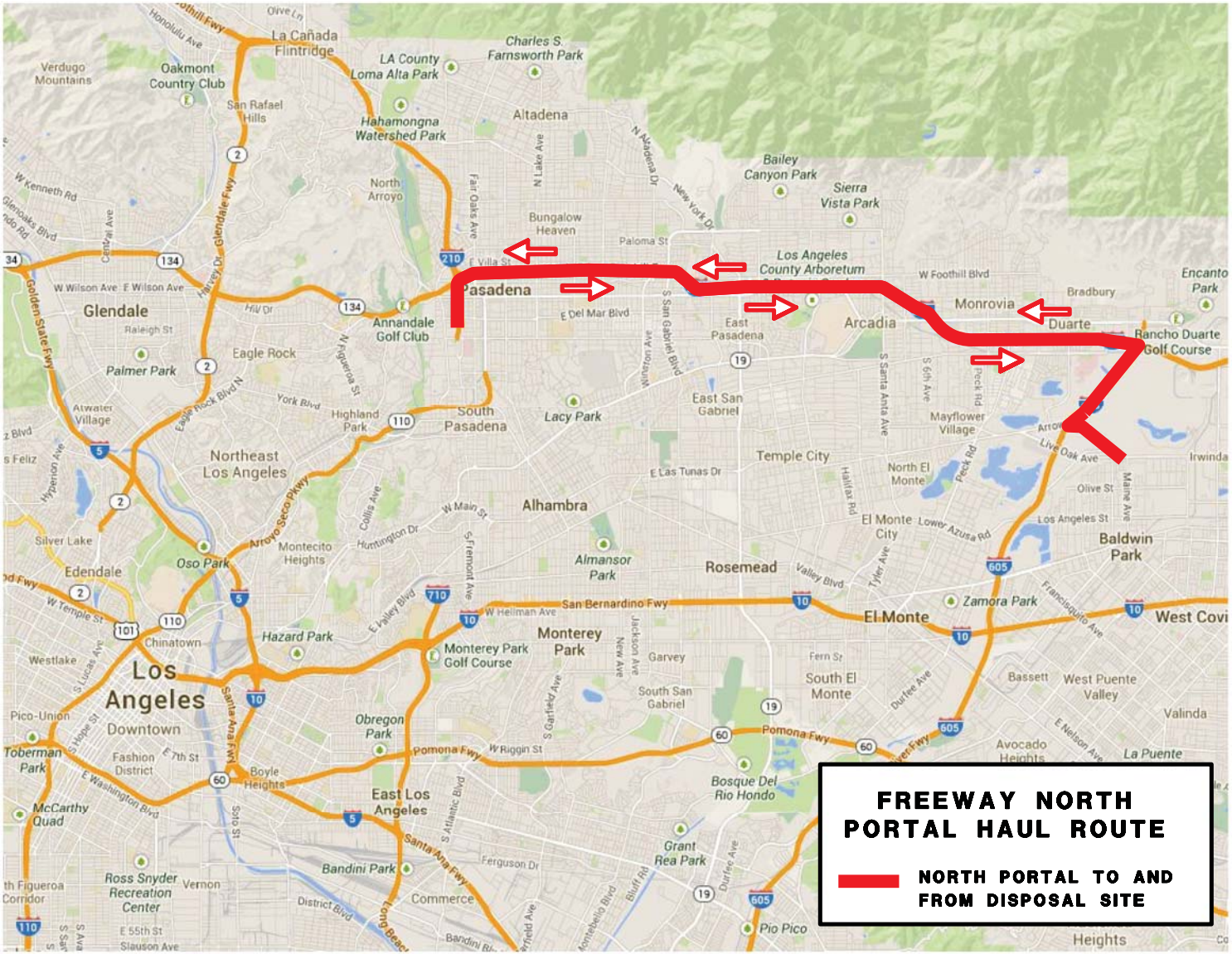

FIGURE 2-9
Sheet 1 of 2

SR 710 North Study
Haul Route for the Freeway Tunnel Alternative

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Aerial Image © Google Earth, 2014. Annotation by CH2M HILL, 2014

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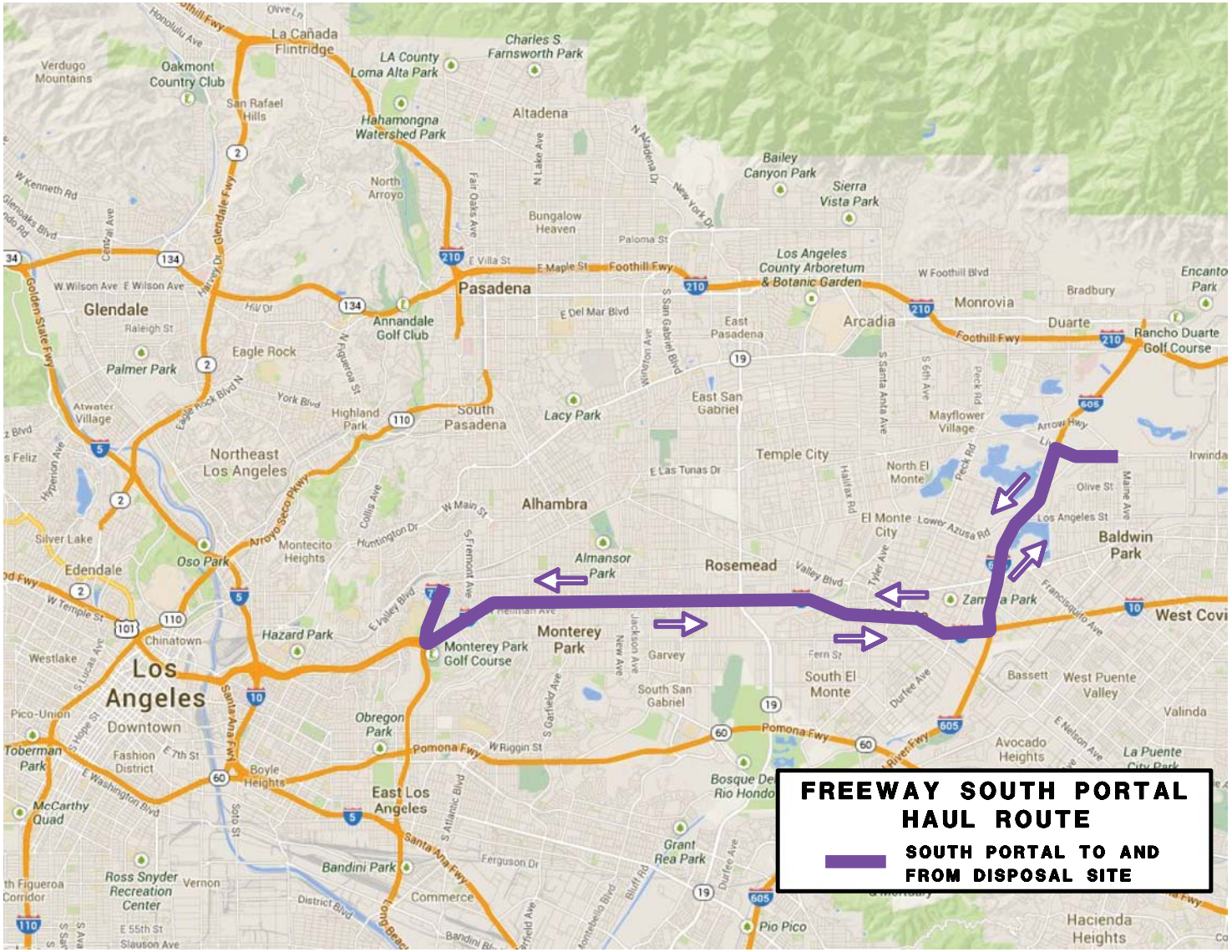

FIGURE 2-9
Sheet 2 of 2

N

SR 710 North Study
Haul Route for the Freeway Tunnel Alternative

07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

SOURCE: Aerial Image © Google Earth, 2014. Annotation by CH2M HILL, 2014

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If the single-bore or dual-bore design variation of the Freeway Tunnel Alternative is expected to pass through potentially contaminated soil or groundwater, the Contractor would be required to set up an area at the construction portal to sample and classify the excavated material as it is excavated. A sampling and analysis plan would be required so that the excavated material is classified properly and so the correct handling methods and disposal sites are selected. Excavated material that is determined to be hazardous and cannot be taken to the Manning or Olive Pits would be transported to a landfill certified for accepting hazardous waste appropriate for the waste encountered.

Construction Staging and Phasing

Each component of the Freeway Tunnel Alternative would be staged to minimize the disruption to traffic and maximize the effectiveness of the construction activities. Preliminary construction phasing of the bored tunnel portions of the Freeway Tunnel Alternative are as follows:

- Construction at portals would be excavated at both the south and north ends of the bored tunnel alignment to launch the TBMs. The portal would be excavated from the top down, first by installing support of excavation walls at the headwall and along the sidewalls of the planned excavation and then by excavating the soil or rock within those walls, employing groundwater control measures where necessary. The Contractor may choose to excavate only the portion of the portal necessary to launch the TBMs prior to launching the machines, or could excavate the entirety of the area necessary for the cut-and-cover tunnels, as the cut-and-cover tunnels would eventually be located in the excavation of the construction portals. During bored tunnel excavation, it is expected that the Contractor would use these areas for laydown of the construction operations.
- It is expected that the freeway tunnels would be excavated using two pressurized-face TBMs for each tunnel bore, launched from each portal. This means that there would be two TBMs total for the single-bore design variation and four TBMs for the dual-bore design variation. With this approach, both of the portals would be launch sites for the TBMs and construction staging areas for the tunneling equipment.
- The bored tunnels would be lined with a water- and gas-tight pre-cast concrete segmental liner as the TBMs pass. However, where the freeway tunnels cross active fault zones, a specially designed steel and concrete composite segmental lining is expected to be installed. The lining would allow for more space inside the tunnel in the fault zones to accommodate expected movement from fault offset. The special lining could be installed by the TBMs as they excavate the tunnels just as the typical segmental concrete lining.
- In the dual-bore tunnel design variation, emergency vehicle cross passages between the two tunnels would likely be excavated using the SEM; these cross passages would be excavated from within the freeway tunnels after the main bored tunnels are excavated. Where necessary, ground treatment and pre-support would be installed depending on the ground type at each cross passage and would be implemented prior to excavation of the cross passages. A cast-in-place concrete lining with water- and gas-proofing where necessary would be installed in the cross passages after excavation is complete.
- It is anticipated that the excavated material from the excavation of the tunnels and cross passages would be removed from both the north and south portals for the freeway tunnels. Excavated material may need to be stockpiled at the construction staging areas if it is too

wet from the tunneling operations to transport. Refer to the section on disposal sites and haul routes for more information about the disposal of excavated material.

- Because it is anticipated that two TBMs would be used to excavate each bore, each TBM would excavate roughly half of the alignment and the TBMs would meet underground at the end of their drives. Because the TBMs would meet underground, the TBM shield would be left in place, providing temporary ground support while the remaining TBM components, including the trailing gear and cutterhead, would be removed from the tunnel. The cutterhead would be removed in pieces, with the Contractor supporting the ground around it additionally as needed, and a reinforced concrete cast-in-place final lining would be installed inside each TBM shield (between the segmental lining already installed by each TBM). Abandoning the TBM shield is a practice that is commonly performed if a TBM cannot be retrieved at a shaft or portal location at the end of its drive.
- As the bored tunnels are being excavated and lined, the installation of the roadway deck and concrete internal structure can begin to be installed some distance after the TBMs pass. The internal structure is expected to be a combination of pre-cast reinforced concrete and cast-in-place reinforced concrete.

