07-LA-710, PM 26.7/32.1T
EA: 07-187900
Project ID: 0700000191

DRAFT PROJECT REPORT

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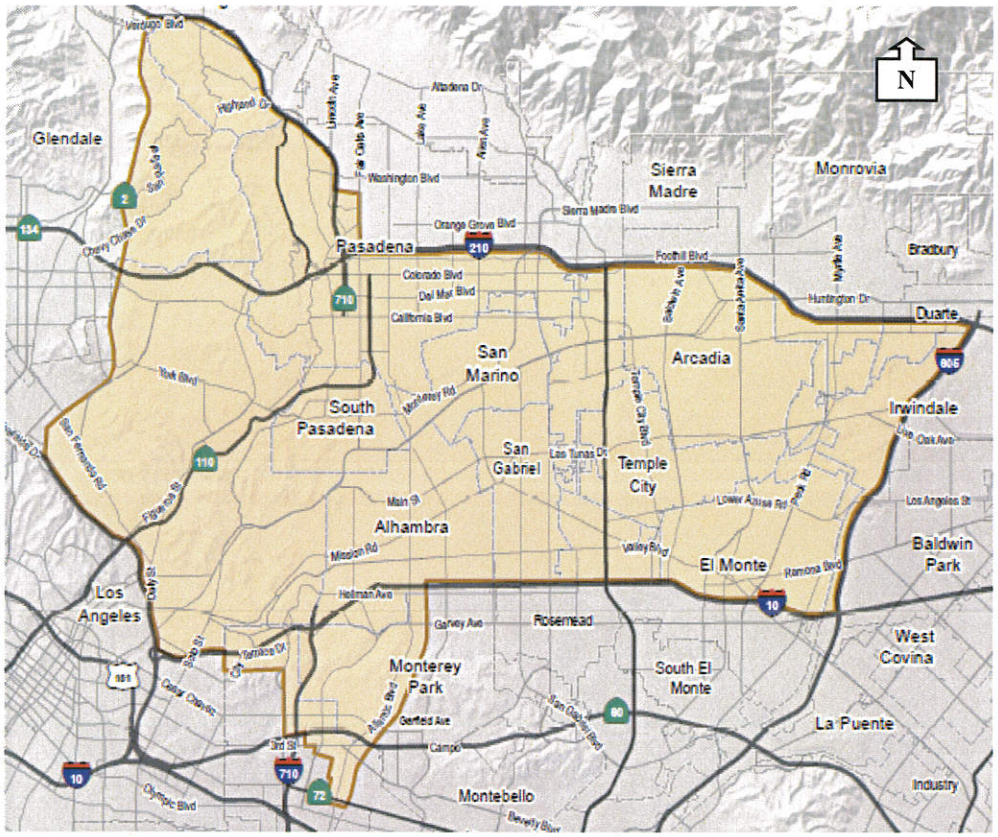


Improvements on State Route 710 (SR 710) and Surrounding Area
North to I-210, East to I-605, South to I-10, and West to I-5 and SR 2

The Right-of-Way Data Sheets were completed by a consultant. I have reviewed the right-of-way information contained in this Draft Project Report and the Right-of-Way Data Sheet attached hereto, and found the data to be in compliance as to form and procedures only. No inferences or assertions are made as to the validity of the data or values implied by the Right-of-Way Data Sheets.

ANDREW P. NIERENBERG
DEPUTY DISTRICT DIRECTOR – RIGHT OF WAY

APPROVAL RECOMMENDED:

JOHN K. LEE
PROJECT MANAGER

APPROVED:

JERREL KAM
DEPUTY DISTRICT DIRECTOR – DIVISION OF DESIGN

3-3-15
DATE

This Draft Project Report has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

JANET W. HUANG
REGISTERED CIVIL ENGINEER

1/13/2015
DATE

Prepared by

CH2MHILL

For

California Department of Transportation (Caltrans)

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
ADA	Americans with Disabilities Act
ADL	aerially deposited lead
ADT	average daily traffic
APS	Advance Planning Study
ASTM	ASTM International (formerly American Society for Testing and Materials)
ATM	Active Traffic Management
BC	begin horizontal curve
bgs	below ground surface
BMP	Best Management Practice
BNB	BRT noise barrier
BRT	Bus Rapid Transit
Cal State LA	California State University, Los Angeles
Caltrans	California Department of Transportation
CB	catch basin
CEQA	California Environmental Quality Act
CMS	changeable message sign
dBA	A-weighted decibel
DPR	Draft Project Report
DEIR/EIS	Draft Environmental Impact Report/Environmental Impact Statement
EB	eastbound
EC	end horizontal curve
FFFS	Fixed Fire Fighting System
FHWA	Federal Highway Administration
ft^2	square feet
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
FTNB	freeway tunnel noise barrier
HCM	Highway Capacity Manual
HDM	Highway Design Manual
HOV	high-occupancy vehicle
HRA	Health Risk Assessment

I	Interstate
ID	internal design diameter
ISA	Initial Site Assessment
ITS	Intelligent Transportation System
JPL	Jet Propulsion Laboratory
LID	low-impact development
LOS	level of service
LRT	Light Rail Transit
LRTP	Long-Range Transportation Plan
LSA	LSA Associates, Inc.
Metro	Los Angeles County Metropolitan Transportation Authority
mph	miles per hour
MSA	Metropolitan Statistical Area
MSAT	mobile source air toxic
MTC	Multimodal Transportation Centers
NAC	Noise Abatement Criteria
NADR	Noise Abatement Decision Report
NB	northbound
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NSR	Noise Study Report
OC	overcrossing
O&M	operations and maintenance
PPP	Public-Private Partnership
RCB	reinforced concrete box
RCC	reinforced concrete channel
RCP	reinforced concrete pipe
REC	recognized environmental condition
ROD	Record of Decision
ROW	right-of-way

RTP	Regional Transportation Plan
SB	southbound
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
SR	State Route
SWDR	Stormwater Data Report
SWITRS	Statewide Integrated Traffic Records System
TAP	Transit Access Pass
TASAS	Traffic Accident Surveillance and Analysis System
TBF	tree box filter
TBM	tunnel boring machine
TDM	Transportation Demand Management
TMP	Transportation Management Plan
TNB	TSM/TDM noise barrier
TSM	Transportation System Management
TSSP	Traffic Signal Synchronization Program
TTR	Transportation Technical Report
UPRR	Union Pacific Railroad
US	United States Route
VA	Value Analysis
VOC	volatile organic compounds
WB	westbound

07 - LA - 710, PM 26.7/32.1T
07 – 187900
EFIS 0700000191

DRAFT PROJECT REPORT
State Route 710 North Study

1. INTRODUCTION

The State Route (SR) 710 North Study is the culmination of a long history of efforts to address north-south mobility in east/northeast Los Angeles and the western San Gabriel Valley. The lack of continuous north-south transportation facilities leads to congestion on freeways and local streets, and poor transit operations within the area between SR 2 and Interstates 5, 10, 210, and 605 (I-5, I-10, I-210, and I-605, respectively). The SR 710 North Study area is shown in Figure 1-1.

The California Department of Transportation (Caltrans) is the lead agency under the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). Caltrans, in cooperation with the Los Angeles County Metropolitan Transportation Authority (Metro), proposes transportation improvements to improve efficiency and reduce congestion in the area. The SR 710 North Study area is approximately 100 square miles 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.

The proposed build alternatives were developed to improve the efficiency of regional and local north-south travel demands, reduce congestion, and minimize environmental impacts related to mobile sources in the study area. This Draft Project Report (DPR) will focus on the improvements within the proposed Caltrans right-of-way (ROW) of each alternative. The full scope of the Bus Rapid Transit (BRT) and Light Rail Transit (LRT) Alternatives, with the majority of improvements proposed outside Caltrans ROW (Chapter 5, Section A-III and A-IV of this DPR), will be presented in their respective Advanced Conceptual Engineering Reports.

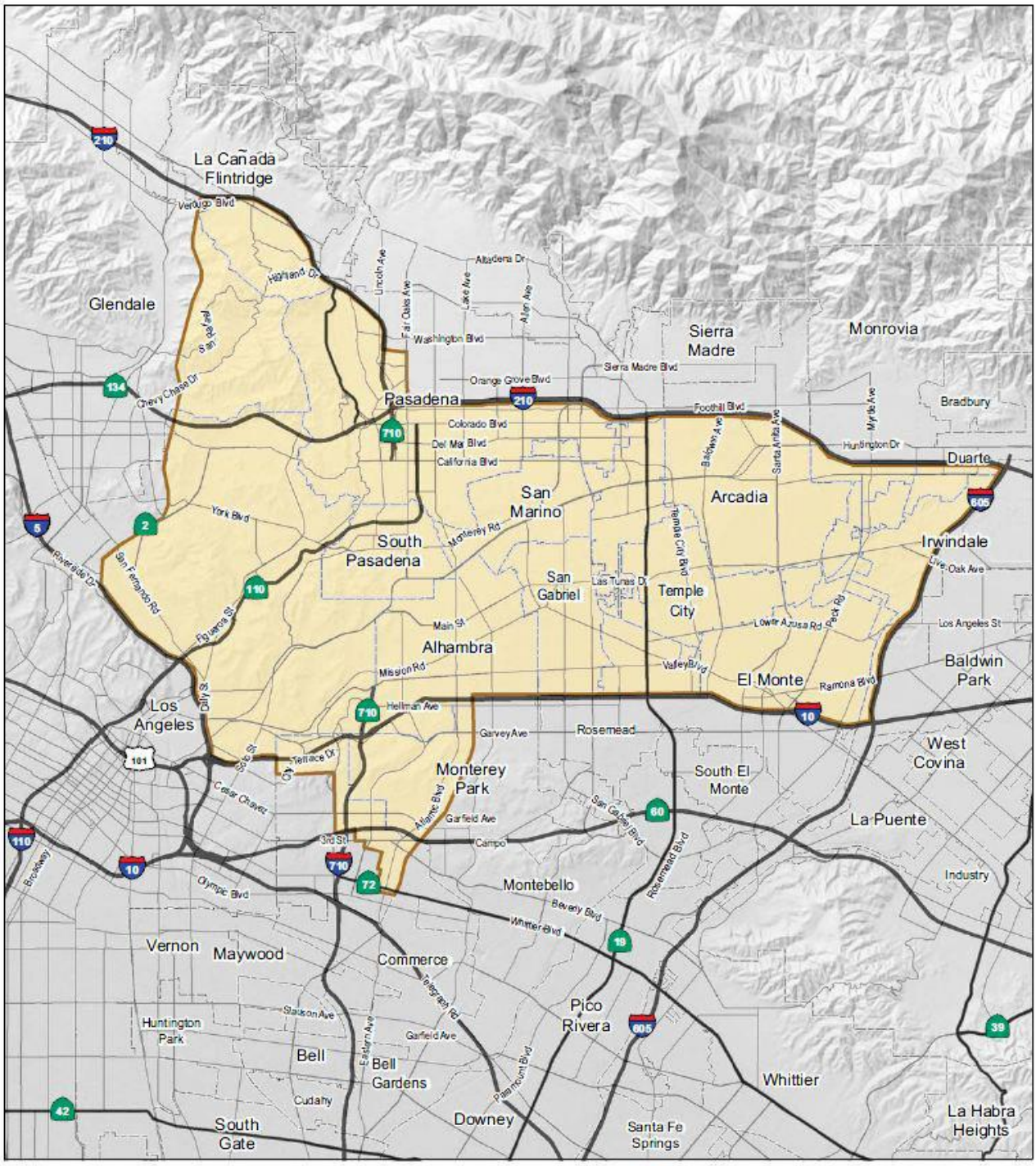
At the current stage, five alternatives are being refined to avoid or minimize potential impacts to the extent possible. Where impacts cannot be avoided or minimized, feasible mitigation measures are identified to reduce impacts. The five alternatives included in this report are:

- No Build Alternative
- Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative
- BRT Alternative
- LRT Alternative
- Freeway Tunnel Alternative

2. RECOMMENDATION

It is recommended that the DPR transmit the Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS), allowing the DEIR/EIS to be circulated to the public for review and comment. The supporting technical documents will be made available in facilities at Caltrans District 7, Metro, and local libraries in the study area. A complete distribution list can be found in the DEIR/EIS.

A public hearing will be held during the circulation period of the DEIR/EIS. All comments will be reviewed, responded to, taken into consideration, and incorporated into the final document as appropriate. It is also recommended that Caltrans and Metro prepare a Cooperative Agreement to define the terms and conditions under which the cooperative features of this project described herein will be implemented, and the roles and responsibilities of the respective parties.



LEGEND

SR 710 North Study Area

FIGURE 1-1

SR 710 North Study
Project Location
07-LA-710 (SR 710)
EA 187900
EFIS 0700000191

0 1.25 2.5
MILES

SOURCE: ESRI (2008); LSA (2013)

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3. BACKGROUND

A. Project History

The history of the planning efforts to complete the SR 710 Freeway corridor dates back to 1933 when Legislative Route 167, later renamed 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 (now I-210). The part of the facility from Long Beach to the I-10 was incorporated in 1983 into the Interstate Highway System as Interstate 710 (I-710). The part of the facility from I-10 to Valley Boulevard (southern stub) and from I-210 to the I-210/SR 710/SR 134 interchange (northern stub) was designated as SR 710 in 1984.

Over the years, planning efforts continued on 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 Federal Highway Administration (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. Feasibility studies were performed in 2006 that found a bored tunnel alternative would be viable and would warrant more detailed evaluation.

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.

As a result of initial screening, the *Alternatives Analysis Report* (AA Report) was issued with the *State Route 710 Study Conceptual Engineering Report* as one of its appendices in December 2012 (CH2M HILL, 2012a).

Twelve possible alternatives (some with design variations) were analyzed, including the No Build Alternative, TSM/TDM Alternative, two BRT Alternatives, two LRT Alternatives, four Freeway Alternatives, and two Highway/ Arterial Alternatives. For these alternatives, additional data were collected and a 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 into the secondary screening.

B. Community Interaction

In March 2011, Caltrans published a Notice of Intent (NOI) under NEPA and a Notice of Preparation (NOP) under CEQA to initiate the environmental review process for the proposed project. The environmental review process began with a series of "SR 710 Conversations" as an outreach effort led by Metro, including 21 prescoping and scoping meetings throughout the study area. In March and April of 2011, Caltrans and Metro accepted comments on the proposed project and documented all the scoping comments in the *SR 710 North Gap Closure, Scoping Summary Report* (Volumes I and II), dated September 2011 (Caltrans, 2011). Metro also initiated the SR 710 Gap Closure Transit Profile Study to gather transit service and patronage data and to assess current and future transit travel markets within the study area.

During the feasibility study for the AA Report and throughout the development of the DEIR/EIS, there have been extensive outreach efforts including:

- Stakeholder Outreach Advisory Committee Meetings
- Technical Advisory Committee Meetings
- All Communities Convening Information Sessions and Open House Meetings
- Community Liaison Council Meetings
- Geotechnical boring outreach efforts
- Social media postings and updates
- Web site updates

The DEIR/EIS provides more details on the community outreach efforts.

C. Existing Facility

The study area is approximately 100 square miles and is 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. According to data from the Southern California Association of Governments (SCAG), the study area had a population of 0.95 million people in 2012, and 389,000 jobs were located in the study area.

At the southern end of the project limits, the existing I-710 south of the interchange with I-10 has three lanes in the northbound direction and three to four lanes in the southbound direction. All lanes are 12 feet wide. Median and outside shoulders are provided; however, the widths of shoulders are nonstandard in some segments. In the northbound direction, the median width is 15 feet and the outside shoulder width is 8 feet. In the southbound direction, the existing median has a total width of

30 feet with a barrier/metal beam guard railing that separates the opposing traffic. The outside shoulder is paved with widths varying from 8 to 10 feet. The typical section showing the existing freeway configuration at the southern end of the project limits is provided in Attachments I-1b and J-1b. North of the I-10 interchange, the existing SR 710 has three lanes in the southbound direction beginning with a two-lane on-ramp from Valley Boulevard. In the northbound direction, SR 710 varies from two to three lanes ending with a two-lane off-ramp to Valley Boulevard.

At the northern end of the project limits, the existing SR 710 south of the interchange with I-210/SR 134 has two to three lanes in the northbound direction and one to two lanes in the southbound direction. All lanes are 12 feet wide. Channelizers are placed along the inside edge of traveled way to route the southbound traffic. There is an existing concrete median barrier with 15 feet of paved median to either side; the existing outside shoulders in both directions vary from 8 to 14 feet. The typical section showing the existing freeway configuration at the northern end of the project limits is provided in Attachments I-1c and J-1c.

4. PURPOSE AND NEED

A. Problem, Deficiencies, Justification

The study area is centrally located within the extended urbanized area of Southern California. With few exceptions, the area from Santa Clarita in the north to San Clemente in the south (approximately 90 miles) 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).

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
  - SR 118
  - United States Route (US)-101/SR 134/I-210
  - I-10
  - SR 60

  - I-105
  - SR 91
  - SR 22
- Major north-south freeway routes:
  - I-405
  - US-101/SR 170
  - I-5
  - SR 110
  - I-710/SR 710
  - I-605
  - SR 57

Of the seven north-south routes, four are located partially within the study area (I-5, SR 110, I-710, and I-605), 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-to-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 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.

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.

B. Regional and System Planning

I. Federal and State Systems

The route 710 is included in the State Freeway and Expressway System and is classified as a freeway. The portions of the 710 freeway from I-10 to Valley Boulevard and the freeway south of the I-210/SR 134 interchange are designated as SR 710. South of the I-10 interchange the 710 freeway is designated as I-710. The SR 710 terminates at the I-210/SR 134 interchange in Pasadena.

II. State Planning

According to Caltrans seismic design criteria, the SR 710 north of I-10 within the study area is classified as an ordinary nonstandard facility.

III. Regional Planning

The proposed SR 710 North Study has taken into consideration regional projects that are included in the 2012 SCAG Regional Transportation Plan/Sustainable Commuter Strategy (RTP/SCS). These proposed regional future project improvements are included in the No Build Alternative (Chapter 5 Section A-1 and Attachment E-1 in this report). Regional planning projects include:

- The financially constrained list of projects in the 2012 SCAG RTP.
- The currently planned projects in Los Angeles County that are identified in Measure R (Note: Measure R is the transportation sales tax measure approved by voters in 2008).
- Other projects as defined in the “Constrained Plan” of Metro’s 2009 Long-Range Transportation Plan (through 2035).

IV. Local Planning

The concepts such as TSM/TDM, BRT, and LRT have been analyzed to generate the engineering design of the build alternatives. The build alternatives also incorporate regional projects that are included in the 2012 SCAG RTP/SCS and other planning projects included in the No Build Alternative (Chapter 5 Section A-1 and Attachment E-1 in this report).

V. Transit Operator Planning

Currently, there are a number of transit operators and bus lines operating within the project study area. In addition to the two major transit providers – Foothill Transit and Metro – there are also existing local bus lines. All existing available transit systems within the study area have been evaluated, and refinements were included to complement existing routes as well as suggested new transit routes. The BRT Alternative and the LRT Alternative provide the analysis and proposed improvements to bus and light rail transit systems, respectively. The TSM/TDM Alternative consists of local street and intersection improvements that could be implemented alone or incorporated into other build alternatives as applicable.

C. Traffic

I. Existing Traffic Analysis

The existing traffic analysis was conducted using available and newly collected data for the study area freeway system and intersections. New data were collected in 2013, the base year for the existing condition traffic analysis. Tables 4-1 and 4-2 summarize the existing traffic conditions on the freeway system. Nine freeways are included in the analysis; the limits and post miles are listed in both tables. The *Transportation Technical Report* (TTR)*, SR 710 North Study, Los Angeles County, California* (CH2M HILL, 2014b) includes detailed information on the traffic forecasting and operational analysis summarized in this DPR.

The range of the daily and peak hour traffic volumes is provided in Table 4-1. Average daily traffic (ADT) is for both directions of travel, 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 miles), which include intersecting freeways where traffic volumes change substantially.

TABLE 4-1. Existing Conditions (2013) Freeway Volumes

Freeway	Limits	Absolute Post Miles	Volume		
			ADT[a]	AM Peak Hour[b]	PM Peak Hour[b]
I-5	Between I-710 and SR 134	129.9 <-> 144.7	87,000 - 285,000	3,800 - 10,400	5,300 - 12,700
I-10	Between I-5 and I-605	17.2 <-> 30.1	114,000 - 237,000	4,900 - 8,900	4,900 - 10,200
I-210	Between I-5 and I-605	0 <-> 37.4	55,000 - 281,000	1,800 - 11,100	2,400 - 13,900
I-605	Between SR 60 and I-210	7.0 <-> 27.5	102,000 - 251,000	3,700 - 9,600	2,200 - 9,800
I-710[c]	Between I-5 and Valley Boulevard	18.5 <-> 27.1	43,000 - 205,000	2,200 - 10,200	3,000 - 9,900
SR 2	Between I-5 and I-210	7.0 <-> 15.7	45,000 - 162,000	2,600 - 9,200	2,300 - 8,700
SR 60	Between I-5 and I-605	0.6 <-> 12.3	109,000 - 267,000	5,800 - 10,800	4,600 - 12,800
SR 110	Between I-5 and Fair Oaks Avenue	25.3 <-> 32.1	37,000 - 191,000	1,300 - 11,200	1,600 - 7,100
SR 134	Between I-5 and I-210/SR 710	5.0 <-> 14.7	93,000 - 224,000	4,300 - 8,900	3,500 - 8,300

Source: TTR (CH2M HILL, 2014b)
Notes:
Additional details can be found in Tables 5-3 to 5-24 of the TTR (CH2M HILL, 2014b)
[a] Both directions
[b] Peak direction only
[c] Includes SR 710 between I-10 and Valley Boulevard

Table 4-2 is an overview of the level of service (LOS) for the freeways. The analysis was conducted using the *2010 Highway Capacity Manual* (HCM) procedures for merge, diverge, weave, and basic sections (Caltrans, 2010a). The procedures and analysis criteria in Chapters 11, 12, and 13 of Volume 2 of the HCM were applied using a standard methodology to divide a freeway corridor into analysis segments. Each freeway is composed of multiple segments (a total of 31 to 175 segments in both directions).

The breakdown of the percentage of peak hour segments operating at each LOS grade is provided in Table 4-2. The percentages were calculated by summing the total number of segments for both directions and peak hours operating at a specific LOS, and dividing by two times the total number of segments in the freeway. I-5 has the highest percentage of LOS E and F segments, while SR 110 (north of I-5) has the lowest.

TABLE 4-2. Existing Conditions (2013) Freeway LOS

Freeway	Limits	Absolute Post Miles	Number of Segments[b]	Percentage[a] of Segments at each LOS					
				LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	129.9 <-> 144.7	94	0%	0%	6%	30%	30%	34%
I-10	Between I-5 and I-605	17.2 <-> 30.1	75	2%	9%	37%	25%	13%	15%
I-210	Between I-5 and I-605	0 <-> 37.4	175	4%	23%	30%	22%	7%	14%
I-605	Between SR 60 and I-210	7.0 <-> 27.5	34	0%	12%	37%	26%	12%	13%
I-710[c]	Between I-5 and Valley Boulevard	18.5 <-> 27.1	31	3%	15%	24%	23%	15%	21%
SR 2	Between I-5 and I-210	7.0 <-> 15.7	41	20%	41%	16%	11%	6%	6%
SR 60	Between I-5 and I-605	0.6 <-> 12.3	66	0%	14%	32%	23%	14%	17%
SR 110	Between I-5 and Fair Oaks Avenue	25.3 <-> 32.1	38	9%	37%	32%	16%	4%	3%
SR 134	Between I-5 and I-210/SR 710	5.0 <-> 14.7	52	0%	8%	50%	32%	7%	4%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-3 to 5-24 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours
[b] Both directions
[c] Includes SR 710 between I-10 and Valley Boulevard

Table 4-3 is a summary of intersection operations in the study area. The HCM delay calculation was used to determine LOS, ranging from LOS A to F. The analysis was conducted using the procedures in the 2010 HCM (via the Synchro software) for most intersections, except where unusual geometries required analysis with the 2000 HCM (Caltrans, 2000). At four-way stop-controlled intersections, the weighted average delay of all four approaches was used to determine the LOS. At two-way stop-controlled intersections, the average delay for the worst approach was used to determine the LOS.

