

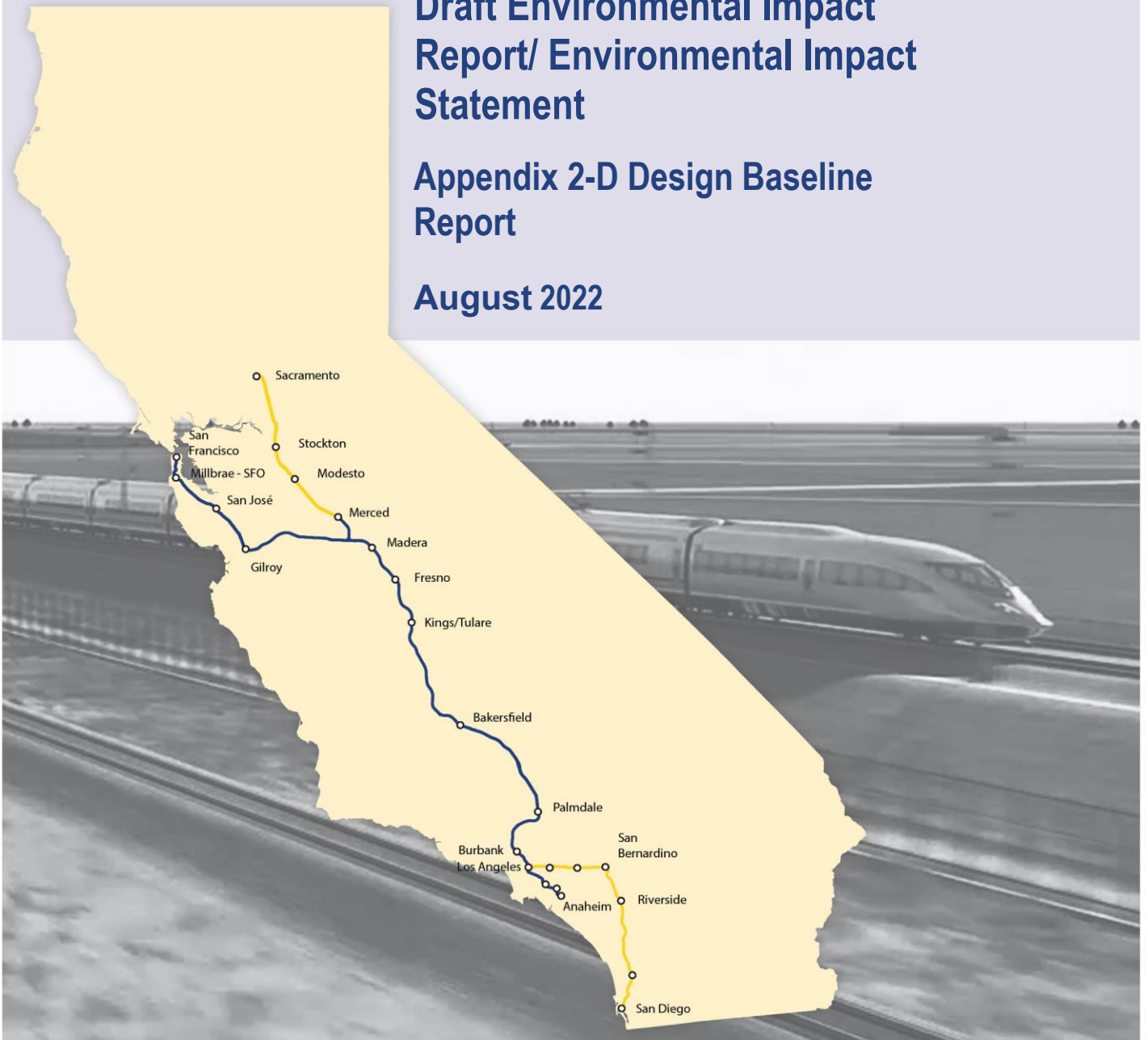
California High-Speed Rail Authority

Palmdale to Burbank *Project Section*

Draft Environmental Impact
Report/ Environmental Impact
Statement

Appendix 2-D Design Baseline
Report

August 2022



The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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Appendix A – Location of Proposed SoundwallsA-1

ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ANF	Angeles National Forest
AREMA	American Railway Engineering and Maintenance-of-Way Association
ATC	Automatic Train Control
ATO	Automatic Train Operation
ATP	Automatic Train Protection
ATS	Automatic Train System
Authority	California High-Speed Rail Authority
BMP	Best Management Practice
Caltrans	California Department of Transportation
CASQA	California Storm Water Quality Association
CEQA	California Environmental Quality Act
CGP	Construction General Permit
CHSTP	California High-Speed Train Project
CPUC	California Public Utilities Commission
CSA	Construction Staging Area
DBR	Design Baseline Report
DSA	Disturbed Soil Area
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FLS	Fire Life Safety
FRA	Federal Railroad Administration
HDC	High Desert Corridor
HDM	Highway Design Manual
HFZ	Hazardous Fault Zone
HMF	Heavy Maintenance Facility
HSR	High-Speed Rail
I	Interstate
LCC	Life Cycle Cost
LMF	Light Maintenance Facility
METRO	Los Angeles County Metropolitan Transportation Authority
MOIF	Maintenance of Infrastructure Facilities
MOIS	Maintenance of Infrastructure Siding Facilities
MS4	Municipal Separate Storm Sewer System
MUTCD	Manual on Uniform Traffic Control Devices
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OCS	Overhead Contact System
PAA	Preliminary Alternatives Analysis
PE4P	Preliminary Engineering for Project Definition

PS	Paralleling Stations
PS&E	Plans, Specifications & Estimates
PTC	Positive Train Control
PUC	Power Utility Connection
RC	Regional Consultant
REJ	Rail Expansion Joint
RIR	Relocation impact Report
ROW	Right of Way
RWQCB	Regional Water Quality Control Board
SAA	Supplemental Alternative Analysis
SCRRA	Southern California Regional Rail Authority
SGMNM	San Gabriel Mountains National Monument
SR	State Route
SRS	Standalone Radio Site
SS	Traction Power Substation
SWDR	Storm Water Data Report
SWPP	Storm Water Pollution Prevention Plan
TC	Transportation Center
TOR	Top of Rail (elevation)
TPF	Traction Power Facility
TSEFCZ	Train Safety and Emergency Zone
UPRR	Union Pacific Railroad
US	United States
UTS	Unarmored Threespine Stickleback

EXECUTIVE SUMMARY

The California High-Speed Rail (HSR) Authority (Authority) proposes to construct, operate, and maintain an electric-powered HSR system in California. When completed, it would run from San Francisco to the Los Angeles Basin in under 3 hours at speeds capable of exceeding 200 miles per hour. The system would eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations.

The Authority and the Federal Railroad Administration (FRA) have prepared program-wide, Tier 1 environmental documents for the HSR system under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Specifically, the Authority and FRA prepared the Statewide Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (Authority and FRA 2005) to evaluate the ability of the HSR system to meet the existing and future capacity demands on California's intercity transportation system. The Authority and FRA also prepared the Bay Area to Central Valley HSR Program EIR/EIS (Authority and FRA 2008) to identify a corridor alignment and the station locations for the connection between the Bay Area and the Central Valley.

The Authority is now undertaking second-tier, project environmental evaluations for several sections of the statewide system. This report is for the Palmdale to Burbank Project Section. This project section is approximately 38- to 44-mile long and has multiple Build Alternatives under study. The project section extends through a variety of land uses and ecoregions, including urban, rural, and mountainous terrain. Each Build Alternatives would involve areas of tunneling beneath the Angeles National Forest (ANF), including portions within the San Gabriel Mountains National Monument (SGMNM).

This report documents the preliminary engineering design that defines SR14A Build Alternative, the preliminary preferred alternative in the Palmdale to Burbank Project Section of the California HSR System. This Design Baseline Report provides a summary of the preliminary engineering design guidelines, constraints, and key features of the preliminary preferred alternative of this section.

The northern limit of the Palmdale-Burbank Project Section is STA 296+82.67 (Spruce Ct). North of this point the information is shown for reference only since the environmental analysis is included in the Bakersfield to Palmdale Project Section Environmental Document.

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1 INTRODUCTION

1.1 Purpose

The purpose of this Design Baseline Report (DBR) is to provide a summary of the Preliminary Engineering for Project Definition that defines the preliminary preferred alternative of the Palmdale to Burbank Section Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). This Design Baseline Report also documents the deliverables for each item listed under Engineering Output in Table 1 of the TM 0.1.

1.2 Project Overview

The planning, design, construction, and operation of the California High-Speed Rail (HSR) System are the responsibility of the California High-Speed Rail Authority (Authority), a state governing board formed in 1996. The Authority's statutory mandate is to develop an HSR system coordinated with the State's existing transportation network, including intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports. The Authority's plans call for high-speed intercity train service on more than 800 miles of track throughout California, connecting the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. Implementation of the California HSR System is planned in two phases. Phase 1 would connect San Francisco to Los Angeles and Anaheim through the Central Valley. Phase 2 would connect the Central Valley (Merced Station) to Sacramento, and another extension is planned from Los Angeles to San Diego. The California HSR System would meet the requirements of Proposition 1A, including maximum, nonstop service travel time between San Francisco and Los Angeles of two hours and 40 minutes.

The Palmdale to Burbank Project Section would be a critical link in the Phase 1 California HSR System connecting San Francisco and the Bay Area to Los Angeles and Anaheim. In 2005, the Authority and the Federal Railroad Administration (FRA) relied on Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) documents to select the State Route (SR) 58/Soledad Canyon and METRO/Metrolink corridors as the preferred alignment between Bakersfield and Sylmar, with a station in the City of Palmdale. This alignment would extend east from Bakersfield along SR 58, generally following SR 58 through the Tehachapi Mountains to Mojave, along METRO/Metrolink corridors through Antelope Valley and Soledad Canyon, and generally follow SR 14 from the City of Santa Clarita to Sylmar in the City of Los Angeles (FRA 2005). The SR 58/Soledad Canyon and METRO/Metrolink corridor from Bakersfield to Los Angeles was later split into two sections for more detailed project-level evaluation: the Bakersfield to Palmdale Section and the Palmdale to Los Angeles Section.

The alternatives for the Palmdale to Los Angeles Section were then defined through public scoping conducted for the Palmdale to Los Angeles Section in 2007, the alignment and station screening evaluation process described in the Palmdale to Los Angeles Preliminary Alternatives Analysis Report (PAA) (2010), and the Palmdale to Los Angeles Supplemental Alternatives Analysis (SAA) Reports (2011, 2012, and 2014).

A recommendation in the 2014 SAA Report in May 2014 was that the Palmdale to Los Angeles Section be divided into two sections (Palmdale to Burbank and Burbank to Los Angeles). Following this recommendation, a second public scoping period took place from July to September 2014. Following this public scoping period, the Palmdale to Burbank SAA Report (2015) was presented to the Authority Board of Directors in June 2015.

Subsequently, during the June 9, 2015, Board meeting, issues were raised regarding the alternatives presented in the 2015 SAA. Subsequent to the Board meeting, the Authority explored ways to refine the alternatives so as to address concerns raised at the Board meeting and through previous stakeholder outreach. The 2016 SAA, presented to the Authority Board of Directors in April of that year, reflects refinements to the rail alignments, stations, and ancillary features presented in the 2015 SAA.

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2 PROJECT DESCRIPTION

The project section has multiple Build Alternatives under study. The project section extends through a variety of land uses and ecoregions, including urban, rural, and mountainous terrain. Each Build Alternative would involve areas of tunneling beneath the Angeles National Forest (ANF), including portions within the San Gabriel Mountains National Monument (SGMNM).

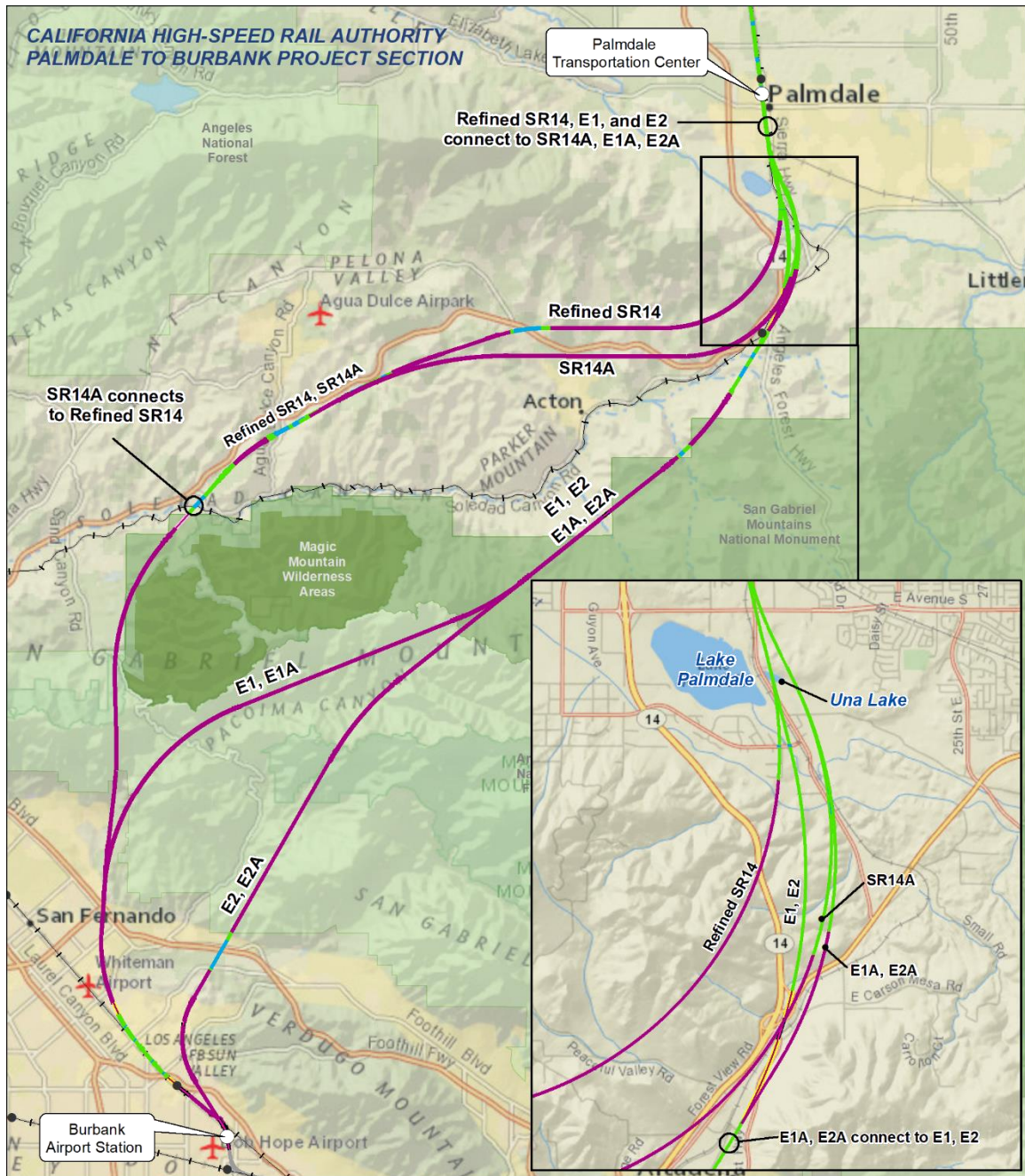
The northern limit of the Palmdale-Burbank Project Section is STA 296+82.67 (Spruce Ct). North of this point the information is shown for reference only since the environmental analysis of Palmdale Subsection is included in the Bakersfield to Palmdale Project Section Environmental Document.

From the north, this project section would continue south through Palmdale, southwest through the ANF, and then continue into the San Fernando Valley where it would connect with the Burbank Airport Station and terminate at Winona Avenue in the south.

2.1 Build Alternatives

This section briefly describes the Palmdale to Burbank Project Section Build Alternatives: Refined SR14, E1, E2, SR14A, E1A and E2A. Please refer to section 2.2 of this report for a description of SR14A as the selected preliminary preferred alternative.

The HSR Build Alternatives for the Palmdale to Burbank Project Section include six end-to-end Build Alternatives. Each end-to-end Build Alternative includes four subsections: Palmdale (included in the Bakersfield to Palmdale Project Section Environmental Document), Central, Burbank, and Maintenance Facility. Figure 2-1 depicts the general location of the Refined SR14, E1, E2, SR14A, E1A and E2A Build Alternatives and key project features.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
 Source: HSR Authority, 05/2020. Basemap Source: National Geographic, 2016
 May 28, 2020

Proposed HSR Station	HSR Alignment Profile	Angeles National Forest
Metrolink Station	At-grade	Magic Mountain Wilderness Areas
Metrolink	At-grade Covered	San Gabriel Mountains National Monument
Other HSR Project Section	Cut and Cover	
	Elevated / Aerial Structure	
	Retained Cut / Trench	
	Tunnel	

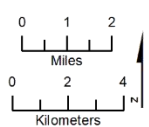


Figure 2-1 Palmdale to Burbank Build Alternatives

2.1.1 Refined SR14 Build Alternative

Palmdale Subsection

The description of Palmdale Subsection is included for reference only since the environmental analysis of this subsection is part of the Bakersfield to Palmdale Project Section Environmental Document.

The northern limit of the Palmdale Subsection is Avenue O in the City of Palmdale, on the west side of Sierra Highway. South of Avenue O, the Refined SR14 Build Alternative would run parallel to and approximately 200 feet west of the existing Metrolink Antelope Valley right-of-way. The alignment would enter the Palmdale TC after crossing over East Avenue Q, approximately two miles south of Avenue O. The alignment would follow the existing 6th Street East right-of-way through the Palmdale TC.

After continuing through the Palmdale TC, the Refined SR14 Build Alternative would remain in the 6th Street East right-of-way until intersecting Avenue R. South of Avenue R, the alignment would continue for approximately 700 feet to a point east of Spruce Court. This point represents the southern limit of the Palmdale Subsection.

A traction power facility would be located near Avenue O.

Central Subsection

The Refined SR14 Build Alternative would continue south at-grade, crossing the current alignment of Sierra Highway near the intersection of East Avenue S. The alignment would cross Una Lake on an embankment. The alignment would also cross the San Andreas Fault Zone at grade in the vicinity of Una Lake. Approximately 0.25 mile south of Una Lake, the Refined SR14 Build Alternative would cross the current alignments of Sierra Highway and the Metrolink rail line, which would both be reconstructed to accommodate the HSR alignment.