Temporary Construction Easements

The majority of the improvements in the Freeway Tunnel Alternative are anticipated to be constructed within existing publicly owned ROWs. However, it is anticipated that the dual-bore design variation of the Freeway Tunnel Alternative would require TCEs where there is not sufficient room within the public ROWs to accommodate the construction activities and/or storage of materials or equipment for those improvements. Any land used as a TCE during construction of improvements under either design variation of the Freeway Tunnel Alternative would be returned to its original or better condition prior to the return of that land to the original owner after completion of the construction activities requiring that TCE. No permanent project features would be constructed within the boundaries of the TCEs used for construction of either design variation of the Freeway Tunnel Alternative.

Cost

The total estimated cost of the Freeway Tunnel Alternative is approximately $5,650 million for the dual-bore design variation and $3,150 million for the single-bore design variation. Of that total, the cost of the TSM/TDM improvements that would be constructed with either design variation of the Freeway Tunnel Alternative is estimated to be approximately $50 million. The roadway, structures, and ROW costs are included in these estimates for both design variations.

Schedule

Construction of the Freeway Tunnel Alternative would take approximately 4 to 5 years for the single-bore design variation and approximately 5 years for the dual-bore design variation.

2.3 Comparison of Alternatives

Table 2.15 provides information for comparison of the four Build Alternatives and the No Build Alternative. The table summarizes the alternatives considered, including design features, environmental effects and measures identified.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Alternative Descriptions and Features						
Alternative Descriptions	The No Build Alternative does not include any improvements included in the SR 710 North Study Build Alternatives.	The TSM/TDM Alternative would provide strategies and improvements to increase efficiency and capacity for all modes in the transportation system with lower capital cost investments and/or lower potential impacts including Intelligent Transportation Systems, local street and intersection improvements, Active Traffic Management, expanded bus service and bus service improvements, and pedestrian and bicycle facility improvements. This Alternative is designed to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. The TSM/TDM Alternative includes: • Widening of the Garfield Avenue Bridge • Construction of a new bridge for the SR 710 connector road to Mission Road underpass crossing under the UPRR with retaining walls • Retaining Walls • Noise Barriers	The BRT Alternative would provide high-speed, high-frequency bus service through a combination of new, and dedicated and mixed-flow traffic lanes to key destinations between East Los Angeles and Pasadena. The proposed route is approximately 12 mi long. The BRT Alternative includes: • BRT trunk line arterial street and station improvements • Frequent bus service • New bus feeder services • Enhanced connecting bus services • BRT service would use 60 ft articulated buses with three doors • Latest fare collection technology such as on-board smart card (TAP card) readers • Two bus feeder routes that would connect additional destinations with the BRT mainline • 17 BRT stations • Minor Street Widening • Retaining Walls • Noise Barriers	The LRT Alternative would provide an approximately 7.5 mi long passenger rail line operated on a dedicated guideway, with 3 mi of aerial segments and 4.5 mi of bored tunnel segments. The LRT Alternative includes: • Seven LRT stations • New bus feeder services • Enhanced existing bus services • New aerial bridges along the entire elevated alignment • Realignment of the SR 710 NB off-ramp to be adjacent to the SB on-ramp • Restriping of Mednik Avenue between First Street and Floral Drive to provide a new Class II bicycle lane • Retaining walls Noise barriers	The alignment for the Freeway Tunnel Alternative will start at the existing southern stub of SR 710 in Alhambra, north of I-10, and connect to the existing northern stub of SR 710, south of the I-210/SR 134 interchange in Pasadena with either a single-bore or dual-bore tunnel configuration. The dual-bore and single-bore design variations are each approximately 6.3 mi long, with 4.2 mi of bored tunnel, 0.7 mi of cut-and-cover tunnel, and 1.4 mi of at-grade freeway segments. The single-bore and dual-bore design variations include: • Extension of St. John Avenue from Del Mar Boulevard to California Boulevard • Widening of Pasadena Avenue to include a new lane from the proposed NB SR 710 off-ramp at Pasadena Avenue to Colorado Boulevard • Replacement of the Hellman Avenue and Green Street overcrossing bridges • Demolition and replacement with an at-grade road of the Del Mar Boulevard overcrossing • A new bridge at the Laguna Regulating Basin and a new overpass bridge at Valley Boulevard • Emergency, communication, and ventilation systems • Pedestrian and bicycle facility improvements • Retaining walls • Noise Barriers The dual-bore design variation would also include widening of the Ramona Boulevard undercrossing and SR 710/I-10 bridges.	--
Alternative Costs	--	$105 million	$139 million (BRT improvements) plus $102 million for the TSM/TDM improvements $241 million total	$2,368 million (LRT Alternative improvements) plus $52 million for the TSM/TDM Alternative improvements $2,420 million total	$3,100 million (single-bore design variation) and $5,600 million (dual-bore design variation) plus $50 million for the TSM/TDM improvements Single-Bore Total: $3,150 million Dual-Bore Total: $5,650 million	--
Property Acquisition						
Full parcel acquisition	--	Approximately 1 parcel	0 parcels	Approximately 58 parcels	Single-Bore: Approximately 1 parcel Dual-Bore: Approximately 1 parcel	--
Partial parcel acquisition	--	Approximately 31 parcels	Approximately 45 parcels	Approximately 11 parcels	Single-Bore: Approximately 2 parcels Dual-Bore: Approximately 3 parcels	--
Aerial easement	--	Approximately 2 parcels	0	Approximately 12 parcels	Single-Bore: 0 Dual-Bore: 0	--
Subsurface easement	--	0	0	1 parcel	Single Bore: Approximately 32 parcels Dual Bore: Approximately 41 parcels	--

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Permanent tunnel easement	--	0	0	Approximately 183 parcels	Single Bore: Approximately 324 parcels Dual-Bore: Approximately 563 parcels	--
Permanent footing easement	--	0	0	0	Single-Bore: Approximately 3 parcels Dual-Bore: Approximately 3 parcels	--
Temporary construction easements	--	Approximately 16 parcels	Approximately 36 parcels	Approximately 13 parcels	Single-Bore: Approximately 52 parcels Dual-Bore: Approximately 47 parcels	--
Construction period	--	Approximately 2 years	Approximately 2 years	Approximately 6 years	Single-Bore: Approximately 4 to 5 years Dual-Bore: Approximately 5 years	--
Potential Environmental Impacts						
Land Use	No temporary land use effects would occur.	• Direct, construction-related effects on existing land uses • TCEs on approximately 16 parcels • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements	• Direct, construction-related effects on existing land uses • TCEs on approximately 36 parcels • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements • Temporary occupancy of approximately 0.02 ac of land in Cascades Park and permanent incorporation of approximately 0.011 ac of land from Cascades Park • The TSM/TDM Alternative improvements included in the BRT Alternative would also result in additional temporary land use impacts	• Direct, construction-related effects on existing land uses • TCEs on approximately 13 parcels • Temporary loss of approximately 240 parking spaces • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements	• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements • TCEs: – Single-Bore: TCEs on approximately 52 parcels – Dual-Bore: TCEs on approximately 47 parcels • Temporary loss of approximately 17 parking spaces	• **Parks-1: Compliance with the Public Park Preservation Act (applies to the BRT Alternative):** As part of the right of way acquisition process for the BRT Alternative, the Los Angeles County Metropolitan Transportation Authority (Metro) Division of Right of Way personnel will coordinate with the City of Monterey Park to provide compensation for the acquisition of land from Cascades Park as required under the Public Park Preservation Act. • **Cascades-1: Temporary Construction Easements (applies to the BRT Alternative):** The Resident Engineer will require the Construction Contractor to return land in Cascades Park that would be occupied for temporary construction easements (TCEs) to a condition that is at least as good as that which existed prior to the project at the completion of the construction of the BRT Alternative in this area. The Los Angeles County Metropolitan Transportation Authority (Metro) will require the Construction Contractor to fence and properly secure all active construction areas in and adjacent to Cascades Park within the limits of construction to protect the safety of park patrons during construction. When the sidewalks in Cascades Park at Atlantic Boulevard are temporarily closed during construction, Metro will require the Construction Contractor to develop and clearly sign pedestrian detours prior to the intersections of Atlantic Boulevard and El Portal Place to avoid making pedestrians backtrack to get to a safe crossing. • **Cascades-2: Permanent Incorporation of Land (applies to the BRT Alternative):** Metro will include the replacement of the sidewalks affected by the permanent incorporation of land