The traffic analysis summarized in this DPR included 38 intersections (some stop-controlled) in the study area, in multiple cities. All of the 38 intersections are on the state highway system (SR 19 or freeway ramps). The intersections analyzed were included in the TTR, where the intersections were screened based on volume, location, and classification. Table 4-3 includes the total approach volume, LOS, and delay for existing conditions of the AM and PM peak hours. Additional intersections are analyzed in the TTR (CH2M HILL, 2014b).

TABLE 4-3. Existing Conditions (2013) Intersection Volume and LOS

Intersection	City	Control	AM Peak			PM Peak		
			Total Approach Volume	LOS	Delay[a]	Total Approach Volume	LOS	Delay[a]
SR 710 NB Off-Ramp and Valley Boulevard	Alhambra	Signalized	4,852	C	28.5	3,574	B	12.8
SR 710 SB On-Ramp and Valley Boulevard	Alhambra	Signalized	3,979	D	48.4	3,929	E	75.5
I-605 NB Ramps and Ramona Boulevard	Baldwin Park	Signalized	2,696	C	25.8	3,303	D	53.3
Rosemead Boulevard and California Boulevard	Unincorporated	Signalized	2,992	C	25.7	3,856	C	30.6
Rosemead Boulevard and Colorado Boulevard	Unincorporated	Signalized	3,131	C	27.8	4,252	E	70.0
Peck Road and I-10 EB Ramps	El Monte	Unsignalized	2,064	E	40.1[c]	2,348	F	40.1[c]
Santa Anita Avenue and I-10 EB Ramps	El Monte	Signalized	2,580	B	16.2	3,691	C	26.0
I-210 EB Ramps and Berkshire Place	La Cañada Flintridge	Unsignalized	1,357	D	25.7	806	B	14.2
I-210 EB Ramps and Foothill Boulevard	La Cañada Flintridge	Unsignalized	2,073	A	3.6[c]	1,732	A	0.6[c]
I-210 WB Ramps and Berkshire Place	La Cañada Flintridge	Unsignalized	2,056	C	22.3[b]	1,158	B	12.1[b]
I-210 WB Ramps and Foothill Boulevard	La Cañada Flintridge	Signalized	2,306	B	12.5	1,499	B	11.3
SR 2 Ramps and Foothill Boulevard	La Cañada Flintridge	Signalized	1,927	A	9.2	1,974	A	9.5
Eagle Rock Boulevard and SR 2 Ramps	Los Angeles	Signalized	3,759	D	41.5[c]	3,616	D	40.0[c]
Figueroa Street and SR 134 EB Ramps	Los Angeles	Signalized	2,052	A	1.0	1,897	A	1.0
Figueroa Street and SR 134 WB Ramps	Los Angeles	Unsignalized	1,127	E	44.9	988	E	38.8
Myrtle Avenue and I-210 EB Ramps	Monrovia	Signalized	2,665	C	23.9	3,110	C	29.3
Atlantic Boulevard and SR 60 EB Ramps	Monterey Park	Signalized	2,634	B	10.1	3,066	B	11.7
Atlantic Boulevard and SR 60 WB Ramps	Monterey Park	Signalized	2,526	B	13.2[c]	3,014	B	11.8[c]
Fair Oaks Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	3,090	C	21.8	3,129	B	18.7
Fair Oaks Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	3,041	C	22.1	3,140	C	23.6

TABLE 4-3. Existing Conditions (2013) Intersection Volume and LOS

Intersection	City	Control	AM Peak			PM Peak		
			Total Approach Volume	LOS	Delay[a]	Total Approach Volume	LOS	Delay[a]
Hill Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	2,913	C	30.6	3,860	C	33.5
Hill Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	3,156	D	38.6	3,255	B	19.1
I-210 EB Ramps and Mountain Street	Pasadena	Unsignalized	1,233	E	36[b]	1,092	C	22.1[b]
I-210 WB Ramps and Mountain Street	Pasadena	Unsignalized	1,167	C	15.7[b]	1,241	C	21.4[b]
Lake Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	4,232	C	23.2	4,626	B	19.9
Lake Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	4,162	D	44.5	4,319	C	23.0
Marengo Street and Corson Street (I-210 EB Ramps)	Pasadena	Signalized	2,564	B	16.0	2,635	B	16.5
Marengo Street and Maple Street (I-210 WB Ramps)	Pasadena	Signalized	1,908	C	23.7	2,047	C	25.6
San Rafael Avenue and SR 134 EB Ramps	Pasadena	Signalized	1,284	A	2.9	1,126	A	3.4
San Rafael Avenue and SR 134 WB Ramps	Pasadena	Signalized	815	B	13.7	759	B	13.2
Rosemead Boulevard and Lower Azusa Road	Rosemead	Signalized	3,081	C	27.9[c]	3,233	C	24.1[c]
Rosemead Boulevard and Marshall Street	Rosemead	Signalized	3,639	C	30.6	4,235	D	43.4
Rosemead Boulevard and Mission Drive	Rosemead	Signalized	3,856	D	47.7	4,112	D	50.3
Rosemead Boulevard and Valley Boulevard	Rosemead	Signalized	4,129	D	50.3	4,562	E	55.7
Rosemead Boulevard and Huntington Drive	San Gabriel	Signalized	3,910	C	31.7	5,156	D	48.6
Fair Oaks Avenue and SR 110 NB Off-Ramp	South Pasadena	Signalized	2,803	A	9.6	3,555	B	18.0
Fair Oaks Avenue and SR 110 SB On-Ramps	South Pasadena	Signalized	3,238	B	15.0	3,224	B	14.5
Rosemead Boulevard and Las Tunas Drive	Temple City	Signalized	2,979	C	33.3	3,991	D	38.7

[a] Seconds per vehicle
[b] Represents highest delay at any approach for two-way stop-controlled intersection
[c] Geometry cannot be analyzed with HCM 2010, so HCM 2000 was used
NB – northbound; SB – southbound; EB – eastbound; WB – westbound

II. Future Traffic Conditions

Future freeway performance was projected using the SR 710 North travel demand model, which was based on the 2012 SCAG RTP/SCS, and validated to study area conditions. Details of the SR 710 North travel demand model can be found in the TTR, Section 3 (CH2M HILL, 2014b). Tables 4-4 and 4-5 are summaries of the freeway volumes and performance for the future year (2035) no build conditions. Traffic volumes are generally increasing, and LOS is worse for 2035 no build conditions compared to existing conditions.

TABLE 4-4. Future (2035) No Build Freeway Volumes

Freeway	Limits	Post Miles	Volume		
			ADT[a]	AM Peak Hour[b]	PM Peak Hour[b]
I-5	Between I-710 and SR 134	129.9 <-> 144.7	91,000 - 290,000	3,900 - 10,500	4,900 - 12,800
I-10	Between I-5 and I-605	17.2 <-> 30.1	123,000 - 260,000	6,100 - 10,100	4,800 - 10,900
I-210	Between I-5 and I-605	0 <-> 37.4	63,000 - 288,000	4,300 - 11,100	2,500 - 14,300
I-605	Between SR 60 and I-210	7.0 <-> 27.5	107,000 - 256,000	3,900 - 9,800	2,600 - 9,900
I-710[c]	Between I-5 and Valley Boulevard	18.5 <-> 27.1	45,000 - 230,000	2,300 - 11,400	3,100 - 11,300
SR 2	Between I-5 and I-210	7.0 <-> 15.7	45,000 - 162,000	2,500 - 9,100	2,300 - 8,600
SR 60	Between I-5 and I-605	0.6 <-> 12.3	113,000 - 265,000	5,900 - 11,000	4,900 - 12,500
SR 110	Between I-5 and Fair Oaks Avenue	25.3 <-> 32.1	39,000 - 193,000	1,300 - 11,100	1,700 - 7,000
SR 134	Between I-5 and I-210/SR 710	5.0 <-> 14.7	93,000 - 239,000	4,200 - 9,400	3,600 - 8,900

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions
[b] Peak direction only
[c] Includes SR 710 between I-10 and Valley Boulevard

TABLE 4-5. Future (2035) No Build Freeway LOS

Freeway	Limits	Post Miles	Number of Segments[b]	Percentage[a] of Segments at each LOS					
				LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	129.9 <-> 144.7	94	0%	1%	7%	22%	29%	42%
I-10	Between I-5 and I-605	17.2 <-> 30.1	75	2%	5%	29%	31%	15%	17%
I-210	Between I-5 and I-605	0 <-> 37.4	175	3%	22%	27%	23%	10%	15%
I-605	Between SR 60 and I-210	7.0 <-> 27.5	34	0%	15%	31%	26%	12%	16%
I-710[c]	Between I-5 and Valley Boulevard	18.5 <-> 27.1	31	2%	15%	24%	18%	10%	32%
SR 2	Between I-5 and I-210	7.0 <-> 15.7	41	16%	40%	21%	11%	6%	6%
SR 60	Between I-5 and I-605	0.6 <-> 12.3	66	0%	11%	32%	26%	12%	20%
SR 110	Between I-5 and Fair Oaks Avenue	25.3 <-> 32.1	38	9%	36%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/SR 710	5.0 <-> 14.7	52	0%	3%	47%	36%	12%	3%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours
[b] Both directions
[c] Includes SR 710 between I-10 and Valley Boulevard

Future intersection performance was projected using the SR 710 North travel demand model, based on the 2012 SCAG RTP/SCS, and validated to study area conditions. The analysis was conducted using the procedures in the 2010 HCM (via the Synchro software) for most intersections, except where unusual geometries required analysis with the 2000 HCM. Details of the SR 710 North travel demand model can be found in the TTR, Section 3 (CH2M HILL, 2014b).

Table 4-6 is a summary of the intersection operations in the study area. Traffic analysis included 38 intersections, some of which are unsignalized (that is, stop-controlled). All of the 38 intersections are on the state highway system (including SR 19 and freeway ramps). The intersections analyzed were included in the TTR, where the intersections were screened based on volume, location, and classification. Table 4-6 includes the total approach volume, LOS, and delay for future (2035) of the AM and PM peak hours. At most of the intersections, the total approach volume and delays are expected to increase compared to existing conditions (Table 4-3).

TABLE 4-6. Future (2035) No-Build Intersection Volume and LOS

Intersection	City	Control	AM Peak			PM Peak		
			Total Approach Volume	LOS	Delay[a]	Total Approach Volume	LOS	Delay[a]
SR 710 NB Off-Ramp and Valley Boulevard	Alhambra	Signalized	5,170	C	33.5	4,458	B	17.2
SR 710 SB On-Ramp and Valley Boulevard	Alhambra	Signalized	4,150	D	51.7	4,235	F	95.3
I-605 NB Ramps and Ramona Boulevard	Baldwin Park	Signalized	2,973	D	36.5	3,301	D	43
Rosemead Boulevard and California Boulevard	Unincorporated	Signalized	3,132	C	27.6	3,987	C	32.1
Rosemead Boulevard and Colorado Boulevard	Unincorporated	Signalized	3,812	D	38.8	5,248	F	116.5
Peck Road and I-10 EB Ramps	El Monte	Unsignalized	2,018	C	19.5[c]	2,369	F	155.1[c]
Santa Anita Avenue and I-10 EB Ramps	El Monte	Signalized	2,838	B	17.2	3,822	C	25.5
I-210 EB Ramps and Berkshire Place	La Cañada Flintridge	Unsignalized	1,101	C	15.3	764	B	13
I-210 EB Ramps and Foothill Boulevard	La Cañada Flintridge	Unsignalized	2,083	A	2.9[c]	1,868	A	0.7[c]
I-210 WB Ramps and Berkshire Place	La Cañada Flintridge	Unsignalized	1,903	C	18.5[b]	1,283	B	12.2[b]
I-210 WB Ramps and Foothill Boulevard	La Cañada Flintridge	Signalized	3,252	B	16.2	1,888	B	12.7
SR 2 Ramps and Foothill Boulevard	La Cañada Flintridge	Signalized	1,510	B	12.1	3,065	C	23.5
Eagle Rock Boulevard and SR 2 Ramps	Los Angeles	Signalized	3,650	D	36.6[c]	3,515	D	37.8[c]
Figueroa Street and SR 134 EB Ramps	Los Angeles	Signalized	2,178	A	1	2,148	A	1
Figueroa Street and SR 134 WB Ramps	Los Angeles	Unsignalized	862	C	20.2	995	E	44.3
Myrtle Avenue and I-210 EB Ramps	Monrovia	Signalized	2,811	C	27.5	3,372	D	38
Atlantic Boulevard and SR 60 EB Ramps	Monterey Park	Signalized	2,849	B	10.5	3,715	B	15.2
Atlantic Boulevard and SR 60 WB Ramps	Monterey Park	Signalized	2,928	B	17.4[c]	3,454	B	17.4[c]

TABLE 4-6. Future (2035) No-Build Intersection Volume and LOS

Intersection	City	Control	AM Peak			PM Peak		
			Total Approach Volume	LOS	Delay[a]	Total Approach Volume	LOS	Delay[a]
Fair Oaks Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	3,164	B	14.4	3,039	B	19.4
Fair Oaks Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	3,058	C	21	3,209	C	24.2
Hill Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	2,957	C	30.1	3,770	C	31.4
Hill Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	2,722	C	26	3,309	C	28.4
I-210 EB Ramps and Mountain Street	Pasadena	Unsignalized	1,258	E	38.8[b]	1,164	C	21.3[b]
I-210 WB Ramps and Mountain Street	Pasadena	Unsignalized	1,161	C	15[b]	1,204	C	19.9[b]
Lake Avenue and Corson Street (I-210 EB Off-Ramp)	Pasadena	Signalized	4,312	B	17.5	4,663	C	20.6
Lake Avenue and Maple Street (I-210 WB On-Ramp)	Pasadena	Signalized	4,321	D	46.3	4,488	C	25.1
Marengo Street and Corson Street (I-210 EB Ramps)	Pasadena	Signalized	2,669	B	17.4	2,644	B	15.3
Marengo Street and Maple Street (I-210 WB Ramps)	Pasadena	Signalized	2,096	C	25.5	2,306	D	36.5
San Rafael Avenue and SR 134 EB Ramps	Pasadena	Signalized	2,007	C	26.8	2,090	D	46.1
San Rafael Avenue and SR 134 WB Ramps	Pasadena	Signalized	773	B	14.9	889	B	16
Rosemead Boulevard and Lower Azusa Road	Rosemead	Signalized	3,074	C	26.5[c]	3,355	C	25.3[c]
Rosemead Boulevard and Marshall Street	Rosemead	Signalized	3,766	D	35.4	4,290	D	48.1

TABLE 4-6. Future (2035) No-Build Intersection Volume and LOS

Intersection	City	Control	AM Peak			PM Peak		
			Total Approach Volume	LOS	Delay[a]	Total Approach Volume	LOS	Delay[a]
Rosemead Boulevard and Mission Drive	Rosemead	Signalized	4,065	D	45.5	4,188	D	50.3
Rosemead Boulevard and Valley Boulevard	Rosemead	Signalized	4,337	E	56.4	4,718	E	56
Rosemead Boulevard and Huntington Drive	San Gabriel	Signalized	4,265	C	34.6	5,508	D	53.2
Fair Oaks Avenue and SR 110 NB Off-Ramp	South Pasadena	Signalized	2,529	A	7.1	3,567	B	17.6
Fair Oaks Avenue and SR 110 SB On-Ramps	South Pasadena	Signalized	3,240	B	14.5	3,272	B	14.3
Rosemead Boulevard and Las Tunas Drive	Temple City	Signalized	3,315	D	36.3	4,244	D	40.3

[a] Seconds per vehicle
[b] Represents highest delay at any approach for two-way stop-controlled intersection
[c] Geometry cannot be analyzed with HCM 2010, so HCM 2000 was used

III. Collision Analysis

Accident data for Caltrans facilities within the SR 710 North Study area were obtained from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) for the 36-month period from April 1, 2009, through March 31, 2012. The actual numbers of recorded accidents and the accident rates are summarized in Table 4-7 (Freeway Mainlines) and Table 4-8 (Ramps).

TABLE 4-7. Summary of Accident Data on Freeway Mainlines within the Study Area (TASAS: April 1, 2009, to March 31, 2012)

Location	Post Mile	Direction	Total Number of Accidents	Actual Accident Rate (accident/million vehicle miles)			Statewide Average Rate (accident/million vehicle miles)		
				Fatality	Fatality and Injured	Total	Fatality	Fatality and Injured	Total
SR 2	13.000 TO 23.438	EB	187	0.000	0.14	0.33	0.003	0.23	0.70
		WB	322	0.002	0.17	0.56	0.003	0.23	0.70
I-5	13.000 TO 23.000	NB	1490	0.002	0.25	1.09	0.005	0.37	1.19
		SB	2211	0.001	**0.39**	**1.62**	0.005	0.37	1.19
I-10	18.000 TO 32.000	EB	2193	**0.005**	**0.31**	**1.28**	0.004	0.29	0.95
		WB	1945	**0.006**	0.29	**1.13**	0.004	0.29	0.95
SR 60	0.545 TO 12.029	EB	1245	0.004	0.25	0.88	0.004	0.29	0.95
		WB	1046	0.004	0.23	0.74	0.004	0.29	0.95
SR 110	25.000 TO 31.913	NB	648	0.003	**0.37**	**1.36**	0.004	0.24	0.76
		SB	601	**0.018**	**0.54**	**1.64**	0.004	0.24	0.76
SR 134	9.000 TO 13.341	EB	225	0.004	0.16	0.46	0.003	0.27	0.88
		WB	241	0.002	0.19	0.49	0.003	0.27	0.88
I-210	17.000 TO 38.000	EB	2105	0.004	0.24	0.84	0.003	0.27	0.88
		WB	1809	0.001	0.20	0.72	0.003	0.27	0.88
I-605	17.000 TO 26.000	NB	1193	0.002	**0.37**	**1.32**	0.004	0.28	0.90
		SB	650	0.003	0.20	0.72	0.004	0.28	0.90
SR 710	23.000 TO 27.475	NB	225	0.003	0.18	0.79	0.005	0.29	0.89
		SB	361	**0.006**	0.25	**1.12**	0.005	0.29	0.89

Information was obtained from Caltrans TASAS - Table B of the Selective Accident Rate Calculation for each freeway.
Highlighted-bold numbers: Locations with actual accident rate higher than statewide average rate.
accident/million vehicle miles – accidents per million vehicle miles
Fatality: Rate for Fatal Crashes
Fatality and Injured: Rate for Fatal and Injured Crashes
Total: Rate for all crashes

TABLE 4-8. Summary of Accident Data on Ramps within the Study Area (TASAS: April 1, 2009, to March 31, 2012)

Location (PM to PM)	Post Mile	Total Number of Accidents	Actual Accident Rate (accident/million vehicle)			Average Accident Rate (accident/million vehicle)		
			Fatality	Fatality and Injured	Total	Fatality	Fatality and Injured	Total
SR 710 Ramp SB 710 On-Ramp Valley Boulevard	27.354	2	0.000	0.04	0.09	0.002	0.22	0.63
SR 710 Ramp NB 710 Off-Ramp Valley Boulevard	27.387	16	0.000	0.19	0.61	0.003	0.35	1.01
SR 710 Ramp NB 710 On-Ramp from Del Mar	32.211	12	0.000	0.00	**0.86**	0.002	0.22	0.63
SR 710 Ramp SB 710 Off-Ramp to Del Mar	32.247	0	0.000	0.00	0.00	0.004	0.24	0.75
SR 710 Ramp NB 710 Off-Ramp to WB Route 134	32.339	4	0.000	0.10	0.41	0.004	0.16	0.49
SR 710 Ramp SB 710 On-Ramp from EB Route 134	32.418	1	0.000	0.12	0.12	0.003	0.11	0.32
SR 710 Ramp NB 710 Off-Ramp to EB Route 210	32.571	0	0.000	0.00	0.00	0.005	0.13	0.38

Information was obtained from TASAS - Table B of the Selective Accident Rate Calculation for each freeway.
Accident rates on mainline are per million vehicle miles.
Highlighted-bold numbers: Locations with actual accident rate higher than average accident rate (**bold numbers**).
Fatality: Rate for Fatal Crashes
Fatality and Injured: Rate for Fatal and Injured Crashes

Traffic data for the local roads within the study area are available from the Statewide Integrated Traffic Records System (SWITRS) database. The SWITRS report from July 1, 2010, through July 1, 2013, compiled by the California Highway Patrol, includes all recorded accidents within each city in the study area. The information provided from these recorded accidents includes location, severity, type of collision, and occurrence time of day. This information is similar to the Caltrans TASAS for freeways as previously discussed. The accident counts and the respective rates of severity, alcohol-related incidents, and location for both freeways and local roads are tabulated for comparison in Table 4-9. The respective rate of the collision type and time of day for both freeways and local roads are also averaged and tabulated for comparison in Table 4-10.

TABLE 4-9. Local Street and Caltrans Accident Data Comparison[a]
(Accident Counts, Rate of Severity, Alcohol-Related Accidents, and Location)

City	Year (Number of accidents)				Severity (%)[b]			Alcohol (%)[b]	State Highway (%)[b]	
	2010-2011	2011-2012	2012-2013	Total	PDO	Injury	Fatality	Alcohol?	Yes	No
Alhambra	970	1,026	242	2,238	73%	27%	0.1%	4%	0%	100%
Baldwin Park	296	384	77	757	61%	39%	0.7%	11%	3%	97%
El Monte	612	623	266	1,501	40%	60%	0.1%	12%	2%	98%
Los Angeles	33,611	33,811	14,950	82,372	33%	66%	0.7%	9%	2%	98%
Monrovia	282	285	100	667	56%	44%	0.1%	9%	3%	97%
Monterey Park	436	521	163	1,120	59%	41%	0.4%	6%	1%	99%
Pasadena	1,786	1,650	497	3,933	52%	48%	0.3%	6%	2%	98%
San Gabriel	276	253	125	654	38%	62%	0.3%	14%	1%	99%
South Pasadena	168	153	46	367	42%	58%	0.3%	11%	4%	96%
Total	38,437	38,706	16,466	93,609						
Local Road Average	**4,271**	**4,301**	**1,830**	**18,722**	**50%**	**49%**	**0.3%**	**9%**	**2%**	**98%**
Freeway Average	**N/A**	**N/A**	**N/A**	**2,080**	**71%**	**28%**	**0.4%**	**5%**	**100%**	**0%**

[a] Accident data for the local street (from SWITRS) were not fully recorded for the range 2012-2013.
[b] Data shown are the average value of the 3-year period (2010-2013).
PDO – property damage only
N/A – not applicable

TABLE 4-10. Local Street and Caltrans Accident Data Comparison[a]
(Rate of Collision Types and Occurrence Time of the Day; Value shown is the average from 2010-2013)

City	Collision Type								Time of Day			
	Auto/Pedestrian	Broadside	Head-On	Hit Object	Overturned	Rear End	Sideswipe	Other	6 AM-10AM	10AM-3PM	3PM-7PM	7PM-6AM
Alhambra	3%	33%	6%	5%	0%	29%	22%	3%	16%	33%	29%	21%
Baldwin Park	4%	24%	8%	5%	1%	31%	19%	9%	16%	24%	28%	32%
El Monte	6%	35%	6%	8%	1%	25%	15%	5%	15%	27%	29%	30%
Los Angeles	9%	31%	8%	7%	0%	21%	19%	5%	17%	26%	27%	31%
Monrovia	5%	34%	5%	7%	1%	22%	21%	4%	16%	32%	28%	24%
Monterey Park	6%	33%	6%	4%	1%	26%	22%	3%	20%	34%	26%	20%
Pasadena	5%	38%	6%	6%	0%	23%	17%	4%	18%	33%	29%	20%
San Gabriel	7%	29%	6%	8%	1%	26%	18%	6%	17%	25%	30%	28%
South Pasadena	4%	29%	5%	15%	1%	24%	16%	6%	14%	32%	28%	26%
Local Road Average	**5%**	**32%**	**6%**	**7%**	**1%**	**25%**	**19%**	**5%**	**17%**	**30%**	**28%**	**26%**
Freeway Average	**0%**	**2%**	**0%**	**19%**	**1%**	**52%**	**23%**	**1%**	**23%**	**24%**	**31%**	**23%**

[a] Accident data for the local street (from SWITRS) were not fully recorded for the range 2012-2013.