In the 19 miles between Una Lake and Lang Station, the Refined SR14 Build Alternative would traverse a series of short tunnels, viaducts, and at-grade sections as it crosses hilly terrain.

After crossing the Vulcan Mine in at-grade and covered twin tunnels, the Refined SR14 Build Alternative would enter 13-mile-long twin tunnels with a maximum depth of approximately 2,080 feet. These tunnels would proceed underneath portions of the ANF including SGMNM, a small portion of the City of Santa Clarita that borders the ANF including SGMNM and the Sylmar and Pacoima neighborhoods of the City of Los Angeles. The twin tunnels would also pass through the San Gabriel fault zone and the Sierra Madre fault zone through this area.

The alignment would emerge from tunnels east of the existing Antelope Valley Metrolink Corridor near Montague Street in the Pacoima neighborhood of Los Angeles. From Montague Street, Refined SR14 would continue south in a retained cut/trench, transitioning up to ground level, passing over the existing Hansen Spreading Grounds on embankment, before going over the Los Angeles County Flood Control Channel on a bridge and entering the existing Metrolink corridor near Sheldon Street. Continuing along the eastside of the Metrolink Corridor, Refined SR14 would then proceed south at-grade where it would cross over Tuxford Street and under the I-5 freeway. Continuing southeast from the I-5 undercrossing, the Refined SR14 Build Alternative would transition below grade in an open trench to just north of Olinda Street. From just north of Olinda Street to just south of Sunland Boulevard, the Refined SR14 Build Alternative would be below ground in a cut and cover box structure. Metrolink would remain on the surface and the Sun Valley Metrolink station would be reconstructed south of Olinda Street on the surface. South of Sunland Boulevard the Refined SR14 Build Alternative would continue in a mined or bored tunnel until reaching Lockheed Drive, the southern limit of this subsection.

Burbank Subsection

Lockheed Drive represents the northern limit of the Refined SR14 Burbank Subsection. From Lockheed Drive, the Refined SR14 Build Alternative would continue in a mined or bored tunnel

until passing Cohasset Street where would continue in a cut-and-cover box until entering the Burbank Airport Station. The Burbank Airport Station would be an underground station, beginning near Kenwood Street and extending to just north of Winona Drive and the Burbank Airport east/west runway.

Maintenance Facility

The description of the Maintenance Facility is included for reference only since the environmental analysis of this subsection is part of the Bakersfield to Palmdale Project Section Environmental Document.

There would be an optional light maintenance facility (LMF) located near Avenue M, west of the existing UPRR/Metrolink rail corridor and proposed HSR alignment. In order to connect with the LMF and associated facilities, two lead tracks would continue north from Avenue O (the northern terminus of the Palmdale Subsection) until reaching the LMF site. The lead tracks would be located parallel to and west of the UPRR/Metrolink rail corridor, which would remain in its existing location. To accommodate the proposed HSR facilities, Sierra Highway would be relocated to the west.

2.1.2 E1 Build Alternative

Palmdale Subsection

The E1 Build Alternative, ancillary features, and station site within the Palmdale Subsection would be identical to the Refined SR14 Palmdale Subsection, with the exception of traction power facility locations. The E1 traction power facility would be located near Avenue Q, whereas the Refined SR14 traction power facility would be located near Avenue O.

Central Subsection

The E1 Central Subsection would continue from the southern terminus of the Palmdale Subsection at-grade, and generally follow the existing Sierra Highway alignment. The alignment would continue at-grade across Una Lake. South of Una Lake, the E1 Build Alternative would curve west, crossing the existing Sierra Highway and Metrolink corridors, which would be realigned to the east. In the vicinity of Una Lake, the alignment would cross the San Andreas Fault Zone at grade.

Between Una Lake and 0.2 mile south of the Enchanted Hills Road western terminus, the E1 Build Alternative would traverse a series of viaducts and at-grade sections, and a cut-and-cover tunnel that would continue beneath the Pearblossom Highway/SR 14 freeway interchange, Sierra Highway and Metrolink corridor. After a retained trench stretch, another cut-and-cover tunnel would cross underneath an extension of Mountain Springs Road.

Approximately 0.2 mile south of the Enchanted Hills Road western terminus, the E1 Build Alternative would enter approximately 1.6-mile-long twin tunnels (maximum depth approximately 700 feet) that would pass beneath rural residences and then under the ANF (including the portion overlaid by the SGMNM).

The E1 Build Alternative would exit the tunnels outside the ANF including SGMNM boundaries in the vicinity of Aliso Canyon Road. The alignment would continue at-grade before crossing a tributary of the Santa Clara River via a 700-foot-long viaduct. The E1 Build Alternative would return to at-grade for approximately 300 feet until entering twin tunnels (22 miles in length, maximum depth approximately 2,200 feet) immediately west of Aliso Canyon Road. The initial 16.5 miles of the tunnels would continue beneath the ANF, including approximately 6 miles of SGMNM.

The E1 Build Alternative would continue southwesterly from Aliso Canyon Road in twin tunnels toward Arrastre Canyon Road. The alignment would continue southwesterly from Arrastre Canyon Road beneath the ANF including SGMNM.

After crossing beneath Little Tujunga Canyon Road and the San Gabriel fault, the E1 Build Alternative would continue in a more southwesterly direction. The twin tunnels would pass through the San Gabriel fault zone and the Sierra Madre fault zone.

The alignment would emerge from tunnels east of the existing Antelope Valley Metrolink Corridor near Montague Street in the Pacoima neighborhood of Los Angeles.

From Montague Street, the E1 Build Alternative would follow the same routing as described for Refined SR14 from its emergence near Montague Street to the end of the Central Subsection at Lockheed Drive.

Burbank Subsection

Lockheed Drive represents the northern limit of the E1 Burbank Subsection. South of Lockheed Drive, the E1 Build Alternative and ancillary features within the Burbank Subsection would be identical to the features described for the Refined SR14 Burbank Subsection.

Maintenance Facility

The alignment and ancillary features within the E1 Maintenance Facility would be identical to the features described for the Refined SR14 Maintenance Facility.

2.1.3 E2 Build Alternative

Palmdale Subsection

The E2 Build Alternative, ancillary features, and station site within the Palmdale Subsection would be identical to the E1 Palmdale Subsection.

Central Subsection

The E2 Build Alternative within the Central Subsection would be identical to the E1 Build Alternative between Spruce Court and Aliso Canyon Road.

To the immediate west of Aliso Canyon Road, the E2 Build Alternative would enter twin 16.6-mile-long tunnels, initially heading southwest (maximum depth approximately 2,670 feet). The initial 7 miles of these tunnels would continue beneath the ANF including SGMNM. The E2 Build Alternative would continue southwesterly, curving to a more south-southwesterly direction as the alignment passes beneath Mendenhall Ridge Road and then through the San Gabriel fault.

After proceeding beneath the ANF including SGMNM in twin tunnels, the E2 Build Alternative would transition from tunnels to at-grade in the hills above the Lake View Terrace neighborhood of the City of Los Angeles. After crossing the Sierra Madre fault zone, the E2 Build Alternative would continue at grade for approximately 0.2 mile, before transitioning to an elevated viaduct structure over Arnwood Road, Foothill Boulevard, and the I-210 freeway and then would continue to cross Big Tujunga Wash, and cross below Wentworth Street in the Shadow Hills neighborhood (City of Los Angeles).

After crossing Wentworth Street, the E2 Build Alternative would transition to tunnels (maximum depth approximately 240 feet) for approximately 1.5 miles. This portion of the alignment would continue in the same south-southwesterly direction until approximately Peoria Street in the Sun Valley neighborhood of the City of Los Angeles. Beneath Peoria Street, the E2 Build Alternative would curve to the southeast beneath Sunland Boulevard, I-5, and San Fernando Road. This tunnel would extend until San Fernando Road. At this point, the alignment would transition into a cut-and-cover tunnel that would cross Sand Fernando Road until Lockheed Drive, which is the southern limit of this subsection.

Burbank Subsection

From Lockheed Drive, the E2 Build Alternative would continue into a cut-and-cover tunnel for approximately 0.3 mile before entering the Burbank Airport Station underneath Kenwood Street.

After exiting the underground station, the alignment would join with the tunnel alignment proposed within the Burbank to Los Angeles Project Section.

Maintenance Facility

The features within the Maintenance Facility area, including alignment and ancillary features would be identical to the features described for the Refined SR14 Maintenance Facility.

2.1.4 SR14A Build Alternative

Palmdale Subsection

The SR14A Build Alternative, ancillary features, and station site within the Palmdale Subsection would be identical to the E1 Palmdale Subsection.

Central Subsection

Within the Central Subsection, the SR14A Build Alternative would diverge from the SR14 Build Alternative south of Avenue R, continuing south of Spruce Court at grade, curving eastward and continuing south approximately 300 feet east of Una Lake. South of Una Lake, the SR14A Build Alternative would curve westward, cross over the SCRRA Antelope Valley Line, Sierra Highway and the Soledad Siphon, and continue southwest and enter a tunnel portal approximately 0.5 mile northeast of the Sierra Highway/Pearblossom Highway intersection. The SR14A Build Alternative would then continue westward, in an approximately 13-mile-long tunnel before surfacing approximately 0.75 mile east of Agua Dulce Canyon Road. The alignment would transition between at-grade and elevated profiles closely paralleling State Route SR 14 before entering an approximately 1-mile-long tunnel. Transitioning from tunnel to at grade, the SR14A Build Alternative would converge with the Refined SR14 Build Alternative at the Soledad Canyon Mining Operations (Vulcan Mine) site. The remaining SR14A Build Alternative south of the Vulcan Mine site, under the ANF including SGMNM, and into the San Fernando Valley, would be identical to the Refined SR14 Build Alternative.

Burbank Subsection

Within the Burbank Subsection, the six Build Alternatives would be identical, including alignment and other facilities.

Maintenance Facility

The features within the Maintenance Facility area, including alignment and ancillary features would be identical to the features described for the Refined SR14 Maintenance Facility.

2.1.5 E1A Build Alternative

Palmdale Subsection

As noted above, the E1A Build Alternative would be identical to SR14A Build Alternative within the Palmdale Subsection, including alignment and other facilities.

Central Subsection

In the Central Subsection, the E1A Build Alternative would diverge from the E1 Build Alternative south of Avenue R, continuing south of Spruce Court at grade, curving eastward and continuing south approximately 300 feet east of Una Lake. South of Una Lake, the E1A Build Alternative would curve westward, cross over the SCRRA Antelope Valley Line, Sierra Highway and the Soledad Siphon, and continue southwest and enter a tunnel portal approximately 1,900 feet northeast of the Sierra Highway/Pearblossom Highway intersection. After proceeding underground for approximately 1.5 miles, the E1A Build Alternative would transition to an at-grade profile approximately 350 feet south of Vincent View Road. Just south of Foreston Dr, the E1A Build Alternative would converge with the E1 Build Alternative. The remaining E1A Build

Alternative south of Foreston Dr, under the ANF including SGMNM, and into the San Fernando Valley would be identical to the E1 Build Alternative.

Burbank Subsection

Within the Burbank Subsection, the six Build Alternatives would be identical, including alignment and other facilities.

Maintenance Facility

The features within the Maintenance Facility area, including alignment and ancillary features would be identical to the features described for the Refined SR14 Maintenance Facility.

2.1.6 E2A Build Alternative

Palmdale Subsection

Within the Palmdale Subsection, the E2A Build Alternative would be identical to SR14A Build Alternative, including alignment and other facilities.

Central Subsection

In the Central Subsection, the E2A Build Alternative would follow an identical route to the E1A Build Alternative to Foreston Dr, where it would rejoin with the E2 Build Alternative. The remaining E2A Build Alternative south of Vincent View Road, under the ANF including SGMNM, and into the San Fernando Valley would be identical to the E2 Build Alternative.

Within the Burbank Subsection, the E2A Build Alternative would be identical to the other Build Alternatives, including alignment and other facilities.

Maintenance Facility

The features within the Maintenance Facility area, including alignment and ancillary features would be identical to the features described for the Refined SR14 Maintenance Facility.

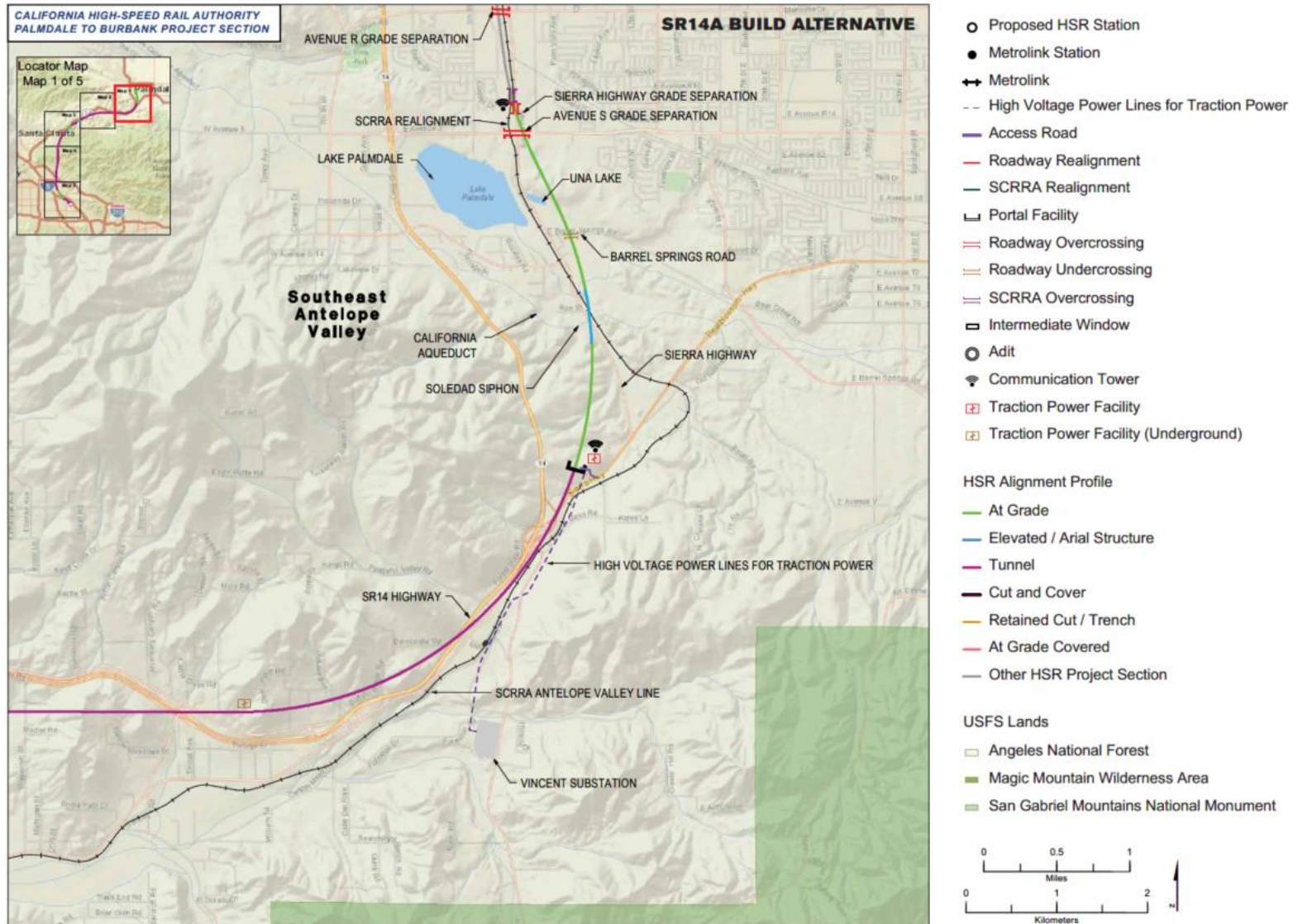
2.2 Preliminary Preferred Alternative

2.2.1 SR14A Build Alternative

This section describes the Preliminary Preferred Alternative SR14A alignment and ancillary features, depicted in Figure 2-2 through Figure 2-7.