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						in Cascades Park in the adjacent areas of Cascades Park as part of final design. If any shrubs and/or trees are removed from the areas that will be permanently incorporated, the Construction Contractor will replace those trees elsewhere in Cascades Park after consultation with the City of Monterey Park.
	No permanent land use effects would occur.	• Two aerial easements related to bridge construction • Acquisition of approximately 0.6 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately 26 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 220 on-street parking spaces during all hours • Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP • Noise effects to approximately six parks and recreation resources • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan	• Acquisition of approximately 0.3 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately 1,029 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 114 on-street parking spaces during all hours • Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP • Noise effects on approximately four parks and recreation resources • The TSM/TDM Alternative improvements included in the BRT Alternative would also result in additional permanent land use impacts	• Tunnel easements beneath approximately 183 parcels, permanent aerial easements above approximately 12 parcels, and permanent subsurface easements beneath approximately 1 parcel • Acquisition of approximately 18.0 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Loss of approximately four on-street parking spaces • Inconsistent with specific individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP • Noise effects to approximately one park and recreation resource • The TSM/TDM Alternative improvements included in the LRT Alternative would also result in additional permanent land use impacts	Potential permanent effects include: • **Easements:** – **Single-Bore:** Tunnel easements under approximately 324 parcels, footing easements on approximately 3 parcels, and subsurface easements beneath approximately 32 parcels – **Dual-Bore:** Tunnel easements under approximately 563 parcels, subsurface easements under approximately 41 parcels and footing easements on 3 parcels and a maintenance easement on 1 parcel • Acquisition of 1.5 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans • Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP for the single-bore Freeway Tunnel design variation (the single-bore Freeway Tunnel design variations would not provide the capacity for four lanes of traffic in each direction) and the non-toll dual-bore Freeway Tunnel design variation • Inconsistency with specific individual policies, objectives, and program goals in the City of Alhambra and City of South Pasadena General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan • The TSM/TDM Alternative improvements included in the Freeway Tunnel Alternative would also result in additional permanent land use impacts	• **LU-1: General Plans:** If a Build Alternative is selected for implementation, the Los Angeles County Metropolitan Transportation Authority (for the TSM/TDM, BRT, and LRT Alternatives) and the California Department of Transportation (for the Freeway Tunnel Alternative) will request the applicable local jurisdictions to amend their General Plans and/or other local land use plans after the acquisition of land for the selected alternative to reflect the improvements in that Build Alternative. • **LU-2: RTP/SCS and FTIP (applies to the TSM/TDM, BRT, and LRT Alternatives or any Freeway Tunnel Alternative other than the Freeway Tunnel Alternative with the dual-bore tunnel design variation with the tolled operational variation):** The Los Angeles County Metropolitan Transportation Authority will coordinate with the Southern California Association of Governments on needed amendments to the next cycle of the RTP/SCS and FTIP to reflect the selected project and to delete the projects (RTP ID 18790 and FTIP ID 18790) describing a tunnel extension of SR 710 North with 4 toll lanes in each direction from those transportation plans.
Growth	The No Build Alternative does not include any of the improvements in the SR 710 North Study Build Alternatives and, therefore, would not result in impacts related to growth that could occur under the Build Alternatives.	No impact. Although the SR-710 North Study Project will improve mobility and circulation, the study area is largely built out and none of the Build Alternatives provides new access to undeveloped or underdeveloped areas; therefore, the SR-710 North Study Project is not expected to result in unplanned growth.				No avoidance, minimization, and/or mitigation measures are required.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Community Impacts						
Community Character and Cohesion	The No Build Alternative does not have temporary effects on community character and cohesion In addition, the No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives • Minor temporary lane restrictions during construction.	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives • Temporary lane restrictions during construction	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives • Temporary lane restrictions during construction • Overnight closures along the elevated segments • Displacement of 15 businesses along Mednik Avenue in East Los Angeles	• Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives • Temporary lane restrictions during construction • Temporary delays and detours for the traveling public at multiple locations in the study area during construction • Permanent 0.6 ac easement • Permanent acquisition of 1.0 ac of land	The following measures are applicable to all of the Build Alternatives: • **CI-1: Property Acquisition:** All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970 as amended. • **T-1:** Transportation Management Plan • **AQ-1:** Fugitive Dust • **AQ-2:** Equipment and Vehicle Emissions • **AQ-3:** Diesel Fuel Emissions and Sensitive Receptors • **N-1:** Construction in State ROW • **N-2:** Construction Outside State ROW • **N-3:** Tunnel Boring Machine • **N-4:** Supply and Muck Trains • **N-5:** Ground-Borne Noise and Vibration • **V-1:** Vividness • **V-2:** Intactness • **V-3:** Unity • **V-4:** Walls with Aesthetic Treatments • **V-5:** Built Structures • **V-6:** Landscaping • **V-7:** Short-Term Visual
Relocation	No temporary effects to environmental justice populations.	The TSM/TDM Alternative would potentially result in: • TCEs on approximately 16 parcels • Creation of approximately 1,400 person-year jobs, which would generate a total of approximately $64.7 million (in 2010 dollars) in employment earnings	• TCEs on approximately 36 parcels • Creation of approximately 3,100 person-year jobs, which would generate a total of approximately $148.6 million (in 2010 dollars) in employment earnings	The LRT Alternative would potentially result in: • TCEs on approximately 13 parcels • Creation of approximately 31,500 person-year jobs, which would generate a total of approximately $1.5 billion (in 2010 dollars) in employment earnings	• TCEs on approximately 52 parcels for single bore and 47 parcels for dual bore • Creation of approximately 41,100 person-year jobs for single-bore and 73,700 for dual-bore, which would generate a total of approximately $1.9 billion (in 2010 dollars) in employment earnings for single-bore and approximately $3.5 billion (in 2010 dollars) for dual-bore.	No avoidance, minimization and/or mitigation measures are required.
	No permanent effects to environmental justice populations.	• Approximately one full parcel acquisition and approximately 31 partial parcel acquisitions, none of which would result in the displacement of businesses or employees • Displacement of one business from a State-owned parcel with approximately six employees at that business • Loss of approximately $1,000 in annual property tax revenue and approximately $1,939 in sales tax revenue • Creation of approximately 300 person-year jobs, which would generate approximately $10.5 million per year (in 2010 dollars) in employment earnings over the long term.	• Approximately 45 partial parcel acquisitions, resulting in a loss of approximately $2,111 in annual property tax revenue and approximately $1,939 in sales tax revenue • Creation of approximately 600 person-year jobs, which would generate a total of approximately $19.6 million (in 2010 dollars) per year in employment earnings over the life of the improvements.	• 58 full parcel acquisitions and approximately 11 partial parcel acquisitions, requiring the relocation of approximately 73 businesses and resulting in the displacement of approximately 645 employees • Displacement of 1 business from a State-owned parcel with approximately 30 employees at that business • Loss of approximately $50,885 in annual property tax revenue and approximately $75,425 in sales tax revenue • Operation and maintenance is estimated to result in approximately 1,300 person-year jobs, which would generate a total of approximately $45.4 million (in 2010 dollars) per year in employment earnings over the life of the improvements	• Require one full parcel acquisition, which would require the relocation of approximately 1 business and the displacement of approximately 5 employees. • Result in approximately 2 and 3 partial parcel acquisitions (single-bore and dual-bore, respectively) • Displacement of 1 business from a State-owned parcel with approximately 30 employees • Result in the loss of approximately $1,042 in annual property tax revenue no loss of sales tax revenue (single-bore and dual-bore) **Single-Bore:** Operation and maintenance would result in approximately 800 to 900 person-year jobs for the operational variation that includes trucks and tolls or	• **CI-1: Property Acquisition:** All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970 as amended.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
					approximately 900 person-year jobs for the operational variation that includes trucks, tolls, and express buses, which would generate a total of approximately $28.6 million or approximately $32.1 million (in 2010 dollars), respectively, per year in employment earnings. **Dual-Bore:** Operation and maintenance would result in approximately 1,200 person-year jobs for the operational variation that includes tolls or approximately 1,000 person-year jobs for the operational variation that excludes tolls, which would generate a total of approximately $41.2 million or $33.5 million (in 2010 dollars), respectively, per year in employment earnings.	
Environmental Justice	No temporary or permanent effects to environmental justice populations.	None of the Build Alternatives would result in disproportionate adverse impacts on environmental justice populations				Measure **CI-1 is** applicable.
Utilities and Emergency Services	No temporary or permanent effects to utilities and emergency services.	No impact. Although the SR-710 North Study Project will improve mobility and circulation, the study area is largely built out and none of the Build Alternatives provides new access to undeveloped or underdeveloped areas; therefore, the SR-710 North Study Project is not expected to result in unplanned growth.				No avoidance, minimization, and/or mitigation measures are required.
Traffic and Transportation/ Pedestrian and Bicycle Facilities	No temporary impacts related to traffic, transportation, pedestrian facilities, and bicycle facilities In addition, the No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Loss of some on-street parking spaces during minor street work • Closures of sidewalks, crosswalks, and bicycle facilities to protect the safety of pedestrians, bicyclists, and construction workers. Because ADA-compliant local streets, sidewalks, and crosswalks would be closed during construction of the Build Alternatives, ADA accessibility would also be affected during those closures.	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Lane restrictions during off-peak hours at approximately 6 locations • Loss of some on-street parking spaces during minor street work • Closures of sidewalks, crosswalks, and bicycle facilities, including ADA-compliant facilities, to protect the safety of pedestrians, bicyclists, and construction workers. • The BRT Alternative would include most of the improvements included in the TSM/TDM Alternative, therefore; the BRT alternative would result in similar temporary lane width reductions, reductions in the number of lanes, limited temporary losses of on-street parking spaces during minor construction work, and restrictions on the number of lanes during off-peak hours associated with the TSM/TDM Alternative improvements	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 29 locations (24 from the TSM/TDM Alternative improvements and 5 additional locations) • Lane restrictions during utility relocations and temporary road deck installation and removal • Delays from haul route disposal traffic • Loss of on-street parking spaces during minor construction • Weekend full road closures during construction • Overnight closures where the elevated alignment would cross SR 60, SR 710/I-710 , or other roads to accommodate placement of concrete barriers adjacent to the median and the construction of falsework • Closures of sidewalks, crosswalks, and bicycle facilities, including ADA-compliant facilities, to protect the safety of pedestrians, bicyclists, and construction workers • The LRT Alternative would include most of the improvements included in the TSM/TDM Alternative, therefore; the LRT alternative would result in similar temporary lane width reductions, reductions in the number of lanes, limited temporary losses of on-street parking spaces during minor construction work, and restrictions on the number of lanes during off-peak	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Loss of some on-street parking spaces during minor street work • Delays and detours at several locations in the vicinity of the north and south tunnel portals: – **Single-Bore:** Delays and detours at 5 and 7 locations, respectively, in the vicinity of the south tunnel portal. Delays and detours at 8 and 11 locations, respectively, in the vicinity of the north tunnel portal – **Dual-Bore:** Delays and detours at 4 and 9 locations, respectively, in the vicinity of the south tunnel portal. Delays and detours at 8 and 11 locations, respectively, in the vicinity of the north tunnel portal • Construction-related closures of freeway on- and off-ramps • **Temporary Closures:** – **Single-Bore:** 5 on NB SR 710, 7 on SB SR 710, and 1 on WB I-210 – **Dual-Bore:** 5 on NB SR 710, 5 on SB SR 710, and 2 on WB I-210 • Delays from haul route disposal traffic • Closure of on-street parking on the Green Street Bridge • Closures of sidewalks, crosswalks, and bicycle facilities, including ADA-compliant facilities, to protect the safety of pedestrians, bicyclists, and construction	• **T-1: Transportation Management Plan**: This measure addresses short term adverse transportation impacts during construction of the Build Alternatives, including potential delays for emergency service providers through preparation of a Transportation Management Plan (TMP) during final design, including coordination of the development of the TMP with emergency services providers. The TMP would be implemented during project construction • **T-2: Pedestrian and Bicycle Facility Closures**: When sidewalks, crosswalks, and/or bicycle facilities are temporarily closed during construction, pedestrian and bicycle detours will be developed and clearly signed prior to closing the locations.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
				hours associated with the TSM/TDM Alternative improvements	workers • The Freeway Tunnel Alternative would include most of the improvements included in the TSM/TDM Alternative, therefore; the Freeway Tunnel alternative would result in similar temporary lane width reductions, reductions in the number of lanes, limited temporary losses of on-street parking spaces during minor construction work, and restrictions on the number of lanes during off-peak hours associated with the TSM/TDM Alternative improvements	
	The No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	In the Horizon Year (2035), compared to the No Build Alternative, the TSM/TDM Alternative would result in: • A minor increase in combined AM and PM peak-period regional area VMT • Slight improvement in combined AM and PM peak-period regional area VHT • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • No reduction in VMT on local arterials • Modest increase in the percent of long-distance trips using local arterials • No improvement in travel times • Third highest number of new linked transit trips • No change in transit mode split • Lowest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mi of high-frequency transit service • Adverse effects at 18 intersections and on 8 freeway segments • Delays at intersections for pedestrians and bicyclists • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 220 on-street parking spaces during all hours of the day	In the Horizon Year (2035), compared to the No Build Alternative, the BRT Alternative would result in: • A minor increase in combined AM and PM peak-period regional area VMT • A reduction in combined AM and PM peak-period regional area VHT • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • Minor decrease in VMT on local arterials • Modest increase in the percent of long-distance trips using local arterials • No improvement in travel times • Second highest number of new linked transit trips • Minor increase in transit mode split • Greatest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mi of high-frequency transit service • Adverse effects at 13 intersections and on 13 freeway segments • Delays at intersections for pedestrians and bicyclists • Permanent loss of approximately 1,055 on-street parking spaces in the AM and PM peak periods and approximately 334 on street parking spaces during all hours of the day • The traffic modeling projections listed above include the effects of the BRT Alternative improvements in addition to the effects of the TSM/TDM Alternative improvements associated with the BRT Alternative	In the Horizon Year (2035), compared to the No Build Alternative, the LRT Alternative would result in: • A minor increase in combined AM and PM peak-period regional area VMT • A reduction in combined AM and PM peak-period regional area VHT • A minor increase in daily person throughput (trips) at the east-west screenline • Moderate increase in job accessibility • Modest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • Modest increase in VMT on local arterials • Modest increase in the percent of long-distance trips using local arterials • Minor improvement in travel times • Greatest number of new linked transit trips • Minor increase in transit mode split • Greatest daily transit person trips crossing the east-west screenline • Minor change in percent of study area population and employment within 0.25 mi of high-frequency transit service • Adverse effects at approximately 13 intersections and on approximately 17 freeway segments • Delays at intersections for pedestrians and bicyclists • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 89 on-street parking spaces during all hours of the day • The traffic modeling projections listed above include the effects of the LRT Alternative improvements in addition to the effects of the TSM/TDM Alternative improvements associated with the LRT Alternative.	In the Horizon Year (2035), compared to the No Build Alternative, the Freeway Tunnel Alternative would result in: • The largest increase in combined AM and PM peak period regional area VMT • The greatest reduction in AM and PM peak period regional area VHT • The greatest increase in daily person throughput (trips) at the east-west screenline • The greatest increase in job accessibility • The greatest increase in total daily vehicle volumes crossing the east-west screenline on arterials and freeways • The greatest reduction in VMT on local arterials • The greatest improvement in travel times • Substantial reduction in the percent of long-distance trips using local arterials • Lowest number of new linked transit trips • No increase in transit mode split • Lowest daily transit person trips crossing the east-west screenline • No change in percent of study area population and employment within 0.25 mi of high-frequency transit service • Adverse effects at approximately 6 to 11 intersections and on approximately 18 to 31 freeway segments, depending on the design and operational variations • Delays at intersections for pedestrians and bicyclists • Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 85 on-street parking spaces during all hours of the day • The traffic modeling projections listed above include the effects of the Freeway Tunnel Alternative improvements in addition to the effects of the TSM/TDM Alternative improvements associated with the Freeway Tunnel Alternative.	No avoidance, minimization and/or mitigation measures are required.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Visual and Aesthetics	No temporary effects to visual and aesthetics.	• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderately low to moderate visual impacts due to construction activities	• **V-7: Short-Term Visual Effects**: During final design, Metro (TSM/TDM, BRT, and LRT Alternatives) and Caltrans (Freeway Tunnel Alternative) will identify land uses adjacent to construction areas that may be sensitive to views of construction, staging, and materials storage areas. The final design will include features to minimize views of those areas. Metro and Caltrans will require the Construction Contractor to implement and maintain these features throughout the construction period.
	No permanent effects to visual and aesthetics.	• Minor physical changes or visible impacts to the environment • A minimal increase in lighting in existing business and residential areas • Limited changes in glare from changes in traffic control cycles and additional travel lanes • Approximately 7 noise barriers may result in a low to high visual impact	• Minor new shade and shadow effects at new bus stops and signage • Low permanent visual impacts on key views • Approximately 3 noise barriers may result in a moderate to moderately high visual impact. • In addition to the visual and aesthetic impacts associated with the BRT Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the BRT Alternative would also occur	• Moderately low to moderate permanent visual impacts on key views • TSM/TDM Alternative noise barriers may result in a moderate to high visual impact • Low permanent impacts related to light, glare, and shade and shadows • In addition to the visual and aesthetic impacts associated with the LRT Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the LRT Alternative would also occur.	• Moderately low to moderate visual impacts on key views • Minimal vehicle headlight glare from new non-tunnel segments built below the existing grade level • Minimal shade and shadow impacts • Approximately 4 to 6 noise barriers may result in moderate to high visual impacts • In addition to the visual and aesthetic impacts associated with the Freeway Tunnel Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the Freeway Tunnel Alternative would also occur.	• **V-1: Vividness (applies to the LRT and Freeway Tunnel Alternatives):** Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the vividness of views based on a number of measures in the final design. • **V-2: Intactness (applies to the LRT and Freeway Tunnel Alternatives):** Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the intactness of views based on a number of measures in the final design. • **V-3: Unity (applies to the LRT and Freeway Tunnel Alternatives)**: Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the unity of views based on a number of measures in the final design. • **V-4: Walls with Aesthetic Treatments:** The final designs of sound walls and retaining walls adjacent to identified viewer groups or within sensitive Key Views within State-owned right of way and for the Freeway Tunnel Alternative will be based on Caltrans Highway Design Manual standards and consideration of community input. Metro design standards will be used for the TSM/TDM, BRT, and LRT Alternatives. • **V-5: Built Structures (applies to the LRT Alternative)**: Metro (LRT Alternative) will design the project structures to blend with or enhance the surrounding areas. • **V-6: Landscaping (applies to the LRT**