The average percentage of injury accidents is 49 percent for local roads, which is noticeably higher than the average percentage of injury accidents for freeways at 28 percent. However, the average fatality percentages for local roads (0.3 percent) and freeways (0.4 percent) are similar. The percentage of injury accidents in the cities of El Monte, Los Angeles, and San Gabriel is greater than 60 percent. In addition, the types of collisions that occurred more frequently on local roads compared to freeways in the study area were as follows: automobile-pedestrian, head-on, and broadside collisions. These types of collisions are typically uncommon on freeways due to restricted pedestrian access and safety barriers dividing opposing traffic. Furthermore, the type of collisions that occurred more frequently on the freeways compared to the local roads in the study area were as follows: hit object, sideswipe, and rear-end collisions. The high percentage of sideswipe and rear-end collisions on the freeways is generally congestion related. Alcohol-induced accidents are substantially higher on local roads; the percentage is almost double that of the freeways.

5. 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 AA Report (CH2M HILL, 2012a), a screening analysis was conducted to determine the alternatives to be carried forward for analysis in the DEIR/EIS. The screening of alternatives followed a three-step sequential process: preliminary screening, initial screening, and secondary screening. The proposed alternatives (No Build, TSM/TDM, BRT, LRT, and Freeway Tunnel Alternatives) are each described below. Section B includes transportation alternatives that were withdrawn from further consideration.

A. Viable Alternatives

I. No Build Alternative

The No Build Alternative does not include the SR 710 North Study improvements. The No Build Alternative includes projects/planned improvements through 2035 that are contained in the Federal Transportation Improvement Program (FTIP), as listed in the SCAG 2012 RTP/SCS, Measure R, and the funded part of Metro's 2009 Long-Range Transportation Plan (LRTP). Attachment E-1 illustrates the projects included in the No Build Alternative. These projects have been, or are being, evaluated separately.

II. Transportation System Management/Transportation Demand Management (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 presented in Attachment F-1.

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.

a. Transportation System Management (TSM)

TSM strategies increase the efficiency of existing facilities (that is, TSM strategies are actions that increase the number of vehicle trips that 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 implemented is Garfield Avenue; therefore, TSSP on this corridor is included in the TSM/TDM Alternative. The locations are listed in Table 5-1. The following provides a further explanation of the ITS elements:
  - Traffic signal upgrades include turn arrows, vehicle and bicycle detection, accessible pedestrian signals, pedestrian countdown timers, incorporation into 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 includes 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.

TABLE 5-1. TSM/TDM Alternative Elements

ID No.	Description	Location
ITS 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

- 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 5-2 outlines the location 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 arterial CMS. Data on arterial speeds would be collected and distributed through Los Angeles County's Information Exchange Network. 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 5-2. Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location
Local Street Improvements		
L-1	Figueroa Street from SR 134 to Colorado Boulevard	City of Los Angeles (Eagle Rock)
L-2a	Fremont Avenue from Huntington Drive to Alhambra Road	City of South Pasadena
L-2c	Fremont Avenue from Mission Road to Valley Boulevard	City of Alhambra
L-3[a]	Atlantic Boulevard from Glendon Way to I-10	City of Alhambra
L-4	Garfield Avenue from Valley Boulevard to Glendon Way	City of Alhambra
L-5	Rosemead Boulevard from Lower Azusa Road to Marshall Street	City of Rosemead
L-8[a]	Fair Oaks Avenue from Grevelia Street to Monterey Road	City of South Pasadena
Intersection Improvements		
I-1	West Broadway/Colorado Boulevard	City of Los Angeles (Eagle Rock)
I-2	Eagle Rock Boulevard/York Boulevard	City of Los Angeles (Eagle Rock)
I-3	Eastern Avenue/Huntington Drive	City of Los Angeles (El Sereno)
I-8	Fair Oaks Avenue/Monterey Road	City of South Pasadena
I-9	Fremont Street/Monterey Road	City of South Pasadena
I-10	Huntington Drive/Fair Oaks Avenue	City of South Pasadena
I-11	Fremont Avenue/Huntington Drive	City of South Pasadena
I-13	Huntington Drive/Garfield Avenue	Cities of Alhambra/South Pasadena/San Marino
I-14	Huntington Drive/Atlantic Boulevard	Cities of Alhambra/South Pasadena/San Marino
I-15	Atlantic Boulevard/Garfield Avenue	Cities of Alhambra/South Pasadena/San Marino
I-16	Garfield Avenue/Mission Road	City of Alhambra
I-18	San Gabriel Boulevard/Huntington Drive	City of San Marino/Unincorporated Los Angeles County (East Pasadena/East San Gabriel)
I-19	Del Mar Avenue/Mission Road	City of San Gabriel
I-22	San Gabriel Boulevard/Marshall Street	City of San Gabriel
I-24	Huntington Drive/Oak Knoll Avenue	City of San Marino
I-25	Huntington Drive/San Marino Avenue	City of San Marino
I-43	Del Mar Avenue/Valley Boulevard	City of San Gabriel
I-44	Hellman Avenue/Fremont Avenue	City of Alhambra
I-45	Eagle Rock Boulevard/Colorado Boulevard	City of Los Angeles (Eagle Rock)

TABLE 5-2. Local Street and Intersection Improvements of the TSM/TDM Alternative

ID No.	Description	Location
Other Road Improvements		
T-1[b]	Valley Boulevard to Mission Road Connector	Cities of Alhambra/Los Angeles (El Sereno)
T-2	SR 110/Fair Oaks Avenue Hook Ramps	Cities of South Pasadena/Pasadena
T-3[c]	St. John Avenue Extension between Del Mar Avenue and California Boulevard	City of Pasadena

[a] Local Street Improvements L-3 and L-8 would not be constructed with the BRT Alternative.
[b] Other Road Improvement T-1 would only be constructed with the TSM/TDM and BRT Alternatives.
[c] Other Road Improvement T-3 would not be constructed with either the dual-bore or single-bore design variation of the Freeway Tunnel Alternative.

b. Transportation Demand Management (TDM)

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 (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 5-3 and 5-4 and illustrated in Attachment F-1. The transit service improvements enhance bus headways between 10 and 30 minutes during the peak hour and 15 to 60 minutes during the off-peak period. Bus headways are the amount of time between consecutive bus trips (traveling in the same direction) on the bus route. 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 5-4.

TABLE 5-3. 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 Avenue	10-12	15	10	15
770	Metro	Rapid	From Downtown Los Angeles to El Monte via Garvey Avenue/Cesar Chavez Avenue	10-13	15	10	15
76	Metro	Local	From Downtown Los Angeles to El Monte via Valley Boulevard	12-15	16	10	15
78	Metro	Local	From Downtown Los Angeles to Irwindale via Las Tunas Drive	10-20	16-40	10	15
378	Metro	Limited	From Downtown Los Angeles to Irwindale via Las Tunas Drive	18-23	-	20	30
79	Metro	Local	From Downtown Los Angeles to Santa Anita via Huntington Drive	20-30	40-45	15	30
180	Metro	Local	From Hollywood to Altadena via Los Feliz/ Colorado Boulevard	30	30-32	15	30
181	Metro	Local	From Hollywood to Pasadena via Los Feliz/ Colorado Boulevard	30	30-32	15	30
256	Metro	Local	From Commerce to Altadena via Hill Avenue/ Avenue 64/Eastern Avenue	45	45	30	40
258	Metro	Local	From Paramount to Alhambra via Fremont Avenue/ Eastern Avenue	48	45-55	20	30
260	Metro	Local	From Compton to Altadena via Fair Oaks Avenue/ Atlantic Boulevard	16-20	24-60	15	30
762[a]	Metro	Rapid	From Compton to Altadena via Atlantic Boulevard	25	30-60	15	30
266	Metro	Local	From Lakewood to Pasadena via Rosemead Boulevard/ Lakewood Boulevard	30-35	40-45	15	30
267	Metro	Local	From El Monte to Pasadena via Temple City Boulevard/ Del Mar Boulevard	30	30	15	30
485	Metro	Express	From Union Station to Altadena via Fremont/ Lake Avenue	40	60	30	60
487	Metro	Express	From Westlake to El Monte via Santa Anita Avenue/ Sierra Madre Boulevard/San Gabriel Boulevard	18-30	45	15	30
489	Metro	Express	From Westlake to East San Gabriel via Rosemead Boulevard	18-20	-	15	-
270	Metro	Local	From Norwalk to Monrovia via Workman Mill/ Peck Road	40-60	60	30	60
780	Metro	Rapid	From West Los Angeles to Pasadena via Fairfax Avenue/ Hollywood Boulevard/ Colorado Boulevard	10-15	22-25	10	20
187	Foothill	Local	From Pasadena to Montclair via Colorado Boulevard/ Huntington Drive/Foothill Boulevard	20	20	15	15

[a] This route would not be included as part of the BRT Alternative because the BRT Alternative would replace this service.

Express – Express Bus
Foothill – Foothill Transit

TABLE 5-4. Active Transportation and Bus Enhancements of the TSM/TDM Alternative

ID No.	Description	Location
Bus Service Improvements		
Bus-1	Additional bus service	See Table 5-3
Bus-2	Bus stop enhancements	Along routes listed in Table 5-3
Bicycle Facility Improvements		
Bike-1	Rosemead Boulevard bike route (Class III)	Colorado Boulevard to Valley Boulevard (through Los Angeles County, Temple City, Rosemead)
Bike-2	Del Mar Avenue bike route (Class III)	Huntington Drive to Valley Boulevard (through San Marino, San Gabriel)
Bike-3	Huntington Drive bike route (Class III)	Mission Road to Santa Anita Avenue (through the City of Los Angeles, South Pasadena, San Marino, Alhambra, Los Angeles County, Arcadia)
Bike-4	Foothill Boulevard bike route (Class III)	In La Cañada Flintridge
Bike-5	Orange Grove bike route (Class III)	Walnut Street to Columbia Street (in Pasadena)
Bike-6	California Boulevard bike route (Class III)	Grand Avenue to Marengo Avenue (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

The proposed TSM/TDM improvements completely or partially located within Caltrans ROW are summarized as follows. The design plans for these locations are included in Attachment F-2.

- [I-22] San Gabriel Boulevard near I-10 ramps: Intersection and local street improvement, restripe lane to WB I-10 on-ramp and realign lane from WB I-10 off-ramp.
- [I-44] Fremont Avenue and Hellman Avenue near I-10 ramps: Intersection and local street improvement, restripe and realign intersection near the WB I-10 ramps.
- [L-1] North Figueroa Street from Colorado Boulevard to SR 134 ramps: Intersection and local street improvement, restripe eastbound and WB SR 134 ramps.
- [L-3] Atlantic Boulevard from Glendon Way to I-10: Intersection and local street improvement, realign westbound I-10 on-ramp.
- [L-4] Garfield Avenue from Valley Boulevard to Glendon Way: Intersection and local street improvement.
- [T-1] SR 710 Connector from Valley Boulevard to Mission Road:
  - Remove existing southbound connector from Valley Boulevard.

- [T-1] SR 710 Connector at Valley Boulevard:
  - Propose intersection and local street improvement.
  - Add two-lane SR 710 connector from Valley Boulevard.
  - Realign and restripe northbound SR 710 connector to Valley Boulevard.
  - Add new four-lane SR 710 connector north of Valley Boulevard.
- [T-1] SR 710 Connector at Alhambra Avenue:
  - Add new four-lane SR 710 connector south of Alhambra Avenue.
  - Add roundabout at the intersection of SR 710 connector and Alhambra Avenue.
- [T-2] SR 110 Hook Ramps and Fair Oaks Avenue:
  - Propose intersection and local street improvement.
  - Add one through-lane and one right-turn-only lane to the northbound SR 110 off-ramp, and restripe the existing ramp lanes for left-turning traffic only.
  - Construct additional retaining walls.
- [T-2] SR 110 and State Street:
  - Realign the southbound SR 110 off-ramp to State Street.
  - Add new southbound SR 710 on-ramp from State Street.
- [T-2] SR 110 and State Street:
  - Realign the southbound SR 110 off-ramp to State Street.
- [T-3] St. John Avenue from California Boulevard to Del Mar Boulevard:
  - Add extension of St. John Avenue.
  - Realign the southbound SR 710 off-ramp to California Boulevard.

III. Bus Rapid Transit (BRT) Alternative

The BRT Alternative would provide high-speed, high-frequency bus service through a combination of the existing bus lanes, new dedicated bus lanes, and mixed-flow traffic lanes to key destinations between East Los Angeles and Pasadena. Attachment G-1 illustrates the route of the BRT Alternative, which is approximately 12 miles in length, crossing I-10, SR 60, and SR 110 with minor impacts to Caltrans ROW. The plans of the proposed BRT design within

Caltrans ROW are also included in Attachment G-2. A complete discussion and proposed design is presented in the *Advanced Conceptual Engineering Report Bus Rapid Transit Alternative* (CH2M HILL, 2014e).

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 12-mile 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 will 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 ROW through a variety of methods that include restriping the roadway, restricted on-street parking during peak periods, and narrowing medians, planted parkways, or sidewalks. Buses would share existing lanes with other traffic in cases where there is not enough ROW. The exclusive lanes would be exclusive 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-foot 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.

A total of 17 BRT stations with amenities would be placed, on average, at approximately 0.8-mile 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 will 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
- Atlantic Boulevard at Main Street
- Huntington Drive at Garfield Road
- Huntington Drive at Marengo Avenue
- Fair Oaks Avenue at Glenarm Street
- Fair Oaks Avenue at Mission 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 Lake Avenue (single direction only)
- Colorado Boulevard at Hill Avenue (single direction only)

Two bus feeder routes that would connect additional destinations with the BRT mainline are also proposed in this alternative:

- Bus feeder route that runs along Colorado Boulevard, Rosemead Boulevard, and Valley Boulevard to the El Monte transit station.
- Bus feeder route that would travel from Atlantic Boulevard near the Gold Line station to the Metrolink stations in the City of Commerce and Montebello via Beverly Boulevard and Garfield Avenue.

The TSM/TDM Alternative improvements would also be constructed as part of the BRT Alternative; except 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 the transit refinement on Route 762. 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. Many Intersection Improvements, such as I-8, I-10, I-13, and I-14, would also be partially or fully incorporated as appropriate.

The proposed BRT improvements completely or partially located within Caltrans ROW are summarized below. The design plans for these locations are included in Attachment G-2.

- Atlantic Boulevard/SR 60: Realign the SR 60 eastbound and westbound on-ramps (Sheets 6 and 7).
- Atlantic Boulevard/SR 60: Modify the SR 60 westbound off-ramp curb returns at Atlantic Boulevard (Sheet 8).
- Atlantic Boulevard/I-10: Modify the entrance to the I-10 westbound on-ramp (Sheet 10).
- Fair Oaks Avenue/SR 110: Add one through lane and one right-turn-only lane to the SR 110 northbound off-ramp, restripe the existing ramp lanes for left-turning traffic only, and construct additional retaining walls (Sheet 11).

IV. Light Rail Transit (LRT) Alternative

The LRT Alternative would include passenger rail operated along a dedicated guideway, similar to other Metro light rail lines. The LRT alignment is approximately 7.5 miles long, with 3 miles of aerial segments and 4.5 miles of bored tunnel segments. Attachment H-1 provides the LRT Alternative exhibit along with the proposed design plans within Caltrans ROW. The detailed design and analysis is covered in *Advanced Conceptual Engineering Report Light Rail Transit Alternative* (AECOM, 2014).

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 the 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-foot 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 at the portals and the stations. The cut-and-cover construction method would be used at the portals and the stations. The depth of the bored tunnel will vary from approximately 20 feet to 90 feet 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 feet to 20 feet bgs. The horizontal and vertical alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering. Other supporting tunnel systems include emergency evacuation cross passages for pedestrians, a ventilation system consisting of exhaust fans at each portal and an exhaust duct along the entire length of the tunnel, fire detection and suppression systems, communications and surveillance systems, and 24-hour monitoring, similar to the existing LRT system.

Trains would operate at speeds of up to 65 miles per hour (mph) approximately every 5 minutes during peak hours and every 10 minutes during off-peak hours.

Seven stations would be located along the LRT alignment:

- Mednik Station 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
- 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; 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 the proposed stations except the Mednik Avenue, Cal State LA, and Fillmore Street stations.

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.

Two bus feeder services would be provided. One would travel 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 travel 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 would be increased in frequency and/or span of service.

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

The proposed LRT improvements completely or partially located within Caltrans ROW are summarized below. The design plans for the alignment segments are included in Attachment H-2.

- SR 60 at Mednik Avenue Overcrossing (OC): Construct three columns — one in the median and two located on either side of SR 60 and within Caltrans ROW (Sheet 1).
- SR 710 from Floral Drive to Valley Boulevard: Construct elevated railway structure within Caltrans ROW (Sheets 2 through 11).
- I-710 at Valley Boulevard: Construct elevated railway structure and railway tunnel structure, realign I-710 off-ramp at Valley Boulevard, and construct additional retaining walls and sound walls (Sheets 12 through 117).
- SR 110 at Fair Oaks Avenue: Construct railway tunnel structure beneath Caltrans ROW (Sheets 18 and 19).

V. Freeway Tunnel Alternative

The alignment for the Freeway Tunnel Alternative starts at the existing southern stub of SR 710 in Alhambra, just north of I-10, and connects to the existing northern stub of SR 710 south of the I-210/SR 134 interchange in Pasadena. Both tunnel design variations, dual-bore tunnel and single-bore tunnel, would include the following tunnel support systems (each with a secondary supply and backup system):

- Lighting
- Emergency evacuation for pedestrians and vehicles
- Air scrubbers
- Ventilation system with air monitoring and emergency controls
- Fixed fire detection and suppression systems
- Communications, monitoring and surveillance systems
- Radio rebroadcast system
- Drainage collection and spill containment systems
- Traffic control of the entire tunnel
- Other systems as required by the Emergency Response Plan

The operations and maintenance (O&M) buildings would be constructed at the northern and southern ends of the tunnel. There would be no operational restrictions for the tunnel, with the exception of vehicles carrying flammable or hazardous materials. Attachments I-1a and J-1a illustrate the dual-bore and single-bore tunnel design variations for the Freeway Tunnel Alternative, respectively.

As part of both design variations of the Freeway Tunnel Alternative, the I-710 northbound off-ramp and southbound on-ramp at Valley Boulevard would be modified.

The TSM/TDM Alternative improvements would also be included as part of the Freeway Tunnel Alternative, in 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 component of the TSM/TDM Alternative improvements that would not be constructed with the Freeway Tunnel Alternative are Other Road Improvement T-1 (Valley Boulevard to Mission Road

Connector) and Other Road Improvement T-3 (St. John Avenue Extension between Del Mar Boulevard and California Boulevard).

a. Design Variations

The Freeway Tunnel Alternative includes two design variations. These variations relate to the number of tunnels constructed. 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. Each of these design variations is described below.

- Dual-Bore Tunnel: The dual-bore tunnel design variation is approximately 6.3 miles long, with 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 design variation would consist of two side-by-side tunnels (one for northbound traffic and one for southbound traffic). Each tunnel would have two levels with traffic traveling in the same direction. Each tunnel would consist of two lanes on each level for a total of four lanes in each tunnel. The easterly tunnel would be for northbound traffic; the westerly tunnel would be for southbound traffic. Each bored tunnel would have an excavated diameter of approximately 60 feet. Vehicle cross passages would be provided throughout this tunnel design variation that would connect one tunnel to the other tunnel for use in an emergency situation.
- 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 northern terminus would be located north of Del Mar Boulevard. No intermediate interchanges are planned for the tunnel.
- The approximate depth of the full-range bored tunnel for the dual-bore tunnel is approximately 20 to 280 feet 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 will 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 feet bgs from the top of the tunnel. The cut-and-cover tunnel segment at the north portal would be up to approximately 0 feet to 30 feet bgs from the top of the tunnel. The horizontal and vertical

alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.

- Attachments I-1d and I-1e demonstrate the typical tunnel cross-sections. The design plans for the dual-bore tunnel variation of the Freeway Tunnel Alternative are included in Attachment I-2.
- Single-Bore Tunnel: The single-bore tunnel design variation is also approximately 6.3 miles long, with 4.2 miles of bored tunnel, 0.7 mile of cut-and-cover tunnel, and 1.4 miles of at-grade segments. The single-bore tunnel design variation would consist of a single, two-level, bored tunnel with two lanes traveling in the same direction on each level. Northbound traffic would use the two lanes on the upper level; southbound traffic would use the two lanes on the lower level. The single-bore tunnel would also have an excavated diameter of approximately 60 feet. It would be in the same location as the northbound tunnel in the dual-bore tunnel design variation.
- The approximate depth of the single-bore tunnel is approximately 20 to 280 feet 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 will be constructed using a TBM while the remaining segments would be constructed using the cut-and-cover construction method. The cut-and-cover tunnel at the south portal would be up to approximately 5 to 60 feet bgs from the top of the tunnel. The cut-and-cover tunnel segment at the north portal would be up to approximately 0 to 30 feet bgs from the top of the tunnel. The horizontal and vertical alignments would be refined during final design, if this alternative is selected, based on more detailed geotechnical investigations and engineering.
- Attachments J-1d and J-1e demonstrate the typical tunnel cross-sections. The design plans for the single-bore tunnel variation of the Freeway Tunnel Alternative are included in Attachment J-2.

b. Operational Variations

There were three different parameters related to the operational variations of the Freeway Tunnel Alternative:

- *Tolling*: Tolls could be charged for vehicles using the tunnel, or it could be free for all drivers (freeway).

- *Trucks*: Trucks could be prohibited or allowed.
- *Express Bus*: An Express Bus could be operated using any of the travel lanes in the tunnel. 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 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.

A summary of the operational variations is provided in Table 5-5, followed by a brief description of each. It should be noted that vehicles carrying flammable or hazardous materials would be restricted from using the tunnel under all design variations.

TABLE 5-5. Summary of Operational Variations for the Freeway Tunnel Alternative

Operational Variations	Design Variations	
	Considered for Dual-Bore Tunnel	Considered for Single-Bore Tunnel
Freeway Tunnel Alternative without Tolls	Yes	No
Freeway Tunnel Alternative without Tolls and Trucks Excluded	Yes	No
Freeway Tunnel Alternative with Tolls	Yes	Yes
Freeway Tunnel Alternative with Tolls and Trucks Excluded	No	Yes
Freeway Tunnel Alternative with Tolls and Express Bus	No	Yes

These operational variations have been studied for the Freeway Tunnel Alternative design variations.

- **Freeway Tunnel Alternative without Tolls**: The facility would operate as a freeway with lanes open to all vehicles excluding tanker trucks. Trucks (excludes tanker trucks) would be allowed and there would be no Express Bus service. This operational variation would be considered only for the dual-bore tunnel design variation.
- **Freeway Tunnel Alternative without Tolls and Trucks Excluded**: The facility would operate as a freeway; however, trucks would be excluded from using the tunnel. There would be no Express Bus service. Signs would be provided along I-210, SR 134, I-710, SR 710, and I-10 to provide advance notice of the truck restriction. This operational variation would be considered for the dual-bore tunnel design variation only.

- **Freeway Tunnel Alternative with Tolls**: All vehicles, except tanker trucks, using the tunnel(s) would be tolled. There would be no Express Bus service. This operational variation would be considered for both the dual-bore and single-bore tunnel design variations.
- **Freeway Tunnel Alternative with Tolls and Trucks Excluded**: This facility would operate as a freeway; however, trucks would be excluded from using the tunnel. All automobiles would be tolled, and there would be no Express Bus service. Signs would be provided along I-210, SR 134, I-710, SR 710, and I-10 to provide advance notice of the truck restriction. This operational variation would be considered for the single-bore tunnel design variation only.
- **Freeway Tunnel Alternative with Tolls and Express Bus:** This operational variation would be considered for the single-bore tunnel design variation only. The freeway 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. Trucks would be permitted. 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 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. A freeway tunnel with the 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 time through the study area, and attract additional transit ridership.