Figure 2-2 SR14A Build Alternative Overview Map



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
 Source: Authority, 2021; National Geographic/Esri, 2021

June 14, 2021

Figure 2-3 SR14A Build Alternative (Map 1 of 5)

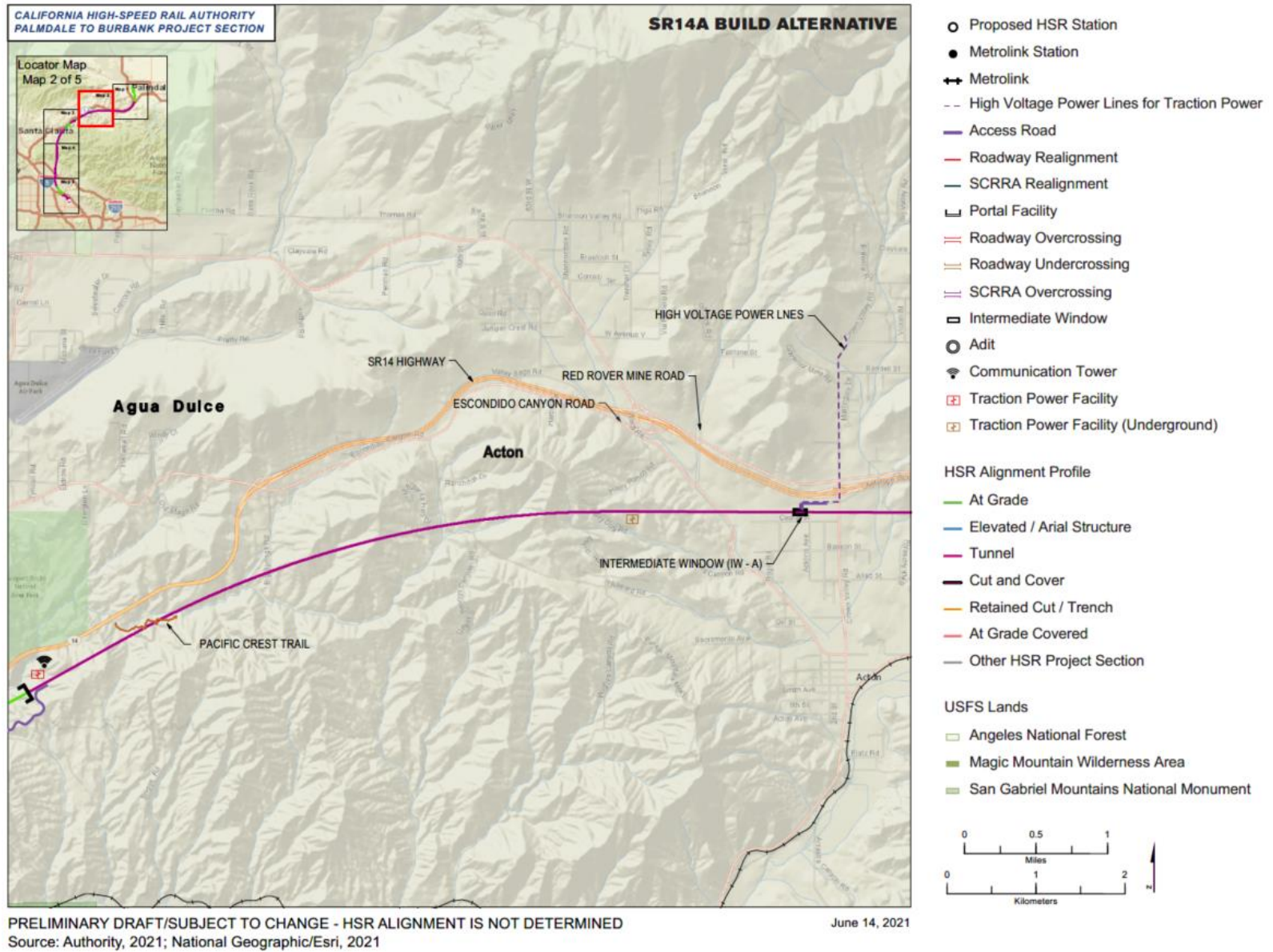


Figure 2-4 SR14A Build Alternative (Map 2 of 5)

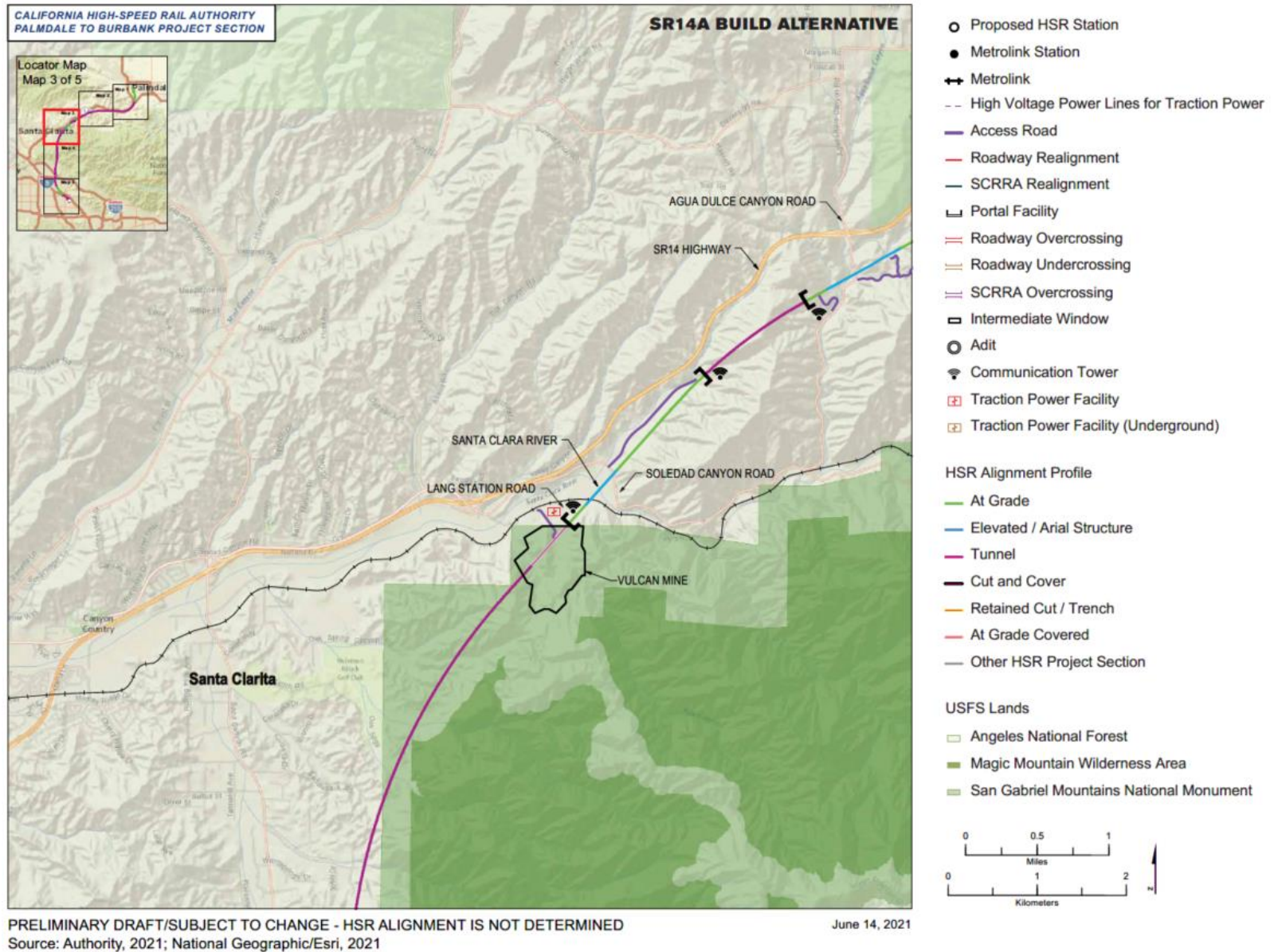


Figure 2-5 SR14A Build Alternative (Map 3 of 5)

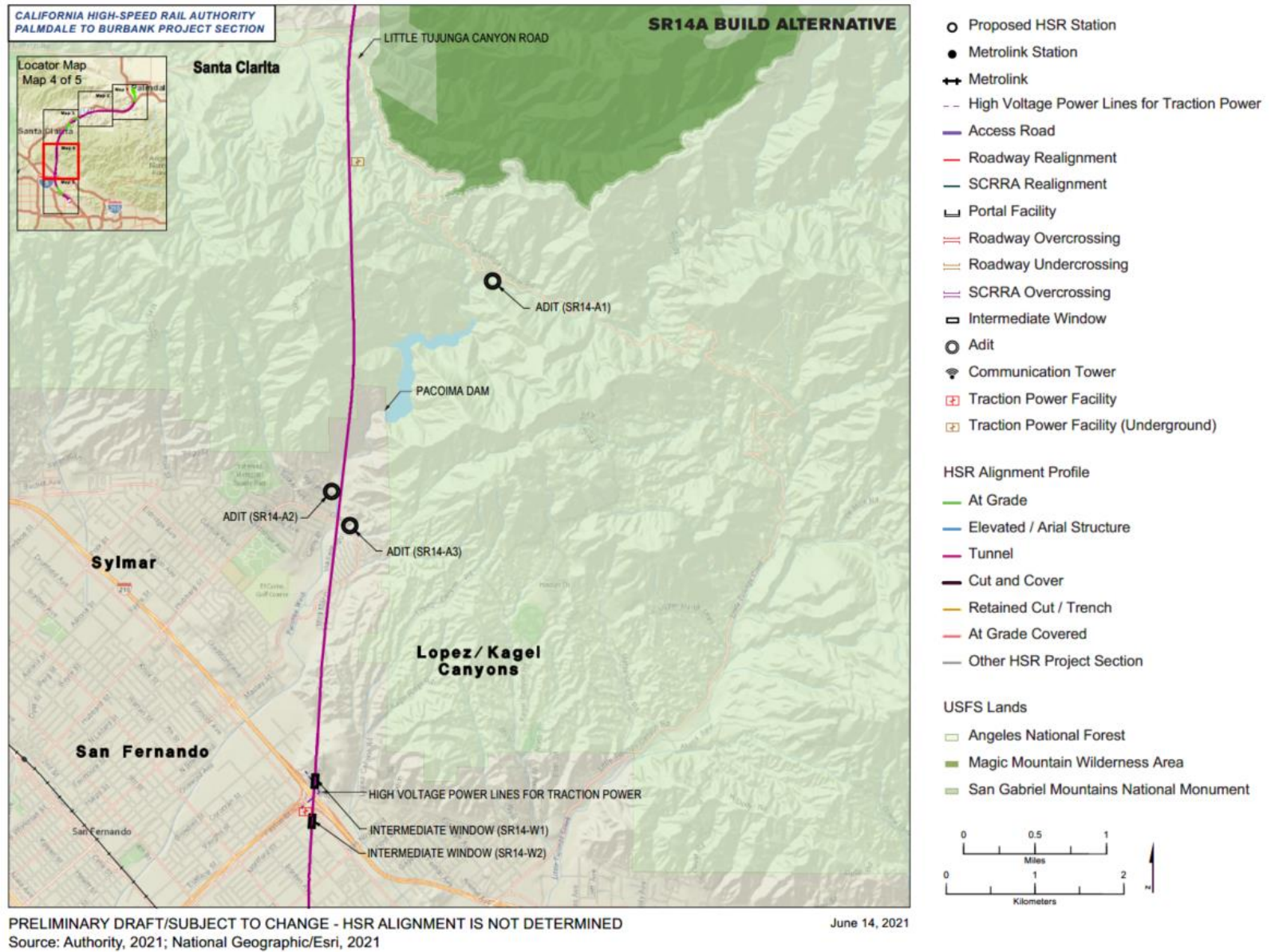
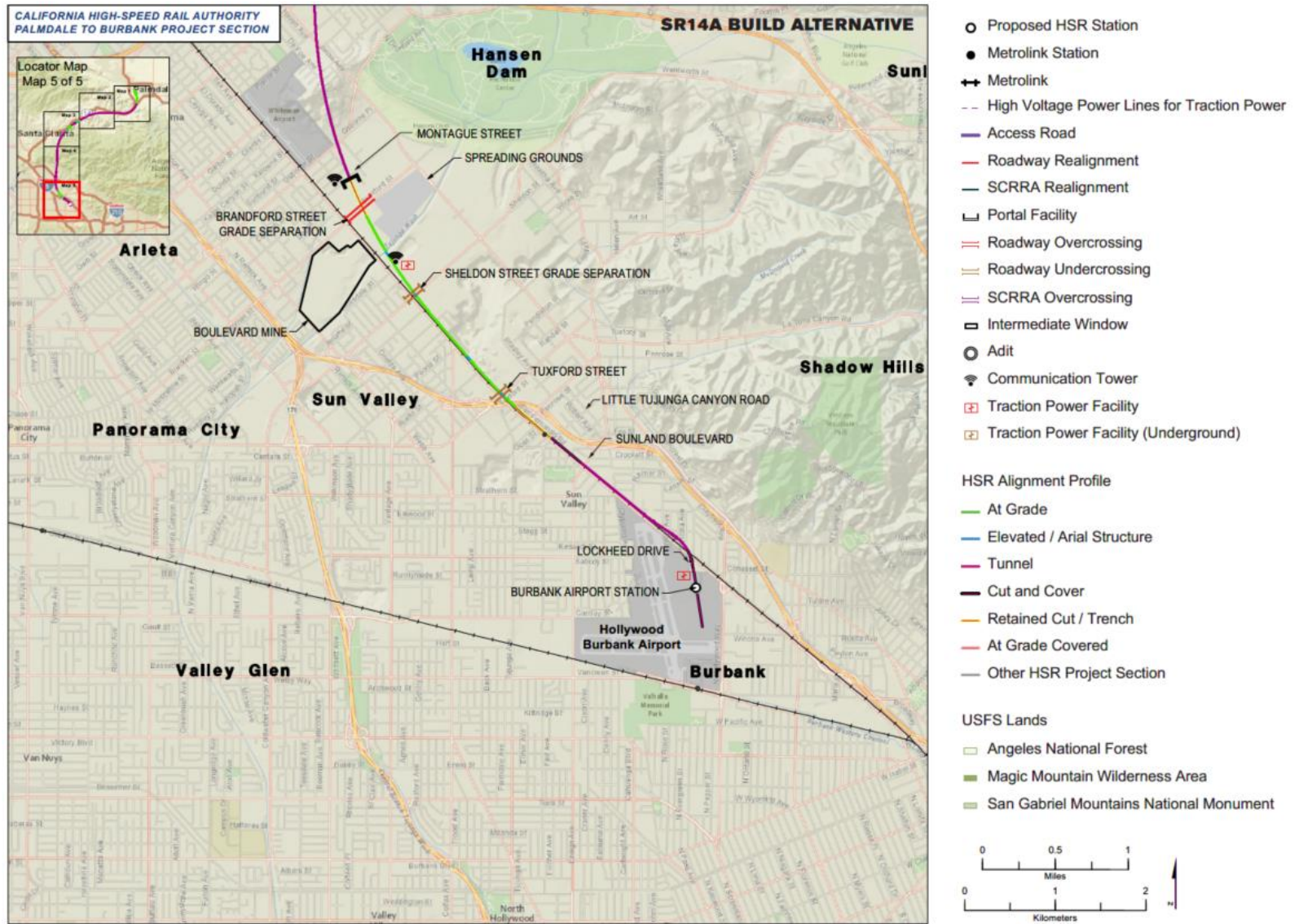


Figure 2-6 SR14A Build Alternative (Map 4 of 5)



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HSR ALIGNMENT IS NOT DETERMINED
 Source: Authority, 2021; National Geographic/Esri, 2021

June 14, 2021

Figure 2-7 SR14A Build Alternative (Map 5 of 5)

Palmdale Subsection

The description of Palmdale Subsection is included for reference only since the environmental analysis of this subsection is part of the Bakersfield to Palmdale Project Section Environmental Document.

The Palmdale Subsection is approximately 3.7 miles long and entirely at grade. The northern limit of this subsection is at Avenue O in the City of Palmdale, on the west side of Sierra Highway. South of Avenue O, the alignment would run parallel to and approximately 200 feet west of the existing Metrolink Antelope Valley right-of-way. The alignment would enter the Palmdale TC after crossing East Avenue Q, approximately 2 miles south of Avenue O. The alignment would follow the existing 6th Street East right-of-way through the Palmdale TC.

After passing through the Palmdale TC, the alignment would remain in the 6th Street East right-of-way until intersecting Avenue R. South of Avenue R, the alignment would continue for approximately 700 feet to a point east of Spruce Court. This point represents the southern limit of the Palmdale Subsection.

Central Subsection

Within the Central Subsection, the SR14A Build Alternative would diverge from the Refined SR14 Build Alternative south of Avenue R, continuing south of Spruce Court at grade, curving eastward and continuing south approximately 300 feet east of Una Lake. South of Una Lake, the SR14A Build Alternative would curve westward, cross over the Metrolink Antelope Valley Line, Sierra Highway, and the Soledad Siphon, and continue southwest and enter a tunnel portal approximately 0.5 mile northeast of the Sierra Highway/Pearblossom Highway intersection.

The SR14A Build Alternative would then continue westward in an approximately 13-mile-long tunnel before surfacing approximately 0.75 mile east of Agua Dulce Canyon Road. The alignment would transition between at-grade and elevated profiles closely paralleling SR 14 before entering an approximately 1-mile-long tunnel. Upon emerging from the tunnel, the alignment would continue at grade or on viaduct for approximately 1.7 miles, crossing the Santa Clara River, Soledad Canyon Road, and the existing Metrolink rail alignment on viaduct structures. Bents and columns of the viaducts would be placed to avoid/minimize disturbance within ecologically sensitive portions of the river.

Transitioning from tunnel to at grade, the SR14A Build Alternative would converge with the Refined SR14 Build Alternative at the Soledad Canyon Mining Operations (Vulcan Mine) site.

Continuing from the Santa Clara River toward Lang Station Road, the alignment would enter approximately 0.5-mile-long, at-grade, covered twin tunnels that would be constructed to the south through the Soledad Canyon Mining Operations (Vulcan Mine), California Mine Identification Number 91-19-0038, which is within the boundaries of the ANF including SGMNM. From this point, the alignment would enter twin-bored tunnels for approximately 13 miles, which would be constructed underneath portions of the ANF including SGMNM, City of Santa Clarita, and Pacoima neighborhood of Los Angeles. These tunnels would have a maximum depth of 2,080 feet. The twin tunnels would pass through the San Gabriel Fault zone and the Sierra Madre Fault zone. Upon completion of the tunnels, the Vulcan Mine site would be regraded and restored to a condition better reflecting the surrounding topography.

The alignment would emerge east of the existing Antelope Valley Metrolink Corridor near Montague Street in the Pacoima neighborhood of Los Angeles. From Montague Street, SR14A would continue south for approximately 0.4 mile in a retained cut/trench, transitioning up to ground level, and passing over the existing Hansen Spreading Grounds on embankment before crossing over the Los Angeles County Flood Control Channel on a bridge and entering the existing Metrolink corridor near Sheldon Street. Continuing along the east side of the Metrolink Corridor, the alignment would continue southerly at grade for approximately 1.0 mile where it would cross over Tuxford Street and under the I-5 freeway. Continuing southeast from the I-5 undercrossing, the alignment would transition below-grade in an open trench to just north of

Olinda Street. From just north of Olinda Street to just north of Sunland Boulevard, the alignment would be below-ground in a cut- and-cover box structure. Metrolink would remain on the surface, and the Sun Valley Metrolink station would be reconstructed south of Olinda Street on the surface. South of Sunland Boulevard the alignment would continue in a mined or bored tunnel until reaching Lockheed Drive, the southern limit of this subsection. The SR14A Central Subsection would continue in the cut-and-cover tunnel adjacent to and underneath the realigned Metrolink rail alignment from Olinda Street until reaching the southern limit of this subsection, Lockheed Drive.

Burbank Subsection

Lockheed Drive represents the northern limit of the Burbank Subsection. From Lockheed Drive, the alignment would continue in a cut-and-cover box until entering the Burbank Airport Station. The Burbank Airport Station would be an underground station, beginning near Kenwood Street and extending to just north of Winona Drive and the Burbank Airport east/west runway. South of the Burbank Airport Station, the Build Alternatives would join with the bored tunnel alignment proposed within the Burbank to Los Angeles Project Section.