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						and Freeway Tunnel Alternatives): Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address different levels of visual impacts related to walls and berms and for screening views of project features during final design.
Cultural Resources	No effects to cultural resources.	The TSM/TDM Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The BRT Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The LRT Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The Freeway Tunnel Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The following measures are applicable to all four Build Alternatives: • **CR-1:** Discovery of Cultural Resources • **CR-2:** Discovery of Human Remains • **CR-3:** Native American Monitors • **CR-4:** Post Review Discovery and Monitoring Plan • **CR-5:** Cultural Awareness Training
	No effects on historic properties	• No Adverse Effect on the Segment of Route 66: West Huntington Drive and North Eastern Avenue, San Marino City Hall and Fire Station, Arroyo Seco Parkway Historic District (including the State-owned bridge at the Fair Oaks Avenue Overcrossing [53 0440]), Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue, 270 South Orange Grove Boulevard, Markham Place Historic District, Rialto Theater, Fair Hope Building, Segment of Route 66: West Huntington Drive/ Fair Oaks Avenue, Segment of Route 66: West Huntington Drive/Fremont Avenue, Sequoyah School/Neighborhood Church (3 buildings: Children's Chapel, Nursery School, and Religious Education Building)	• No Adverse Effect based on compliance with Standard Conditions on El Jardin Del Encanto and Cascades Park, Old Pasadena Historic District, Glenarm Building and Electric Fountain, Rialto Theater, Fair Hope Building, and Oaklawn Waiting Station • No Adverse Effect on the Golden Gate Theater, Saint Alphonsus Church, Dr. Henry K. Kawamoto Office, Bekins Storage Co. Roof Sign, Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue, Segment of Route 66: East Colorado Boulevard, South Pasadena Middle School, Community Facilities Planners Building (aka Fair Oaks Professional Group), Raymond Hill Waiting Station, Segment of Route 66 (West Huntington Drive at foot of Fair Oaks Avenue), and War Memorial Building	• No Adverse Effect without Standard Conditions on 4777 East Cesar E. Chavez Avenue, Raymond Florist Historic District, Hospital Veterinary, Fair Hope Building, Rialto Theater, and Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 North Fremont • No Adverse Effect on the Glenarm Building and Electric Fountain, Oaklawn Waiting Station, War Memorial Building, South Pasadena Middle School, Raymond Hill Waiting Station, Segment of Route 66 (South Fair Oaks Avenue/ Fair Oaks Avenue), Arroyo Seco Parkway Historic District, 2020 Fremont Avenue, Otsungna Prehistoric Village Site, and Horatio Rust Site	• No Adverse Effect on the Norton Simon Museum, Raymond-Summit Historic District, Herkimer Arms Apartment House, 270 South Orange Grove Boulevard, Ambassador West Cultural Landscape Historic District, Markham Place Historic District, Old Pasadena Historic District, Otsungna Prehistoric Village Site, and Horatio Rust Site • No adverse effect on 42 historic properties above the tunnel segments in the Freeway Tunnel Alternative	**BRT Alternative** • Jardin Del Encanto and Cascades Park: o Project Condition BRT-1: Incorporate existing design features in the new medians and sidewalks o Project Condition BRT-2: Incorporate in-kind plant materials to replace vegetation removed during construction • Old Pasadena Historic District, Rialto Theatre, Fair Hope Building, and Oaklawn Waiting Station: o Project Condition BRT-3: Equipment Use – Use of equipment other than jackhammers to break up concrete o Project Condition BRT-4: Vibration Management – Preconstruction Building Survey, Vibration Monitoring During Construction, and Vibration Monitoring Plan • Glenarm Building and Electric Fountain o Project Condition BRT-3: Equipment Use o Project Condition BRT-5: Incorporate existing design features in the new medians and sidewalks **LRT Alternative** • Raymond Florist Historic District, Hospital Veterinary, Rialto Theatre, Fair Hope Building, 4777 East Cesar E. Chavez Avenue, Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 North Fremont Avenue: o Project Condition LRT-1: Public outreach and community input; evaluation of existing condition of historic buildings and

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						preconstruction crack survey; vibration and settlement monitoring and documentation during tunneling and excavation activities; implementation of additional preventive/corrective measures as needed, and Vibration Monitoring Plan including vibration instrumentation, monitors, and exceedance notification and reporting procedures. o Project Condition LRT-2: Vibration isolation systems –Incorporate available vibration-isolation systems that are most effective in reducing operational ground-borne noise and vibration into the final construction design • Otsungna Prehistoric Village Site and Horatio Rust Site: o CR-4 – Post Review Discovery and Monitoring Plan **Freeway Tunnel Alternative (tunnel segment)** • Otsungna Prehistoric Village Site and Horatio Rust Site o CR-4 – Post Review Discovery and Monitoring Plan
Hydrology and Floodplains	No temporary effects to hydrology and floodplains.	No improvements would result in construction activities or encroachment within floodplains.	No improvements would result in any construction activities or encroachment within floodplains.	No improvements would result in any construction activities or encroachment within floodplains.	• Temporary construction impacts and potential erosion from clearing of land and vegetation.	No avoidance, minimization, and/or mitigation measures are required.
	No permanent effects to hydrology and floodplains.	No permanent effects to hydrology and floodplains	No permanent effects to hydrology and floodplains	No permanent effects to hydrology and floodplains	• No permanent impacts on floodplain values. • A nominal reduction of the floodplain boundaries of the Dorchester Channel and Laguna Regulating Basin, which would not result in an increase in the water surface elevation in the Laguna Regulating Basin and would result in only a minor increase in water surface elevation in Dorchester Channel (dual-bore design variation only).	
Water Quality and Storm Water Runoff	No temporary water quality and storm runoff effects.	• Temporary disturbance of approximately 21 ac of soil during construction	• Temporary disturbance of approximately 35 ac of soil during construction • The BRT Alternative would also include construction and operation impacts similar to the TSM/TDM Alternative.	• Temporary disturbance of approximately 33 ac of soil during construction • Construction of the TSM/TDM component of the LRT Alternative would disturb a total of approximately 11 ac of soil. Therefore, the total disturbed soil area during construction of the LRT Alternative would be approximately 44 ac. • Groundwater de-watering during construction	• Temporary disturbance of approximately 81 ac and 93 ac of soil, respectively, for the single-bore and dual-bore tunnel design variations during construction • Construction of the TSM/TDM component of the Freeway Tunnel Alternative would disturb a total of approximately 9 ac of soil. Therefore, the total disturbed soil area during construction of the single-bore and dual-bore design variations of the Freeway Tunnel Alternative would be approximately 90 ac and 102 ac,	• **WQ-1: National Pollutant Discharge Elimination:** Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ. • **WQ-2: Dewatering:** Compliance with the requirements of Order No. R4-2013-0095 (NPDES No. CAG994004) for construction site dewatering. • **WQ-3: Groundwater Monitoring (applies to the LRT and Freeway**