B. Rejected Alternatives

The initial screening evaluated a preliminary set of alternatives based on project objectives. This evaluation step resulted in the identification of 12 alternatives that were presented in the AA Report/Conceptual Engineering Report (CH2M HILL, 2012a) for further conceptual engineering and initial environmental analysis evaluation. The set of alternatives included the No Build Alternative, TSM/TDM Alternative, two BRT Alternatives, two LRT Alternatives, four Freeway (F)

Alternatives, and two Highway/Arterial (H) Alternatives. As the screening processes developed, some of the alternatives were rejected based on performance, environmental, and/or community impacts. They are listed and briefly described below:

- BRT-1: This BRT alternative would provide service between Patsaouras Transit Plaza at Los Angeles Union Station and the Jet Propulsion Laboratory (JPL) in La Cañada Flintridge. The route of this alternative contains both exclusive bus lanes and mixed-flow lanes for a total length of 13.9 miles. Upon further analysis, Alternative BRT-1 was rejected for the following reasons:
  - The potential service area of BRT-1 overlaps the service area of the Metro Gold Line.
  - Compared with the current BRT Alternative described in Section 5-A-III, this alternative (BRT-1) performs worse regarding increasing access to high-frequency transit service and increasing north-south transit patronage.
- LRT-6: This LRT alternative consisted of a nearly 8.3-mile LRT corridor and is generally at-grade along Atlantic Boulevard, Huntington Drive, and Fair Oaks Avenue. Two aerial stations and elevated structure segments over I-10 and SR 60 also were proposed for this alternative. The alignment of LRT-6 connects to the Metro Gold Line LRT to Pasadena and East Los Angeles at the northern and southern ends, respectively.

  Upon further analysis, Alternative LRT-6 was rejected for the following reasons:
  - It would require extensive property acquisitions (over 200 properties) along the alignment, and has the highest impact to historic resources compare to other LRT alternatives.
  - There would be extensive loss of parking spaces and loading areas.
  - There was difficulty in siting a maintenance yard.

  F-2: This freeway alternative would originate at the existing SR 710 southerly stub at the I-10 freeway in Alhambra, and connect to the SR 2 freeway in the vicinity of the existing Verdugo Road and York Boulevard interchanges. Alternative F-2 would be an eight-lane freeway primarily constructed in two bored tunnels with cut-and-cover tunnels used for the tunnel entry and exit points (portals) at the southerly and northerly termini with I-10 and SR 2, respectively. The typical tunnel depth of this alternative was 130 to 450 feet from the top of the tunnel to ground level. The length of improvements would be approximately 6.9 miles,

including 4.3 miles of bored tunnel, 0.7 mile of cut-and-cover tunnel, and 1.9 miles of surface/depressed/elevated alignment. Upon further analysis, Alternative F-2 was rejected for the following reasons:

- It has the highest cost compared to other freeway alternatives, mainly because of the substantial ROW impacts.
- It was the least effective of the freeway alternatives at (1) increasing north-south freeway throughput, (2) reducing north-south local street volumes, (3) reducing freeway congestion, and (4) reducing local street congestion.

- F-5: Alternative F-5 would originate at the existing SR 710 southerly stub near I-10, and continue northward connecting to SR 134 near the Colorado Boulevard interchange. Similar to Alternative F-2, this alternative also would be an eight-lane freeway in two bored tunnels with a depth of 100 to 200 feet from the top of the tunnel to ground level. The length of improvements would be approximately 5.8 miles, including 3.8 miles of bored tunnel, 0.6 mile of cut-and-cover tunnel, and 1.4 miles of surface/depressed/elevated alignment.

  Upon further analysis, Alternative F-5 was rejected for the following reasons:

  - There were substantial ROW impacts.
  - It was less effective at (1) increasing north-south freeway throughput, (2) reducing north-south local street volumes, (3) reducing freeway congestion, and (4) reducing local street congestion.

  F-6: Similar to Alternatives F-2 and F-5, this freeway alternative also would originate at the existing SR 710 southerly stub near I-10 and connect to the existing SR 710 northerly stub just south of the I-120/SR 134 interchange. This alternative would be an eight-lane freeway providing three general purpose lanes and one high-occupancy vehicle (HOV) lane in each direction. The alignment of this alternative would be approximately 5.8 miles long and is very similar to the “Depressed Meridian Variation” approved in the ROD in 1992. It contains 0.4 mile of cut-and-cover tunnel and 5.4 miles of surface/depressed/elevated alignment. Grade-separated interchanges would be provided at all major arterials while other minor streets that currently cross the Alternative F-6 alignment would become discontinuous with the use of cul-de-sacs. Upon further analysis, Alternative F-6 was rejected for the following reasons:

- High property acquisitions.
- It has more human environment impacts than freeway Alternative F-7, such as the relocation of business/job opportunities and the required relocation of existing communities.

- H-2: In this alternative, the SR 710 freeway would come to an end at Valley Boulevard and transition to a highway/arterial at Concord Avenue that would cross over Valley Boulevard, the Union Pacific Railroad (UPRR) tracks, and Mission Road/Alhambra Avenue; then proceed northward to the ending near the intersection of San Rafael Avenue and Linda Vista Avenue with a connection to SR 134. The total length of H-2 would be approximately 7.4 miles; access to local streets would be provided by connector roads with at-grade intersections. The addition of the frontage road was not always feasible in this alternative because of the hilly terrain. Also, some of the smaller local side streets with existing access would be converted to cul-de-sacs.

  Upon further analysis, Alternative H-2 was rejected for the following reasons:

  - It has the largest number of property acquisitions of all alternatives.
  - Access control of the proposed alternative affects the operation of the local street system; access to local streets would be limited.

- H-6: This highway/arterial alternative begins at the existing SR 710 southerly stub just north of I-10, and connects the SR 710 freeway directly to Sheffield Avenue. The alignment of this alternative would cross over Valley Boulevard, the UPRR tracks, and Mission Road/Alhambra Avenue to Sheffield Avenue, then proceed northward. At the northern end of this alternative, the roadway would split between St. John Avenue and Pasadena Avenue and then connect to the SR 710 using the existing ramps. The total length of the improvements would be approximately 6.3 miles. The addition of a frontage road is not always feasible because of ROW constraints. Many of the smaller side streets with existing access would be converted to cul-de-sacs to accommodate the improvements. Upon further analysis, Alternative H-6 was rejected for the following reasons:

  - There would be substantial ROW impact, including acquisitions of both residential and commercial properties.

- Access control of the proposed alternative affects the operation of the local street system; access to local streets would be limited.

6. CONSIDERATIONS REQUIRING DISCUSSION

A. Hazardous Waste

CH2M HILL performed a Phase I Initial Site Assessment (ISA) for the SR 710 North Study Area in conformance with the scope and limitations of ASTM International (ASTM) Practice E 1527-05. The scope of this ISA was limited to review of public records and visual evidence of recognized environmental conditions (RECs), and did not include verifying RECs based on environmental testing. Based on the findings of the ISA, the following sites (Subject Properties) were identified with affected media that could potentially impact the proposed study alternatives (Table 6-1).

TABLE 6-1. Summary of ISA Findings for Each Study Alternative

Subject Property No.	Facility	Address	Hazardous Material(s) of Concern	Media Affected[1]	Alternative(s) Affected
1	Former Circle K Stores	1000 West Valley Boulevard, Alhambra	VOCs from gasoline	Soil	BRT
2	Fashion Master Cleaners	1433 Huntington Drive, South Pasadena	Chlorinated VOCs	Soil Vapor, Groundwater	BRT, LRT, TSM/TDM (I-10)
3	Railroad ROW	North of Valley Boulevard and SR 710 and immediately south of Alhambra Avenue/Mission Road	VOCs, semi-VOCs from transported materials, pesticides, metals, wood-treating chemicals	Soil	TSM/TDM (Other Road Improvement T-1)
4	Elite Cleaners	1310 Fair Oaks Avenue	Chlorinated VOCs	Soil Vapor, Groundwater	BRT, LRT
5	Blanchard Landfill	4531 East Blanchard Street, Monterey Park	Methane, VOCs	Soil Vapor	LRT
6	Mercury Die/ Mission Corrugated	3201 West Mission Road, Alhambra	VOCs	Soil Vapor	LRT, Freeway Tunnel, TSM/TDM (Other Road Improvement T-1)

Source: Phase I ISA Report (CH2M HILL, 2014a)
[1] Media affected indicates an existing impact or a potential to impact.
VOCs – volatile organic compounds
Other Road Improvement T-1 – Valley Boulevard to Mission Road Connector Road

It is recommended that Phase II investigations be conducted at the Subject Properties listed above to identify potential impacts.

Also, as is typical with older freeways such as those in parts of the study area, the potential for encountering aerially deposited lead (ADL) on the sides of the freeway is high; ADL is associated with exhaust from former lead-gasoline combustion in motor vehicles. Therefore, prior to construction activities, it is recommended that an ADL investigation be conducted during the Phase II investigation. If a potential ADL impact is present within these areas, the Caltrans ADL guidance document should be followed. A full discussion on hazardous waste is included in the Phase I ISA report (CH2M HILL, 2014a).

B. Value Analysis

A Value Analysis (VA) study was conducted for the SR 710 North Study. The VA study assessed the no build and build alternatives that were brought forward for consideration in this DPR. A 2-week-long comprehensive VA meeting was held in March 2013. There were 23 VA proposals, including 1 TSM proposal, 3 BRT proposals, 6 LRT proposals, 10 Freeway Tunnel proposals, and 3 VA Strategies, that were generated from the VA study. All of the VA proposals and the disposition recommendations are tabulated in Table 6-2. Details of the evaluation and decision making are provided in the *Value Analysis Study Report, District 7, SR 710 North Study, Los Angeles County, California (*CH2M HILL, 2014c).

TABLE 6-2. Summary of VA Proposal and Disposition Recommendation[a]

VA PROPOSAL		DISPOSITION RECOMMENDATION			
		Agree	Agree with Modifications	Further Study Needed	Disagree
TSM-1	Peak Direction HOV Lane on Fremont Avenue and Fair Oaks Avenue during Peak Periods		X		
BRT-1	BRT Enhanced Technology – Guided BRT Operation Combined with Passenger Information System and ITS Technologies		X		
BRT-2	Multimodal Transportation Centers (MTC) for BRT Alternative Combined with Single-Bore Freeway Tunnel with Managed Lanes (FT-1)			X	
BRT-3	Streetcar along Alternative BRT-6A[a] Alignment				X
LRT-1	LRT-4A[a] Alignment on I-710 Median				X
LRT-2	Valley Boulevard OC of LRT		X		
LRT-3	Terminate LRT-4A[a] Alignment at Gold Line North of Arroyo Seco Parkway (SR 110)				X

TABLE 6-2. Summary of VA Proposal and Disposition Recommendation[a]

VA PROPOSAL		DISPOSITION RECOMMENDATION			
		Agree	Agree with Modifications	Further Study Needed	Disagree
LRT-4	LRT At-Grade between Mission Road and Fair Oaks Avenue				X
LRT-5	Hybrid LRT-4A[a]/LRT-6[a] Alternative to Provide At-Grade LRT along Atlantic Boulevard				X
LRT-6	Shortened Tunnel per LRT-4A[a] Alternative – Mission Street Option				X
FT-1	Single-Bore Tunnel with Demand Constrained by Variable Toll	X			
FT-2	Car-Only Freeway Tunnel at 46.5-foot Internal Design Diameter (ID) vs. 52.5-foot ID		X		
FT-3	Raise the Profile at the North Portal by 40 feet Retaining the Same Cover as the Base Design	X			
FT-4	Additional SR 710 Access Located at the North Project Terminus		X		
FT-5	Relocate South Portal to North of Mission Street				X
FT-6	Precast Elements for Tunnel Roadway Decks and Interior Walls			X	
FT-7	Covered Depressed Freeway with a Landscaped Area for "At-Grade Section"				X
FT-8	Move to Public-Private Partnership (PPP) Model of Delivery			X	
FT-9	Utilize "Early Contractor Involvement" into the Project Delivery Options of the Corridor			X	
FT-10	Network-wide Congestion Management by Vehicle Speed Control		X		
Strategy LRT-S1	Combination LRT 1, LRT 2, and LRT 3				X
Strategy FT-S1	Single-Bore Tunnel with Demand Constrained by Variable Toll (FT 1) Combined with Car-Only Freeway Tunnel at 46.5-foot ID				X
Strategy BRT-A1	Addition of BRT with Enhanced Technology to Freeway Tunnel Alternative		X		

Source: Data Summarized from VA Study Report (CH2M HILL, 2014c)
[a] All the alternatives mentioned in Table 6-2 refer to those in the AA Report (CH2M HILL, 2012a).

Two VA proposals were accepted for implementation into the build alternatives resulting in a cost savings of approximately $2.7 billion. Seven design proposals were accepted with modifications for implementation. The performance improvement and the value improvement of these proposals are not cumulative. Four other proposals were conditionally accepted and require further study that was beyond the scope of the VA.

A cost-benefit analysis also was presented in the VA Study Report.

C. Resource Conservation

The proposed project, by increasing capacity and providing TSM/TDM strategies, should reduce congestion, improve traffic flow and reduce energy consumption. The proposed improvements to transit services and active transportation options, such as bicycles and pedestrians, also should help in reducing fossil fuel consumption and greenhouse gas emission.

D. Right-of-Way Issues

Throughout the development of the build alternatives, efforts have been made to minimize ROW impacts to the extent possible. ROW impacts included full and partial property acquisitions, and permanent and temporary easements.

- TSM/TDM Alternative: The ROW impacts in the TSM/TDM Alternative occur at the street intersections. The majority of impacts are to commercial properties such as restaurants, drug stores, spas, service stations, and others. Residential properties are impacted by the improvements at some smaller intersections as well. The ROW Data Sheet for the TSM/TDM Alternative is provided in Attachment N-1.
- BRT Alternative: This alternative was designed within the confines of the existing street alignment. The majority of the improvements can be completed within the existing ROW; however, partial acquisitions and temporary construction easements are proposed at and near some street intersections. The ROW impacts are anticipated to be minor relative to the other build alternatives. The ROW Data Sheet for the BRT Alternative with the feasible TSM/TDM improvements is provided in Attachment N-2.
- LRT Alternative: The majority of the LRT Alternative is either underground or aerial. For this reason, the properties impacted are mainly those used for station sites, traction power substations, tunnel ventilation, and the portal areas at the ends of the alignment. There are potential impacts that could result from the encumbrance of aerial easements and subsurface easements under this alternative. The ROW Data Sheet for the LRT Alternative with the feasible TSM/TDM improvements is provided in Attachment N-3.
- Freeway Tunnel Alternative: Both the dual-bore and single-bore variations of the Freeway Tunnel Alternative are almost entirely underground and connect the existing discontinuous SR 710 between the terminus north of I-10 to the terminus south of the I-210/SR 134 interchange. Therefore, the property impacts are concentrated at the portals of both ends

of the proposed alignments where the tunnels surface. Other than the property acquisitions, potential ROW impacts could also result from the subsurface easements for the Freeway Tunnel Alternative. The ROW Data Sheets for both the dual-bore tunnel design and single-bore tunnel design of this alternative with the feasible TSM/TDM improvements are provided in Attachments N-4 and N-5, respectively.

Impacts to residential properties would include the acquisition of subterranean easements for bored tunnel segments of the Freeway Tunnel and LRT Alternatives. The effects of these impacts will be nominal, and no displacements are expected to result. Nonresidential impacts would include the acquisition of real property and easements from commercial, industrial, and service-related businesses near tunnel portal sites, at light rail stations, and along street and intersection improvements throughout the study area. Table 6-3 summarizes the anticipated displacement units by alternative alone, without incorporation of the possible TSM/TDM improvements.

TABLE 6-3. Summary of Displacement Units by Alternative

Units	Freeway Tunnel with Incorporated TSM/TDM		LRT with incorporated TSM/TDM	BRT with incorporated TSM/TDM	TSM/TDM
	Dual Bore Option	**Single Bore Option**			
Residential Units	0	0	0	0	0
Residential Displacements (residents)	0	0	0	0	0
Nonresidential Units (including Agriculture)	2	2	94	1	1

Source: Data summarized from *Draft Relocation Impact Report* (Epic Land Solutions, Inc., 2014)

Across all alternatives, no residential displacements are anticipated. However, some businesses will be displaced and will require relocation. These displacements are anticipated to be minimal for the TSM/TDM, BRT, and Freeway Tunnel Alternatives; but they would be more substantial for the LRT Alternative. Proposed replacement sites for the displaced properties have been identified within the state-mandated 50-mile radius, and primarily fall within the boundaries of the displacement cities/communities. The lists of anticipated full/partial parcel acquisition, temporary construction easement acquisition, and permanent easement acquisition of each alternative are provided in the *Draft Relocation Impact Report* (Epic Land Solutions, Inc., 2014), and summarized in Table 6-4 (information shown in Table 6-4 for the BRT, LRT, and Freeway Tunnels Alternatives includes the acquisition of incorporated TSM/TDM improvements).

TABLE 6-4. Summary of Parcel/Area Acquisition

Full Acquisition		Freeway Tunnel with Incorporated TSM/TDM		LRT with incorporated TSM/TDM	BRT with incorporated TSM/TDM	TSM/TDM
		Dual Bore	Single Bore			
Number of Parcels	Total	1	1	58	1	1
	Total within State ROW	1	1	1[a]	0	0
Total Acquisition Area (ft^2)		11,901	11,901	477,372	8,020	8,020
Total Acquisition Area within State ROW (ft^2)		11,901	11,901	11,397[a]	0	0
Partial Acquisition[b]		**Freeway Tunnel with Incorporated TSM/TDM**		**LRT with incorporated TSM/TDM**	**BRT with incorporated TSM/TDM**	**TSM/TDM**
		Dual Bore	**Single Bore**			
Number of Parcels	Total	387	278	236	579	41
	Total within State ROW	387	278	9[a]	0	4
Total Partial Fee Acquisition Area (ft^2)		93,257	65,823	338,834	27,283	15,623
Total Partial Fee Acquisition Area within State ROW (ft^2)		93,257	65,823	166,621[a]	0	600
Total TCE (ft^2)		707,663	688,205	421,712	58,908	32,571
Total TCE within State ROW (ft^2)		707,663	688,205	131,155[a]	0	19,869
Total PE (ft^2)		1,816,927	826,997	657,005	9,945	9,945
Total PE within State ROW (ft^2)		1,816,927	826,997	13,047[a]	0	8,972

Source: Data summarized from *Draft Relocation Impact Report* (Epic Land Solutions, Inc., 2014)
"State ROW" in this table refers to the future state ROW associated with the proposed alternative.
[a] Potential acquisition that may be considered state ROW in the future.
[b] Partial acquisitions include right of entries.
TCE – temporary construction easement
PE – permanent easement
ft^2 – square feet

Research shows that as of the time of this DPR, adequate relocation resources exist and will be available to all displacees without discrimination. The agencies should be advised that depending on the alternative selected, funds will need to be allocated toward relocation and ROW requirements. The actual estimated value of the ROW for each alternative has been provided in the Caltrans ROW Data Sheets (Attachment N). The detailed study and in-depth analysis of ROW issues are presented in the *Draft Relocation Impact Report* (Epic Land Solutions, Inc., 2014).

E. Environmental Issues

The DEIR/EIS has been prepared in accordance with Caltrans environmental procedures, as well as state and federal environmental regulations. The attached DEIR/EIS is the appropriate document for the proposed project.

F. Air Quality Conformity

For a project to conform to the State Implementation Plan, the project must be included in approved transportation plans and programs, such as the RTP and FTIP. The tolled operational variation of the Freeway Tunnel Alternative dual-bore design variation is consistent with the scope of the design concept as described in the SCAG 2012 RTP (*SR710 North Extension [tunnel] [alignment TBD]. 4 toll lanes in each direction in tunnel*) and the 2013 FTIP (*Project ID: 18790 Route 710: Study to perform alternative analysis, engineering, and environmental studies to close 710 Freeway gap*).

The alternatives comply with the RTPs and programs, and are considered to be regionally important. These alternatives are not exempt from regional emissions analyses due to the proposed freeway tunnel and roadway widening. At the local level, the proposed improvements are not expected to result in carbon monoxide concentrations exceeding standards and new violations of particulate matter emission levels. However, the Freeway Tunnel Alternatives may potentially be a project of air quality concern, which will be a determination made by the SCAG Transportation Conformity Working Group. The SR 710 North Study area is located in the South Coast Air Basin, within which the air quality regulations are administered by the South Coast Air Quality Management District (SCAQMD). The proposed build alternatives will comply with all SCAQMD requirements.

G. Health Risk Assessment

The general Health Risk Assessment (HRA) approach has been communicated among Caltrans, Metro, and SCAQMD; the current decision is that the HRA discussion for this project will be provided in the CEQA context only. The HRA will evaluate risks from the eight mobile source air toxics (MSATs)

included in the Caltrans CT-EMFAC model (Version 5), and only the alternatives determined to have high potential of MSAT effects (that is, with a high potential for an increase of diesel vehicle emissions) will be included in the quantitative HRA. Assuming the TSM/TDM, BRT, and LRT Alternatives show no potential or low potential for substantial health risk impacts, a quantitative HRA will be performed only for each design variation under the Freeway Tunnel Alternative.

Two scenarios are evaluated in the HRA:

- Scenario 1: No Build Alternative and Freeway Tunnel Alternative versus Existing Condition (70-year average emissions)
- Scenario 2: Freeway Tunnel Alternative versus No Build Alternative (snapshot emissions)

Although the quantitative health risk modeling will not be performed for the alternatives with no potential or low potential for MSAT effects, MSAT emission analysis will be performed for each of the alternatives. Then, the results will be used to compare the MSAT emission trend on highways and principle arterials within the project area among the alternatives.

H. Title VI Considerations

It has been the FHWA's and the Federal Transit Administration's (FTA's) long-standing policy to actively ensure nondiscrimination under Title VI of the 1964 Civil Rights Act in federally funded activities. The Civil Rights Restoration Act of 1987 clarified the intent of Title VI to include all programs and activities of federal-aid recipients, subrecipients, and contractors whether those programs and activities are federally funded or not. Environmental justice has been a concern within the SR 710 study area, and it was a major concern raised by the El Sereno community during prior environmental review in the 1980s and 1990s. Therefore, the potential for an alternative to result in environmental justice impacts (that is, a disproportionate adverse impact to low income and minority populations) was identified as one of the criteria in analyzing the alternatives of the SR 710 North Study.

I. Noise Abatement Decision Report

There are four build alternatives included in the SR 710 North Study. According to the initial analysis, the Noise Abatement Decision Report (NADR) was prepared after the completion of the Noise Study Report (NSR) and prior to circulation of the DEIR/EIS.

I. Results of the Noise Study Report

The NSR for the SR 710 North Study was prepared by LSA Associates, Inc. (LSA), and submitted for the approval of Branch Chief/Noise and Vibration Branch of Caltrans District 7 in October 2014. The results of the NSR (LSA, 2014b) are summarized below.

A total of 26 long-term and 152 short-term noise level measurements were conducted at representative locations to document the existing noise environment. Additionally, 26 short-term exterior-to-interior noise level measurements were conducted at 13 schools within the study area. A total of 899 representative receptors were evaluated for potential noise impacts resulting from the alternatives.

- **TSM/TDM Alternative, BRT Alternative, and Freeway Tunnel Alternatives**

The implementation of the TSM/TDM, BRT, and Freeway Tunnel Alternatives would result in potential short-term noise impacts during construction and long-term operational noise impacts after completion. The future traffic noise levels were modeled using either the peak-hour traffic volumes provided in the SR 710 North Study TTR (CH2M HILL, 2014b), or the worst-case traffic operations (prior to speed degradation), whichever is lower. When traffic noise impacts have been identified as one or more of the following occurrences, noise abatement measures must be considered:

(1) An increase of 12 A-weighted decibels (dBA) or more over existing noise levels
(2) Predicted noise levels that approach or exceed the Noise Abatement Criteria (NAC)

No substantial noise level increase of 12 dBA or more from the corresponding existing noise level would result from the operation of the completed TSM/TDM, BRT, and Freeway Tunnel Alternatives. Based on the modeling results, a total of 9 noise barriers for the TSM/TDM Alternative, 6 noise barriers for the BRT Alternative, and 18 noise barriers for the Freeway Tunnel Alternatives were evaluated.