Maintenance Facility

As shown on Figure 2-8, there would be a Maintenance Facility site in Lancaster, west of the existing UPRR/Metrolink rail corridor and proposed alignment.

The Maintenance Facility is included for reference only since the environmental analysis of this subsection is part of the Bakersfield to Palmdale Project Section Environmental Document.

To connect the Palmdale to Burbank Project Section to the Maintenance Facility, the Build Alternatives would continue north from Avenue O (the northern terminus of the Palmdale Subsection) at grade until reaching Avenue L. The Build Alternatives would be parallel to and west of the UPRR/Metrolink rail corridor, which would remain in its existing location. As discussed below, roadway and land-use modifications would be required to connect the Maintenance Facility to the Palmdale to Burbank Project Section.

Approximately 4.2 miles of Sierra Highway would be relocated to the west. Preliminary plans for relocating the Sierra Highway place it between 500-2,900 feet west of its existing location. This would provide a separation of between 500 and 2,800 feet between the rail corridor and the highway. Other roadway modifications would affect Avenue L, Avenue M, and Avenue N. Avenue L would be raised with a new roadway overpass, and Avenue M would be re-aligned to the south of its existing location at the crossing with a new flyover roadway bridge. Both would span the Maintenance Facility, HSR, Metrolink track, and UPRR track. Avenue N would end in a cul-de-sac west of the HSR tracks, but a gate would allow access over the trenched tracks on a new roadway overpass that would be at grade with existing West Avenue N. Access to and from the Maintenance Facility would be on the north side from Avenue L 4 and on the south side from Avenue N.

The Maintenance Facility and associated alignment and ancillary features would require land-use modifications, including conversion of both existing and planned non-transportation land uses to a permanent (rail) transportation use. Existing land uses reflect the way a parcel is currently being used, regardless of zoning. Planned land uses reflect the planned future use as designated within the relevant jurisdiction's general plan.

Regarding safety and security at the Maintenance Facility, the south end of the Maintenance Facility would be within the U.S. Air Force Plant 42 Airport boundary, and accident potential zones (APZs) I and II, which could result in safety issues. APZs I and II allow for transportation and rail as consistent uses. APZ I does not allow for passenger terminals or aboveground transmission lines.

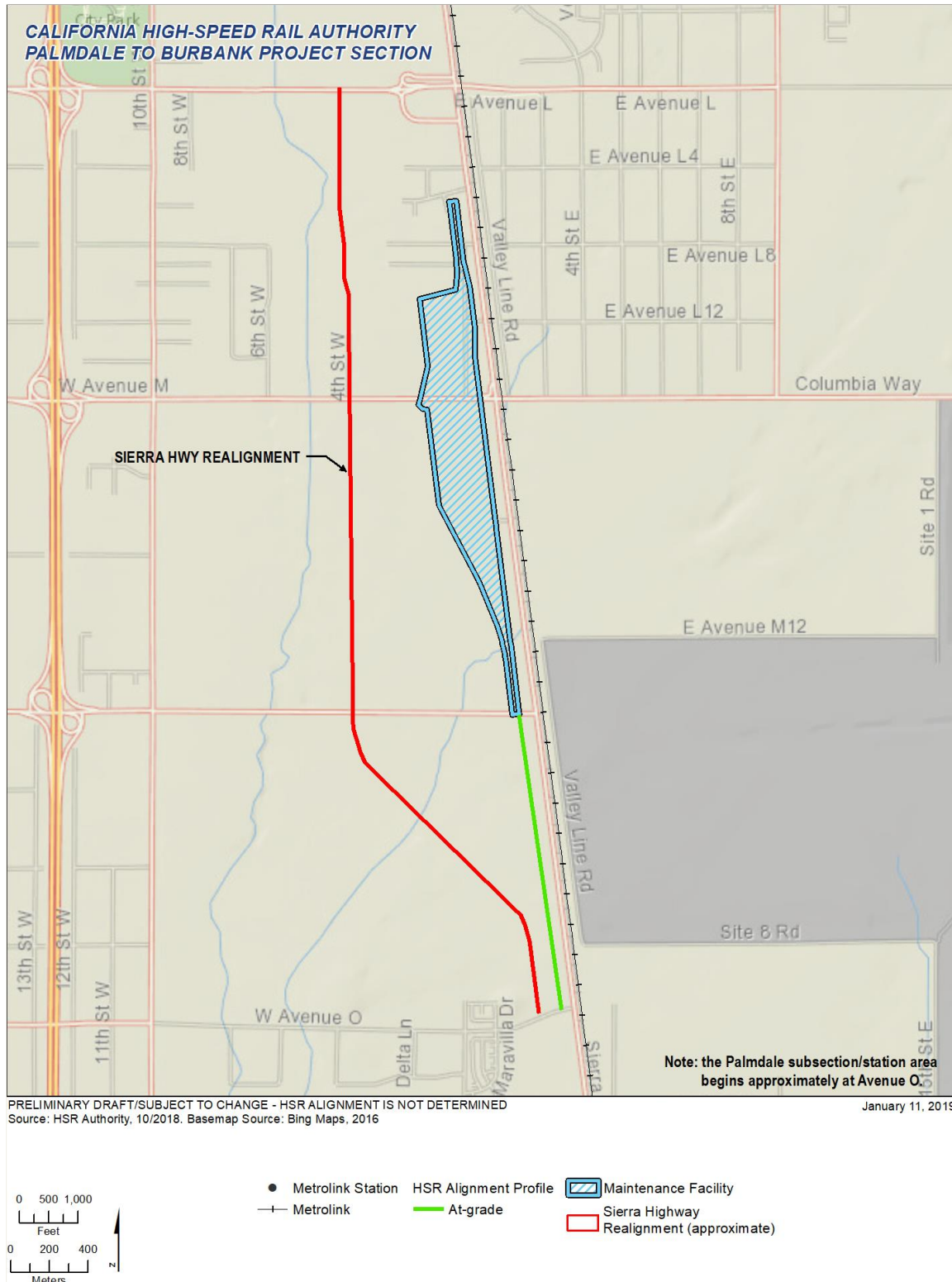


Figure 2-8 Maintenance Facility

2.2.2 Design Features

The project footprint includes the project components and right-of-way needed to construct, operate, and maintain the permanent California HSR System. The project footprint primarily consists of rail alignment, which would include both a northbound and a southbound track in a corridor ranging from 60 feet to several hundred feet wide. Additional right-of-way is included in the footprint to accommodate ancillary features discussed in Section 2.2.2.2.

2.2.2.1 HSR Alignment Profile Types

The dedicated, fully grade-separated infrastructure needed to operate high-speed trains has more stringent alignment requirements than does the infrastructure for lower-speed trains. In the Palmdale to Burbank Project Section, the HSR Build Alternatives would use six different track profiles: (1) at grade, (2) at-grade covered, (3) cut-and-cover, (4) retained cut/trench profile, (5) tunnel, and (6) elevated/aerial structure. These profile types are discussed below. Types of bridges that might be required include full channel spans, large box culverts, and, for some wider river crossings, limited piers within the ordinary high-water channel.

At-Grade Profile

At-grade track sections (Figure 2-9) are best suited for areas where the ground is relatively flat and in rural areas where interference with local roadways is infrequent. The height of at-grade sections may vary to accommodate slight changes in topography and to provide clearance for stormwater culverts and structures to allow water flow as well as occasional wildlife movement. Figure 2-10 represents a typical cross section of an at-grade cut, and Figure 2-11 depicts a typical cross section of an at-grade fill in constrained situations.

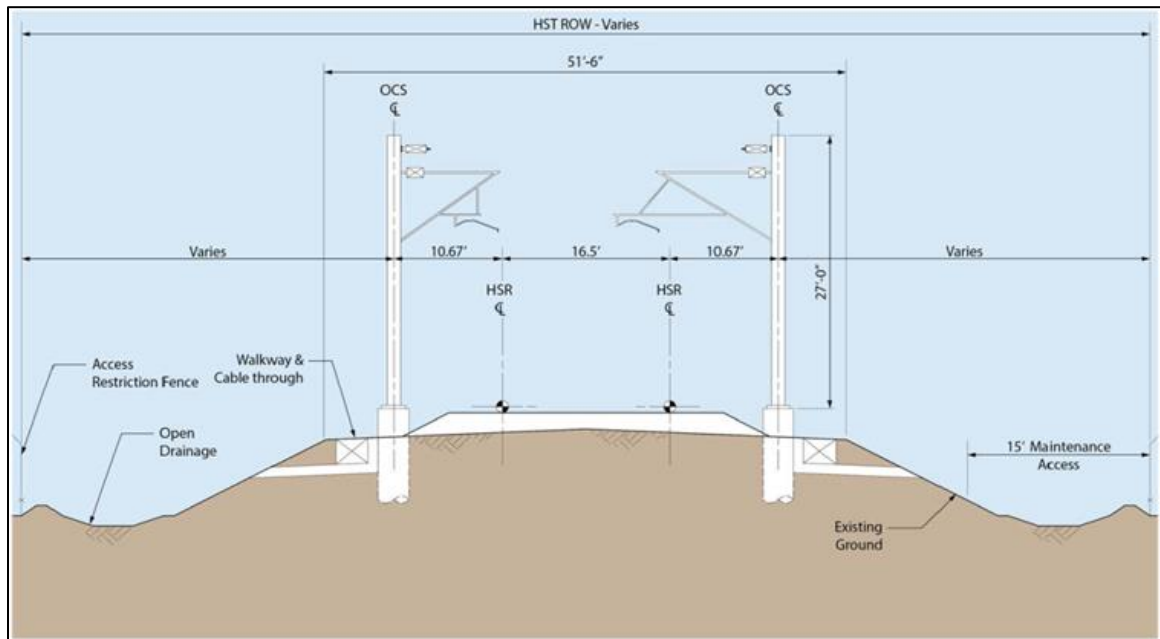


Figure 2-9 Typical High-Speed Rail At-Grade Cross Section

Cut Sections

Cut sections (Figure 2-10) are used only for short distances in highly urbanized or constrained situations, such as when the rail alignment crosses under existing surface-level rail tracks, roads, or highways, or passes through mountainous regions with right of way constraints. Cut sections are also used for roads or highways when it is desirable to depress the roadway underneath surface HSR tracks.

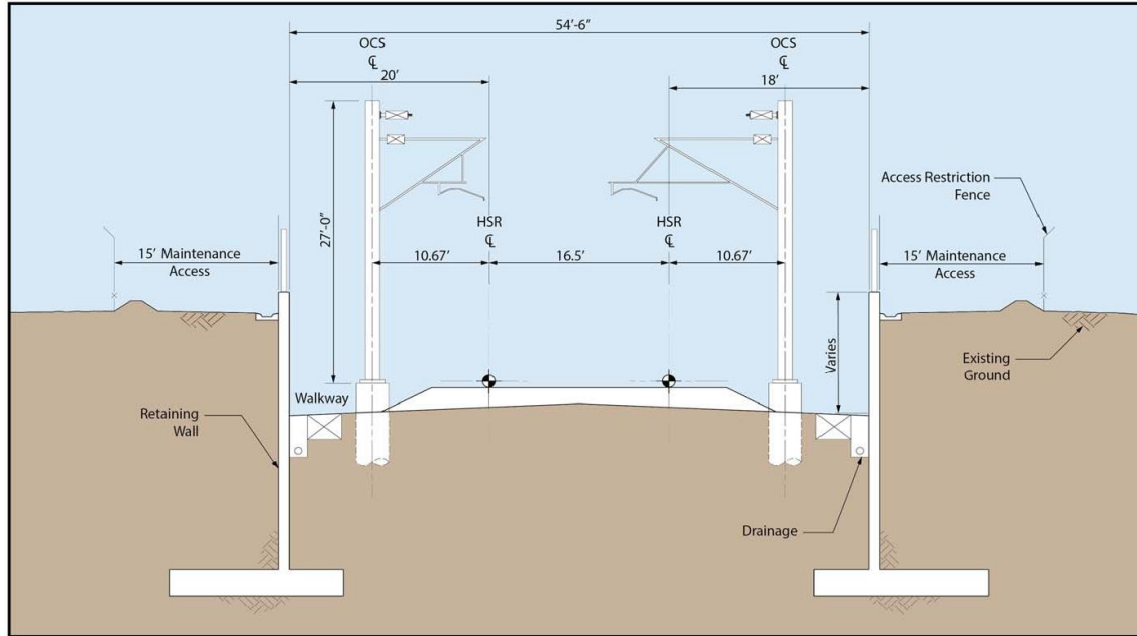


Figure 2-10 Typical High-Speed Rail At-Grade Cross Section (Cut)

Fill Sections

Embankment profiles are mainly used in mountainous terrain where the HSR profile must be above original ground level and the corridor is not constrained. Side slopes are generally suitable for vegetation. Retained walls in embankment profiles (Figure 2-11) are also used for short distances in highly urbanized or constrained situations such as when the right-of-way is too narrow to allow side slopes, or in the proximity of elevated structures when the rail alignment crosses over existing surface-level rail tracks, roads, or highways. Fill sections are also used for roads or highways when it is desirable to elevate the roadway over surface HSR tracks.

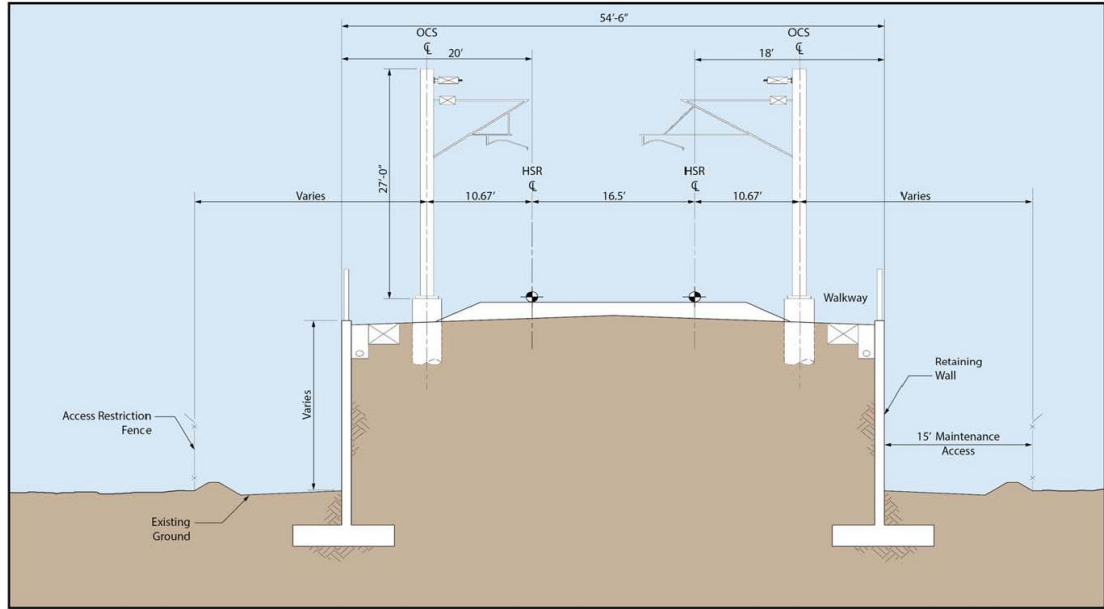


Figure 2-11 Typical High-Speed Rail At-Grade Cross Section (Fill)

At-Grade Covered Profile

An at-grade covered profile (Figure 2-12) would put the HSR in a (potentially prefabricated) tunnel that placed at-grade and covered with earth to create an above-ground structure. Such a profile is advantageous in locations where the vertical alignment of the rail would normally be at grade, but enclosure is preferred.

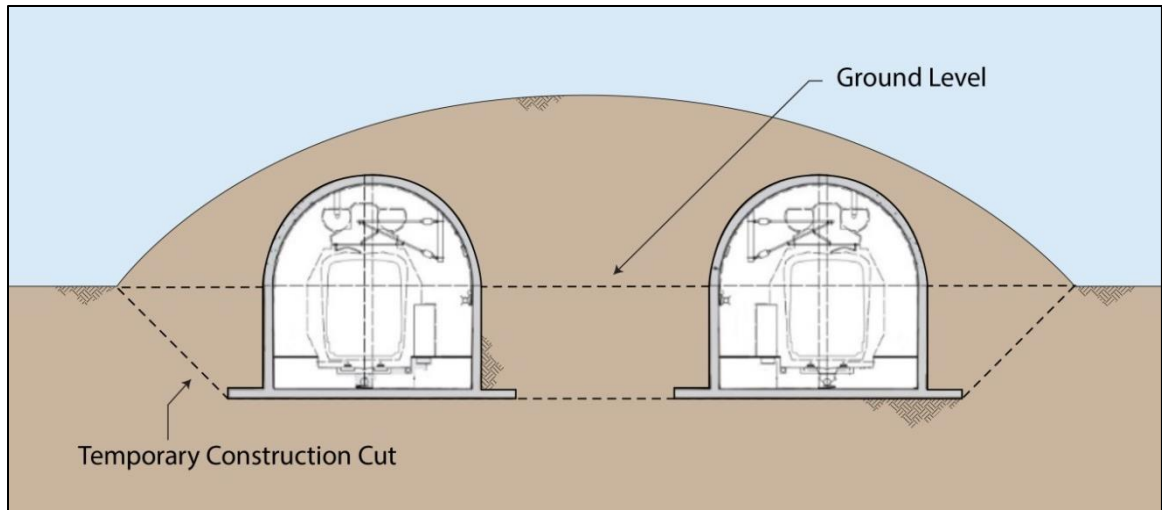


Figure 2-12 Typical High-Speed Rail At-Grade Covered Tunnel Cross Section

Cut and Cover Profile

A cut-and-cover profile (Figure 2-13) would place the HSR into a covered trench, more commonly known as a cut-and-cover tunnel. Cut-and-cover tunneling is used when the vertical profile of the alignment would be below ground surface at a depth that makes shallow bored-tunneling infeasible. Cut-and-cover tunneling therefore requires land clearance, and structures or features above cut-and-cover areas would need to be removed during construction.