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
					respectively. • Groundwater de-watering during construction	**Tunnel Alternatives):** A comprehensive investigation to establish a baseline for groundwater levels and quality (chemistry) in the areas in which tunneling or excavations would occur. • **WQ-4: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative):** Compliance with the provisions of the NPDES Permit, Statewide Storm Water Permit, Waste Discharge Requirements (WDRs). • **WQ-5: Improvements Outside State-Owned Right of Way (applies to the TSM/TDM, BRT, and LRT Alternatives):** Compliance with the Standard Urban Storm Water Mitigation Plan (SUSMP) prepared for the Los Angeles Regional Water Quality Control Board WDRs for Municipal Separate Storm Sewer System Order No. R4-2012-0175 • **WQ-6: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative):** A Caltrans-approved Design Pollution Prevention BMPs will be prepared. • **WQ-7: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative):** Caltrans-approved Treatment BMPs will be prepared and implemented.
	No permanent water quality and storm runoff effects.	• A permanent increase in impervious surface area of approximately 3.8 ac • Treatment of 76% of newly created or replaced impervious surface area storm water runoff within State-owned ROW	• A permanent increase in impervious surface area of approximately 1.2 ac • Treatment of 575% and 114%, respectively, of the new impervious surface area within and outside State-owned ROW. • The total net increase in impervious surface area would be approximately 3.8 ac for the TSM/TDM component of the BRT Alternative. Therefore, the total net increase in impervious surface area for the BRT Alternative would be approximately 5 ac.	• A permanent increase in impervious surface area of approximately 16.5 ac • Treatment of 31% of the new impervious surface area within State-owned ROW and 47% of the newly created or replaced impervious surface area outside State-owned ROW. • The total net increase in impervious surface area would be approximately 2.2 ac for the TSM/TDM component of the LRT Alternative. Therefore, the total net increase in impervious surface area for the LRT Alternative would be approximately 18.7 ac.	• A permanent increase in impervious surface area of approximately 1.7 ac and 13.5 ac, respectively, for the single-bore and dual-bore design variations • Treatment of 5,350% and 705%, respectively, of the net new impervious surface area for the single-bore and dual-bore design variations • The total net increase in impervious surface area would be approximately 1.1 ac for the TSM/TDM component of the single-bore and dual-bore design variations of the Freeway Tunnel Alternative. Therefore, the total net increase in impervious surface area would be approximately 2.8 ac and 14.6 ac, respectively.	No avoidance, minimization and/or mitigation measures are required.
Geology, Soils, Seismic, and Topography	No temporary geology and soils effects.	• Minor grading activities with no modification of existing topography • Low potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and/or landslides • Low potential for soil settlement, collapse, and expansion	• Minor grading activities with no modification of existing topography • Low potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides • Low potential for soil settlement, collapse, and expansion	• Soil excavation and tunneling • Low to moderate potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides • Low potential for soil settlement, collapse, expansion, and lateral	• Soil excavation and tunneling • Low to moderate potential to encounter naturally occurring oil or gas during construction • Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides • Low potential for soil settlement, collapse, expansion, and lateral spreading	• **GEO-1: Final Geotechnical/Baseline Report:** A comprehensive geologic and geotechnical investigation will be conducted and design-level geotechnical/baseline reports will be prepared. • **GEO-2: Quality Assurance/Quality Control Plan:** The Resident Engineer will maintain a quality assurance/

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Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
		• Improvements in a Liquefaction Hazard Zone • Moderate erosion of surficial soils • Improvements that cross the active Raymond and potentially San Rafael Faults • Improvements in a potential dam inundation area	• Improvements in a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond and potentially active San Rafael Faults	spreading • Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond and potentially active San Rafael Faults • Improvements in a potential dam inundation area • Slope instability • Potential for ground settlement and differential settlement immediately above and adjacent to the bored tunnel portion	• Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone • Moderate erosion of surficial soils • An alignment that crosses the active Raymond and potentially active San Rafael and Eagle Rock Faults • Improvements in a potential dam inundation area • Slope instability • Potential for ground settlement and differential settlement immediately above and adjacent to the bored tunnel portion	quality control plan during construction. Comprehensive real-time monitoring with geotechnical tunnel data management software and implementation of an observational approach to construction management will be implemented during construction of the LRT or Freeway Tunnel Alternatives. • **GEO-3: Tunnel Design (applies to the LRT and Freeway Tunnel Alternatives):** Project Engineer will make sure that measures to prevent effects from tunnel construction and operation are included in the comprehensive geologic and geotechnical investigation and the design-level geotechnical/baseline report and the project design and specifications. • **GEO-4: Tunnel Construction (applies to the LRT and Freeway Tunnel Alternatives):** It is expected that bored tunnels for either the LRT or Freeway Tunnel Alternative would be constructed using a tunnel boring machine (TBM). During construction, the Project Engineer will select a pre-qualified contractor with experience with large, pressurized-face TBMs.
Paleontology	No temporary paleontological resource effects. All impacts are considered permanent	No temporary paleontological resource effects. All impacts are considered permanent	No temporary paleontological resource effects. All impacts are considered permanent	No temporary paleontological resource effects. All impacts are considered permanent	No temporary paleontological resource effects. All impacts are considered permanent	No measures required.
	No permanent paleontological effects	• Minor ground disturbance in areas with high sensitivity for paleontological resources. • During excavation and grading, fossils would be able to be recovered	• Minor ground disturbance in areas with high sensitivity for paleontological resources. • During excavation and grading, fossils would be able to be recovered	• Improvements located in areas with high sensitivity for paleontological resources • The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	• Located in area with high sensitivity for paleontological resources • The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	• **PAL-1: Paleontological Mitigation Plan and Paleontological Resources Impact Mitigation Program**: A PMP or PRIMP is required that addresses monitoring and treatment of fossils.
Hazardous Waste and Materials	No temporary or permanent hazardous waste effects	• Four properties with known hazardous waste contamination are located adjacent to or within the TSM/TDM Alternative • Widening and/or demolition of bridges may encounter asbestos-containing materials	• Three properties with known hazardous waste contamination are located adjacent to the BRT Alternative • No bridge widening/demolition proposed	• Four properties with known hazardous waste contamination are located adjacent to or within the LRT Alternative • No bridge widening/demolition proposed • Bored tunnel will be water and gas tight, and the intrusion of hazardous materials/gas into the tunnel is not expected	• Two properties with known hazardous waste contamination are located adjacent to the Freeway Tunnel Alternative • Widening and/or demolition of existing bridges may encounter asbestos-containing materials • Bored tunnel will be water and gas tight and the intrusion of hazardous materials/gas into the tunnel is not expected	• **HW-1: Striping and Pavement Markings:** Sampling, handling, treatment and disposal of striping and pavement markings will be conducted in accordance with applicable local, State and federal regulations. • **HW-2: Transformers (applies to the TSM/TDM, BRT, and LRT Alternatives):** Transformer removal, required, removed and disposed of in accordance with applicable State regulations. • **HW-3: Lead Compliance Plan:** A Lead Compliance Plan in accordance with applicable regulations that will address the presence of aerially deposited lead (ADL) in the soils within the project area and the health and safety of

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Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						construction workers. • **HW-4: Aerially-Deposited Lead Investigation:** Sampling, handling, treatment and disposal ADL will be conducted consistent with applicable local, State and federal regulations and requirements. • **HW-5: Demolition of Structures and Bridges:** Structures planned for demolition within the project area will be assessed for the possible presence of asbestos-containing materials (ACM), lead-based paint (LBP), and equipment containing chlorofluorocarbons (CFCs). • **HW-6**: **SCAQMD Rule 1403:** Compliance with SCAQMD Rule 1403 during demolition of bridges and structures. • **HW-7: Phase II Site Investigations:** Phase II Site Investigations will be conducted to determine if special handling, treatment, or disposal provisions associated with hazardous wastes will be required for the project. • **HW-8: Soils Adjacent to the Railroad ROW (applies to the TSM/TDM Alternative):** Soils adjacent to railroad ROW will be sampled to determine whether they require special handling and disposal. • **HW-9: Tunnel Construction Activities (applies to the LRT and Freeway Tunnel Alternatives):** Tunnel spoils will be tested prior to removal off-site and disposed of at an appropriate landfill or designated site. • **HW-10 Unknown Hazards (applies to all four Build Alternatives):**Excavation and demolition activities will be monitored and if unknown hazards encountered, characterization, treatment and disposal will be consistent with federal and state regulations. • **WQ-2**: Dewatering • **GEO-1:** Final Geotechnical/Baseline Report
Air Quality	No temporary construction air quality effects	• Short-term air quality impacts from construction emissions	• Short-term air quality impacts from construction emissions • Although the BRT Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the BRT Alternative, therefore, the emissions would not be additive.	• Short-term air quality impacts from construction emissions • Although the LRT Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the LRT Alternative, therefore, the emissions would not be additive.	• Short-term air quality impacts from construction emissions • Although the Freeway Tunnel Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the single-bore design variation, therefore, the emissions would not be additive.	• **AQ-1: Fugitive Dust**: Compliance with South Coast Air Quality Management District Rule 403. • **AQ-2: Equipment and Vehicle Emissions**: During all site preparation, grading, excavation, and construction, Construction Contractor required to reduce vehicle and equipment emissions through various measures. • **AQ-3: Diesel Fuel Emissions and**

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Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						Sensitive Receptors: Construction Contractor to implement measures to reduce diesel fuel emissions near sensitive receptors. • **AQ-4: Caltrans Standard Specifications for Construction (applies to the Freeway Tunnel Alternative)**: Comply with Caltrans Standard Specifications for Construction (Sections 14-9.03 and 18 [Dust Control] and Section 39-3.06 [Asphalt Concrete Plant Emissions]). • **Measure AQ-5 Metro Green Construction Policy (applies to the TSM/TDM, BRT, and LRT Alternatives)**: Metro will require the Construction Contractors to comply with its "Green Construction Policy" (adopted 2011, or more current).
	The 2020 and 2035 regional air quality emissions under the No Build Alternative are projected to be higher than existing emissions levels.	• 2020 PM_{10} emissions higher than the 2020 No Build Alternative emissions • Criteria pollutant emissions higher than the 2035 No Build Alternative emissions, with the exception of ROGs • 2035 diesel PM plus diesel exhaust organic gas emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis	• Criteria pollutant emissions higher than the 2035 No Build Alternative emissions, with the exception of ROGs • 2035 diesel PM plus diesel exhaust organic gas emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis • The operational air quality analysis for the BRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the BRT Alternative	• Criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of ROGs • 2025 diesel PM plus diesel exhaust organic gas emissions higher than the 2025 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis • The operational air quality analysis for the LRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the LRT Alternative	**Single-Bore** • PM_{10} and $PM_{2.5}$ emissions higher than the 2025 and 2035 No Build Alternative emissions • Highest 24-hour and annual $PM_{2.5}$ and annual PM_{10} concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis **Dual-Bore** • 2025 criteria pollutant emissions higher than the 2025 No Build Alternative emissions, with the exception of reactive organic gases and carbon monoxide • 2035 criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of reactive organic gas emissions • PM_{10} 2035 emissions higher than the existing condition emissions • Highest 24-hour and annual $PM_{2.5}$ and annual PM_{10} concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Consistent with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to	--