The NADR (LSA, 2014a) is an evaluation of the reasonableness and feasibility of incorporating noise abatement measures into the alternative analysis and constitutes the preliminary decision on noise abatement measures to be incorporated into the DEIR/EIS. It is also required for Caltrans to meet the conditions of Title 23 *Code of Federal Regulations*, Part 772 of the FHWA standards.

The construction cost estimates for sound barriers are compared to reasonable allowances in the NADR to identify which sound barrier configurations are reasonable from a cost perspective; however, the NADR does not present the final decision regarding noise abatement. Rather, it presents key information on abatement to be considered throughout the environmental review process, based on the best available information at the time the DEIR/EIS is published. If pertinent parameters change substantially during the final project design, the preliminary noise barrier designs presented in the NADR may be modified or eliminated from the final project.

Tables 6-5 to 6-8 summarize the results of feasible noise barriers from the NADR for the TSM/TDM Alternative, BRT Alternative, Freeway Tunnel Dual-Bore Alternative, and Freeway Tunnel Single-Bore Alternative, respectively.

TABLE 6-5. Summary of Feasible Noise Barriers– TSM/TDM Alternative

TSM/TDM Intersection ID No.	Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station No.	
								Begin	End
L-3	TNB No. 1	6	48	L3/TR-22	1	$55,000	$55,000	29+85	30+15
		8[b]		L3/TR-22	1	$55,000	$55,000		
		10		L3/TR-22	1	$55,000	$55,000		
		12		L3/TR-22	1	$55,000	$55,000		
		14		L3/TR-22	1	$55,000	$55,000		
		16		L3/TR-22	1	$55,000	$55,000		
		18		L3/TR-22	1	$55,000	$55,000		
		20		L3/TR-22	1	$55,000	$55,000		
	TNB No. 2	6	46	L3/TR-34	1	$55,000	$55,000	19+10	19+23
		8[b]		L3/TR-34	1	$55,000	$55,000		
		10		L3/TR-34	1	$55,000	$55,000		
		12		L3/TR-34	1	$55,000	$55,000		
		14		L3/TR-34	1	$55,000	$55,000		
		16		L3/TR-34	1	$55,000	$55,000		
		18		L3/TR-34	1	$55,000	$55,000		
		20		L3/TR-34	1	$55,000	$55,000		
L-5	TNB No. 1	6	202	L5/TR-33	2	$55,000	$110,000	30+18	30+23
		8		L5/TR-33	2	$55,000	$110,000		
		10[b]		L5/TR-33	2	$55,000	$110,000		
		12		L5/TR-33	2	$55,000	$110,000		
		14		L5/TR-33	2	$55,000	$110,000		
		16		L5/TR-33	2	$55,000	$110,000		
		18		L5/TR-33	2	$55,000	$110,000		
		20		L5/TR-33	2	$55,000	$110,000		
T-1	TNB No. 1	8	1247	T1/TR-7 to T1/TR-13	18	$55,000	$990,000	40+95	53+67
		10		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
		12		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
		14		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
		16[b]		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
		18		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
		20		T1/TR-7 to T1/TR-13	18	$55,000	$990,000		
	TNB No. 2	10	963	T1/TR-31	4	$55,000	$220,000	39+75	48+53
		12		T1/TR-30, T1/TR-31	5	$55,000	$275,000		
		14		T1/TR-30, T1/TR-31, T1/TR-33, T1/TR-34	11	$55,000	$605,000		
		16		T1/TR-30, T1/TR-31, T1/TR-33, T1/TR-34, T1/TR-36	15	$55,000	$825,000		
		18		T1/TR-30 to T1/TR-34, T1/TR-36	16	$55,000	$880,000		
		20[c]		T1/TR-30 to T1/TR-34, T1/TR-36	16	$55,000	$880,000		

TABLE 6-5. Summary of Feasible Noise Barriers– TSM/TDM Alternative

TSM/TDM Intersection ID No.	Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station No.	
								Begin	End
T-1	TNB No. 3	6	673	T1/TR-33	4	$55,000	$220,000	43+00	49+52
		8		T1/TR-33	4	$55,000	$220,000		
		10		T1/TR-33	4	$55,000	$220,000		
		12		T1/TR-33	4	$55,000	$220,000		
		14		T1/TR-31, T1/TR-33	8	$55,000	$440,000		
		16		T1/TR-31, T1/TR-33	8	$55,000	$440,000		
		18		T1/TR-31, T1/TR-33	8	$55,000	$440,000		
		20[c]		T1/TR-30, T1/TR-31, T1/TR-33	9	$55,000	$495,000		
	TNB No. 4	6	406	T1/TR-34	6	$55,000	$330,000	39+36	42+40
		8		T1/TR-34	6	$55,000	$330,000		
		10		T1/TR-34	6	$55,000	$330,000		
		12		T1/TR-34	6	$55,000	$330,000		
		14		T1/TR-34	6	$55,000	$330,000		
		16		T1/TR-34	6	$55,000	$330,000		
		18		T1/TR-34	6	$55,000	$330,000		
		20[b]		T1/TR-34	6	$55,000	$330,000		
T-2	TNB No. 1	6	349	T2/TR-2	4	$55,000	$220,000	79+28	82+63
		8		T2/TR-2	4	$55,000	$220,000		
		10[b]		T2/TR-2	4	$55,000	$220,000		
		12		T2/TR-2	4	$55,000	$220,000		
		14		T2/TR-2	4	$55,000	$220,000		
		16		T2/TR-2	4	$55,000	$220,000		
		18		T2/TR-2	4	$55,000	$220,000		
		20		T2/TR-2	4	$55,000	$220,000		
	TNB No. 2	8	743	T2/TR-9	13	$55,000	$715,000	82+37	89+95
		10		T2/TR-9	13	$55,000	$715,000		
		12		T2/TR-9 to T2/TR-11	34	$55,000	$1,870,000		
		14		T2/TR-9 to T2/TR-11	34	$55,000	$1,870,000		
		16		T2/TR-9 to T2/TR-11	34	$55,000	$1,870,000		
		18		T2/TR-9 to T2/TR-11	34	$55,000	$1,870,000		
		20[b]		T2/TR-9 to T2/TR-11	34	$55,000	$1,870,000		

Source: SR 710 North Study NADR (LSA, 2014a)

[a] Number of units that are attenuated by 5 dBA or more by the modeled barrier.

[b] Denotes the minimum wall height required to break the line of sight between the receiver and truck exhaust stack.

[c] Denotes that the maximum feasible barrier height would not break the line of sight between the receptor and the truck exhaust stack.

TNB – TSM/TDM noise barrier

TABLE 6-6. Summary of Feasible Noise Barriers – BRT Alternative

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
BNB No. 1	10	340	BR-450	12	$55,000	$660,000	168+95	172+05
	12		BR-450	12	$55,000	$660,000		
	14		BR-450	12	$55,000	$660,000		
	16		BR-450	12	$55,000	$660,000		
	18		BR-450	12	$55,000	$660,000		
	20[b]		BR-450	12	$55,000	$660,000		
BNB No. 2	10	826	BR-448	3	$55,000	$165,000	173+00 & 177+02	176+85 & 181+48
	12		BR-447, BR-449	9	$55,000	$495,000		
	14		BR-444, BR-447, BR-449	16	$55,000	$880,000		
	16		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	18		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	20[c]		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
BNB No. 3	6	623	BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000	173+55 & 177+04	176+98 & 180+30
	8[b]		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	10		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	12		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	14		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	16		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	18		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
	20		BR-443, BR-444, BR-446, BR-447, BR-449	24	$55,000	$1,320,000		
BNB No. 4	8[b]	67	BR-397	1	$55,000	$55,000	248+20	248+58
	10		BR-397	1	$55,000	$55,000		
	12		BR-397	1	$55,000	$55,000		
	14		BR-397	1	$55,000	$55,000		
	16		BR-397	1	$55,000	$55,000		
	18		BR-397	1	$55,000	$55,000		
	20		BR-397	1	$55,000	$55,000		

TABLE 6-6. Summary of Feasible Noise Barriers – BRT Alternative

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
BNB No. 5	6	146	BR-122	1	$55,000	$55,000	260+16	260+95
	8		BR-122	1	$55,000	$55,000		
	10[b]		BR-122	1	$55,000	$55,000		
	12		BR-122	1	$55,000	$55,000		
	14		BR-122	1	$55,000	$55,000		
	16		BR-122	1	$55,000	$55,000		
	18		BR-122	1	$55,000	$55,000		
	20		BR-122	1	$55,000	$55,000		

Source: SR 710 North Study NADR (LSA, 2014a)

[a] Number of units that are attenuated by 5 dBA or more by the modeled barrier.

[b] Denotes the minimum wall height required to break the line of sight between the receiver and truck exhaust stack.

[c] Denotes that the maximum feasible barrier height would not break the line of sight between the receptor and the truck exhaust stack.

BNB – BRT noise barrier

TABLE 6-7. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Dual-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 2	6	115	FR-2	1	$55,000	$55,000	1378+57	1379+00
	8[b]		FR-2	1	$55,000	$55,000		
	10		FR-2	1	$55,000	$55,000		
	12		FR-2	1	$55,000	$55,000		
	14		FR-2	1	$55,000	$55,000		
	16		FR-2	1	$55,000	$55,000		
	18		FR-2	1	$55,000	$55,000		
	20		FR-2	1	$55,000	$55,000		
FTNB A No. 3A	6	2453	FR-6, FR-8 to FR-11, FR-13, FR-15, FR-17	17	$55,000	$935,000	1407+00	1425+50
	8		FR-6 to FR-11, FR-13, FR-15 to FR-17	21	$55,000	$1,155,000		
	10		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	12[b]		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	14		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	16		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	18		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	20		FR-6 to FR-17	26	$55,000	$1,430,000		
FTNB No. 3B	6	3091	FR-6, FR-8 to FR-11, FR-13, FR-15, FR-17	17	$55,000	$935,000	1425+21	1431+40
	8		FR-6 to FR-11, FR-13, FR-15 to FR-17, FR-19, FR-21	26	$55,000	$1,430,000		
	10		FR-6 to FR-13, FR-15 to FR-19, FR-21	32	$55,000	$1,760,000		
	12[b]		FR-6 to FR-13, FR-15 to FR-21	35	$55,000	$1,925,000		
	14		FR-6 to FR-13, FR-15 to FR-21	35	$55,000	$1,925,000		
	16		FR-6 to FR-13, FR-15 to FR-21	35	$55,000	$1,925,000		
	18		FR-6 to FR-13, FR-15 to FR-21	35	$55,000	$1,925,000		
	20		FR-6 to FR-21	37	$55,000	$2,035,000		
FTNB No. 4	6	2621	FR-15, FR-17	5	$55,000	$275,000	1406+78 & 1414+25	1414+05 & 1431+40
	8		FR-13 to FR-15, FR-17	10	$55,000	$550,000		
	10		FR-10, FR-13 to FR-15, FR-17	12	$55,000	$660,000		
	12		FR-10, FR-12 to FR-17, FR-19	21	$55,000	$1,155,000		
	14		FR-10 to FR-17, FR-19	23	$55,000	$1,265,000		
	16		FR-10 to FR-19	26	$55,000	$1,430,000		
	18		FR-9 to FR-19	27	$55,000	$1,485,000		
	20[b]		FR-9 to FR-19	27	$55,000	$1,485,000		

TABLE 6-7. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Dual-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 5	6	1801	FR-25, FR-26, FR-33 to FR-38	21	$55,000	$1,155,000	1432+48	1449+75
	8		FR-25, FR-26, FR-33 to FR-38	21	$55,000	$1,155,000		
	10		FR-25, FR-26, FR-33 to FR-38	21	$55,000	$1,155,000		
	12		FR-25, FR-26, FR-29, FR-33 to FR-38	25	$55,000	$1,375,000		
	14		FR-25, FR-26, FR-28 to FR-31, FR-33 to FR-38	34	$55,000	$1,870,000		
	16		FR-25 to FR-31, FR-33 to FR-38	40	$55,000	$2,200,000		
	18		FR-25 to FR-31, FR-33 to FR-38	40	$55,000	$2,200,000		
	20[b]		FR-25 to FR-38	43	$55,000	$2,365,000		
FTNB No. 6D	6	1404	FR-51	4	$55,000	$220,000	1432+85	1447+60
	8		FR-51	4	$55,001	$220,004		
	10		FR-51	4	$55,002	$220,008		
	12		FR-47, FR-48, FR-50, FR-51	11	$55,003	$605,033		
	14		FR-47-FR-51	15	$55,004	$825,060		
	16		FR-47-FR-51	15	$55,005	$825,075		
	18		FR-47-FR-51	15	$55,006	$825,090		
	20[c]		FR-47-FR-51	15	$55,007	$825,105		
FTNB No. 7	6	673	FR-49	4	$55,000	$220,000	1440+35	1446+80
	8		FR-49	4	$55,000	$220,000		
	10		FR-49	4	$55,000	$220,000		
	12		FR-48, FR-49	8	$55,000	$440,000		
	14		FR-48, FR-49	8	$55,000	$440,000		
	16		FR-47 to FR-49	9	$55,000	$495,000		
	18		FR-47 to FR-49	9	$55,000	$495,000		
	20[b]		FR-47 to FR-49	9	$55,000	$495,000		
FTNB No. 8	6	406	FR-50, FR-51	6	$55,000	$330,000	1436+80	1439+85
	8		FR-50, FR-51	6	$55,000	$330,000		
	10		FR-50, FR-51	6	$55,000	$330,000		
	12		FR-50, FR-51	6	$55,000	$330,000		
	14		FR-50, FR-51	6	$55,000	$330,000		
	16		FR-50, FR-51	6	$55,000	$330,000		
	18		FR-50, FR-51	6	$55,000	$330,000		
	20[b]		FR-50, FR-51	6	$55,000	$330,000		

TABLE 6-7. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Dual-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 9	6	84	FR-72	1	$55,000	$55,000	1751+75	1752+25
	8[b]		FR-72	1	$55,000	$55,000		
	10		FR-72	1	$55,000	$55,000		
	12		FR-72	1	$55,000	$55,000		
	14		FR-72	1	$55,000	$55,000		
	16		FR-72	1	$55,000	$55,000		
	18		FR-72	1	$55,000	$55,000		
	20		FR-72	1	$55,000	$55,000		
FTNB No. 10	8	1207	FR-75, FR-80	10	$55,000	$550,000	1774+35	1784+20
	10		FR-75, FR-80	10	$55,000	$550,000		
	12		FR-75, FR-80	10	$55,000	$550,000		
	14[b]		FR-75 to FR-78, FR-80	18	$55,000	$990,000		
	16		FR-75 to FR-80	22	$55,000	$1,210,000		
	18		FR-75 to FR-80	22	$55,000	$1,210,000		
	20		FR-75 to FR-81	23	$55,000	$1,265,000		
FTNB No. 11	10[b]	1404	FR-91	2	$55,000	$110,000	1786+00	1800+28
	12		FR-91	2	$55,000	$110,000		
	14		FR-91, FR-92	5	$55,000	$275,000		
	16		FR-85, FR-91, FR-92	6	$55,000	$330,000		
	18		FR-85, FR-90 to FR-92	9	$55,000	$495,000		
	20		FR-85, FR-89 to FR-92	12	$55,000	$660,000		
FTNB No. 12	14	556	FR-96	3	$54,997	$164,991	1800+20	1805+95
	16		FR-96	3	$54,998	$164,994		
	18		FR-96	3	$54,999	$164,997		
	20[c]		FR-96	3	$55,000	$165,000		
FTNB No. 13A	10[b]	2315	FR-104, FR-105	5	$55,000	$275,000	1783+50	1806+20
	12		FR-104, FR-105	5	$55,000	$275,000		
	14		FR-104, FR-105, FR-108	7	$55,000	$385,000		
	16		FR-104, FR-105, FR-108	7	$55,000	$385,000		
	18		FR-104, FR-105, FR-108	7	$55,000	$385,000		
	20		FR-104, FR-105, FR-108, FR-109	9	$55,000	$495,000		
FTNB No. 13B	18[b]	709	FR-108	2	$55,000	$110,000	1790+65	1806+20
	20		FR-108	2	$55,000	$110,000		

TABLE 6-7. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Dual-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 14	8	263	FR-115	1	$55,000	$55,000	1774+15	1776+22
	10		FR-115	1	$55,000	$55,000		
	12		FR-115	1	$55,000	$55,000		
	14		FR-115	1	$55,000	$55,000		
	16[b]		FR-115	1	$55,000	$55,000		
	18		FR-115	1	$55,000	$55,000		
	20		FR-115	1	$55,000	$55,000		
FTNB No. 15	8	262	FR-116	1	$55,000	$55,000	1768+60	1769+90
	10		FR-116	1	$55,000	$55,000		
	12[b]		FR-116	1	$55,000	$55,000		
	14		FR-116, FR-117	2	$55,000	$110,000		
	16		FR-116, FR-117	2	$55,000	$110,000		
	18		FR-116, FR-117	2	$55,000	$110,000		
	20		FR-116, FR-117	2	$55,000	$110,000		

Source: SR 710 North Study NADR (LSA, 2014a)

[a] Number of units that are attenuated by 5 dBA or more by the modeled barrier.

[b] Denotes the minimum wall height required to break the line of sight between the receiver and truck exhaust stack.

[c] Denotes that the maximum feasible barrier height would not break the line of sight between the receptor and the truck exhaust stack.

FTNB – freeway tunnel noise barrier

TABLE 6-8. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Single-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 1	14	537	FR-2	1	$55,000	$55,000	1376+15	1381+30
	16		FR-2	1	$55,000	$55,000		
	18		FR-2	1	$55,000	$55,000		
	20[c]		FR-2	1	$55,000	$55,000		
FTNB No. 2	6	115	FR-2	1	$55,000	$55,000	1378+57	1379+00
	8[b]		FR-2	1	$55,000	$55,000		
	10		FR-2	1	$55,000	$55,000		
	12		FR-2	1	$55,000	$55,000		
	14		FR-2	1	$55,000	$55,000		
	16		FR-2	1	$55,000	$55,000		
	18		FR-2	1	$55,000	$55,000		
	20		FR-2	1	$55,000	$55,000		
FTNB No. 3A	6	2453	FR-6, FR-8 to FR-11, FR-13, FR-15, FR-17	17	$55,000	$935,000	1406+90	1425+40
	8		FR-6, FR-8 to FR-11, FR-13, FR-15 to FR-17	20	$55,000	$1,100,000		
	10		FR-6, FR-8 to FR-13, FR-15 to FR-17	23	$55,000	$1,265,000		
	12[b]		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	14		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	16		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	18		FR-6 to FR-13, FR-15 to FR-17	24	$55,000	$1,320,000		
	20		FR-6 to FR-17	26	$55,000	$1,430,000		
FTNB No. 3B	6	3091	FR-6, FR-8 to FR-11, FR-13, FR-15, FR-17, FR-21	19	$55,000	$1,045,000	1425+21	1431+40
	8		FR-6, FR-8 to FR-11, FR-13, FR-15 to FR-19, FR-21	28	$55,000	$1,540,000		
	10		FR-6, FR-8 to FR-13, FR-15 to FR-21	34	$55,000	$1,870,000		
	12[b]		FR-6, FR-8 to FR-13, FR-15 to FR-21	34	$55,000	$1,870,000		
	14		FR-6, FR-8 to FR-13, FR-15 to FR-21	34	$55,000	$1,870,000		
	16		FR-6, FR-8 to FR-13, FR-15 to FR-21	34	$55,000	$1,870,000		
	18		FR-6, FR-8 to FR-13, FR-15 to FR-21	34	$55,000	$1,870,000		
	20		FR-6, FR-8 to FR-21	36	$55,000	$1,980,000		

TABLE 6-8. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Single-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 4	6	2621	FR-15, FR-18, FR-19, FR-21	10	$55,000	$550,000	1406+65 & 1414+22	1413+92 & 1431+40
	8		FR-14, FR-15, FR-17 to FR-19, FR-21	15	$55,000	$825,000		
	10		FR-13 to FR-15, FR-17 to FR-19, FR-21	18	$55,000	$990,000		
	12		FR-13 to FR-19, FR-21	21	$55,000	$1,155,000		
	14		FR-13 to FR-19, FR-21	21	$55,000	$1,155,000		
	16		FR-13 to FR-19, FR-21	21	$55,000	$1,155,000		
	18		FR-10, FR-12 to FR-19, FR-21	26	$55,000	$1,430,000		
	20[c]		FR-9 to FR-19, FR-21	29	$55,000	$1,595,000		
FTNB No. 5	6	1801	FR-25, FR-26, FR-33 to FR-37	19	$55,000	$1,045,000	1432+48	1449+75
	8		FR-25, FR-26, FR-33 to FR-37	19	$55,000	$1,045,000		
	10		FR-25, FR-26, FR-31, FR-33 to FR-37	22	$55,000	$1,210,000		
	12		FR-25, FR-26, FR-28 to FR-31, FR-33 to FR-37	32	$55,000	$1,760,000		
	14		FR-24 to FR-26, FR-28 to FR-31, FR-33 to FR-37	33	$55,000	$1,815,000		
	16		FR-24 to FR-31, FR-33 to FR-37	39	$55,000	$2,145,000		
	18		FR-24 to FR-37	42	$55,000	$2,310,000		
	20[b]		FR-24 to FR-37	42	$55,000	$2,310,000		
FTNB No. 6S	20[c]	1454	FR-47, FR-51	5	$55,000	$275,000	1432+85	1447+75
FTNB No. 7	6	673	FR-49	4	$55,000	$220,000	1440+20	1446+75
	8		FR-49	4	$55,000	$220,000		
	10		FR-49	4	$55,000	$220,000		
	12		FR-48, FR-49	8	$55,000	$440,000		
	14		FR-48, FR-49	8	$55,000	$440,000		
	16		FR-47 to FR-49	9	$55,000	$495,000		
	18		FR-47 to FR-49	9	$55,000	$495,000		
	20[b]		FR-47 to FR-49	9	$55,000	$495,000		
FTNB No. 8	6	406	FR-50, FR-51	6	$55,000	$330,000	1436+65	1439+70
	8		FR-50, FR-51	6	$55,000	$330,000		
	10		FR-50, FR-51	6	$55,000	$330,000		
	12		FR-50, FR-51	6	$55,000	$330,000		
	14		FR-50, FR-51	6	$55,000	$330,000		
	16		FR-50, FR-51	6	$55,000	$330,000		
	18		FR-50, FR-51	6	$55,000	$330,000		
	20[b]		FR-50, FR-51	6	$55,000	$330,000		

TABLE 6-8. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Single-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 9	6	84	FR-72	1	$55,000	$55,000		
	8[b]		FR-72	1	$55,000	$55,000		
	10		FR-72	1	$55,000	$55,000		
	12		FR-72	1	$55,000	$55,000		
	14		FR-72	1	$55,000	$55,000		
	16		FR-72	1	$55,000	$55,000		
	18		FR-72	1	$55,000	$55,000		
	20		FR-72	1	$55,000	$55,000		
FTNB No. 10	8	1207	FR-75, FR-80	10	$55,000	$550,000	1774+35	1784+20
	10		FR-75, FR-80	10	$55,000	$550,000		
	12		FR-75, FR-78, FR-80	12	$55,000	$660,000		
	14[b]		FR-75 to FR-78, FR-80	18	$55,000	$990,000		
	16		FR-75 to FR-80	22	$55,000	$1,210,000		
	18		FR-75 to FR-80	22	$55,000	$1,210,000		
	20		FR-75 to FR-80	22	$55,000	$1,210,000		
FTNB No. 11	12[b]	1404	FR-91	2	$55,000	$110,000	1786+00	1800+28
	14		FR-91, FR-92	5	$55,000	$275,000		
	16		FR-91, FR-92	5	$55,000	$275,000		
	18		FR-85, FR-89 to FR-92	12	$55,000	$660,000		
	20		FR-85, FR-89 to FR-92	12	$55,000	$660,000		
FTNB No. 12	14	556	FR-96	3	$55,000	$165,000	1800+20	1805+95
	16		FR-96	3	$55,000	$165,000		
	18		FR-96	3	$55,000	$165,000		
	20[c]		FR-96, FR-97	5	$55,000	$275,000		
FTNB No. 13A	10[b]	2315	FR-104, FR-105	5	$55,000	$275,000	1783+50	1806+20
	12		FR-104, FR-105	5	$55,000	$275,000		
	14		FR-104, FR-105	5	$55,000	$275,000		
	16		FR-104, FR-105	5	$55,000	$275,000		
	18		FR-104, FR-105	5	$55,000	$275,000		
	20		FR-102, FR-104, FR-105, FR-107	10	$55,000	$550,000		
FTNB No. 14	8	263	FR-115	1	$55,000	$55,000	1774+15	1776+22
	10		FR-115	1	$55,000	$55,000		
	12		FR-115	1	$55,000	$55,000		
	14		FR-115	1	$55,000	$55,000		
	16[b]		FR-115	1	$55,000	$55,000		
	18		FR-115	1	$55,000	$55,000		
	20		FR-115	1	$55,000	$55,000		

TABLE 6-8. Summary of Feasible Noise Barriers - Freeway Tunnel Alternative Single-Bore Design Variation

Noise Barrier No.	Height (feet)	Approximate Length (feet)	Receiver Locations Benefited	Number of Benefited Units[a]	Reasonable Allowance Per Benefited Unit	Total Reasonable Allowance	Station Number	
							Begin	End
FTNB No. 15	8	262	FR-116	1	$55,000	$55,000	1768+60	1769+90
	10		FR-116	1	$55,000	$55,000		
	12[b]		FR-116	1	$55,000	$55,000		
	14		FR-116, FR-117	2	$55,000	$110,000		
	16		FR-116, FR-117	2	$55,000	$110,000		
	18		FR-116, FR-117	2	$55,000	$110,000		
	20		FR-116, FR-117	2	$55,000	$110,000		

Source: SR 710 North Study NADR (LSA, 2014a)

[a] Number of units that are attenuated by 5 dBA or more by the modeled barrier.