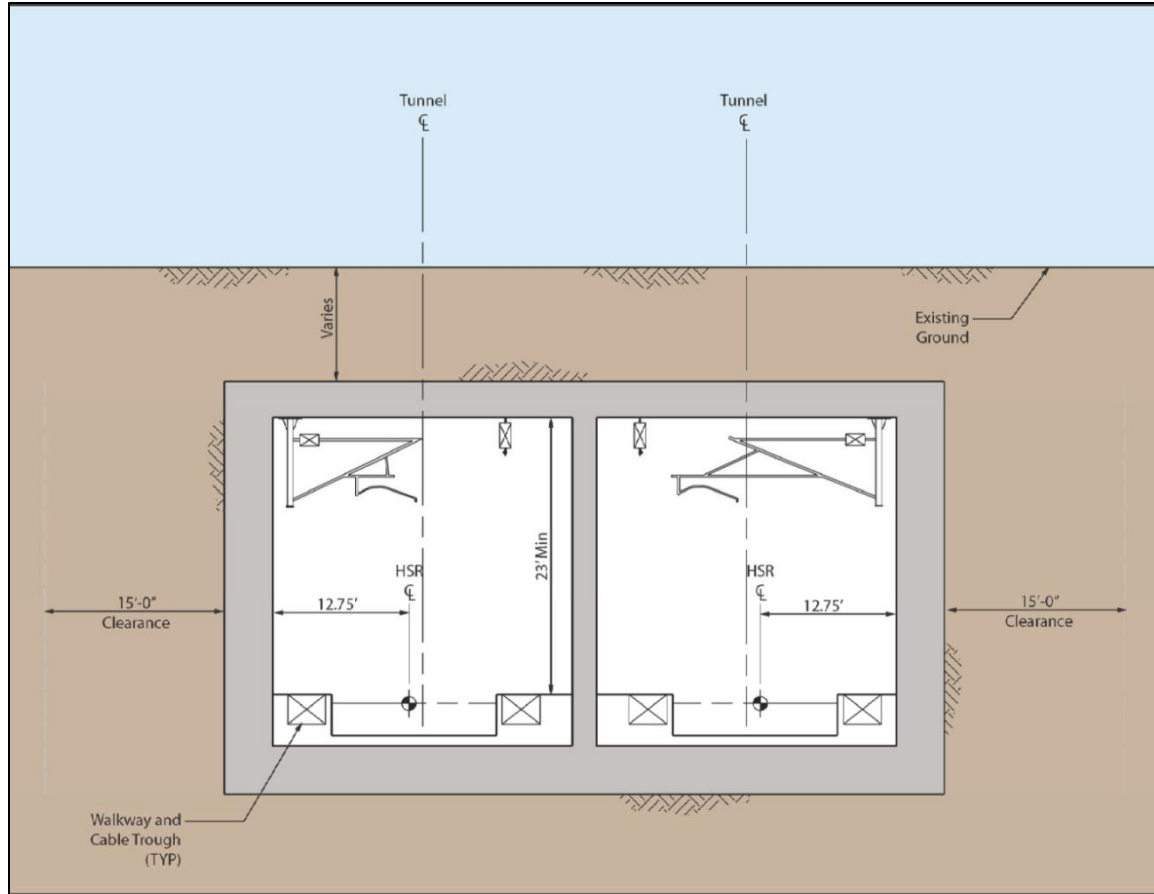


Figure 2-13 Typical HSR Cut-and-Cover Cross-Section

Retained Cut/Trench Profile

A trench or retained cut consists of a vertically retained excavation below ground level with lateral retaining walls embedded in the terrain. Unlike in a cut-and-cover profile, the trench would remain uncovered after construction. Figure 2-14 shows a typical cross section.

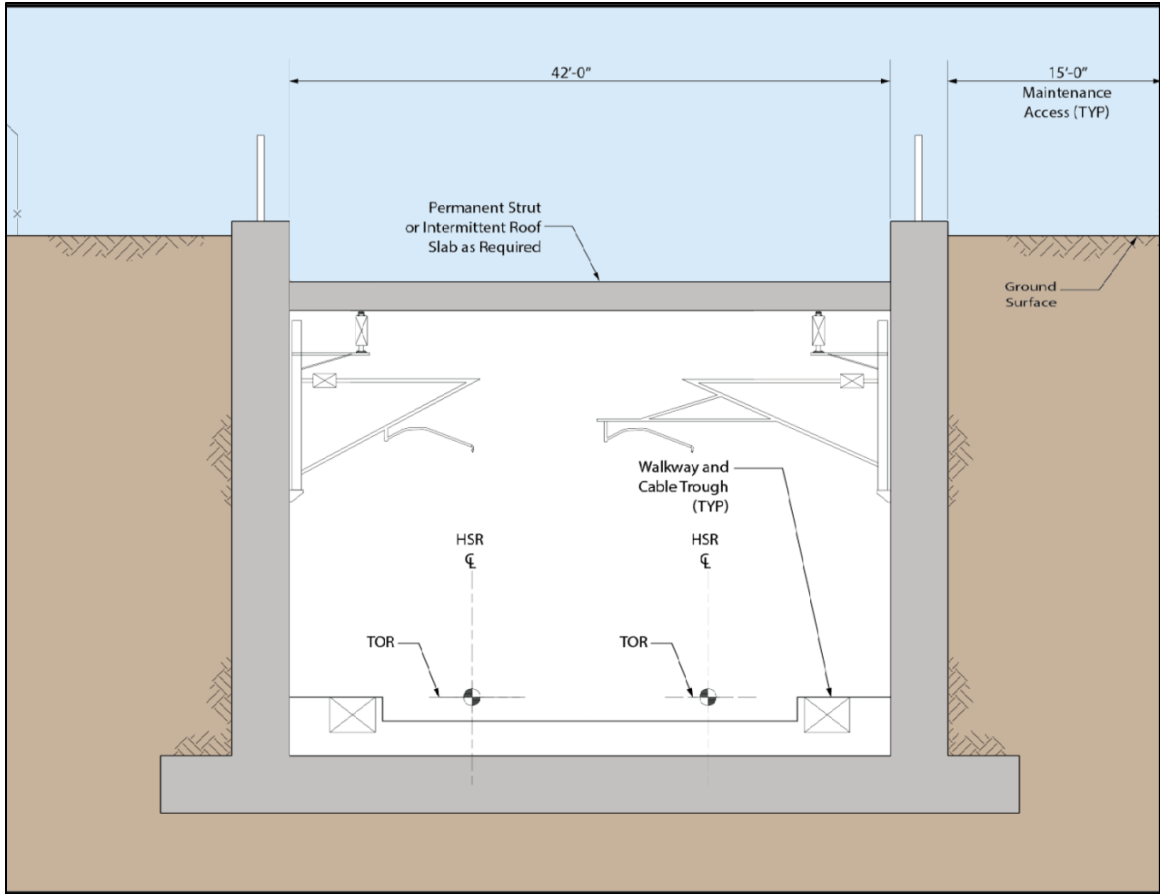


Figure 2-14 Typical HSR Retained Cut/Trench Cross-Sections

Tunnel Profile

Tunnel sections (Figure 2-15 and Figure 2-16) are used when the rail alignment traverses highly variable topography or highly constrained, densely developed urban situations, and the HSR must be deep below original ground level. Tunnels are typically bored or mined so that the original ground surface is preserved.

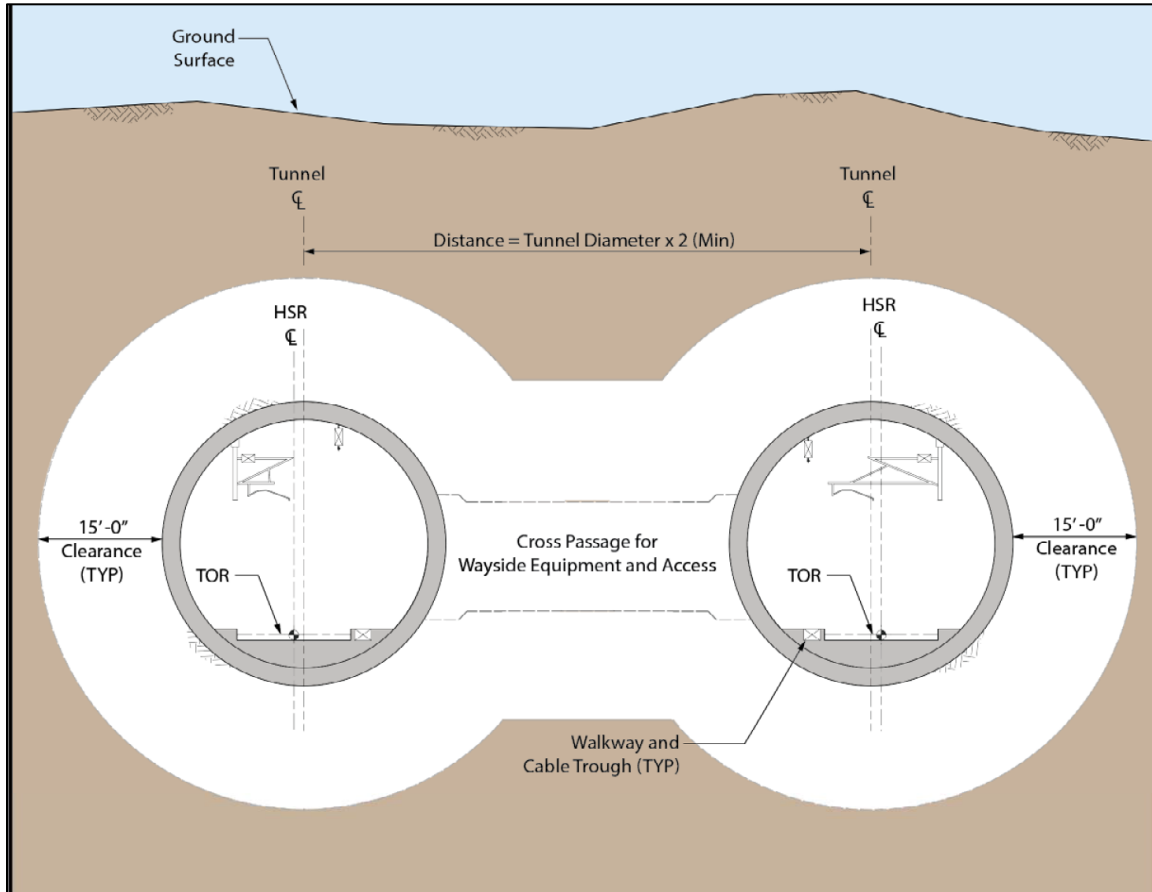


Figure 2-15 Typical High-Speed Rail Tunnel Cross-Section in Twin Tunnel

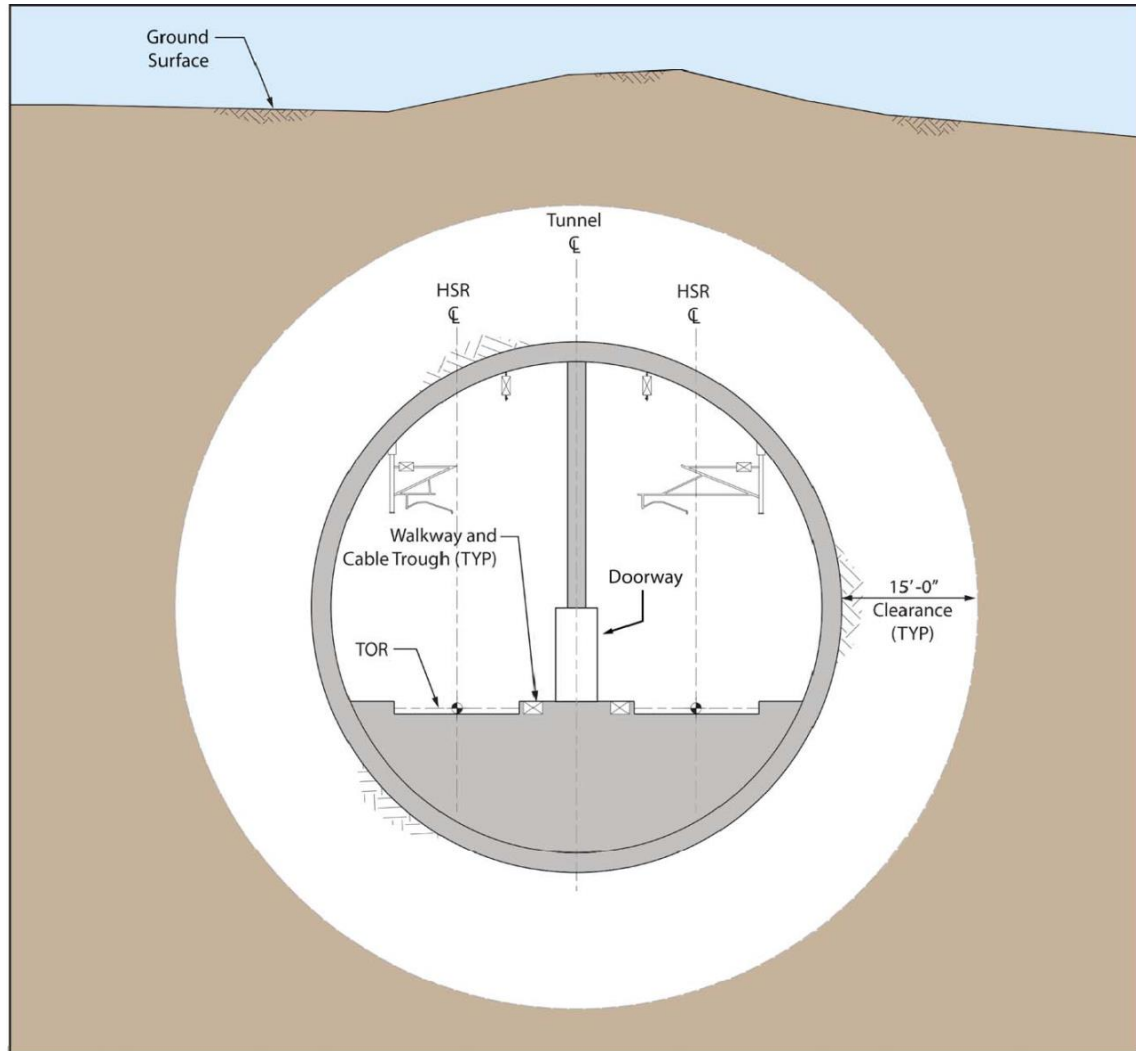


Figure 2-16 Typical High-Speed Rail Tunnel Cross-Section in Single Tunnel

Tunnel Portals

Tunnel portals provide a transition from tunneled sections to cut, at-grade, or elevated sections. Figure 2-17 shows an example of a tunnel portal. During construction, portals serve as the primary access to the tunnels. In the permanent configuration, facilities and infrastructure elements would be located at the portals to support HSR tunnel operations, including the provisions needed to meet first responder, fire and life safety, and ventilation requirements. *High-Speed Train Tunnel Portal Facilities, TM 2.4.6* (Authority 2010b) describes the permanent structures associated with the tunnel portals for the Palmdale to Burbank Project Section, including a representative layout of these elements. It also provides general guidance used to determine which elements of the portal infrastructure are required; the principal factors influencing these decisions are tunnel length, the proximity of other tunnels to the portals, accessibility, and environmental impacts.



Source: Authority and FRA, 2014

Figure 2-17 Tunnel Portal

Permanent Portal Facilities

The following major infrastructure elements are incorporated in the portal design, based on preliminary engineering design, and are subject to change as the design of the Palmdale to Burbank Project Section is refined:

- Noise Mitigation Hood
 - Up to 150 feet long to mitigate aerodynamic noise effects
- Portal Ventilation Building
 - Three-story, roughly 65-foot-high building housing fan assemblies at the portals to extract smoke from the tunnels in the event of fire
 - Located immediately over the tunnel portal with direct tunnel access
- Access Road
 - Portal access for emergency responders, evacuating passengers, and maintenance staff
 - A 22-foot-wide road that runs up and around the portal ventilation building to provide access to the third floor
- Emergency Vehicle Assembly and Turnaround Area
 - Minimum 75-foot by 75-foot area
 - Adjacent to the tunnel portal
- Rescue Area/Passenger Assembly Area
 - Minimum 5,000-square-foot, well-lit assembly point for emergencies
 - As close as practical to the tunnel portal
- Fire Hydrants and Water Supply

- For tunnel firefighting purposes
- Supplied by 4-inch water line proposed along the alignment for tunnel water needs
- Area Lighting
 - Lighting system to illuminate the portal site during a train evacuation
- Train Surface Evacuation and Fire Control Zone
 - Immediately outside the portal where a train exiting a tunnel under emergency conditions can stop to allow passengers to safely disembark
 - Access for emergency responders to reach the train in emergencies
- Communication Facilities
 - Communication tower (CT) approximately 100 feet high and 6 feet in diameter (may be required to enable reliable transmission)
- Rock Fall and Debris Containment
 - Trench excavations or berms to prevent materials from slopes in the portal area from reaching the tracks or damaging equipment or structures
- Detention Pond
 - For stormwater runoff at each portal location
- Parking for Tunnel Maintenance and Traction Power Facilities (traction power facilities potentially include TPSSs, paralleling stations [PS], and switching stations)
 - Approximately eight spaces for maintenance staff
- Public Utilities
 - For example, water, electricity, telephone, and sewer lines

TM 2.4.6 also establishes general guidance for determining which elements of the portal infrastructure are required. The principal factors influencing this decision are:

- Length of tunnel
- Proximity of one tunnel to another
- Accessibility of portal locations
- Environmental impacts at portal location

Elevated/Aerial Structure Profile

Elevated profiles (Figure 2-18 and Figure 2-19) can be used in urban areas where extensive road networks must be maintained. They may also be used in rugged, mountainous, or otherwise uneven terrain to ensure a level track, reducing the need for tunneling or other grade-stabilizing measures. Elevated sections have two basic configurations: (1) single structure with both tracks; or (2) twin structures, each with a single track.