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
					traffic assumptions" in the Southern California Association of Governments' regional emissions analysis for the tolled operational variation The operational air quality analysis for the Freeway Tunnel Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the Freeway Tunnel Alternative	
Noise	No temporary noise effects	• Less than perceptible temporary noise impacts from construction traffic and activity	• Less than perceptible temporary noise from construction traffic and activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously	• Less than perceptible temporary noise impacts from construction traffic and activity • Short-term ground-borne noise and vibration effects from tunnel boring construction activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously	• Less than perceptible temporary noise impacts from construction traffic and activity • Short-term ground-borne noise and vibration effects from tunnel boring construction activity • Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously.	• **N-1: Construction in State ROW (applies to the Freeway Tunnel Alternative)**: Within State-owned ROWs noise will be controlled in conformance with Caltrans Standard Specifications Section 14-8.02, "Noise Control." • **N-2: Construction Outside State ROW (applies to the TSM/TDM, BRT, and LRT Alternatives):** During construction outside State-owned ROWs, compliance with the hours of operation, the allowable noise levels at specified distances from construction activities, and other noise reduction/avoidance requirements in the applicable jurisdiction's Municipal Code and/or Noise Ordinance will be required. • **N-3: Tunnel Boring Machine (applies to the LRT and Freeway Tunnel Alternatives):** Metro (LRT Alternative) or Caltrans (Freeway Tunnel Alternative), as appropriate, will require the Construction Contractor to maintain machinery in good working order during all tunnel boring activities. • **N-4: Supply and Muck Trains (applies to the LRT and Freeway Tunnel Alternatives):** The Metro (LRT Alternative) or Caltrans (Freeway Tunnel Alternative) Project Engineer will include specific minimization measures in the Plans, Specifications, and Estimates (PS&E) if supply or muck trains are used to remove spoils. • **N-5: Ground-Borne Noise and Vibration:** For the TSM/TDM and BRT Alternatives, Caltrans or Metro will not allow the Construction Contractor to use pile driving or other activities that generate high levels of vibration during the construction of the TSM/TDM or BRT Alternatives. Caltrans and Metro will require the Construction Contractor to carry out construction activities for the LRT and Freeway Tunnel Alternatives in compliance with

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
						applicable federal, State and local noise and vibration guidance.
	No permanent noise effects	• Noise levels at approximately 27 receptor locations that would approach or exceed the NAC as applicable to the land uses at each sensitive receptor location • Seven noise barriers were found to be reasonable and feasible	• Operational long-term traffic noise impacts • Noise levels at approximately 129 receptor locations that would approach or exceed Noise Abatement Criteria • Noise levels at approximately 9 receptor locations that would approach or exceed the NAC as applicable to the land uses at each receptor location • Three modeled noise barriers were found to be reasonable and feasible • Five noise barriers in the TSM/TDM Alternative would also be included in the BRT Alternative	• Long-term ground-borne noise during operation • Noise barriers ranging in height from 4.0 to 9.5 feet will be placed at the edge of the track and a noise barrier will be placed along the perimeter of the LRT maintenance yard • Approximately 12 receptors will experience a moderate impact while approximately 5 receptors will experience a severe noise impact as defined by FTA noise criteria. • It is expected that along with the LRT Alternative, the TSM/TDM Alternative components will be constructed except improvements T-1. Therefore, five barriers identified for the TSM/TDM improvements are recommended • Ground-borne vibration impacts to approximately 450 residential buildings and 1 commercial office building	• Operational long-term traffic noise impacts associated with traffic noise • The noise levels at approximately 66 receptor locations for the single-bore design variation and approximately 75 receptor locations for the dual-bore design variation would approach or exceed the NAC as applicable to the land uses at each sensitive receptor location • Six modeled noise barriers were found to be reasonable and feasible • Five noise barriers in the TSM/TDM Alternative would also be included in the Freeway Tunnel Alternative	• **N-6: Grifols Vibration Study**: For the TSM/TDM Alternative, Caltrans or Metro will not allow the Construction Contractor to use pile driving or other activities that generate high levels of vibration during the construction of the TSM/TDM Alternative. During PS&E for the Freeway Tunnel Alternative, the Caltrans Project Engineer will prepare a site-specific evaluation of potential airborne dust due to vibration associated with freeway tunnel construction at the Grifols facility. The analysis will use more detailed engineering and soil conditions developed during final design. The Caltrans Project Engineer will include the results of the evaluation, and any specific measures to ensure that vibration from the Project does not affect the clean room's compliance with the International Organization for Standardization (ISO) standards for airborne dust in clean rooms, if found to affect clean room compliance with ISO airborne dust standards, will be incorporated into the PS&E. During PS&E for the LRT Alternative, the Metro Project Engineer will prepare a site-specific evaluation of potential airborne dust due to vibration associated with the construction of the LRT Alternative at the Grifols facility. The analysis will use more detailed engineering and soil conditions. The Metro Project Engineer will include the results of the evaluation, and any specific measures to address vibration, if found to affect clean room operation, shall be incorporated into the PS&E. • **N-7: Vibration Isolation Systems (applies to the LRT Alternative):** The Metro Project Engineer, during final design of the LRT Alternative, will conduct additional field testing and analysis for the specific identification of ground-borne noise impacts and will incorporate the vibration isolation system or systems to comply with FTA ground-borne noise level criteria. The vibration isolation systems could be utilized.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Energy	There are no temporary energy impacts.	• Construction would require approximately 33,600 billion BTUs	• Construction would require approximately 55,300 billion BTUs	• Construction would require approximately 422,000 billion BTUs	• Construction would require approximately 523,000 billion BTUs (single bore) and 926,000 billion BTUs (dual bore)	• **E-1: Construction Efficiency Plan**: As part of the Plans, Specifications, and Estimates phase, the Project Engineer will prepare a construction efficiency plan.
	--	• Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	• Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	• Maintenance-related energy consumption would increase approximately 0.2% in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in an approximately 0.7% increase from the 2035 baseline condition (No Build Alternative)	For the single-bore design variation: • Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 baseline condition (No Build Alternative) • Operational energy consumption in the study area would result in an approximately 0.7 to 1.0 % decrease (single bore) and from the 2035 baseline condition (No Build Alternative) For the dual-bore design variation: • Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 No Build Alternative. • Operational energy consumption in the study area would result in no change compared to the 2035 No Build Alternative.	No measures required.
Natural Communities	No temporary or permanent impacts to natural communities.	• No temporary or permanent impacts on sensitive natural communities • Temporary impacts to non-sensitive plant communities (0.3 acre of nonnative grassland and 0.5 acre of disturbed/developed) • Permanent impacts to non-sensitive plant communities (less than 0.1 acre of nonnative woodlands and 0.7 acre of disturbed/developed)	• No temporary or permanent impacts on sensitive natural communities • Temporary impacts to non-sensitive plant communities (0.6 acre of disturbed/developed) • Permanent impacts to non-sensitive plant communities (1.9 acres of nonnative grassland and 123.8 acres of disturbed/developed)	• No temporary or permanent impacts on sensitive natural communities • Temporary impacts to non-sensitive plant communities (2.1 acres of nonnative grassland, 8.0 acres of nonnative woodland, and 29.7 acres of disturbed/developed) • Permanent impacts to non-sensitive plant communities (12.6 acres of nonnative grassland, 3.9 acres of nonnative woodland, and 93.6 acres of disturbed/developed)	• The single-bore and dual-bore design variations would each result in permanent impacts to approximately 1.09 acres of wetland complex and would potentially result in indirect temporary impacts to nearby riparian habitats. • The single-bore design variation would result in temporary impacts to non-sensitive plant communities (2.9 acres of nonnative grassland, less than 0.1 acre of nonnative woodland, and 53.4 acres of disturbed/developed) • The dual-bore design variation would result in temporary impacts to non-sensitive plant communities (2.2 acres of nonnative grassland, 1.1 acres of nonnative woodland, and 51.7 acres of disturbed/developed) • The single-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 31.6 acres of nonnative woodland, and 244.9 acres of disturbed/developed) • The dual-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 32.4 acres of nonnative woodland, and 244.9 acres of	• **NC-1 – Riparian/Riverine Habitat Protection (applies to the Freeway Tunnel Alternative):** Environmentally Sensitive Area (ESA) fencing or other marker will be installed around any riparian or riverine habitats to be preserved. No grading or fill activities or structures will be authorized in marked areas. • **NC-2 – Construction Plan (applies to the Freeway Tunnel Alternative):** Nonsensitive upland habitat areas will be designated for equipment maintenance, staging, fueling, and other related activities. • **NC-3 – Compliance Monitoring (applies to the Freeway Tunnel Alternative):** The Construction Contractor will be required to have a qualified biologist monitor during construction in the vicinity of riparian and riverine areas. • **WQ-1 – National Pollutant Discharge Elimination:** Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ. • **IS-1 –** Weed Abatement Program

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
					disturbed/developed)	• **WET**-1: Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit • **WET**-2: Obtain CDFW Streambed Alteration Agreement • **WET**-3: Obtain RWQCB Section 401 Water Quality Certification
Wetlands and Other Waters	No temporary or permanent impacts to wetlands and other resources	No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	• The single-bore design variation would result in approximately 0.02 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. • The dual-bore design variation would result in approximately 0.2 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. • The single-bore design variation would result in approximately 0.06 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel • The dual-bore design variation would result in approximately 0.5 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel • The permanent impacts on the Laguna Channel would not impact the Arroyo Seco	• **WET-1 –** Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit • **WET-2 –** Obtain CDFW Streambed Alteration Agreement (applies to the Freeway Tunnel Alternative) • **WET-3 –** Obtain RWQCB Section 401 Water Quality Certification (applies to the Freeway Tunnel Alternative) • **NC-1:** Riparian/Riverine Habitat Protection • **NC-2:** Construction Plan • **NC-3:** Compliance Monitoring • **WQ-1:** National Pollutant Discharge Elimination • **WQ-**2: Dewatering • **WQ-**3: Groundwater Monitoring • **WQ-**4: Improvements in State-Owned ROW • **WQ-**5: Improvements Outside State-Owned ROW • **WQ-**6: Improvements in State-Owned ROW • **IS-**1: Weed Abatement Program
Plant Species	No temporary or permanent impacts to plant species	No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields)	No temporary direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields) The BRT Alternative would potentially result in removal of approximately 136 trees protected by local tree ordinances.	• No temporary or permanent direct or indirect impacts on Parish's gooseberry and slender mariposa-lily • Temporary impacts to approximately 8 trees within the State right of way not protected by a local ordinance • Temporary indirect impacts and exacerbate existing indirect permanent edge effects on a Coulter's goldfields population within approximately 250 feet of the permanent impact area for the LRT Alternative • Removal of approximately 21 trees protected by various local tree ordinances	• No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-lily, and Coulter's goldfields) • Temporary impacts to approximately 36 trees in the City of Pasadena that are protected by the City's Trees and Tree Protection Ordinance • Potential permanent impacts to the Coulter's goldfields within the permanent impact area of the single-bore and dual-bore design variations • Potential permanent impacts to a Southern California black walnut tree that is approximately 4 feet outside the permanent impact area for the Freeway	• **PS-1 – Coulter's Goldfields (applies to the LRT Alternative):** Should the LRT Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the Biological Study Area (BSA) be unavailable, effects of the LRT Alternative on the Coulter's goldfields population will be addressed. • **PS-2 – Coulter's Goldfields (applies to the Freeway Tunnel Alternative):** Should the Freeway Tunnel Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the BSA be unavailable, the effects of the Freeway