[b] Denotes the minimum wall height required to break the line of sight between the receiver and truck exhaust stack.

[c] Denotes that the maximum feasible barrier height would not break the line of sight between the receptor and the truck exhaust stack.

FTNB – freeway tunnel noise barrier

- **LRT Alternative**

According to the *LRT Preliminary Operation Plans Technical Memorandum* (CH2M HILL, 2012b), the total number of train pass-bys on Fridays (worst-case day) would be 296 (236 during daytime hours and 60 during nighttime hours). When the future train operation noise levels were compared to the existing daily noise levels, there were 13 receptors (out of a total of 29 receptor locations) that would experience moderate or severe impacts. Typically, noise abatement associated with the FTA criteria is to reduce impacts to no-impact with the noise barriers designed at minimum height. Unlike the protocol methodology, an analysis showing costs at multiple heights is not completed. The noise barriers at these locations were considered at the edge of the track due to the track being elevated above ground. The future noise level impacts would be reduced to no impact at all receptors within 1,000 feet of the LRT Alternative alignment (limits of analysis) with the implementation of proposed noise barriers at the recommended heights. Table 6-9 shows a summary of proposed barrier heights and the corresponding train operation noise impacts (refer to the NADR [LSA, 2014a] for detailed information).

TABLE 6-9. Summary of Barrier Evaluation and Operations Noise Impact Analysis for LRT Alternative

Receptor Location	Existing Noise Level (L_{dn})	Train Operations Noise Level (L_{dn})	Noise Exposure Increase (dBA)	No Impact, Moderate, Severe[a]	Proposed Barrier Height (feet)[b]	Train Noise Level With Mitigation (dBA)	No Impact, Moderate, Severe After Mitigation[a]
LR-01	54.6	63.6	9.5	Severe	6.0	54.4	No Impact
LR-02	54.6	57.2	4.5	Moderate	4.0	51.8	No Impact
LR-03	63.1	67.5	5.7	Severe	5.5	59.5	No Impact
LR-04	63.1	60.5	1.9	Moderate	4.0	55.8	No Impact
LR-05	64.6	63.7	2.6	Moderate	4.0	58.4	No Impact
LR-06	58.0	67.3	9.8	Severe	9.5	56.9	No Impact
LR-07[c]	61.9	63.7	4.0	-	0.0	-	-
LR-08	61.9	68.3	7.3	Severe	7.0	58.7	No Impact
LR-09	60.0	59.1	2.6	Moderate	4.0	54.4	No Impact
LR-10	65.6	69.3	5.2	Severe	5.0	60.8	No Impact
LR-11	67.8	68.4	3.3	Moderate	4.0	61.4	No Impact
LR-12	67.6	67.9	3.2	Moderate	4.0	60.6	No Impact
LR-13	67.6	67.9	3.2	Moderate	4.0	60.6	No Impact
LR-14	67.6	67.3	2.9	Moderate	4.0	60.2	No Impact
LR-15	67.6	67.6	3.0	Moderate	4.0	60.4	No Impact
LR-16	67.7	60.5	0.8	No Impact	0.0	-	-
LR-17	61.7	54.7	0.8	No Impact	0.0	-	-
LR-18	67.0	56.3	0.4	No Impact	0.0	-	-
LR-19	64.4	55.9	0.6	No Impact	0.0	-	-
LR-20	61.9	61.9	3.0	Moderate	4.0	56.4	No Impact
LR-21	65.9	62.1	1.5	Moderate	4.0	56.5	No Impact
LR-22	61.8	62.0	3.1	Moderate	4.0	57.0	No Impact
LR-23	69.7	63.0	0.8	No Impact	0.0	-	-
LR-24	77.0	65.8	0.3	No Impact	0.0	-	-
LR-25	63.3	56.2	0.8	No Impact	0.0	-	-
LR-26	76.7	57.0	0.0	No Impact	0.0	-	-
LR-27	71.4	61.6	0.4	No Impact	0.0	-	-
LR-28	58.9	52.3	0.9	No Impact	0.0	-	-
LR-29	58.1	54.2	1.5	No Impact	0.0	-	-

Source: SR 710 North Study NADR (LSA, 2014a)

[a] Transit Noise and Vibration Impact Assessment Manual, Table 3-1 (FTA, 2006)

[b] Proposed barrier height is relative to the track height level.

[c] Non-noise-sensitive active park. Only passive parks are classified as being noise sensitive. Level shown for reporting purposes only.

L_{dn} – day-night average sound level

J. Traffic Analysis

Traffic analysis for all the build alternatives was performed using the same methodology described in Future Traffic Conditions (Section 4.C.II of this DPR). Future freeway performance was projected using the SR 710 North travel demand model, based on the 2012 SCAG RTP/SCS, with post-processing of the results for consistency. Details of the SR 710 North travel demand model can be found in the TTR,

Section 3 (CH2M HILL, 2014b). The freeway traffic volume summaries for all build alternatives are provided in Attachment C of this DPR. Tables 6-10 through 6-18 are summaries of the future traffic conditions of the study area freeway system for all build alternatives.

TABLE 6-10. TSM/TDM (2035) Freeway LOS

Freeway	Limits	Absolute Post Miles	Number of Segments[b]	Percentage[a] of Segments at each LOS					
				LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	129.9 <-> 144.7	94	0%	1%	7%	22%	27%	43%
I-10	Between I-5 and I-605	17.2 <-> 30.1	75	2%	6%	27%	29%	19%	17%
I-210	Between I-5 and I-605	0 <-> 37.4	175	4%	21%	28%	23%	10%	15%
I-605	Between SR 60 and I-210	7.0 <-> 27.5	34	0%	15%	31%	25%	12%	18%
I-710[c]	Between I-5 and Valley Boulevard	18.5 <-> 27.1	31	0%	8%	18%	24%	13%	37%
SR 2	Between I-5 and I-210	7.0 <-> 15.7	41	16%	43%	20%	11%	5%	6%
SR 60	Between I-5 and I-605	0.6 <-> 12.3	66	0%	9%	33%	24%	13%	20%
SR 110	Between I-5 and Fair Oaks Avenue	25.3 <-> 32.1	38	9%	34%	34%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	5.0 <-> 14.7	52	0%	3%	48%	34%	11%	5%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours
[b] Both directions
[c] Includes SR 710 between I-10 and Valley Boulevard

TABLE 6-11. BRT (2035) Freeway LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	23%	27%	43%
I-10	Between I-5 and I-605	2%	6%	29%	29%	18%	17%
I-210	Between I-5 and I-605	4%	21%	28%	23%	10%	14%
I-605	Between SR 60 and I-210	0%	15%	31%	26%	12%	16%
I-710[b]	Between I-5 and Valley Boulevard	0%	8%	18%	24%	13%	37%
SR 2	Between I-5 and I-210	15%	43%	20%	11%	5%	7%
SR 60	Between I-5 and I-605	0%	10%	33%	24%	13%	20%
SR 110	Between I-5 and Fair Oaks Avenue	9%	36%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	48%	34%	11%	5%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours
[b] Includes SR 710 between I-10 and Valley Boulevard

TABLE 6-12. LRT (2035) Freeway LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	22%	27%	44%
I-10	Between I-5 and I-605	2%	5%	23%	31%	18%	20%
I-210	Between I-5 and I-605	4%	21%	27%	23%	9%	15%
I-605	Between SR 60 and I-210	0%	13%	32%	26%	12%	16%
I-710[b]	Between I-5 and Valley Boulevard	2%	15%	18%	21%	13%	32%
SR 2	Between I-5 and I-210	17%	39%	22%	11%	5%	6%
SR 60	Between I-5 and I-605	0%	10%	32%	22%	16%	20%
SR 110	Between I-5 and Fair Oaks Avenue	9%	32%	37%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	48%	35%	11%	4%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours
[b] Includes SR 710 between I-10 and Valley Boulevard

TABLE 6-13. (2035) Freeway Alternative- Dual-Bore (No Toll) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	6%	26%	25%	42%
I-10	Between I-5 and I-605	1%	8%	23%	32%	18%	17%
I-210	Between I-5 and I-605	0%	12%	31%	29%	10%	15%
I-605	Between SR 60 and I-210	0%	16%	31%	26%	10%	16%
I-710	Between I-5 and I-10	0%	0%	13%	16%	23%	39%
SR 2	Between I-5 and I-210	33%	32%	15%	13%	4%	4%
SR 60	Between I-5 and I-605	0%	10%	33%	25%	13%	20%
SR 110	Between I-5 and Fair Oaks Avenue	11%	37%	34%	13%	4%	1%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	36%	12%	6%
SR 710 Tunnel	Between I-10 and I-210 (16 segments)	6%	16%	47%	19%	13%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

TABLE 6-14. (2035) Freeway Alternative- Dual-Bore (No Toll-No Trucks) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	27%	25%	40%
I-10	Between I-5 and I-605	2%	7%	23%	33%	17%	18%
I-210	Between I-5 and I-605	0%	12%	30%	31%	10%	15%
I-605	Between SR 60 and I-210	0%	16%	29%	28%	9%	18%
I-710	Between I-5 and I-10	0%	0%	13%	13%	26%	39%
SR 2	Between I-5 and I-210	32%	34%	17%	12%	1%	4%
SR 60	Between I-5 and I-605	0%	10%	32%	26%	13%	20%
SR 110	Between I-5 and Fair Oaks Avenue	11%	37%	33%	13%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	36%	13%	5%
SR 710 Tunnel	Between I-10 and I-210 (16 segments)	6%	13%	50%	19%	13%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

TABLE 6-15. (2035) Freeway Alternative- Dual-Bore (Toll) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	25%	26%	41%
I-10	Between I-5 and I-605	2%	7%	22%	33%	17%	19%
I-210	Between I-5 and I-605	0%	13%	30%	29%	10%	15%
I-605	Between SR 60 and I-210	0%	16%	29%	26%	12%	16%
I-710	Between I-5 and I-10	0%	0%	13%	23%	15%	40%
SR 2	Between I-5 and I-210	32%	33%	17%	12%	2%	4%
SR 60	Between I-5 and I-605	0%	10%	33%	24%	14%	20%
SR 110	Between I-5 and Fair Oaks Avenue	11%	37%	34%	13%	4%	1%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	37%	12%	5%
SR 710 Tunnel	Between I-10 and I-210 (16 segments)	6%	22%	56%	9%	6%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

TABLE 6-16. (2035) Freeway Alternative- Single-Bore (Toll) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	6%	23%	27%	44%
I-10	Between I-5 and I-605	2%	6%	27%	31%	16%	19%
I-210	Between I-5 and I-605	0%	17%	31%	25%	9%	15%
I-605	Between SR 60 and I-210	0%	15%	31%	26%	12%	16%
I-710	Between I-5 and I-10	0%	0%	18%	27%	10%	35%
SR 2	Between I-5 and I-210	24%	37%	17%	13%	5%	4%
SR 60	Between I-5 and I-605	0%	10%	32%	26%	12%	20%
SR 110	Between I-5 and Fair Oaks Avenue	9%	36%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	37%	12%	5%
SR 710 Tunnel	Between I-10 and I-210 (12 segments)	0%	25%	50%	21%	4%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

TABLE 6-17. (2035) Freeway Alternative- Single-Bore (Toll-No Trucks) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	23%	28%	42%
I-10	Between I-5 and I-605	2%	6%	28%	29%	17%	18%
I-210	Between I-5 and I-605	0%	18%	28%	27%	10%	15%
I-605	Between SR 60 and I-210	0%	15%	31%	26%	12%	16%
I-710	Between I-5 and I-10	0%	0%	15%	27%	13%	35%
SR 2	Between I-5 and I-210	23%	38%	17%	13%	5%	4%
SR 60	Between I-5 and I-605	0%	11%	31%	26%	12%	20%
SR 110	Between I-5 and Fair Oaks Avenue	11%	34%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	37%	12%	5%
SR 710 Tunnel	Between I-10 and I-210 (12 segments)	0%	25%	50%	21%	4%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

TABLE 6-18. (2035) Freeway Alternative- Single-Bore (Toll-Express Bus) LOS

Freeway	Limits	Percentage[a] of Segments at each LOS					
		LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
I-5	Between I-710 and SR 134	0%	1%	7%	22%	27%	44%
I-10	Between I-5 and I-605	2%	7%	27%	29%	18%	17%
I-210	Between I-5 and I-605	0%	19%	29%	25%	10%	15%
I-605	Between SR 60 and I-210	0%	15%	31%	26%	12%	16%
I-710	Between I-5 and I-10	0%	0%	18%	26%	11%	35%
SR 2	Between I-5 and I-210	23%	38%	18%	13%	2%	5%
SR 60	Between I-5 and I-605	0%	11%	31%	25%	13%	20%
SR 110	Between I-5 and Fair Oaks Avenue	9%	36%	33%	16%	4%	3%
SR 134	Between I-5 and I-210/ SR 710	0%	3%	44%	37%	12%	5%
SR 710 Tunnel	Between I-10 and I-210 (12 segments)	0%	25%	46%	21%	8%	0%

Source: TTR (CH2M HILL, 2014b)
Additional details can be found in Tables 5-72 to 5-115 of the TTR (CH2M HILL, 2014b)
[a] Both directions, both peak hours

Adverse effects analysis was performed based on comparisons of all the build alternatives compared to the No Build Alternative with an established set of criteria. Detailed summaries of the adverse effects are summarized for each build alternative for freeways and intersections in the TTR, Section 7 (CH2M HILL, 2014b).

In general, the build alternatives shift both arterial traffic and freeway traffic. The Freeway Tunnel Alternative variations result in a marked shift in traffic from the arterial to the freeway. The biggest increases are on I-210 and the system interchanges on either side of the tunnel alignment. The TSM/TDM, BRT, and LRT Alternatives have a mixed effect; the increase in transit service results in some reduction in arterial traffic, but the intersection improvements drive traffic back to the freeway.

On the freeways, there are some negative effects from the TSM/TDM, BRT, and LRT Alternatives due to the TSM/TDM improvements changing interchange traffic patterns without adding freeway capacity. While the freeway traffic volumes will increase with the Freeway Tunnel Alternative variations, there is little net overall change in LOS. In other words, the alternatives can accommodate the increased traffic (primarily on the connections to the SR 710 tunnel) while still providing surface street benefits.

Potential improvement analysis for intersections and freeways was performed for the identified adverse effects based on a wide range of considerations. Potential improvements were evaluated for feasibility, and some were recommended for implementation. Detailed summaries of the potential improvements are summarized for each build alternative in the TTR, Section 7 (CH2M HILL, 2014b).

K. Design Exceptions

Due to existing design constraints and limitations along the proposed build alternatives, such as surrounding land use and limited ROW, the following design exceptions have been proposed. Approval for exceptions of proposed nonstandard features will require approval for the preferred alternative once selected. Based on the Caltrans Highway Design Manual (HDM) *Table 82.1A Mandatory Standards,* and *Table 82.1B Advisory Standards* (Caltrans, 2012), the required design exceptions for the portions of the build alternatives within the state ROW are provided in Tables 6-19 through 6-28.

I. Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative

The required mandatory and advisory design exceptions for this alternative are summarized in Tables 6-19 and 6-20, respectively.

TABLE 6-19. TSM/TDM Alternative Mandatory Standard Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 504.8 Access Control at Ramp Terminals of Local Streets	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	50 feet	Within 50 feet	Yes
2	HDM 504.8 Access Control at Ramp Terminals of Local Streets	SR 110 SB On-Ramp at State Street, Pasadena	Ramp	50 feet	Within 50 feet	No
3	HDM 504.2B Deceleration Length	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	270 feet Min	115 feet	Yes
4	HDM 504.2B Deceleration Length	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	570 feet Min	193.33 feet	Yes
5	HDM 202.1 HDM 202.2 Superelevation Rates	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	12%	4%	Yes
6	HDM 202.1 HDM 202.2 Superelevation Rates	SR 110 SB On-Ramp at State Street, Pasadena	Ramp	12%	2%	No
7	HDM 302.1 Shoulder Width Adjacent to Retaining Wall	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	10 feet	4 feet	Yes
8	HDM 504.3 Exit Ramp Lane Widening at Terminus	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	18 feet	12 feet	Yes

TABLE 6-20. TSM/TDM Alternative Advisory Standard Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 504.2B Ramp Angle	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	04° 52’ 08”	03° 11’ 03”	Yes
2	HDM 302.1 HDM 504.3K Ramp Shoulder Width	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	2 feet Min.	0 feet on north side and 2 to 8 feet on south side	Yes
3	HDM 504.2B Exit Nose Contrasting Surface Treatment	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	Exit Nose Contrasting Surface Treatment	No Exit Nose Contrasting Surface Treatment	Yes
4	HDM 504.2B Exit Nose Width	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	23 feet	14.5 feet	Yes
5	HDM 504.3K Length of Single Lane Exit Ramp after Exit Nose	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	100 feet Min.	0 feet	Yes
6	HDM 504.3K Transition from Single to Double Lane on Exit Ramp	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	120 feet	75 feet	Yes
7	HDM 202.5(1) Superelevation Transition	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	150 feet	84 feet	Yes
8	HDM 202.5(1) Superelevation Transition	SR 110 SB On-Ramp at State Street, Pasadena	Ramp	150 feet	36 feet	No
9	HDM 202.2 HDM 202.5A HDM 202.5B Superelevation Runoff	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	150 feet	84 feet	Yes
10	HDM 202.2 HDM 202.5A HDM 202.5B Superelevation Runoff	SR 110 SB On-Ramp at State Street, Pasadena	Ramp	150 feet	36 feet	No
11	HDM 504.3 Design Speed at Ramp Terminus	SR 110 SB Off-Ramp at State Street, Pasadena	Ramp	25 mph	18 mph	Yes
12	HDM 504.3 Design Speed at Ramp Terminus	SR 110 SB On-Ramp at State Street, Pasadena	Ramp	25 mph	12 mph	No
13	HDM 504.2.5(a) Design Speed at Vertical Curves Located Beyond Ramp Exit Nose	SR 110 NB Off-Ramp at Fair Oaks Avenue, Pasadena	Ramp	50 mph	22 mph	Yes

II. Bus Rapid Transit (BRT) Alternative

The required mandatory and advisory design exceptions for this alternative are summarized in Tables 6-21 and 6-22, respectively.

TABLE 6-21. BRT Alternative Mandatory Standard Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 202.2 Superelevation Rates	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 185-foot Radius Curve	Ramp	12%	4%	Yes
2	HDM 202.2 Superelevation Rates	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 180-foot Radius Curve	Ramp	12%	4%	Yes
3	HDM 202.2 Superelevation Rates	SR 60 WB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 170-foot Radius Curve	Ramp	12%	6%	No
4	HDM 202.2 Superelevation Rates	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 160-foot Radius Curve	Ramp	12%	6%	No
5	HDM 203.2 Curve Radius	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 250-foot Radius Curve	Ramp	215 feet	180 feet	No
6	HDM 203.2 Curve Radius	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 185-foot Radius Curve	Ramp	215 feet	185 feet	Yes
7	HDM 203.2 Curve Radius	SR 60 WB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 225-foot Radius Curve	Ramp	215 feet	160 feet	No
8	HDM 203.2 Curve Radius	SR 60 WB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 170-foot Radius Curve	Ramp	215 feet	170 feet	Yes
9	HDM 504.3 Lane Widths	SR 60 EB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 185-foot Radius Curve	Ramp	15 feet	13 - 15 feet	No
10	HDM 504.3 Lane Widths	SR 60 WB-Loop On-Ramp at Atlantic Boulevard, Monterey Park, 170-foot Radius Curve	Ramp	16 feet	13 feet	Yes

TABLE 6-22. BRT Alternative Advisory Standard Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 202.5 (1) (2) Superelevation Transition	SR 60 WB-Loop On-Ramp at Atlantic Boulevard, Monterey Park	Ramp	1/3 of transition in curve	All in curve	Yes

III. Light Rail Transit (LRT) Alternative

The required mandatory and advisory design exceptions for this alternative are summarized in Tables 6-23 and 6-24, respectively.

TABLE 6-23. LRT Alternative Mandatory Standard Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 302.1 Left Shoulder Width	Existing SR 60 at Mednik Avenue Unincorporated Los Angeles County	Mainline	10 feet	WB: 0.5 foot EB: 2 feet	Yes
2	HDM 309.1 (3)(a) Minimum Horizontal Clearance	I-10 EB to I-710 SB Connector Bent #69 / STA 119+40.52 City of Monterey Park	Ramp	10 feet	1.5 feet	No
3	HDM 309.1 (3)(a) Minimum Horizontal Clearance	I-710 NB to I-10 WB Connector Bent #71 / STA 124+27.21 City of Monterey Park	Ramp	10 feet	8.5 feet	No
4	HDM 309.1 (3)(a) Minimum Horizontal Clearance	I-710 NB and SB Mainline Bent #86 / STA 156+43.55 City of Alhambra	Mainline	10 feet	7.5 feet	No
5	HDM 309.1 (3)(a) Minimum Horizontal Clearance	SR 710 NB Mainline Bent #87 / STA 158+67.61 City of Alhambra	Mainline	10 feet	2 feet	No
6	HDM 309.1 (3)(a) Minimum Horizontal Clearance	SR 710 NB Mainline/Off-Ramp to Valley Boulevard Bent #88 / STA 161+30.91 City of Alhambra	Mainline/ Ramp	10 feet	2 feet	No
7	HDM 309.1 (3)(a) Minimum Horizontal Clearance	SR 710 SB Mainline/On-Ramp from Valley Boulevard Bent #91 / STA 16+91.46 City of Alhambra	Mainline/ Ramp	10 feet	2 feet	No
8	HDM 501.3 Minimum Interchange Spacing	At interchange between the proposed SR 710 NB Off-Ramp and Valley Boulevard Cities of Alhambra and Los Angeles	Mainline	2 miles	5,100 feet (0.97 mile)	Yes
9	HDM 502.2 Local Street Interchanges	At interchange between the proposed SR 710 NB Off-Ramp and Valley Boulevard Cities of Alhambra and Los Angeles	Mainline	Partial Interchange shall not be used	Partial Interchange	Yes

TABLE 6-24. LRT Alternative Advisory Standard Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 304.1 Side Slope	Proposed SR 710 NB Off-Ramp City of Alhambra	Ramp	4:1 or Flatter	2:1	No
2	HDM 309.1 (2)(c) Clear Recovery Zone (CRZ)	SR 710 SB Mainline Bent #87 / STA 158+67.61 City of Alhambra	Mainline	4 feet from face of barrier	0 feet from face of barrier	No
3	HDM 309.1 (2)(c) Clear Recovery Zone (CRZ)	SR 710 NB and SB Mainline/Off- and On-Ramps from Valley Boulevard Bent #91 / STA 16+91.46 City of Alhambra	Mainline/ Ramp	4 feet from face of barrier	0 feet (NB) / 3.5 feet (SB) from face of barrier	No
4	HDM 403.3 Angle of Intersection	At intersection of the proposed SR 710 NB Off-Ramp and Valley Boulevard Cities of Alhambra and Los Angeles	Ramp	Close to 90°, but not less than 75°	59°	No

IV. Freeway Tunnel Alternative

There are two design variations, dual-bore tunnel and single-bore tunnel, for the Freeway Tunnel Alternative. The required mandatory and advisory design exceptions for the dual-bore tunnel variation are tabulated in Tables 6-25 and 6-26, respectively. The required mandatory and advisory design exceptions for the single-bore tunnel variation are tabulated in Tables 6-27 and 6-28, respectively. These design exception items are based on the current proposed tunnel design, which is not yet approved; revisions/changes to the tables are anticipated.