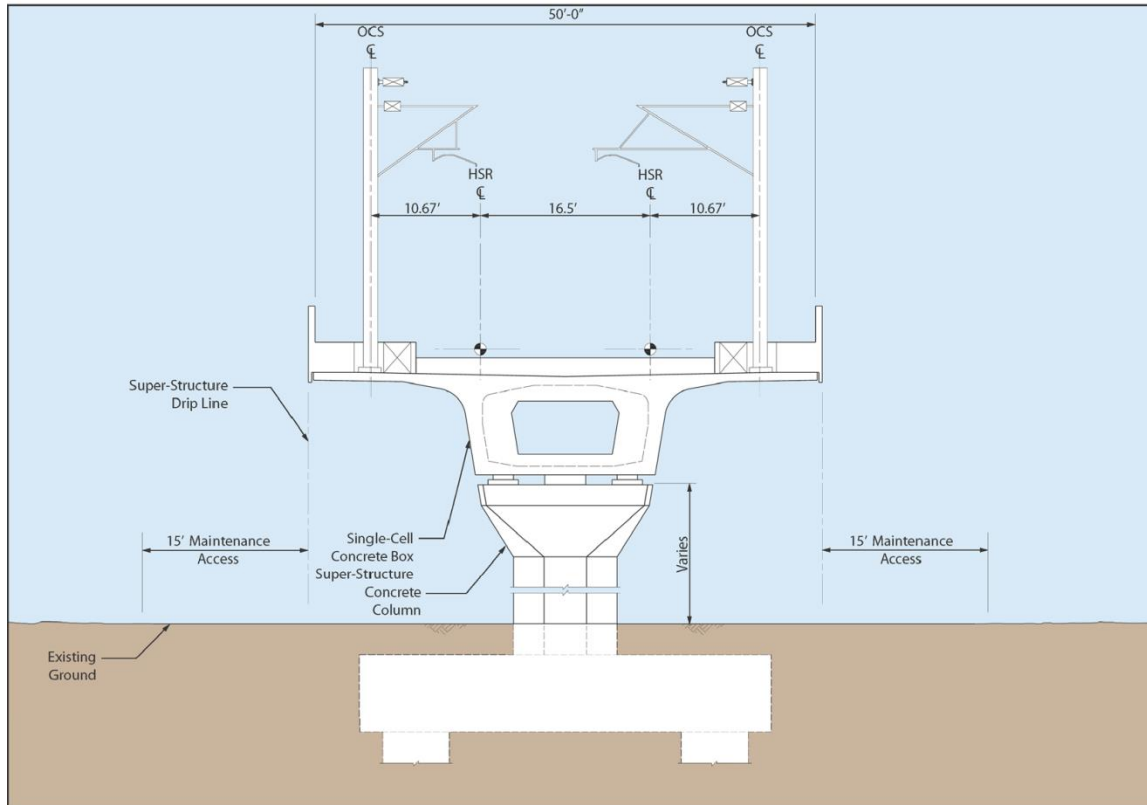


Figure 2-18 Typical HSR Two-Track Elevated Cross-Section

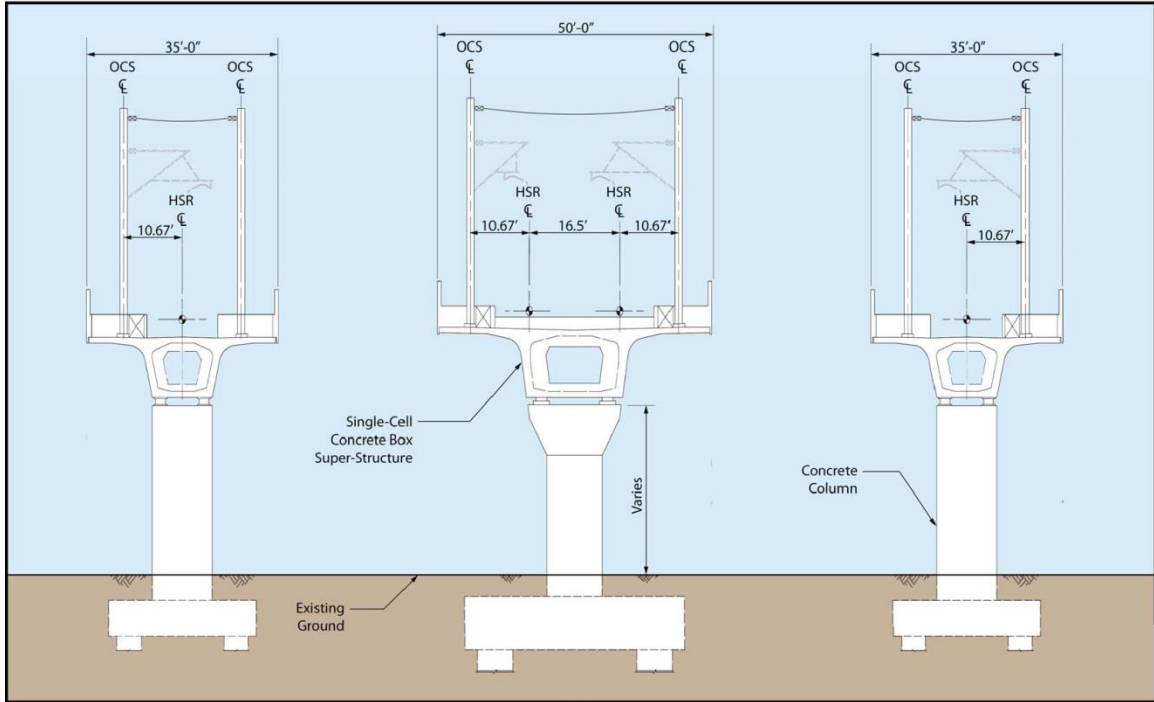


Figure 2-19 Typical HSR Four-Track Elevated Cross-Sections

Straddle Bents

When the HSR elevated profile crosses over a roadway or railway on an extremely sharp skew (degree of difference from the perpendicular), a straddle bent makes sure that the piers are outside of the functional/operational limit of the roadway or railway.

As shown on Figure 2-20, a straddle bent is a pier structure that spans (or “straddles”) the functional/operational limit of a roadway, highway, or railway. Typical roadway and highway crossings that have a small skew angle (i.e., the crossing is nearly perpendicular) generally use intermediate piers in medians and span the functional right-of-way. However, for larger-skew-angle crossing conditions, median piers would result in excessively long spans that are not feasible. Straddle bents that clear the functional right-of-way can be spaced as needed (typically 110 feet apart) to provide feasible span lengths for bridge crossings at larger skew angles.

Train Detention Zone

When portions of the HSR elevated profile are closer than 1,300 feet to tunnel portals, a train detention zone is implemented on the deck of the elevated structure and the typical structure section changes to accommodate the train detention zone geometrical requirements.

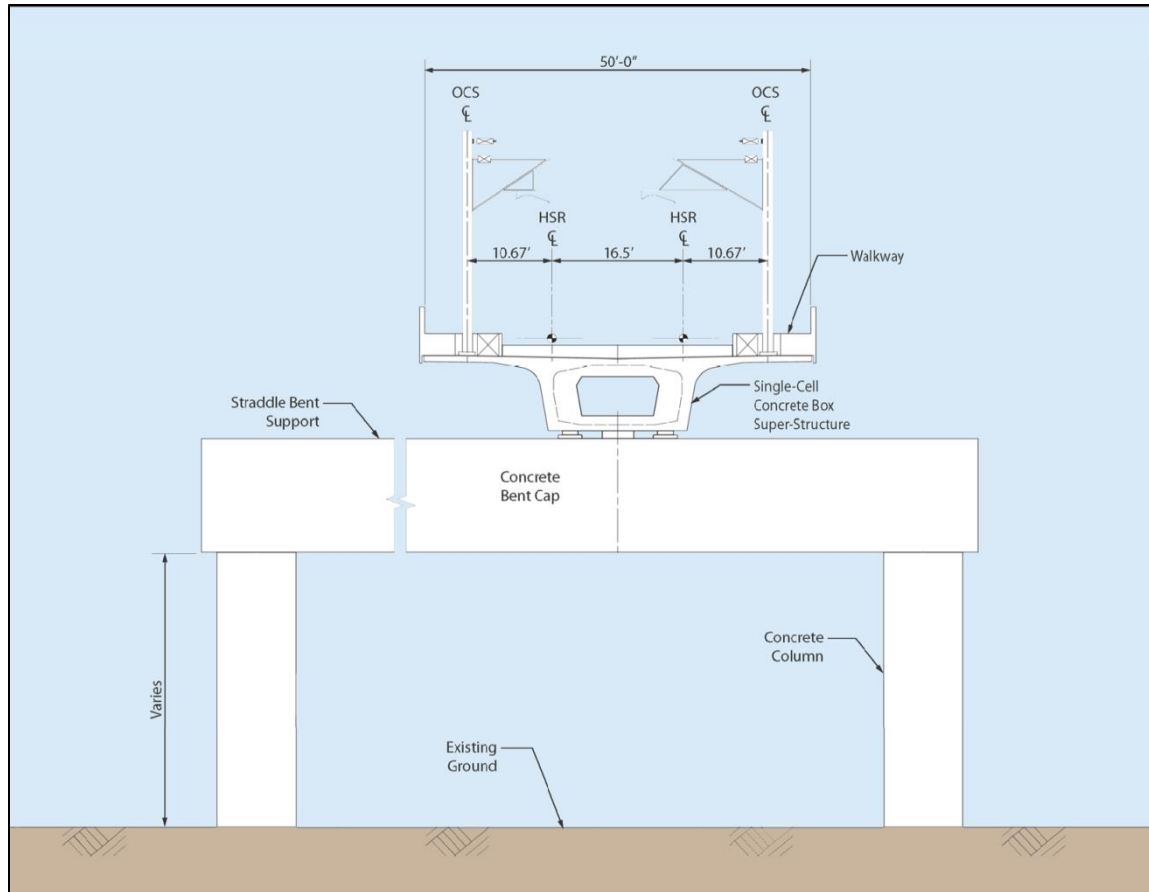


Figure 2-20 Straddle Bent Typical Cross Section

2.2.2.2 High-Speed Rail Ancillary Features

The Build Alternative footprint includes components of the Palmdale to Burbank Project Section and right-of-way needed to construct, operate, and maintain permanent HSR features. This includes features that provide necessary support for the construction, operations, and maintenance of the Build Alternatives, otherwise known as ancillary features.

The Build Alternative footprint includes ancillary features such as the Maintenance Facility (although it is included in the environmental document of the Bakersfield-Palmdale Project Section) and equipment storage areas, temporary and permanent access roads, TPSS, switching stations and PSs, train signaling and communication facilities, temporary and permanent access roads, grade separations (overcrossings and undercrossings), intrusion protection barriers, and wildlife crossing structures. The Build Alternative footprint also includes areas for utility relocation, roadway relocation, electrical power connection, and construction activities (including laydown, storage, and similar areas).

Additionally, construction of deep bored tunnels could require some temporary surface impact areas such as adits and intermediate windows. These ancillary features are described in detail below.

Adits

Adits are intermediate tunnel access shafts to facilitate construction of bored tunnels. An adit can serve as a tunnel boring machine (TBM) entry or exit point and can enable the use of multiple TBMs to shorten construction time. Adits may also facilitate construction of fault chambers and

other similar design requirements that increase safety for HSR operations and maintenance in seismically active areas. After construction is completed, a small permanent structure and associated power facilities for emergency egress, maintenance, and ventilation equipment could be installed at selected adit locations.

A typical adit consists of an inclined access gallery, or deep vertical shaft, connecting the surface to an underground cavern and trackway tunnels. Distinct access galleries and temporary construction staging areas (CSA) have been defined for the adit options.

Several adit location options have been identified for each Build Alternative. These sites were selected based on engineering and feasibility considerations, including the presence of existing access roads, location of known faults and fault traces, available space for construction staging, opportunities to shorten construction duration, and potential use as a starting point for conventional construction methods (i.e., if the adit is in fault zone, it could be more convenient to build a portion of the tunnel with mined methods, as this technique allows for better and easier execution of ground treatments than other methods). For the purpose of this analysis, several adit location options have been included in the footprint to allow for refined selection in a more advanced design stage, and not all adits analyzed in this Draft EIR/EIS would be constructed.

Intermediate Windows

An intermediate window is a vertical shaft connecting to an underground construction area that would comprise an elevator and gantry cranes to provide access, water, power, ventilation, and other support during construction. After construction is complete, a small structure for permanent access, and possibly ventilation equipment, would remain at the surface. Figure 2-21 shows a typical intermediate window.



Figure 2-21 Typical Intermediate Window

Similar to the approach to adits in this draft, some intermediate window locations are identified for each Build Alternative. For the purpose of this analysis, some intermediate window options have been included in the footprint to allow for refined selection in a more advanced design stage, and not all intermediate windows analyzed in this Draft EIR/EIS would be constructed.

2.2.2.3 Grade Separations

A safely operating HSR system consists of a fully access-controlled and largely grade-separated guideway. Unlike existing passenger and freight train alignments, the Palmdale to Burbank Project Section would not include at-grade road crossings, nor would the rail alignment be shared with freight trains. The following list describes possible scenarios for HSR grade separations:

Elevated HSR Road Crossings—In urban areas, raising the HSR (as shown in Figure 2-18 through Figure 2-20) might be more feasible than elevating roads over the HSR. This could be especially applicable in densely developed urban areas where use of an elevated HSR guideway would minimize impacts on the existing roadway system.

Roadway Overcrossings—There are many roadway and state route facilities that currently cross at grade with or over the Metrolink railroad tracks. Figure 2-22 illustrates how a roadway would be grade-separated over both the HSR and the existing railroad in these situations. Figure 2-23 illustrates a typical roadway overcrossing of the HSR tracks. Overcrossings would generally be constructed to match lane counts and widths of existing roads, depending on average daily traffic volumes. Minimum vertical clearance would be 27 feet over the HSR. Specifications would be based on county road standards, and, where applicable, other freight/passenger railroad standards.

Local Road Overcrossings—Similar conditions to those described above for roadway overcrossings would apply when at-grade HSR tracks cross a local road. Figure 2-23 illustrates a typical roadway overcrossing of HSR tracks.

Roadway Undercrossings—HSR Build Alternatives may require undercrossings for the HSR to pass over roadways. Figure 2-24 illustrates how a roadway would be grade-separated below the HSR guideway.

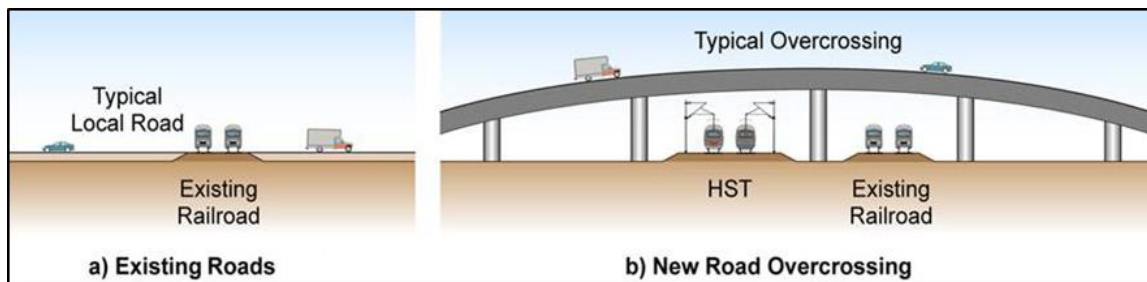


Figure 2-22 Replacing At-Grade Crossing with Overcrossing

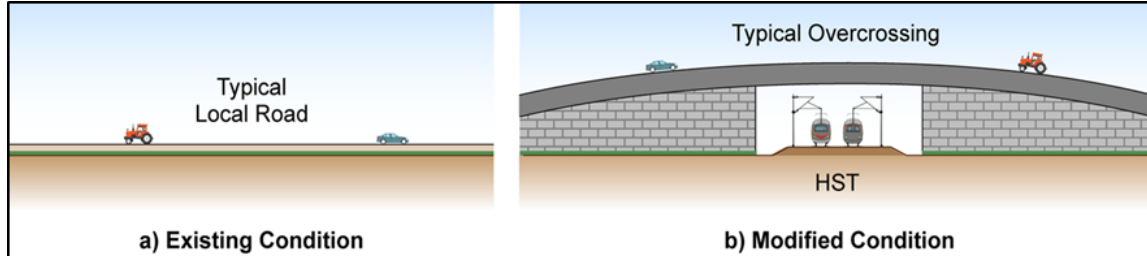


Figure 2-23 Replacing Local Road with Overcrossing

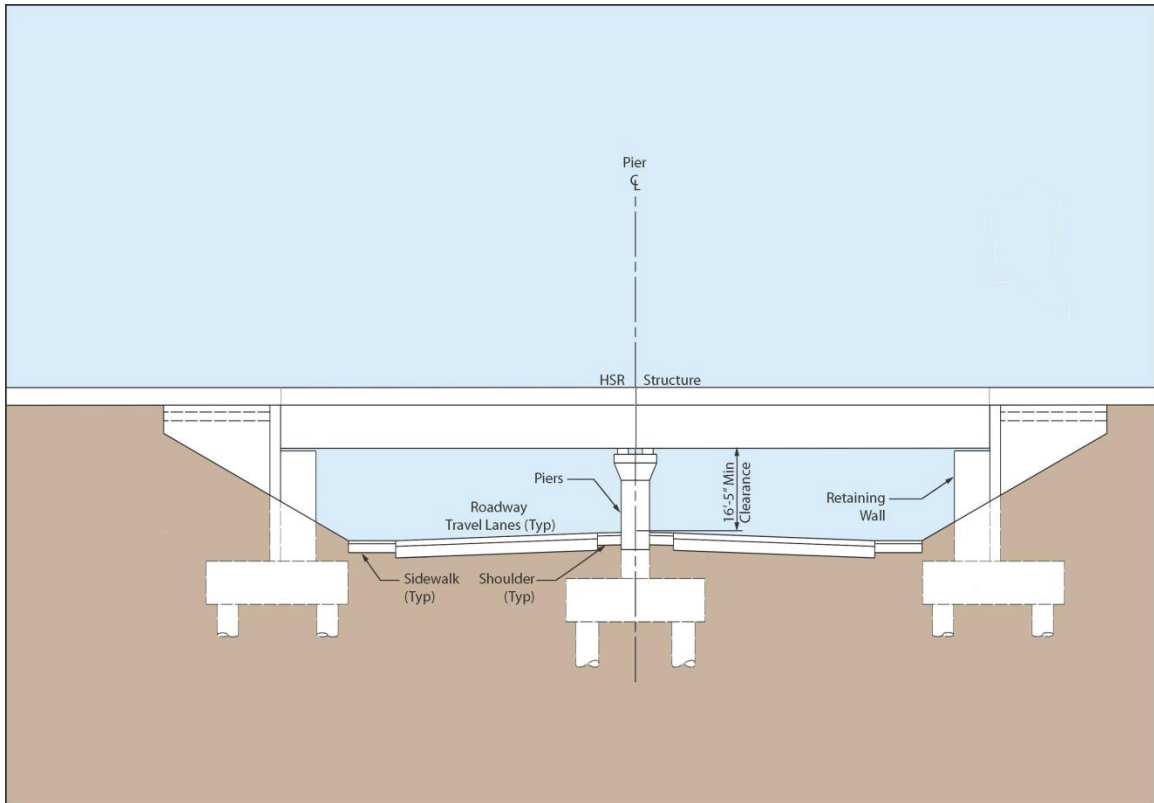


Figure 2-24 Typical Cross Section of Roadway Grade-Separated Beneath High-Speed Rail Guideway

Irrigation and Drainage Facilities—The HSR tracks would affect some existing drainage and irrigation facilities. Depending on the extent of the impact, existing facilities would be modified, improved, or replaced as needed to maintain existing drainage and irrigation functions and to support HSR drainage requirements.