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
					Tunnel Alternative • The single-bore and dual-bore design variations would result in removal of approximately 84 trees protected by local tree ordinances	Tunnel Alternative on the Coulter's goldfields population will be addressed. • **PS-3 – Southern California Black Walnut (applies to the Freeway Tunnel Alternative):** Implement measures to address the project effects on the Southern California black walnut. • **PS-4 – Trees Protected by City and/or County Ordinances:** Avoid/minimize impacts to trees where feasible. If not feasible, obtain appropriate tree removal permits.
Animal Species	No temporary or permanent impacts to threatened and endangered species	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Temporary indirect impacts through habitat loss if special-status bats begin using bridges (including the Garfield Avenue Bridge) proposed for demolition or widening as roosting habitat • Temporary and permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding and is suitable habitat for western spadefoot toad and San Bernardino ring-necked snake	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding, and is suitable habitat for western Spadefoot toad and San Bernardino ring-necked snake	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Indirect temporary impacts to riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities • Temporary impacts through habitat loss if special-status species bat populations begin using bridges proposed for removal as roosting habitat • Temporary and permanent impacts to nonnative woodlands that may contain eucalyptus trees with winter roosting aggregations of adult monarch butterflies	• Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake • Indirect temporary and permanent impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place • Indirect temporary impacts to riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities • Temporary and permanent impacts to a limited amount of nonnative grasslands that may support milkweed plants required for monarch butterfly breeding and is suitable habitat for western spadefoot toad and San Bernardino ring-necked snake • Temporary and permanent impacts to nonnative woodlands that may contain eucalyptus trees with winter roosting aggregations of adult monarch butterflies • Temporary impacts through habitat loss if special-status species bat populations begin using bridges proposed for removal as roosting habitat	• **AS-1 – Bats:** Due to the presence of marginally suitable roosting habitat, avoidance and minimization efforts will be implemented. • **AS-2 – Monarch Butterfly:** Avoidance and minimization measures in areas of potentially suitable habitat for winter roosting aggregations of monarch butterfly and the species' egg, caterpillar, and pupal stages will be implemented. • **AS-3 – Amphibians and Reptiles:** Avoidance and minimization measures in areas of potentially suitable habitat for coast range newt, western spadefoot, two-striped garter snake, western pond turtle, San Bernardino ring-necked snake, and South Coast garter snake species will be implemented. • **AS-4 – Other Special-Status Bird Avoidance and Minimization Measures:** Avoidance and minimization efforts for birds protected under California Fish and Game Code Sections 3503 and 3503.5, and the Migratory Bird Treaty Act (MBTA) will be implemented.
Threatened and Endangered Species	No temporary impacts to threatened and endangered species	Potential temporary indirect impacts through habitat loss to Townsend's big-eared bats if they are discovered using bridges proposed for widening as roosting habitat and indirect temporary impacts to foraging bats may occur from if nighttime construction activities take place.	Determined to have no direct or indirect temporary impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	• **NC-1 –** Riparian/Riverine Habitat Protection • **NC-2 –** Construction Plan • **NC-3 –** Compliance Monitoring • **AS-1 –** Bats
	No permanent impacts to threatened and endangered species	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	No avoidance, minimization, and/or mitigation measures are required.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Invasive Species	No impacts to invasive species	Potentially result in the spread of permanent invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	The following measure is applicable to all four Build Alternatives: • **IS-1: Weed Abatement Program**
Cumulative Impacts	The No Build Alternative does not include any of the improvements in the SR 710 North Study Build Alternatives and, therefore, would not result in the cumulative impacts related to visual/aesthetics and animal species that could occur under the Build Alternatives.	**Visual/Aesthetics:** No cumulative impact. **Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	**Visual/Aesthetics:** No cumulative impact. **Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	**Visual/Aesthetics:** Potential to contribute to an cumulative impact for the Eastside Phase II Transit Corridor Project. **Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	**Visual/Aesthetics:** No cumulative impact. **Animal Species:** Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	No measures beyond the project-specific measures listed above.

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In addition to the comparison of alternatives provided in Table 2.15, a Cost-Benefit Analysis has been prepared for the proposed project. The Cost-Benefit Analysis provides a means of comparing the costs of an alternative directly with the benefits that the alternative would deliver. In addition to environmental factors, the Cost-Benefit Analysis includes capital costs, operation and maintenance costs, time saving benefits, value of time, vehicle operating cost saving, and safety performance. The result of the Cost-Benefit Analysis will be considered in conjunction with the information provided in Table 2.15 during identification of the Preferred Alternative.

2.4 Summary of the Final Decision Making Process

After circulation of the Draft EIR/EIS, all comments will be considered, and Caltrans, in consultation with Metro, will identify a Preferred Alternative and make the final determination of the project's effect on the environment. Under the California Environmental Quality Act (CEQA), Caltrans will certify that the project complies with CEQA, prepare Facts and Findings for all significant impacts identified, prepare a Statement of Overriding Considerations (SOC) if needed for impacts that will not be mitigated below a level of significance under CEQA, and certify that the findings and SOC have been considered prior to project approval. Caltrans will then file a Notice of Determination with the State Clearinghouse that will identify whether the project will have significant impacts, if mitigation measures were included as conditions of project approval, that findings were made, and that an SOC was adopted. With respect to the National Environmental Policy Act (NEPA), Caltrans, as assigned by the FHWA, will document and explain its decision regarding the selected alternative, project impacts, and mitigation measures in a Record of Decision (ROD).

2.5 Alternatives Considered but Eliminated from Further Discussion

2.5.1 Alternative Screening

During the preliminary studies for the SR 710 North Study, a wide range of possible transportation alternatives were evaluated. Alternatives were identified based on past studies and comments received from stakeholders, including elected officials, city and agency staff, and the community. The resulting options were evaluated and refined through a sequential screening process (including preliminary, initial, and secondary screenings) to identify the alternatives that best meet the Need and Purpose of the study. The screening process was detailed in the *Alternatives Analysis Report* (December 2012) and is summarized below.

- **Preliminary Screening:** An unscreened set of alternatives was identified during project initiation through a process that included a review of prior studies and public input received during the "710 Conversations" scoping process conducted by Metro and Caltrans in 2011. From this large set of alternatives, the preliminary screening step led to the identification of the preliminary set of alternatives, consisting of 42 alternatives representing a reasonable range of modes and alignments. Criteria used for the preliminary screening included the potential to accommodate regional north-south travel, reduce local street congestion, minimize community impacts, minimize the potential to encounter contaminated soil and groundwater, and accommodate ridership potential (for relevant modes). Within each travel mode, alternatives were evaluated against each other, and the most promising alternatives from each mode were selected to be included in the preliminary set of alternatives.

- **Initial Screening:** The initial screening evaluated the preliminary set of alternatives based on eight project objectives. In general, the initial screening relied on available data and schematic representations of each alternative. To find the best performing alternatives within each mode in the initial screening, the performance of each alternative was compared only to that of other alternatives of the same mode. This evaluation step resulted in the identification of the initial set of alternatives (consisting of 12 alternatives and representing each mode from the preliminary set of alternatives) which were carried forward for a secondary screening.
- **Secondary Screening:** In the secondary screening step of the alternatives analysis phase, the initial set of alternatives were studied and evaluated using detailed performance measures reflecting the eight project objectives. Additional engineering and environmental evaluation of each alternative was conducted based on travel demand and ridership forecasting specific to each alternative and the conceptual-level engineering plans. One alternative in each mode that performed best on the secondary screening was brought forward for further study in this EIR/EIS.

As stated above, 12 alternatives were identified and studied as part of the secondary screening in the *Alternatives Analysis Report* (December 2012). The 12 alternatives included the No Build Alternative, the TSM/TDM Alternative, 2 BRT alternatives (BRT-1 and BRT-6), 2 LRT alternatives (LRT-4A and LRT-6), 4 freeway alternatives (F-2, F-5, F-6, and F-7), and 2 highway alternatives (H-2 and H-6). In addition, one BRT design variation (BRT-6A) and two LRT design variations (LRT-4B and LRT-4D) were analyzed. Alternatives BRT-1, BRT-6A, LRT-4B, LRT-4D, LRT-6, F-2, F-5, F-6, H-2, and H-6 were considered but withdrawn from further environmental study as stand-alone alternatives, and are described below. The remaining alternatives (No Build, TSM/TDM, BRT-6, LRT-4A/B, and F-7) were refined and carried forward for further study in this EIR/EIS.

2.5.1.1 Alternative BRT-1

Alternative BRT-1 would provide BRT service between Los Angeles Union Station and the Jet Propulsion Laboratory (JPL) in La Cañada Flintridge.

Among the BRT alternatives evaluated in the *Alternatives Analysis Report* (December 2012), the measures for the objectives related to transportation system performance were similar to one another and did not clearly favor one alternative over the others. However, Alternative BRT-1 would require ROW acquisition and would also have a greater potential impact on sensitive habitat. Therefore, Alternative BRT-1 was dropped from further consideration.

2.5.1.2 Alternative BRT-6A

Alternative BRT-6A is a design variation of Alternative BRT-6 but with a different terminal loop than Alternative BRT-6. Instead of traveling both eastbound and westbound on Colorado Boulevard, Alternative BRT-6A would travel only eastbound on Colorado Boulevard and then return westbound on California Boulevard after stopping at Pasadena City College and Caltech.

Among the BRT alternatives evaluated in the *Alternatives Analysis Report* (December 2012), the measures for the objectives related to transportation system performance were similar to one another and did not clearly favor one alternative over the others. Therefore, Alternative BRT-6A was dropped from further consideration.

2.5.1.3 Alternative LRT-4B

Alternative LRT-4B was developed as a design variation of Alternative LRT-4A to reduce the length of the bored tunnel section. Alternative LRT-4B would originate and end at the same locations as Alternative LRT-4A. However, instead of entering a tunnel near the SR 710 terminus at Valley Boulevard, it would remain elevated along Mission Road and Palm Avenue in Alhambra, before entering a tunnel near Main Street. Alternative LRT-4B would have greater construction impacts compared to Alternative LRT-4A because of the location of the tunnel portal in a residential area, far from any freeway access. In addition, the tight curve from Mission Road to Palm Avenue would have resulted in lower design speeds, reducing the operating efficiency and attractiveness of the system to potential riders. Therefore, Alternative LRT-4A was dropped from further consideration.

2.5.1.4 Alternative LRT-4D

Alternative LRT-4D was developed as a design variation of Alternative LRT-4A to eliminate the bored tunnel section and use only cut-and-cover tunnel techniques. Alternative LRT-4D would originate at an underground station beneath Beverly Boulevard, near the existing Atlantic Station on the Metro Gold Line, and end at an underground station beneath the existing Fillmore Station on the Metro Gold Line.

Among the LRT alternatives evaluated in the *Alternatives Analysis Report* (December 2012), the measures for the objectives related to transportation system performance were similar to one another. However, on the measures for the objectives related to environmental and other concerns, Alternative LRT-4D would have greater property impacts compared to Alternatives LRT-4A and LRT-4B. Therefore, Alternative LRT-4D was dropped from further consideration.

2.5.1.5 Alternative LRT-6

Alternative LRT-6 would connect the existing Atlantic and Fillmore stations on the Metro Gold Line. Alternative LRT-6 would begin at an aerial station on Atlantic Boulevard near Pomona Boulevard and terminate with a new, elevated station above the existing Fillmore Station on the Metro Gold Line. The alternative would consist of at-grade and aerial segments.