TABLE 6-25. Dual-Bore Tunnel Mandatory Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 201.1 Stopping Sight Distance	SR 710 just north of I-10 (B-Line), Alhambra	Mainline	660 feet/ 65mph	570 feet/ 59mph	Yes
2	HDM 201.1 Stopping Sight Distance	SB SR 710 Near I-10 interchange (B-Line), Alhambra	Mainline	750 feet/ 70mph	711 feet/ 68mph	No
3	HDM 201.1 Stopping Sight Distance	SR 710/I-10 interchange (B-Line), Monterey Park	Mainline	750 feet/ 70mph	436 feet/ 50mph	Yes
4	HDM 201.1 Stopping Sight Distance	SB SR 710 South of I-10 (B-Line), Monterey Park	Mainline	750 feet/ 70mph	508 feet/ 55mph	Yes
5	HDM 201.1 Stopping Sight Distance	I-210 SB Off-Ramp to St. John Avenue (SJ-2-Line), Pasadena	Ramp	430 feet/ 50mph	320 feet/ 29mph	Yes

TABLE 6-25. Dual-Bore Tunnel Mandatory Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
6	HDM 201.1 Stopping Sight Distance	SR 710 SB On-Ramp from St. John, First vertical curve before the gore (SJ-3-Line), Pasadena	Ramp	430 feet/ 50mph	422 feet/ 49mph	No
7	HDM 201.1 Stopping Sight Distance	SR 710 NB Off-Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	430 feet/ 50mph	321 feet/ 42mph	No
8	HDM 202.2 (1) Superelevation Rate	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	12%	6.50%	Yes
9	HDM 202.2 (1) Superelevation Rate	SB SR 710 to El Monte Busway (G-Line), Los Angeles	Ramp	12%	4%	Yes
10	HDM 202.2 (1) Superelevation Rate	WB I-10 to SB SR 710 (L-Line), Los Angeles	Ramp	12%	2%	Yes
11	HDM 202.2 (1) Superelevation Rate	SR 710 SB On-Ramp from St. John, BC 746+38.25 and EC 747+97.29 (SJ-3-Line), Pasadena	Ramp	10%	7%	No
12	HDM 202.2 (1) Superelevation Rate	SR 710 NB Off-Ramp to Pasadena Avenue, BC 742+85.15 and EC 744+36.76 (PA-4-Line), Pasadena	Ramp	12%	7%	No
13	HDM 202.2 (1) Superelevation Rate	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	12%	10%	Yes
14	HDM 203.2 Standards for Curvature	SB SR 710 South of I-10 (B-Line), Monterey Park	Mainline	2,100 feet	2,000 feet	Yes
15	HDM 302.1 Shoulder Width HDM 309.3(1) Horizontal Clearances	Freeway Tunnel Typical Cross Section Right Shoulder (A-Line), Los Angeles and Pasadena	Mainline	10 feet 6 feet	1 feet	No
16	HDM 302.1 Shoulder Width	SB SR 710 to WB I-10 high-occupancy toll (HOT) Lanes Connector Ramp Right Shoulder (G-Line), Los Angeles	Ramp	10 feet	8 feet	Yes
17	HDM 302.1 Shoulder Width	SR 710 NB Off-Ramp to Valley Boulevard (V-4-Line), Alhambra	Ramp	10 feet	2 – 10 feet	No
18	HDM 302.1 Shoulder Width HDM 309.3(1) Horizontal Clearances	SB SR 710, South of the Beginning of the Cut-and-Cover Tunnel Right Shoulder (SNBT-Line), Alhambra	Mainline	10 feet 6 feet	1 – 10 feet	No
19	HDM 305.1 Median Width Freeways and Expressways	SR 710 South of Valley Boulevard (B-Line), Alhambra	Mainline	22 feet	15.5 feet	No

TABLE 6-25. Dual-Bore Tunnel Mandatory Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
20	HDM 309.2 (1).(a) Vertical Clearances Major Structures	SR 710 (A-Line) Tunnels	Mainline	16.5 feet	15.5 feet	No
21	HDM 501.3 Interchange Spacing	SR 710 between Valley Boulevard and I-10, Alhambra	Mainline	2 miles (10,560 feet)	1 mile (5,280 feet)	Yes
22	HDM 502.2 Isolated Off-Ramps and Partial Interchanges	SR 710 Valley Boulevard Interchange, Los Angeles	Mainline	Full Diamond	Half Diamond	Yes
23	HDM 504.3 Distance Between Ramp Intersection and Local Road Intersection	SR 710 NB Off-Ramp at Valley Boulevard and Westmont Drive (V-4-Line), Alhambra and Los Angeles	Local Street	400 feet	130 feet	Yes
24	HDM 504.3 Distance Between Ramp Intersection and Local Road Intersection	SR 710 SB On-Ramp at Valley Boulevard and Highbury Avenue (V-3-Line), Los Angeles and Alhambra	Local Street	400 feet	160 feet	Yes
25	HDM 504.7 Weaving Sections	WB I-10 ramp and NB Valley Boulevard Exit (SNBT-Line), Alhambra	Mainline	5,000 feet	1,575 feet	No
26	HDM 504.7 Weaving Sections	SR 710 SB On-Ramp at Valley Boulevard and EB I-10 ramp (SSBT-Line), Alhambra	Mainline	5,000 feet	1,290 feet	No
27	HDM 504.7 Weaving Sections	SR 710 SB On-Ramp at Valley Boulevard and WB I-10 ramp (SSBT-Line), Alhambra	Mainline	5,000 feet	2,250 feet	No
28	HDM 504.7 Weaving Sections	EB BUSWAY ramp and NB Top Level Tunnel (B-Line), Alhambra	Mainline	5,000 feet	1,400 feet	No
29	HDM 504.7 Weaving Sections	EB I-10 ramp and NB Top Level Tunnel (B-Line), Monterey Park & Alhambra	Mainline	5,000 feet	2,215 feet	No

BC – begin horizontal curve
EC – end horizontal curve

TABLE 6-26. Dual-Bore Tunnel Advisory Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 202.5 (1)&(2) Superelevation Transition	SR 710 SB On-Ramp at Valley Boulevard Last horizontal curve (V-3-Line), Alhambra	Ramp	240 feet 6% at EC	150 feet 1.97%	No
2	HDM 204.4 Vertical Curve	SB SR 710 to El Monte Busway (G-Line), Los Angeles	Ramp	500 feet	200 feet	No
3	HDM 204.4 Vertical Curve	SR 710 NB Off-Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	500 feet	400 feet	No
4	HDM 204.4 Vertical Curve	SR 710 SB On-Ramp from St. John, First vertical curve before the gore, (SJ-3-Line), Pasadena	Ramp	500 feet	470 feet	No
5	HDM 206.3 Pavement Reductions	SR 710 Freeway South of Valley Boulevard (B-Line), Alhambra	Ramp	50:1	22.5:1	No
6	HDM 208.3 Median	SR 710 SB-Bridge, South of WB I-10 ramp (B-Line), Monterey Park	Mainline	36 feet	16 feet	No
7	HDM 305.1 Median Width Freeways and Expressways	SR 710 Freeway South of Valley Boulevard (B-Line), Alhambra	Mainline	36 feet	22 feet	No
8	HDM 305.1 Median Width Freeways and Expressways	SR 710 Freeway North of Del Mar Boulevard (C-Line), Pasadena	Mainline	36 feet	30 feet	Yes
9	HDM 504.2(4)(a) & HDM 504.2(5)(a) Design Speed Standard	SR 710 SB-Off Ramp to St. John. First vertical curve past the gore (SJ-2-Line), Pasadena	Ramp	50 mph	30 mph	Yes
10	HDM 504.2(4)(a) & HDM 504.2(5)(a) Design Speed Standard	SR 710 SB On-Ramp from St. John, First vertical curve before the gore (SJ-3-Line), Pasadena	Ramp	50 mph	49 mph	No
11	HDM 504.2(4)(a) & HDM 504.2(5)(a) Design Speed Standard	SR 710 NB Off-Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	50 mph	37 mph	No
12	HDM 504.4 Freeway-to-freeway Connections Design Speed	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	50 mph	35 mph	Yes
13	HDM 504.4 Freeway-to-freeway Connections Design Speed	SB SR 710 to WB I-10 (F-Line), Monterey Park and Los Angeles	Ramp	50 mph	38 mph	Yes

TABLE 6-26. Dual-Bore Tunnel Advisory Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
14	HDM 504.4 Freeway-to-freeway Connections Design Speed	SB SR 710 to EB I-10 (E-Line), Los Angeles, Alhambra, and Monterey Park	Ramp	50 mph	35 mph	Yes
15	HDM 504.4 Freeway-to-freeway Connections Design Speed	SB SR 710 to WB Express Lanes (G-Line), Los Angeles	Ramp	50 mph	34 mph	Yes
16	HDM 504.4 Freeway-to-freeway Connections Design Speed	WB I-10 to SB SR 710 (L-Line), Monterey Park	Ramp	50 mph	20 mph	Yes
17	HDM 504.4 Freeway-to-freeway Connections Design Speed	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	50 mph	40 mph	Yes
18	HDM 504.4 (3) Maximum Grade	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	6%	6.91%	Yes
19	HDM 504.4 (5) Single-lane Connector Widening for Passing	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	2 Lanes	1 Lane	Yes
20	HDM 504.4 (5) Single-lane Connector Widening for Passing	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	2 Lanes	1 Lane	Yes

TABLE 6-27. Single-Bore Tunnel Mandatory Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 201.1 Stopping Sight Distance	EB SR 134 to SB SR 710 (I-line), Pasadena	Ramp	430 feet/ 50 mph	330 feet/ 42.5mph	No
2	HDM 201.1 Stopping Sight Distance	SR 710 NB Off-Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	430 feet/ 50 mph	321 feet/ 42mph	No
3	HDM 202.2 (1) Superelevation Rate	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	12%	6.5%	Yes
4	HDM 202.2 (1) Superelevation Rate	SB SR 710 to El Monte Busway (E line) and EB I-10, Los Angeles	Ramp	7%	3%	Yes
5	HDM 202.2 (1) Superelevation Rate	SR 710 NB Off-Ramp to Pasadena Avenue, BC 742+85.15 and EC 744+36.76 (PA-4-Line), Pasadena	Ramp	12%	7%	No
6	HDM 202.2 (1) Superelevation Rate	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	12%	10%	Yes
7	HDM 302.1 Shoulder Width HDM 309.3(1) Horizontal Clearances	Freeway Tunnel Typical Cross Section NB Right Shoulder (A-Line), Los Angeles and Pasadena	Mainline	10 feet 6 feet	1 foot	No
8	HDM 302.1 Shoulder Width HDM 309.3(1) Horizontal Clearances	Freeway Tunnel Typical Cross Section SB Left Shoulder (A-Line), Los Angeles and Pasadena	Mainline	5 feet 4.5 feet	1 foot	No
9	HDM 302.1 Shoulder Width	SR 710 NB Off-Ramp to Valley Boulevard (V-4-Line), Alhambra	Ramp	10 feet	2 - 10 feet	No
10	HDM 302.1 Shoulder Width	SR 710 SB On-Ramp from Valley Boulevard (V-3-Line), Alhambra	Ramp	10 feet	8 feet	No
11	HDM 302.1 Shoulder Width HDM 309.3(1) Horizontal Clearances	SB SR 710, South of the Beginning of the Cut-and-Cover Tunnel Right Shoulder (SNBT-Line), Alhambra	Mainline	10 feet 6 feet	1 - 10 feet	No
12	HDM 305.1 Median Width Freeways and Expressways	SR 710 Freeway North of Del Mar Boulevard and South of Colorado Boulevard (C-Line), Pasadena	Mainline	22 feet	16 feet	No
13	HDM 309.2 (1).(a) Vertical Clearances Major Structures	SR 710 (A-Line) Tunnel	Mainline	16.5 feet	15.5 feet	No
14	HDM 501.3 Interchange Spacing	Valley Boulevard and I-10 Alhambra	Mainline	2 miles (10,560 feet)	1 mile (5,280 feet)	Yes

TABLE 6-27. Single-Bore Tunnel Mandatory Design Exceptions

No.	Mandatory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
15	HDM 502.2 Isolated Off-Ramps and Partial Interchanges	Valley Boulevard Interchange Los Angeles	Mainline	Full Diamond	Half Diamond	Yes
16	HDM 504.3 Distance Between Ramp Intersection and Local Road Intersection	SR 710 NB Off-Ramp at Valley Boulevard and Westmont Drive (V-4-Line), Alhambra and Los Angeles	Local Street	400 feet	130 feet	Yes
17	HDM 504.3 Distance Between Ramp Intersection and Local Road Intersection	SR 710 SB On-Ramp at Valley Boulevard and Highbury Avenue (V-3-Line), Alhambra and Los Angeles	Local Street	400 feet	160 feet	Yes
18	HDM 504.7 Weaving Sections	WB I-10 ramp and NB Valley Exit (SNB-Line), Alhambra	Mainline	5,000 feet	2,340 feet	No
19	HDM 504.7 Weaving Sections	SR 710 SB On-Ramp at Valley Boulevard and EB I-10 ramp (SSB-Line), Alhambra	Mainline	5,000 feet	1,430 feet	No
20	HDM 504.7 Weaving Sections	SR 710 SB On-Ramp at Valley Boulevard and WB I-10 ramp (SSB-Line), Alhambra	Mainline	5,000 feet	2,370 feet	No
21	HDM 504.7 Weaving Sections	EB Busway ramp and Valley Exit, (SNB-Line), Alhambra	Mainline	5,000 feet	3,420 feet	No
22	HDM 504.7 Weaving Sections	EB I-10 ramp & NB Valley Exit (SNB-Line), Monterey Park and Alhambra	Mainline	5,000 feet	4,185 feet	No

TABLE 6-28. Single-Bore Tunnel Advisory Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
1	HDM 202.5 (1)&(2) Superelevation Transition	SR 710 SB On-Ramp at Valley Boulevard Last horizontal curve (V-3-Line), Alhambra	Ramp	240 feet 9% at EC	150 feet 9%	No
2	HDM 204.4 Vertical Curve	WB SR 134 to SB SR 710 (H-Line), Pasadena	Ramp	500 feet	200 feet	Yes
3	HDM 204.4 Vertical Curve	SB I-210 to St. John Avenue (SJ-2-Line), Pasadena	Ramp	498 feet	250 feet	No
4	HDM 204.4 Vertical Curve	SB I-210 to St. John Avenue (SJ-2-Line), Pasadena	Ramp	897 feet	320 feet	Yes
5	HDM 204.4 Vertical Curve	SR 710 NB-Off Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	500 feet	400 feet	No

TABLE 6-28. Single-Bore Tunnel Advisory Design Exceptions

No.	Advisory Standards	Location	Mainline/ Ramp	Standard	Proposed	Existing
6	HDM 305.1 Median Width Freeways and Expressways	SR 710 Freeway South of Valley Boulevard (B-Line), Alhambra	Mainline	36 feet	23 feet	No
7	HDM 305.1 Median Width Freeways and Expressways	SR 710 Freeway North of Del Mar Boulevard & South of Colorado Boulevard (C-Line), Pasadena	Mainline	36 feet	22 feet	No
8	HDM 504.2 (4)(a) HDM 504.2 (5)(a) Design Speed Standard	SR 710 SB-Off Ramp to St. John First vertical curve past the gore (SJ-2-Line), Pasadena	Ramp	50 mph	30 mph	Yes
9	HDM 504.2 (4)(a) HDM 504.2 (5)(a) Design Speed Standard	SR 710 NB-Off Ramp to Pasadena Avenue, First vertical curve past the gore (PA-4-Line), Pasadena	Ramp	50 mph	37 mph	No
10	HDM 504.4 Freeway-to-Freeway Connections Design Speed	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	50 mph	35 mph	Yes
11	HDM 504.4 Freeway-to-Freeway Connections Design Speed	SB SR 710 to WB I-10 (F-Line), Monterey Park, Los Angeles & Alhambra	Ramp	50 mph	43 mph	Yes
12	HDM 504.4 Freeway-to-Freeway Connections Design Speed	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	50 mph	40 mph	Yes
13	HDM 504.4 (3) Maximum Grade	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	6%	7.75%	No
14	HDM 504.4 (5) Single-lane Connector Widening for Passing	WB I-10 to NB SR 710 (D-Line), Alhambra	Ramp	2 Lanes	1 Lane	Yes
15	HDM 504.4 (5) Single-lane Connector Widening for Passing	EB SR 134 to SB SR 710 (I-Line), Pasadena	Ramp	2 Lanes	1 Lane	Yes

L. Needed Structure Rehabilitation and Upgrading

Structure improvements are needed to eliminate conflicts with components of the TSM/TDM Alternative and both design variations of the Freeway Tunnel Alternative. Proposed structure improvements may include replacement of an existing structure; addition of new structure and/or modification of an existing structure. All of the structure improvements listed below are proposed to

meet the objective of the alternatives. Advance Planning Study (APS) reports were prepared for the proposed structures (CH2M HILL, 2014f, 2014g, and 2014h) and included the preliminary construction cost estimates. The APS reports are included in Attachment K of this DPR.

I. Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative

There are two structures included in the TSM/TDM Alternative:

- **SR 710 Connector Underpass (Attachment K-1a):**

The proposed structure is located along the SR 710 Connector between Valley Boulevard and Mission Road. This underpass allows the traffic to travel under the railroad bridge. This railroad bridge is included in improvement T-1 in TSM/TDM Alternative.

- **Garfield Avenue Bridge (Widen) (Attachment K-1b):**

This existing bridge crosses over a train trench with two railroad tracks and is located adjacent to the intersection of Garfield Avenue and Mission Road in the City of Alhambra. The TSM/TDM proposed improvement I-16 would add a dedicated right-turn lane in the northbound direction; this would require the widening of the existing Garfield Avenue Bridge.

II. Freeway Tunnel Alternative – Dual-Bore Tunnel

There are six structures and two cut-and-cover tunnels associated with the Freeway Tunnel Alternative dual-bore design variation. These structures from south to north are as follows:

- **Ramona Boulevard Undercrossing (Widen) (Attachment K-2a):**

The existing Ramona Boulevard Undercrossing consists of two separate structures for northbound (Right Bridge) and southbound (Left Bridge) traffic. Only the Left Bridge is proposed to be widened on both sides of the structure.

- **Route 710/10 Separation (Widen) (Attachment K-2b):**

The existing Route 710/10 Separation, where Route 10 crosses under Route 710, consists of two separate structures for northbound (Right Bridge) and southbound (Left Bridge) traffic. The Left Bridge is proposed to be widened on both sides of the structure.

- **Laguna Basin Bridge (Attachment K-2c):**

Laguna Basin is parallel to the SR 710 Freeway at this location. A 900-foot-long nine-span structure is proposed alongside the Laguna Basin. This bridge will prevent the new alignment from encroaching on the Laguna Flood Control Basin.

- **Hellman Avenue OC (Attachment K-2d):**

A 240-foot-long two-span structure over the SR 710 Freeway at Hellman Avenue is proposed to replace the existing Hellman Avenue OC. The width of the proposed structure will remain the same as the existing bridge (64 feet).

- **Valley Boulevard OC (Attachment K-2e):**

At this location, Valley Boulevard crosses over the proposed SR 710 Freeway cut-and-cover tunnels. A 232-foot-long single-span structure is proposed. Soil will be added beneath this OC to cover the tunnel to a level where the bridge structure will maintain its integrity and bridge inspections can be performed.

- **Cut-and-Cover Tunnel (South Portal) (Attachment K-2f):**

The South Portal Cut-and-Cover Tunnel begins from north of Hellman Avenue and ends north of Valley Boulevard. The main purpose of this cut-and-cover tunnel is to serve as the transition of the SR 710 Freeway between the at-grade surface level and the full-bore tunnel level.

- **Cut-and-Cover Tunnel (North Portal) (Attachment K-2g):**

The North Portal Cut-and-Cover Tunnel begins north of California Boulevard and ends north of Del Mar Boulevard. The main purpose of this cut-and-cover tunnel is to serve as the transition of the SR 710 Freeway between the at-grade surface level and the full-bore tunnel level.

- **Green Street OC (Attachment K-2h):**

A 400-foot-long four-span structure over the SR 710 Freeway at Green Street is proposed to replace the existing 354-foot-long two-span Green Street OC. The width of the structure will remain the same as the existing bridge (66 feet).

III. Freeway Tunnel Alternative – Single-Bore Tunnel

There are four structures and two cut-and-cover tunnels associated with the Freeway Tunnel Alternative single-bore design variation. These structures from south to north are as follows:

- **Laguna Basin Bridge (Attachment K-3a):**

Laguna Basin is parallel to the SR 710 Freeway. A 900-foot-long nine-span structure is proposed along the Laguna Basin. This bridge will prevent the new alignment from encroaching on the Laguna Flood Control Basin.

- **Hellman Avenue OC (Attachment K-3b):**

A 250-foot-long three-span structure over the SR 710 Freeway at Hellman Avenue is proposed to replace the existing Hellman Avenue OC. The width of the proposed structure will remain the same as the existing bridge (64 feet).

- **Valley Boulevard OC (Attachment K-3c):**

At this location, Valley Boulevard crosses over the proposed SR 710 full-bored tunnel with the accommodation of another full-bored tunnel on the west side in the future. A 232-foot-long single-span structure is proposed. Soil will be added beneath this OC to cover the tunnel to a level where the bridge structure will maintain its integrity and bridge inspections can be performed.

- **Cut-and-Cover Tunnel (South Portal) (Attachment K-3d):**

The South Portal Cut-and-Cover Tunnel begins north of Hellman Avenue and ends north of Valley Boulevard. The main purpose of this cut-and-cover tunnel is to serve as the transition of the SR 710 Freeway between the at-grade surface level and the full-bore tunnel level.

- **Cut-and-Cover Tunnel (North Portal) (Attachment K-3e):**

The North Portal Cut-and-Cover Tunnel begins north of California Boulevard and ends north of Del Mar Boulevard. The main purpose of this cut-and-cover tunnel is to serve as the transition of the SR 710 Freeway between the at-grade surface level and the full-bore tunnel level.

- **Green Street OC (Attachment K-3f):**

A 390-foot-long three-span structure over the SR 710 Freeway at Green Street is proposed to replace the existing 354-foot-long two-span Green Street OC. The width of the structure will remain the same as the existing bridge (66 feet).

M. Utility and Other Owner Involvement

For the TSM/TDM Alternative, the existing utilities that may be affected during construction have been identified and are tabulated in Table 6-29. Potential utility conflicts with the other build alternatives, such as BRT, LRT, and Freeway Tunnel Alternatives, also were identified and are tabulated in Tables 6-30 through 6-33.