Wildlife Crossing Structures—Wildlife crossing opportunities would be available through a variety of engineered structures. In addition to dedicated wildlife crossing structures, other options for wildlife crossing would include elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage facilities (i.e., large-diameter culverts and paired 30-inch culverts).

Because of the extensive use of tunnels and elevated portions of trackway associated with each Build Alternative, only one dedicated wildlife crossing structure has been identified as needed in the Palmdale to Burbank Project Section. This crossing structure would be south of Lake Palmdale in the vicinity of the California Aqueduct crossing. At this location, the preliminary wildlife crossing structure design consists of a modified culvert in the embankment that would support the HSR tracks. The typical culvert would be 73 feet long from end to end (crossing structure distance), approximately 10 feet wide (crossing structure width), and provide 3 feet of vertical clearance (crossing structure height), resulting in a calculated openness factor¹ (Caltrans 2007) of 0.41 to accommodate variations in the topography. The height of the at-grade profile

¹ (Height x Width)/Distance = Openness Factor; for example, (4 feet x 8 feet)/72 feet = 0.44.

could require that wildlife crossing structures be depressed no more than 1.5 feet (half the vertical clearance) below-grade, resulting in a higher openness factor.

At locations where stormwater swales parallel the embankment, the approach to wildlife crossing structures would be designed to minimize the amount of surface water runoff entering the structure. A small berm (or lip) would be constructed at the entrance of the wildlife structure to prevent water from entering during small storm events. Swales would be directed around this lip. To allow wildlife free passage over the crossing structures, HSR right-of-way fencing would be constructed at the toe of the slope, up the embankment, and around the entrance of the structure. At locations where an intrusion protection barrier² parallels a proposed wildlife crossing structure, the crossing structure would be extended and designed to pass through the barrier to allow free passage for wildlife.

Additional wildlife crossing structure designs could include circular or elliptical pipe culverts and larger (longer) culverts with crossing-structure distances of up to 100 feet. However, changes to wildlife crossing structure design must be constrained by a minimum of 3 feet of vertical clearance (crossing-structure height), depressed no more than 1.5 feet below-grade (half of the vertical clearance), and must meet or exceed the minimum 0.41 openness factor. Additional dedicated wildlife crossing structures would be placed to the north and south of the Santa Clara River crossing.

2.2.2.4 Traction Power Distribution

The State's electricity grid would power the proposed HSR system. A 2008 study determined that it would not be feasible to physically control the flow of electricity from particular grid sources (Navigant 2008). However, it would be feasible for the Authority to obtain the quantity of power required for the HSR from 100 percent clean, renewable energy sources through a variety of mechanisms, such as paying a clean-energy premium for the electricity consumed. In 2014, the Authority verified the feasibility of powering the HSR system with 100 percent renewable energy sources (Morales 2014). The Palmdale to Burbank Project Section would not include the construction of a separate power source, but it would require the extension of underground or overhead power transmission lines to a series of power substations positioned along the HSR corridor. These power substations would be needed to even out the power feed to the train system. Working in coordination with power supply companies and per design requirements, the Authority has identified frequency and right-of-way requirements for these facilities.

Trains would draw electric power from an overhead contact system with the running rails acting as the other conductor. The contact system would consist of a series of mast poles approximately 23.5 feet higher than the top of the rail, with contact wires suspended from the mast poles between 17 and 19 feet from the top of the rail. The train would have an arm, called a pantograph, to maintain contact with this wire to provide power to the train. The mast poles would be spaced approximately every 200 feet along straight portions of the track down to approximately every 70 feet in tight-turn track areas. The contact system would be connected to the substations, required at approximately 30-mile intervals. Statewide, the power supply would consist of a 2 x 25-kV overhead contact system for the electrified portions of the statewide system.

² The HSR cross sections include provisions for a 102-foot separation of the HSR track centerline from conventional rail systems to avoid intrusion without the need for physical protection from adjacent freight lines. In areas where it is not feasible to provide this separation distance, protection is required to prevent encroachment on the HSR right-of-way. Protection would consist of a swale, berm, or barrier (wall), depending on the separation.

Traction Power Substations

Based on the California HSR System's estimated power needs, each TPSS would need to be approximately 32,000 square feet (200 feet by 160 feet) and be located at approximately 30-mile intervals. Figure 2-25 shows a typical TPSS. Figure 2-26 shows a typical TPSS overhead catenary system (OCS) feeder gantry.



Figure 2-25 Traction Power Substation



**Figure 2-26 Traction Power Substation
Overhead Catenary System Gantry**

A buffer area would be required around TPSSs for safety purposes. For the Palmdale to Burbank Project Section, electrical substations would be constructed at locations where high-voltage power lines cross the Build Alternatives. The TPSS and associated feeder gantry could be screened from view with a perimeter wall or fence. Each TPSS site would have a 20-foot-wide access road (or easement) from the street access point to the protective fence perimeter. Each site would require a parcel of up to 2 acres. Each substation would include an approximately 450-square-foot control room (each Build Alternative design includes these facilities, as appropriate).

Power would be supplied either by Southern California Edison (SCE) or Los Angeles Department of Water and Power (LADWP) transmission lines. SCE has indicated that serving the Palmdale to Burbank Project Section could require reconstruction of some existing lines. This could consist of reconductoring or of installing new power poles. Where electrification of the system is required, power companies would design and implement changes to their transmission lines, which includes environmental review and clearance of the reconstruction. If the engineering design for new or upgraded SCE facilities involves new or different significant environmental impacts, additional environmental review and analysis of the new equipment, including reconstruction of transmission lines, would be completed as part of the California Public Utilities Commission permit application process prior to construction.

During construction and operation, portals, adits, temporary work sites, and certain other ancillary facilities would also require power supplies. These would generally connect to the nearest existing overhead transmission lines.

Switching and Paralleling Stations

Switching and PSs work together to balance the electrical load between tracks, and to turn power on or off to either track in an emergency. Switching stations (Figure 2-27) would be required at approximately 15-mile intervals, midway between the TPSSs. Switching stations would need to be approximately 14,400 square feet (160 feet by 90 feet).

PSs would be required at approximately 5-mile intervals between the switching stations and the TPSSs. The PSs would each need to be approximately 9,600 square feet (120 feet by 80 feet). Each PS would include an approximately 450-square-foot (18 feet by 25 feet) control room. Figure 2-28 shows a typical PS. Figure 2-29 shows a typical PS OCS feeder gantry (overhead wires that feed electricity to a rail vehicle).

The switching and PSs and associated feeder gantries could be screened from view with perimeter walls or fences. TPSSs, traction power switching, and PSs are included in each Build Alternative design as appropriate.



Figure 2-27 Switching Station



Figure 2-28 Paralleling Station



**Figure 2-29 Paralleling Station Overhead
Catenary System Gantries**

Backup and Emergency Power Supply Sources for Stations and Facilities

During normal system operations, power would be provided by the local utility or an TPSS. Should the flow of power be interrupted, the system would automatically switch to a backup power source: an emergency standby generator, an uninterruptable power supply, or a direct current (DC) battery system.

For the Palmdale to Burbank Project Section, permanent emergency standby generators are anticipated to be located at passenger stations and terminal layup/storage and the Maintenance Facility. Standby generators are required to be tested (typically once a month for a short duration) in accordance with National Fire Protection Association (NFPA) 110/111 to verify readiness for backup and emergency use. If needed, portable generators could also be transported to other trackside facilities to reduce the impact of power interruptions on system operations.

Electrical Interconnections

As described above, each TPSS would have two 115/50-kV or 230/50-kV single-phase transformers. These transformers would interconnect the TPSS to two breaker-and-a-half bays,³ built at a new utility switching station within the fence line of an existing utility facility. Interconnection would be made by a short section of 230-kV transmission or 115-kV power lines (tie-lines). Per Authority requirements, the proposed interconnection points would need redundant transmission (i.e., double-circuit electrical lines) from the point of interconnection, with each interconnection connected only to two phases of the transmission source. A new utility switching station would encompass approximately 32,200 square feet (160 by 220 feet) and include an approximately 975-square-foot (15 by 65 feet) control building, a 525-square-foot (15 by 35 feet) battery building, and, if required, a retention basin. The utility switching station could be screened from view with perimeter walls or fences. Figure 2-30 shows a typical electrical interconnection between a typical TPSS and a transmission power line.

³ A *breaker and a half* is a common design of overlapping circuits and circuit breakers to provide system reliability.



Figure 2-30 Electrical Interconnections

Network Upgrades

The Authority has coordinated with Pacific Gas and Electric Company and SCE and determined that network upgrades would be required to meet the projected power demands of the 345-mile portion of the California HSR System within the two utilities' respective service territories. Detailed engineering of electrical interconnections and network upgrade components has not been undertaken and would not be completed until closer to the time of construction. Network upgrades could include modifications to existing infrastructure such as expansion of existing substations and reconductoring of existing electrical lines (i.e., replacement of power structures [poles and lattice steel towers] and electrical conductors with taller structures and more efficient electrical wires or new electrical lines). Anticipated network upgrades are included in the Build Alternative footprint and would be implemented pursuant to California Public Utilities Commission General Order 131-D.

2.2.2.5 Signaling and Train Control Elements

A computer-based, enhanced ATC system would control the trains. The enhanced ATC system would comply with FRA-mandated positive train control requirements, including safe separation of trains, over-speed prevention, and work-zone protection. The ATC system would use a radio-based communications network, including a fiber optic backbone and communications towers at intervals of approximately 1.5 to 3 miles, depending on the terrain and selected radio frequency. Signaling and train control elements within the right-of-way would include 10-foot-by-8-foot communications shelters or signal huts/bungalows that house signal relay components and microprocessor components, cabling to the field hardware and track, signals, and switch machines on the track. Train control facilities ranging from 2,450 square feet (70 by 35 feet) to 7,175 square feet (110 by 65 feet) would be along the track. Each communications tower within these facilities would use a 6- to 8-foot diameter pole that would extend to a height of 100 feet above the tracks. The communications facilities would be in the vicinity of track switches and would be grouped with other traction power, maintenance, station, and similar HSR facilities where possible. Where communications towers could not be located with TPSSs or other HSR facilities, the communications facilities would be near the HSR corridor in a fenced area of approximately 25 feet by 40 feet. Figure 2-31 illustrates a typical at-grade profile with traction power, signaling, and train-control features.

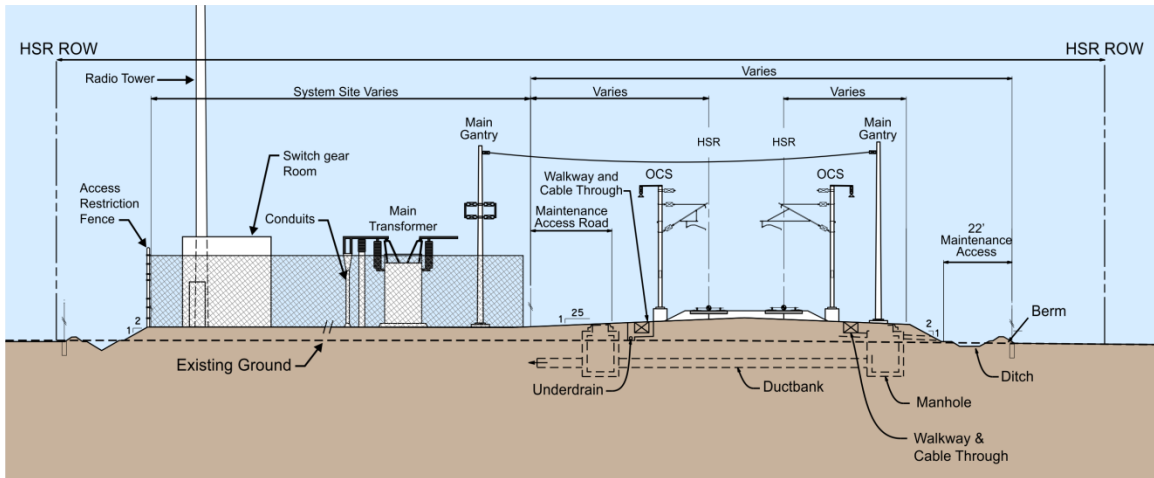


Figure 2-31 Typical Cross Section of At-Grade Profile with Traction Power, Signaling, and Train-Control Features

2.2.2.6 Track Structure

The track structure would consist of either a direct fixation system (with track, rail fasteners, and slab), or ballasted track, depending on local conditions and decisions to be made in later design phases. Ballasted track requires more frequent maintenance than slab track, as described below, but is less expensive to install.

Slab track (or ballast-less track) is a concrete or asphalt structure that is generally stiff and rigid while ballasted track is typically made of crushed stone packed between, below, and surrounding the rail fasteners. Refer to section 6.4.3 for further detail on trackbed structure station sites.

The design of the station areas would provide intermodal connectivity, drop-off facilities, an entry plaza, a station house area for ticketing and support services, an indoor station room where passengers wait and access the HSR, and parking facilities. Station design has not progressed beyond the conceptual stage. The functional station is a basic design that could be more elaborate with cooperation from the local jurisdiction; the station could be an iconic building that would help define a downtown transit core. Preliminary station planning and design are based on dimensional data from Station Platform Geometric Design Guidance (Authority 2008) and volumetric data from Station Program Design Guidelines (Authority 2009b) and incorporate the Authority's Urban Design Guidelines (Authority 2011b). The stations would be designed in accordance with Americans with Disabilities Act accessibility guidelines.

The station house would be adjacent to the primary entrance and plazas and would be open to both patrons and visitors. Services within the station house could include initial ticketing and check-in, traveler's aid and local information services, and concessions. Circulation linkages between the station house and the station platforms could include hallways, an access bridge to cross over railroad tracks, stairs, escalators, elevators, and/or moving sidewalks.

The Palmdale to Burbank Project Section would include a station in the City of Burbank. The station in the City of Palmdale is included for reference only since has been analyzed in the Bakersfield to Palmdale Project Section.

2.2.3 Palmdale Station

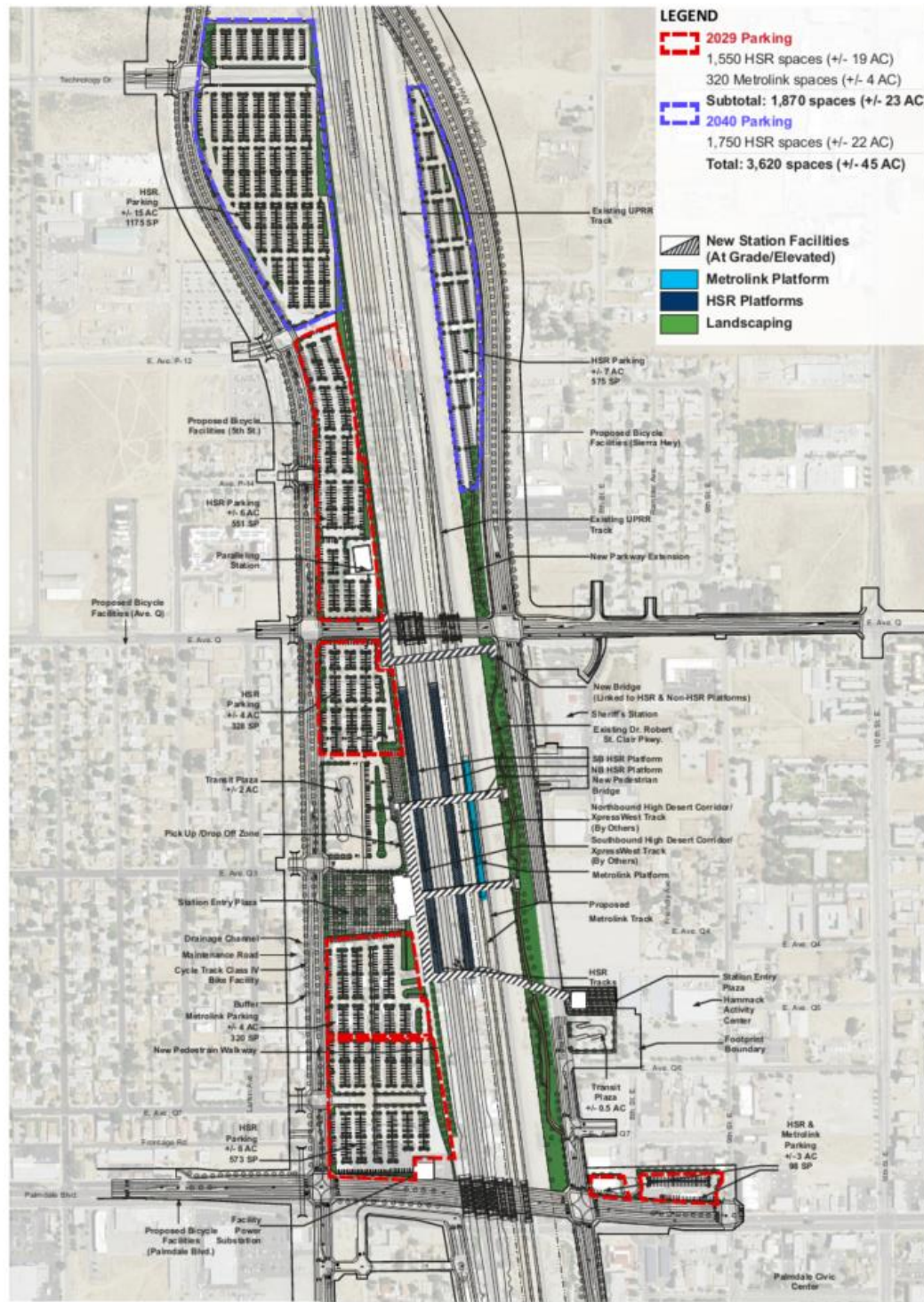
As shown on Figure 2-32, the Palmdale Station would be along the proposed rail alignment within the Palmdale Subsection. The existing Palmdale TC would be incorporated into the Palmdale Station, which would be bound by Technology Drive north and Palmdale Boulevard to the south. The Palmdale Station would consist of train platforms, pedestrian walkways/connectors, a transit

plaza pick-up/drop-off facility for private autos, and surface parking areas. The station would comprise approximately 50 acres and several facilities.