Among the LRT alternatives evaluated in the *Alternatives Analysis Report* (December 2012), the measures for the objectives related to transportation system performance were similar to one another. However, on the measures for the objectives related to environmental and other concerns, Alternative LRT-6 was clearly inferior to Alternative LRT-4A/B. Alternative LRT-6 would require the acquisition of hundreds of properties, impact more historic period properties, and impact more community facilities. Therefore, Alternative LRT-6 was dropped from further consideration.

2.5.1.6 Alternative F-2

Alternative F-2 would originate at the existing SR 710 stub north of I-10 and connect to SR 2 between the Verdugo Road and SR 134 interchanges. The alternative would be an eight-lane freeway primarily constructed in two bored tunnels. Each tunnel would be dedicated to either northbound or southbound travel, with two lanes on each of two levels in each tunnel.

Among the freeway alternatives, Alternative F-7 was superior to Alternative F-2 on the measures for the objectives related to transportation system performance. In addition, Alternative F-2 would require over 300 property acquisitions. Therefore, Alternative F-2 was dropped from further consideration.

2.5.1.7 Alternative F-5

Alternative F-5 would also originate at the existing SR 710 stub north of I-10, similar to Alternative F-2, and connect to SR 134 near the Colorado Boulevard interchange. Alternative F-5 would also be an eight-lane freeway with two bored tunnels for directional travel similar to Alternative F-2. Alternative F-2 would provide access to the SR 134/SR 710 interchange both to and from SR 134 for both eastbound and westbound travel and interchange access to Valley Boulevard.

Among the freeway alternatives, Alternative F-7 was superior to Alternative F-5 on the measures for the objectives related to transportation system performance. In addition, Alternative F-5 would require over 200 property acquisitions. Therefore, Alternative F-5 was dropped from further consideration.

2.5.1.8 Alternative F-6

Alternative F-6 would also originate at the existing SR 710 stub north of I-10, but would consist of a combination of surface and depressed freeway segments, ultimately connecting to the existing SR 710 stub south of the I-210/SR 134 interchanges in Pasadena. Generally, Alternative F-6 would follow a very similar alignment to the “Meridian Variation” approved in the ROD in 1998. Ramps would provide access to the freeway from Valley Boulevard, Mission Road/Alhambra Avenue, Huntington Drive, and Del Mar Boulevard. Senate Bill 416, which was signed into law in 2014, mandated that Alternative F-6 no longer be deemed a feasible alternative.

Among the freeway alternatives, Alternative F-6 performed well on measures for the objectives related to transportation system performance. However, Alternative F-6 would have required over 400 property acquisitions in addition to properties that Caltrans already owns. Alternative F-6 would have also impacted more historic period properties and community facilities than Alternative F-7. Therefore, Alternative F-6 was dropped from further consideration.

2.5.1.9 Alternative H-2

Alternative H-2 would begin at the existing SR 710 stub north of I-10 and connect SR 710 directly to Concord Avenue. SR 710 would come to an end at Valley Boulevard and transition to a major arterial that would travel over Valley Boulevard, the UPRR tracks, and Mission Road/Alhambra Avenue to Concord Avenue. The alignment would ultimately end near the intersection of San Rafael Avenue and Linda Vista Avenue.

None of the highway alternatives evaluated in the *Alternatives Analysis Report* (December 2012) performed well on the measures for objectives related to transportation system performance. They also performed poorly on the measures for objectives related to environmental and other concerns. Alternative H-2 would require over 600 property acquisitions. Therefore, Alternative H-2 was dropped from further consideration.

2.5.1.10 Alternative H-6

Alternative H-6 would also begin at the existing SR 710 stub north of I-10 and connect SR 710 directly to Sheffield Avenue. SR 710 would come to an end at Valley Boulevard and transition to a major arterial that would travel over Valley Boulevard, the UPRR tracks, and Mission Road/Alhambra Avenue to Sheffield Avenue. The alignment would then continue to Huntington Drive, to Fair Oaks Avenue, to Columbia Street, and then to Pasadena Avenue. Just north of the intersection of Pasadena Avenue and Bellefontaine Street, the roadway would split into a northbound segment

along Pasadena Avenue and a southbound segment along St. John Avenue. The improvements in both directions would end near Del Mar Boulevard.

None of the highway alternatives evaluated in the *Alternatives Analysis Report* (December 2012) performed well on the measures for objectives related to transportation system performance. They also performed poorly on the measures for objectives related to environmental and other concerns. Alternative H-6 would require approximately 200 property acquisitions. In addition, Alternative H-2 would have the greatest potential impact to historic resources and designated historic districts/ buildings. Therefore, Alternative H-6 was dropped from further consideration.

2.5.2 Alternatives Withdrawn after the Alternatives Analysis

2.5.2.1 LRT Design Variations for the Southern Segment

Based on stakeholder feedback, two LRT design variations for constructing the LRT alignment within a tunnel in the southern portion of the alignment were evaluated, one under Mednik Avenue and one connecting to the Atlantic Station near Beverly Boulevard. Besides the additional expense of constructing a tunnel, launching the TBMs for either of these alignments would involve substantial ROW acquisition and traffic impacts. In addition, the tunnel configurations pose substantial design challenges due to the grade change around Corporate Center Drive, which would require substantial excavation of the adjacent hill. Therefore, a tunnel along the southern portion of the LRT alignment was dropped from further consideration.

2.5.2.2 Combined LRT/BRT Alternative

A combined LRT/BRT Alternative would include both an LRT alignment and a BRT alignment, providing both LRT and BRT transit service options in the corridor. While the alignments of the BRT and LRT are not identical, they serve similar markets. This alternative concept was withdrawn from further consideration because the two transit services would compete for the same customers. The analysis of the LRT and BRT Alternatives conducted individually for each service indicated that some of the new ridership would be drawn from existing transit services (especially bus). A new LRT or BRT service would provide transit mode and route choice options for existing transit customers. Because they compete for the same customers, a combined LRT/BRT Alternative would result in fewer transit trips than the sum of the two services individually. The capital and operational costs would be the sum of the two alternatives.

2.6 Permits and Approvals Needed

Depending on the Alternative, some or all of the permits, reviews, and approvals listed in Table 2.16 would be required for project construction and operation. The permits, reviews, and approvals identified in Table 2.16 apply to all Build Alternatives unless noted otherwise.

TABLE 2.16:
Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (• indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
FEDERAL AGENCIES						
Federal Highway Administration (FHWA)	Approval for Modified Access Report to the Interstate System	Obtained prior to project approval.				●
	Final Air Quality Conformity Finding (23 USC 327)	Obtained prior to Final EIR/EIS.	●	●		●
	Major Project Operational Independence and Non-Concurrent Construction Determination	Obtained prior to Final EIR/EIS.				●
	Cost Estimate Review (only for FHWA projects over $500 million)	Obtained prior to Final EIR/EIS.				●
	Draft Project Management Plan	Obtained prior to Final EIR/EIS.				●
	Final Project Management Plan	Obtained no later than 90 days after approval of the Record of Decision.				●
Federal Transit Administration (FTA)	Final Air Quality Conformity Finding (23 USC 327)	Obtained prior to Final EIR/EIS.		●	●	
	New Starts Application Approval	Obtained prior to Final EIR/EIS.			●	
	Full Funding Grant Agreement	Obtained prior to completion of final design.			●	
	Small Starts Application Approval	Obtained prior to Final EIR/EIS.		●		
United States Army Corps of Engineers (USACE)	Section 404 Permit for filling or dredging waters of the United States	Obtained during final design.				●
STATE AGENCIES						
California Department of Fish and Wildlife (CDFW)	1602 Agreement for Streambed Alteration	Obtained during final design.				●
State Water Resources Control Board (SWRCB)	Section 402 NPDES Permit (Construction Activity)	Obtained during final design.	●	●	●	●
	Section 402 NPDES Permit (Caltrans NPDES Permit)	Obtained during final design.				●
	Section 402 NPDES Permit (Industrial Activities)	Obtained during final design.	●	●	●	
State Historic Preservation Officer (SHPO)	Concurrence with the determinations of eligibility	SHPO concurrence received on **[to be determined].**	●	●	●	●
	Concurrence on the Finding of Effects	Finding of Effect will be submitted to SHPO after identification of Preferred Alternative.	●	●	●	●

TABLE 2.16:
Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (• indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
California Division of Occupational Safety and Health (Cal/OSHA)	Approval of construction permit	Obtained prior to construction.	●	●	●	●
Department of Toxic Substances Control (DTSC)l	Permits for disposal, treatment, and/or handling of hazardous materials encountered during excavation activities.	Obtained during final design.		●	●	●
REGIONAL AND/OR LOCAL AGENCIES AND UTILITIES						
County of Los Angeles Department of Public Works (LADPW)	Approval of encroachment permits	Prior to any construction that would affect LADPW facilities	●	●	●	●
	Approvals to relocate, protect-in-place, or remove LADPW facilities	Prior to any construction that would affect LADPW facilities	●	●	●	●
Regional Water Quality Control Board (RWQCB)	Section 401 Water Quality certification	Obtained during final design.				●
	Section 402 NPDES (Groundwater Dewatering)	Obtained during final design.	●	●	●	●
	Approval of waste discharge requirements	Obtained during final design.	●	●	●	●
	Approval of encroachment permits	Obtained during final design.	●	●	●	●
Cities of Alhambra, Los Angeles, Pasadena, and South Pasadena	Modifications to existing freeway agreements	Obtained prior to construction.				●
County of Los Angeles and the Cities of Alhambra, Los Angeles, Monterey Park, Pasadena , Rosemead, San Gabriel, San Marino, and South Pasadena	Approval of encroachment permits, street construction permits, street closures, detours, and associated improvements in the public ROW	Obtained prior to construction.	●	●	●	●
Cities of Alhambra, Los Angeles, and Pasadena; County of Los Angeles Sanitation District; and County of Los Angeles Flood Control District	Approvals for discharges into drainage and sewer systems required under MS4 Permits related to groundwater dewatering, if groundwater contamination is present	Obtained prior to construction.			●	●
County of Los Angeles, and the Cities of Alhambra, Los Angeles, Monterey Park, Pasadena, and South Pasadena	Demolition permits	Obtained prior to demolition.	●	●	●	

TABLE 2.16:
Permits, Reviews, and Approvals Required for Project Construction

Agency	Permit/Approval	Timing	Does it apply to the Build Alternative? (• indicates the permit or approval would likely be required)			
			TSM/TDM	BRT	LRT	Freeway Tunnel
City of Monterey Park	Section 4(f) consultation for Cascades Park	Obtained prior to the Final EIR/EIS.		●		
	Park Preservation Act consultation for Cascades Park	Obtained prior to the Final EIR/EIS.		●		
Utility Providers (electrical, water, storm drain, telecommunications, sanitary sewer, natural gas)	Approvals to relocate, protect in-place, or remove utility facilities	Prior to any construction activities that would affect utility facilities.	●	●	●	●
	Approval of encroachment permits	Prior to any construction activities that would affect utility facilities.	●	●	●	●
	Approval of connections to existing utility facilities	Prior to initiation of construction			●	●
	Approval of connections to existing utility facilities	Prior to initiation of operations			●	●
Union Pacific Railroad Company (UPRR)	Memorandum of Understanding and a Construction and Maintenance Agreement with the railroad	Prior to any construction within, above, or below railroad ROW.	●		●	●
Southern California Regional Rail Authority (SCRRA)	Approval of ROW encroachment permits	Prior to any construction above SCRRA railroad ROW.			●	●