I. Transportation System Management/Transportation Demand Management (TSM/TDM) Alternative

For the TSM/TDM Alternative, the utility conflicts anticipated are identified in Table 6-29.

TABLE 6-29. Potential Utility Conflicts for the TSM/TDM Alternative

Service	Provider
Communications	• AT&T • Time Warner Cable
Power	• City of Pasadena – Power • Department of Water & Power - Power Service • Southern California Edison
Sewer	• City of Alhambra
Water	• Metropolitan Water District • City of Alhambra
Cable/TV	• Charter Communications

II. Bus Rapid Transit (BRT) Alternative

Potential utility conflicts for the BRT Alternative were identified and are generally due to the nature of the type of improvements such as roadway and sidewalk width modifications. These utilities and the providers are listed in Table 6-30.

TABLE 6-30. Potential Utility Conflicts for the BRT Alternative

Service	Provider
Communications	• AT&T • Crown Castle • Level 3 Communications • Verizon Wireless
Gas	• Southern California Gas Company
Power	• City of Pasadena – Power • Southern California Edison
Sewer	• Los Angeles County Sanitation Districts • City of Los Angeles - Bureau of Sanitation • City of Alhambra • City of Monterey Park • City of Pasadena • City of San Marino • City of South Pasadena
Water	• California Water Service • Department of Water & Power - Water Service • Metropolitan Water District • City of Alhambra • City of Monterey Park • City of Pasadena – Water • City of South Pasadena
Cable/TV	• Charter Communications • Time Warner Communications • Multiple Providers
Trash/Solid Waste	• Athens Disposal • Allied Waste Services • Burrtec • Belvedere Garbage Disposal District • City of Pasadena

III. Light Rail Transit (LRT) Alternative

Utility impacts were identified for the LRT Alternative. The affected existing utilities along the alternative alignments and the providers are listed in Table 6-31.

TABLE 6-31. Potential Utility Conflicts for the LRT Alternative

Service	Provider
Communications	• AT&T • Crown Castle • Level 3 Communications • Verizon Wireless
Gas	• Southern California Gas Company
Power	• City of Pasadena – Power • Department of Water & Power - Power Service • Southern California Edison
Sewer	• Los Angeles County Sanitation Districts • City of Los Angeles - Bureau of Sanitation • City of Alhambra • City of Monterey Park • City of Pasadena • City of South Pasadena
Water	• California Water Service • Department of Water & Power - Water Service • Metropolitan Water District • City of Alhambra • City of Pasadena – Water • City of South Pasadena
Cable/TV	• Charter Communications

IV. Freeway Tunnel Alternative

For both the dual-bore and single-bore tunnel design variations of the Freeway Tunnel Alternative, most of the utility conflicts are anticipated to be near the portals due to the nature of the type of improvements. The affected existing utilities and the providers along the dual-bore and single-bore alignments are listed in Tables 6-32 and 6-33, respectively.

TABLE 6-32. Potential Utility Conflicts for the Freeway Tunnel Alternative, Dual-Bore Design Variation

Service	Provider
Communications	• AT&T
Gas	• Southern California Gas Company
Power	• City of Pasadena – Power • Department of Water & Power - Power Service • Caltrans
Sewer	• City of Los Angeles – Bureau of Sanitation • City of Alhambra • City of Pasadena
Water	• Department of Water & Power - Water Service • Metropolitan Water District • City of Pasadena - Water

TABLE 6-33. Potential Utility Conflicts for the Freeway Tunnel Alternative, Single-Bore Design Variation

Service	Provider
Communications	• AT&T
Gas	• Southern California Gas Company
Power	• City of Pasadena – Power • Department of Water & Power - Power Service • Caltrans
Sewer	• City of Los Angeles - Bureau of Sanitation • City of Alhambra • City of Pasadena
Water	• Department of Water & Power – Water Service • Metropolitan Water District • City of Pasadena – Water

7. OTHER CONSIDERATIONS

A. Public Hearing Process

It is recommended that the DEIR/EIS and DPR be made available to the public for review and comment. It is also recommended that a public hearing be offered for the developed alternatives.

B. Route Matters

Several build alternatives are under consideration. Once the preferred alternative is selected, the required agreements and documents will be discussed.

C. Permits

The following is a list of agency approvals and permits that are anticipated to be needed for the proposed improvements (This list will be finalized in the Project Report when the preferred alternative is selected):

- State's Encroachment Permit for Construction
- National Pollutant Discharge Elimination System (NPDES) General Construction Activity Stormwater Permit, and the Caltrans Statewide Permit
- California Department of Fish and Wildlife Streambed Alteration 1601 Agreement
- United States Army Corps of Engineers Clean Water Act Section 404 Permit
- State Water Resources Control Board Clean Water Act Section 401 Water Quality Certification
- County of Los Angeles Flood Control Permit
- Los Angeles County Municipal Separate Storm Sewer System (MS4) NPDES Permit
- Los Angeles County Department of Public Works Construction Permit

D. Cooperative Agreements

A Design Cooperative Agreement is in development between the State of California and Metro to define responsibilities for the design, funding, staffing, and ROW acquisition. A separate Cooperative Agreement will be prepared for project construction.

E. Other Agreements

Maintenance Agreements, as well as any other needed agreements, will be prepared as required for the proposed project.

F. Transportation Management Plan for Use During Construction

Transportation Management Plan (TMP) Data Sheets have been prepared for each build alternative and are included in Attachment M. Once the preferred alternative is selected, a revised TMP Data Sheet will be prepared. The objective of the TMP is to mitigate the impacts construction activities will have on freeway and roadway users at various project locations. The TMP will be closely coordinated with Caltrans, Metro, Cities, Los Angeles County, and the public to ensure that traffic at project

locations and the surrounding areas remain at an acceptable level of operation during construction. The following strategies can be implemented in the alternative TMPs as needed:

- Public awareness campaigns prior to and during construction
- Real-time communication with motorists, including CMS and highway advisory radio announcements to alert motorists of upcoming construction impacts, detours, and up-to-date travel conditions
- Promotion of ridesharing and public transit programs
- Identification of TDM techniques on an alternative-specific basis

The cost of the TMP typically ranges from 1 to 2 percent of the total construction cost. However, the amount might be less for some of the build alternatives in the SR 710 North Study because the majority of the proposed projects are underground tunnels that do not interfere with surface traffic (for example, the LRT and Freeway Tunnel Alternatives).

The Incentive and Disincentive strategy is also recommended to promote construction efficiency. Due to insufficient data available at the current stage, the costs to apply this strategy are not available in the TMP Data Sheets in this DPR (Attachment M). Once the preferred alternative is selected, the overall cost of implementing the Incentive and Disincentive Strategy will be calculated and included in the final TMP. The estimated TMP cost for each of the SR 710 North Study build alternatives will be included in the preliminary cost estimate in Attachment L.

G. Stage Construction

At the estimated time of construction, coordination will be required to ensure that the proposed closures and/or detours for this project are coordinated with all other roadway projects in the area that may be impacted, and that potential traffic impacts as a result of this project are adequately addressed. For the discussion on the previous topic, the staging of construction will be closely coordinated with the development of the TMP.

H. Drainage

I. Surface Drainage

Existing systems will either need to be extended and/or augmented in order to contain the required design flows within the project limits. These alternatives will impact several existing

drainage systems and drainage features by removing, blocking, paving over, or interfering with these systems. These impacts may be minimized or avoided by the following:

- Relocation and extension of systems as necessary
- Additional catch basins, downdrains, or overside drains where required
- Abandonment of systems that are no longer serviceable

Major drainage design concepts in this project are described below. Where feasible, the drainage design would:

- Maintain existing offsite drainage flow patterns, yet minimize the number of points at which cross-culverts must be constructed.
- Contain, collect, and treat 100 percent of onsite water quality runoff using appropriately designed collection systems and best management practices (BMPs).
- Modify existing drainage facilities to be capable of handling any increased design flows as much as possible, given existing physical constraints.
- Install pump stations to avoid flooding.

Treatment BMPs would be provided to treat onsite runoff before discharging to corresponding receiving waters.

The regional Laguna Regulating Basin and Dorchester Channel are two major offsite drainage systems that will be impacted by the dual-bore tunnel option. The proposed I-710 widening would encroach horizontally into the west side of the basin. The extent of the encroachment would be up to 20 feet wide and 700 feet long along the western boundary of the basin. The encroachment would also affect the existing maintenance access road along the west side of the basin.

The affected maintenance road for the basin will be replaced by a new entrance and pull-out (maintenance vehicle pull-out) area from the I-10/I-710 connector. The encroaching portion of the roadway will be placed on a bridge structure to avoid reducing the storage volume of the basin.

Under the dual-bore tunnel option, the proposed I-710 on-ramp would encroach into the Dorchester Channel. Including the new grading, it will affect about 728 feet at the southern end and about 267 feet at the northern end of the reinforced concrete channel (RCC). The affected

RCC portion of Dorchester Channel will be changed into double-span reinforced concrete boxes (RCBs) along the original channel alignment. The proposed channel layout is intended to minimize the hydraulic impact to the existing condition.

The south portal includes the surface portion and the cut-and-cover tunnel. Due to adding new lanes and the cut-and-cover construction, many inlets and pipes have to be removed to avoid the conflict. New inlets are proposed at the low points, before the super reversals and beginning of cut-and-cover locations. New crossing culverts are proposed to convey water from the east to the west. No new connection is proposed on the Dorchester Channel. The onsite systems convey all runoff from the high point near Hellman Avenue Bridge to the pump station near Valley Boulevard. A pump station is proposed to pump water out to the Dorchester Channel.

Due to the tunnel construction, the existing pump station and storage chamber south of Del Mar Boulevard are relocated to the north side of Del Mar Boulevard. All offsite flow (west of I-710 and south of Del Mar Boulevard) that drains to this sump area is collected in a proposed swale and pipe, draining north to the trunk line (48-inch reinforced concrete pipe [RCP]) on Del Mar Boulevard. An 84-inch RCP on the west side of I-710 is rerouted to the east side, and joins a 60-inch RCP at Station 1743+00. From the confluence point, a 96-inch RCP runs south to the storage chamber of the relocated pump station. The pump station is designed to handle a 50-year storm event for the drainage area. An outlet pipe connects to an existing 48-inch RCP on Del Mar Boulevard.

The single-bore tunnel option has a similar impact on existing drainage systems, but to a lesser degree, because the project footprint is smaller than the dual-bore tunnel option. There will be no impact to Dorchester Channel. New inlets and pipes are proposed as needed; the pump station and storage chamber at Del Mar Boulevard will be relocated.

II. Tunnel Drainage

A pump station will be constructed at the tunnel low point. The pump station will pump water that collects in a wet well to a local water storage system; then, the water will be treated offsite before being discharged. Inlets located along the lower side of both the northbound and southbound tunnel roadways will collect road runoff and convey it into a steel pipe running beneath the lower roadway within the tunnel. Stormwater will be collected and conveyed to the stormwater pump stations. Therefore, the tunnel roadways will normally generate little or no runoff, except during periods of tunnel washing or tunnel fire. The tunnel drainpipe also will

convey the minor amounts of tunnel seepage (generated on a continuous basis), draining it to the sump. Among the possible water sources, the design flow will be the fire sprinklers and fire hydrant, based on the National Fire Protection Association (NFPA) Fire Protection Handbook (NFPA, 20th edition).

The pump station layout is to place the wet well, electrical transformer, metering pad, and backup generator at the low point recessed area in the middle of southbound and northbound tunnels. The pump room will be constructed at the road surface elevation for maintenance access to the pump station and appurtenance equipment. The wet well will include a recessed area for a smaller sump pump to drain the wet well. Submersible pumps will be used as the basis for the pump station design; however, other pump types may be feasible. A steel discharge pipe is proposed between the wet well of the pump and a storage tank located under the parking lot of the O&M Center, which is north of Valley Boulevard. More detailed analysis is provided in the Preliminary Drainage Report (CH2M HILL, 2014d).

I. Stormwater Quality Management

Water quality and stormwater treatment are also considered in the SR 710 North Study. The treatment BMP strategy for each alternative is to consider the site constraints and determine the feasibility of BMP implementation at the site-specific location. The goal is for the BMPs to retain and treat the paved area runoff to the maximum extent practicable. Each BMP is evaluated individually in accordance with the guidelines provided in the *Project Planning and Design Guide* (Caltrans, 2010b), and *Standard Urban Stormwater Mitigation Plan* (SUSMP) (City of Los Angeles, 2000) for the Los Angeles River region. According to the current Caltrans NPDES permit, the strategy is to first evaluate treatment BMPs that infiltrate, harvest, reuse, and/or evapotranspire the stormwater runoff, followed by BMPs that capture and treat the runoff. Where the entire runoff volume from an 85th percentile 24-hour storm event cannot be infiltrated, harvested, and reused, or evapotranspired, the excess volume may be treated by low-impact development (LID)-based flow-through treatment devices. Where LID-based flow-through treatment devices are not feasible, the excess volume may be treated through conventional volume-based or flow-based stormwater treatment devices. More detailed analysis will be provided in the Stormwater Data Report (SWDR).

For freeway alternatives, only Caltrans-approved BMPs are considered. For other alternatives, tree box filter (TBF) and the catch basin screen and curb inlet filter assembly (CB Screen and Insert) are considered where feasible. The flow-through TBF treatment system has a demonstrated efficiency at

least equivalent to a sand filter. TBFs are proposed at new catch basins where the sidewalk is at least 7 feet wide. This criterion is required to maintain enough clearance to meet the standards of the Americans with Disabilities Act (ADA).

J. Fire/Life Safety Measures

The tunnel segments of the LRT and Freeway Tunnel Alternatives would be regulated by authorities at the federal, state, county, and city levels. Codes typically reference standards and guidelines that are developed by independent organizations. Authorities with potential jurisdiction and codes related to fire/life safety of the tunnels and related facilities may include, but are not limited to, Department of Homeland Security, FHWA, U.S. Department of Justice, Caltrans, and California Building Standards Commission (particularly the Building, Fire, Electrical, and Mechanical codes). Meetings were hosted by the SR 710 North Study team with the Fire Marshal for these specific concerns.

The mechanical system requirements for fire safety in the tunnel segments of the alternatives would be nearly identical. The recommended equipment and mechanical systems include a Fixed Fire Fighting System (FFFS), standpipe and hose system, fire extinguishers, and a tunnel ventilation system. The FFFS is a water-based extinguisher comprising two systems: deluge foam water sprinkler system, and a standpipe and hose system. Fire extinguishers will be located in the hose valve cabinets with a rating of 2-A:20-B:C and a 20-pound weight limit as required per NFPA 502. The main purpose of the tunnel ventilation system is to reduce levels of carbon monoxide. In the case of a fire, the ventilation system will reduce levels of smoke and harmful gases in the tunnel to allow for safe evacuation of motorists and entry for firefighters. In the event that one of the ventilation fans is out of service, the ventilation system will have redundancy to still deliver the required performance. The ventilation system also will provide safe egress in the enclosed and pressurized walkways with emergency exits. Supply fans in the ventilation will keep the emergency walkway area free of smoke in the event of a fire.

K. Accommodation of Oversize Loads

The proposed build alternatives in this study are not expected to permanently affect the ability to transport oversize loads on the state freeway. Among the build alternatives, the mainline vertical clearance is not an issue for all the proposed underpasses and undercrossings. At all the OCs, bridges, and separations, designs are proposed as a means to either improve or maintain the existing vertical clearances.

L. Graffiti Control

Improvements of each alternative covers areas with different severities of graffiti issues. Standard deterrent techniques would be used as part of the proposed design to limit access to bridges and signs. These may include some physical devices, such as rat guards, sign hoods, razor wire, and glare screen patches. For the ground-mounted traffic devices and signs, the approved protective coating would be considered to apply and the graffiti should be removed immediately if there are safety concerns. The viable graffiti control concepts and specific methods will be identified when the preferred alternative is selected.

M. Visual Impact

The draft report of the Visual Impact Assessment assesses the visual impacts of the proposed alternatives and proposes measures to avoid, minimize, and/or conceal any adverse visual impacts associated with the construction of the proposed alternatives on the surrounding visual environment. It includes evaluations on the reduction or avoidance of possible adverse visual impacts and proposes possible levels of visual measures to alleviate those adverse impacts. More detailed analysis is provided in the Draft Visual Impact Assessment report (Tatsumi and Partners, Inc., 2014).

8. FUNDING / PROGRAMMING

Funding for this project will come from a variety of sources such as Measure R, federal funding programs, and some other funding strategies. The Preliminary Cost Estimates for each alternative are provided in Attachment L. The total project costs range from $105,000,000 to $5,650,000,000. Of this total, $780,000,000 will be funded by Measure R; the remaining costs may be provided through federal funding and monies earned through tolling, in combination with other funding strategies to be identified.

9. SCHEDULE

Table 9-1 summarizes project milestones and the anticipated schedule for each.

TABLE 9-1. Project Schedule

Project Milestones		Scheduled Delivery Date
Begin Environmental / Complete Alternative Analysis	M020	December 28, 2012
Notice of Preparation (NOP)	M030	March 2, 2011
Notice of Intent (NOI)	M035	March 9, 2011
Approve DPR	M100	February 2015
Circulate DEIR/EIS Externally	M120	February 2015
Approve Project Report and Project Approval/ Environmental Document (PA/ED)	M160	May 2016
ROD/Notice Of Determination (NOD)	M170	September 2016

10. RISKS

The project risks have been identified and rated. The findings were recorded with detailed information, such as status, category, date risk identified, risk description, root causes, primary objective, risk owner, risk trigger, strategy, and response actions, in the “Project Risk Register” table (Attachment O). Since the risk identification is an ongoing process, this table will be updated accordingly as the project study proceeds and additional information becomes available.

11. FHWA COORDINATION

This project is considered to be a High-Profile Project in accordance with the current FHWA and Caltrans Joint Stewardship and Oversight Agreement.

12. PROJECT REVIEWS

- FHWA (Josue Yambo)
- Caltrans Headquarters Design (Brian Frazer)
- Caltrans Design Manager (Derek Higa)
- Caltrans Headquarters Traffic Operations Liaison (Luu Nguyen)
- Metro (Michelle Smith)
- County of Los Angeles Fire Department (Inspector John Dallas)

13. PROJECT PERSONNEL

The following individuals may be contacted for information pertaining to this DPR:

Metro

• Metro Project Manager:	Michelle Smith	(213) 922-3057

Caltrans

• Caltrans Corridor Manager:	John Lee	(213) 897-5623
• Caltrans Design Manager:	Derek Higa	(213) 897-0394
• Caltrans Environmental Manager:	Garrett Damrath	(213) 897-9016

Consultant – CH2M HILL

• Project Manager:	Yoga Chandran	(714) 435-6111
• Engineering Lead:	Tom Ionta	(714) 435-6238
• Traffic Lead:	Loren Bloomberg	(714) 435-6020
• Environmental Lead:	Deborah Pracilio	(949) 553-0666
• Project Report Lead:	Tom Ionta	(714) 435-6238

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15. LIST OF ATTACHMENTS (UNDER SEPARATE COVER)

A. Vicinity Map

B. Location Map

C. Traffic Volume Exhibits

C-1: Existing Conditions – Traffic Volumes (2012)

C-2: No Build Alternative – Traffic Volumes (2035)

C-3: TSM/TDM Alternative – Traffic Volumes (2035)

C-4: BRT Alternative – Traffic Volumes (2035)

C-5: LRT Alternative – Traffic Volumes (2035)

C-6a: Freeway Alternative – Dual Bore with No Toll – Traffic Volumes (2035)

C-6b: Freeway Alternative – Dual Bore with No Toll & No Trucks – Traffic Volumes (2035)

C-6c: Freeway Alternative – Dual Bore with Toll – Traffic Volumes (2035)

C-7a: Freeway Alternative – Single Bore with Toll – Traffic Volumes (2035)

C-7b: Freeway Alternative – Single Bore with Tolls & No Trucks – Traffic Volumes (2035)

C-7c: Freeway Alternative – Single Bore with Tolls & Express Bus – Traffic Volumes (2035)

D. Accident Data – TASAS Table B

E. No Build Alternative

E-1: No Build Alternative Exhibit – 2035 Programmed Projects

F. TSM/TDM Alternative

F-1: TSM/TDM Alternative Exhibit

F-2: Design Plans – Proposed TSM/TDM Improvements within State Right-of-Way (ROW)

G. BRT Alternative

G-1: BRT Alternative Exhibit

G-2: Design Plans – Proposed BRT Improvements within State ROW

H. LRT Alternative

H-1: LRT Alternative Exhibit

H-2: Design Plans – Proposed LRT Improvements within State ROW

I. Freeway Tunnel Alternative – Dual-Bore Tunnel

I-1a: Freeway Tunnel – Dual-Bore Tunnel Alternative Exhibit

I-1b: Existing SR 710 Typical Section at South Portal

I-1c: Existing SR 710 Typical Section at North Portal

I-1d: Dual-Bore Tunnel Cross Section

I-1e: Dual-Bore Tunnel Cut-and-Cover/Bored Tunnel Transition Section

I-2: Design Plans – Proposed Freeway Dual-Bore Tunnel Improvements

J. Freeway Tunnel Alternative – Single-Bore Tunnel

J-1a: Freeway Tunnel – Single-Bore Tunnel Alternative Exhibit

J-1b: Existing SR 710 Typical Section at South Portal

J-1c: Existing SR 710 Typical Section at North Portal

J-1d: Single-Bore Tunnel Cross Section

J-1e: Single-Bore Tunnel Cut-and-Cover/Bored Tunnel Transition Section

J-2: Design Plans – Proposed Freeway Single-Bore Tunnel Improvements

K. Advance Planning Study Reports

K-1: TSM/TDM Alternative Advance Planning Study Reports

K-1a: SR 710 Connector Underpass

K-1b: Garfield Avenue Bridge (Widen)

K-2: Freeway Tunnel Alternative – Dual-Bore Tunnel Advance Planning Study Reports

K-2a: Ramona Boulevard Undercrossing (Widen)

K-2b: Route 710/10 Separation (Widen)

K-2c: Laguna Basin Bridge

K-2d: Hellman Avenue OC

K-2e: Valley Boulevard OC

K-2f: Cut-and-Cover Tunnel (South Portal)

K-2g: Cut-and-Cover Tunnel (North Portal)

K-2h: Green Street OC

K-3: Freeway Tunnel Single-Bore Alternative Advance Planning Study Report

K-3a: Laguna Basin Bridge

K-3b: Hellman Avenue OC

K-3c: Valley Boulevard OC

K-3d: Cut-and-Cover Tunnel (South Portal)

K-3e: Cut-and-Cover Tunnel (North Portal)

K-3f: Green Street OC

L. Preliminary Cost Estimates (Build Alternatives)

L-1: TSM/TDM Alternative Preliminary Cost Estimate

L-2: BRT Alternative Preliminary Cost Estimate

L-3: LRT Alternative Preliminary Cost Estimate

L-4: Freeway Tunnel Dual-Bore Alternative Preliminary Cost Estimate

L-5: Freeway Tunnel Single-Bore Alternative Preliminary Cost Estimate

M. Transportation Management Plan Data Sheet (Build Alternatives)

M-1: TSM/TDM Alternative TMP Data Sheet

M-2: BRT Alternative TMP Data Sheet

M-3: LRT Alternative TMP Data Sheet

M-4: Freeway Tunnel Dual-Bore Alternative TMP Data Sheet

M-5: Freeway Tunnel Single-Bore Alternative TMP Data Sheet

N. Right-of-Way Data Sheets (Build Alternatives)

N-1: TSM/TDM Alternative ROW Data Sheet

N-2: BRT Alternative ROW Data Sheet

N-3: LRT Alternative ROW Data Sheet

N-4: Freeway Tunnel Dual-Bore Alternative ROW Data Sheet

N-5: Freeway Tunnel Single-Bore Alternative ROW Data Sheet

O. Project Risk Register (2014 – In Progress)

P. Stormwater Data Report – Appendix E

Q. Draft Environmental Document (under separate cover) – *To be provided*