Train platforms would be constructed along either side of the proposed rail alignment, beginning approximately 200 feet south of East Avenue Q. The southbound platform would be west of the southbound tracks, and the northbound platform would be east of the northbound tracks. Each platform would be approximately 1,410 feet long. In addition, a 700-foot Metrolink platform would be constructed east of the HSR platform, running north-south along the Metrolink railway.

Pedestrian access to the station would be provided through a transit plaza and pedestrian overcrossings spanning the rail alignments. These overcrossings would connect the train station/platforms to surrounding parking areas, which would, by 2040, provide 3,300 parking spaces in multiple lots. Two transit centers, one on either side of the alignment, would house terminals for buses and shuttles.

**CALIFORNIA HIGH-SPEED RAIL AUTHORITY
PALMDALE TO BURBANK PROJECT SECTION
PALMDALE STATION**



Palmdale Station Detailed Site Plan

Figure 2-32 Proposed Palmdale Transportation Center

2.2.4 Burbank Airport Station

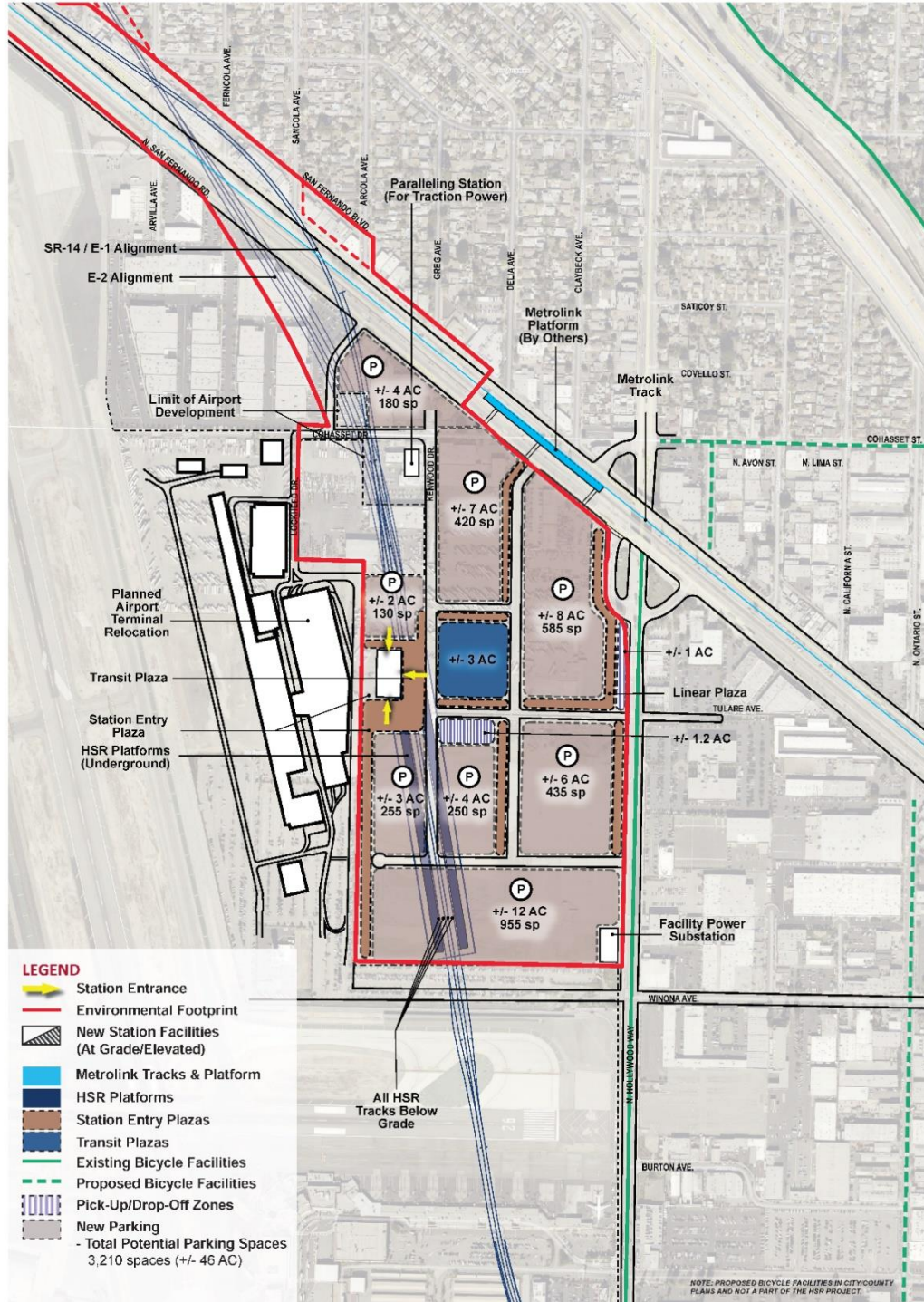
As shown on Figure 2-33, Burbank Airport Station would be along the proposed alignment, with rail facilities underground. The station site would span approximately 70 acres and would include train boarding platforms, a station building (that would house ticketing areas, passenger waiting areas, restrooms, and related facilities), pick-up/drop-off facilities for private autos, a transit center for buses and shuttles, surface parking areas, a power substation and stormwater capture/drainage facilities.

The station site would be west of Hollywood Way and east of the Hollywood Burbank Airport. The airport and ancillary properties occupy much of the land south of the proposed station site,⁴ while industrial and light industrial land uses are found to the east and residential land uses to the north of the station site. I-5 runs parallel to the station site, approximately 0.25 mile north of the proposed Metrolink platform.

Burbank Airport Station would have up to 3,210 surface parking spaces in multiple lots by 2040. Proposed surface parking would be in addition to parking spaces that might be included in the replacement terminal project.

⁴ The Burbank Airport Station would not encroach on or interfere with the Hollywood Burbank Airport Replacement Terminal project.

**CALIFORNIA HIGH-SPEED RAIL AUTHORITY
PALMDALE TO BURBANK PROJECT SECTION
BURBANK STATION**



Burbank Station General Site Plan

Source: PlaceWorks
Date: May 2, 2019

Figure 2-33 Proposed Burbank Airport Station

2.3 Maintenance Facilities

The California HSR System includes four types of maintenance facilities: light maintenance facilities (LMF), maintenance of infrastructure facilities (MOIF), maintenance of infrastructure sidings (MOIS), and heavy maintenance facilities (HMF). The Palmdale to Burbank Project Section would include one Maintenance Facility site in the event that this section were built and operated independently, which could be configured to accommodate one or more of the maintenance operations listed above (LMF/MOIF/MOIS/HMF). If the Palmdale to Burbank Project Section is constructed independent of the statewide system, the Maintenance Facility could be configured to provide both LMF and MOIF operations. However, the Palmdale to Burbank Project Section would likely be constructed and operated as part of the statewide HSR System and, in this case, use of the Maintenance Facility site near Avenue M (described below) may or may not be necessary, depending on the location and types of maintenance facilities constructed in other project sections.

3 DOCUMENTATION OF PRELIMINARY ENGINEERING FOR PROJECT DEFINITION OUTPUT

Table 3-1 lists the deliverables for each item listed under the Engineering Output in Table 1 of the TM 0.1 PEPD Guidelines

Table 3-1 PEPD Engineering Documentation

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Alignment (Plan and Profile)	Alignment design including: <ul style="list-style-type: none"> ▪ Base mapping and photo aerials ▪ Horizontal Alignment showing key existing features (e.g., roadways and driveways, utilities, water bodies, existing structures, sensitive or otherwise regulated environmental resources, etc.) ▪ Vertical Alignment showing key existing features (ground and existing structures, water bodies, over and under crossings) ▪ Typical cross-sections ▪ Station location alternatives ▪ Limits of at-grade, elevated, and underground structures ▪ Right-of-way limits for each Build Alternative including easements ▪ Roadways and railroad in proximity to the proposed alignment ▪ List of alignment-related Design Variances 	Palmdale to Burbank Project Section PEPD Record Set Rev01 Alignment Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Alignment Report
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Alignment Report	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Alignment Report
		Palmdale to Burbank Project Section PEPD Record Set Rev02 Track Alignment Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Track Alignment Plans
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Track Alignment Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Track Alignment Plans

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Roadway Work (Grade Separations)	Roadway design including: <ul style="list-style-type: none"> ▪ Horizontal Alignment. Super elevation designed only for State Highways, not local roadways. ▪ Vertical Alignment showing key existing features (ground, water bodies, over and under crossings) ▪ Clearances shall be confirmed and noted on drawings ▪ Alignment Data Files (including horizontal and vertical InRoads/InRail data files) in electronic format. ▪ Typical cross-sections ▪ Access (pedestrian and vehicular) ▪ Right-of-Way limits including temporary easements and maintenance access for HSR and appurtenant features, and consequential features/uses ▪ Indicate required driveway relocations ▪ Indicate existing and proposed speeds ▪ List of roadways-related Design Variances 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Roadway / Grade Separation Plans (2 Volumes)	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Roadway / Grade Separation Plans Volume I of II Palmdale to Burbank Project Section PEPD Record Set Rev02 Roadway / Grade Separation Plans Volume II of II
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Record Set Rev00 Roadway / Grade Separation Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Record Set Rev00 Roadway / Grade Separation Plans

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Temporary Construction Facilities	Constructability assessment memorandum covering: <ul style="list-style-type: none"> ▪ Construction staging concepts as needed to determine limits and to characterize temporary impacts during construction ▪ Temporary construction/staging measures, sites and facilities ▪ Develop assumptions and quantities for level of construction activities to support air quality analysis 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Construction Staging Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Construction Staging Plans
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Construction Staging Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Construction Staging Plans
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Constructability Assessment Memorandum	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Constructability Assessment Memorandum
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Constructability Assessment Memorandum	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Constructability Assessment Memorandum

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Stations	Station Site alternatives covering: <ul style="list-style-type: none"> ▪ Station footprints ▪ Vehicular and bicycle parking and site configuration ▪ Station Platforms: number, configuration (height and width), location, and relationship to other tracks and platforms in the station ▪ Vertical and horizontal circulation elements ▪ Off-site parking locations and station access routing ▪ Identify intermodal and public transit connections ▪ Facility sizing table 	Palmdale to Burbank Project Section PEPD Record Set Rev01 Burbank Station Area Plans Palmdale to Burbank Project Section PEPD Record Set Rev01 Burbank Station Report	Drawings Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Burbank Station Area Plans Palmdale to Burbank Project Section PEPD Record Set Rev01 Burbank Station Report
Buildings	N/A			

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Tunnels	Tunnel drawings and report including: <ul style="list-style-type: none"> ▪ Tunnel horizontal and vertical alignments ▪ Tunnel cross sections including consideration for fire and life safety requirements, OCS, and other required equipment ▪ Mitigation and design requirements for seismic or Tunnel lining requirements ▪ Portal and ventilation structure locations ▪ Cross passage spacing and locations ▪ Construction methods assessment ▪ Temporary construction easements ▪ Assess operations, emergency and maintenance access identification, locations and right-of-way 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Tunnels Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Tunnels Plans
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Tunnel Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Tunnel Design and Construction Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Tunnel Design and Construction Report
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Tunnel Design and Construction Report	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Tunnel Design and Construction Report
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Tunnel Ventilation Concept Analysis Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Tunnel Ventilation Concept Analysis Report
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Tunnel Ventilation Concept Analysis Report	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Tunnel Ventilation Concept Analysis Report

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Bridges and Elevated Structures	Structure design (plan, elevation, cross-section) to APS level including: <ul style="list-style-type: none"> ▪ Bridge length, width, depth, max. height ▪ Column/footing locations ▪ Foundation type ▪ Number of spans ▪ Transition structures ▪ Changes to affected adjacent facilities (pedestrian, roadway, highway, railroad) ▪ Grade separation structures for crossroad ▪ Major utility relocations Advanced Planning Study Tech Memo / Report including: <ul style="list-style-type: none"> ▪ Structure importance classification (i.e. lifeline, etc.) ▪ Key design and site constraints ▪ Seismic, soils, hydrologic, hydraulic and geomorphic design considerations Construction costs Evaluation of Existing Structures Report including: <ul style="list-style-type: none"> ▪ Caltrans' recommended Rehabilitation Strategy Plan ▪ Expected Remaining life ▪ Seismic retrofit assessment of existing structures to meet the no-collapse performance for Maximum Considered Earthquake (MCE) 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Bridges and Elevated Structures Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Bridges and Elevated Structures Plans
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Elevated Structures Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Bridges and Elevated Structures Advanced Planning Study Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Bridges and Elevated Structures Advanced Planning Study Report
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Elevated Structures Advanced Planning Study Report	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Elevated Structures Advanced Planning Study Report
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Existing Structures Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Existing Structures Report

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Grading	Alignment Plans capturing: <ul style="list-style-type: none"> ▪ Cut-and-fill slope catch points included on alignment plans ▪ Retaining wall locations, lengths and heights ▪ Retaining wall type (standard, MSE, tie-back, etc.) ▪ Construction easement requirements ▪ Assess operations, emergency and maintenance access identification, locations, and right-of-way 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Grading and Drainage Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Grading and Drainage Plans
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Grading and Drainage Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A
Hydrology / Hydraulics / Drainage	<ul style="list-style-type: none"> ▪ Hydrology and Hydraulics Report ▪ Floodplain Impacts Assessment Report ▪ Storm Water Management Report ▪ Additional information as needed to support Section 408, Section 404, Section 401/402 determinations (e.g., hydraulic basis of design in service of regulatory permitting) 	Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment E1	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment E1
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment E2	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment E2
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Hydrology and Hydraulics Report Alignment E1A/E2A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Hydrology and Hydraulics Report Alignment E1A/E2A

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment Refined SR14	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Hydrology and Hydraulics Report Alignment Refined SR14
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Hydrology and Hydraulics Report Alignment SR14A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Hydrology and Hydraulics Report Alignment SR14A
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment E1	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment E1
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment E2	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment E2
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Floodplain Impacts Assessment Report Alignment E1A/E2A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Floodplain Impacts Assessment Report Alignment E1A/E2A

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment Refined SR14	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Floodplain Impacts Assessment Report Alignment Refined SR14
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Floodplain Impacts Assessment Report Alignment SR14A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Floodplain Impacts Assessment Report Alignment SR14A
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment E1	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment E1
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment E2	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment E2
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Stormwater Management Report Alignment E1A/E2A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Stormwater Management Report Alignment E1A/E2A

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment Refined SR14	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Stormwater Management Report Alignment Refined SR14
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Stormwater Management Report Alignment SR14A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Stormwater Management Report Alignment SR14A
Utilities	<ul style="list-style-type: none"> ▪ Existing and relocation of utilities within project limits per TM 2.7.4, Utility Requirements for 15% Design Level (shall be read as PEPD) ▪ High-Risk and Major Utilities Conflict Memo ▪ Utility composite map for disposition of major utilities in critical areas ▪ Define existing footprints for high-risk utilities 	Palmdale to Burbank Project Section PEPD Record Set Rev02 Utility Relocation Plans (2 Volumes)	Drawings	Palmdale to Burbank Project Section PEPD Record Set Rev02 Utility Relocation Plans Volume I of II Palmdale to Burbank Project Section PEPD Record Set Rev02 Utility Relocation Plans Volume II of II
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Utility Relocation Plans	Drawings	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Utility Relocation Plans
		Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report E1 Alignment	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report E1 Alignment

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report E2 Alignment	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report E2 Alignment
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A High Risk and Major Utility Impact Report E1A/E2A Alignment	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A High Risk and Major Utility Impact Report E1A/E2A Alignment
		Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report Refined SR14 Alignment	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 High Risk and Major Utility Impact Report Refined SR14 Alignment
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A High Risk and Major Utility Impact Report SR14A Alignment	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A High Risk and Major Utility Impact Report

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
Geotechnical	<ul style="list-style-type: none"> ▪ Updated Geotechnical Database ▪ Preliminary Geotechnical Design Report ▪ Geotechnical Investigation Plan recommendations ▪ Additional information as needed to support Section 408 determinations (e.g., geotechnical basis of design in service of regulatory permitting) 	Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Report
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Tunnel Feasibility Evaluation for High Speed Rail Tunnels Beneath the Angeles National Forest	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Tunnel Feasibility Evaluation for High Speed Rail Tunnels Beneath the Angeles National Forest
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Investigation Plan Recommendations for P2K Proposed Alignment Alternatives Refined SR14, E1 and E2	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Geotechnical Investigation Plan Recommendations for P2K Proposed Alignment Alternatives Refined SR14, E1 and E2
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Geotechnical Investigation Plan Recommendations for P2K Proposed Build Alternatives SR14A, E1A and E2A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Geotechnical Investigation Plan Recommendations for P2K Proposed Build Alternatives SR14A, E1A and E2A

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Preliminary Ground Conditions for Tunnels 1 and 2, North of ANF Alignment Refined SR14	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Preliminary Ground Conditions for Tunnels 1 and 2, North of ANF Alignment Refined SR14
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Preliminary Ground Conditions for Tunnels 1 and 2, North of ANF Alignment SR14A	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Preliminary Ground Conditions for Tunnels 1 and 2, North of ANF Alignment SR14A
		Palmdale to Burbank Project Section PEPD Record Set Rev01 Central Subsection (South of ANF) and Burbank Section Geotechnical Conditions Report	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Central Subsection (South of ANF) and Burbank Subsection Geotechnical Conditions Report
Right-of-Way	Preliminary Right-of-Way Requirements Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 ROW Requirements Report (4 Volumes)	Report	Palmdale to Burbank Project Section PEPD Record Set Rev01 Right of Way Requirements Report (Volume I of IV) Palmdale to Burbank Project Section PEPD Record Set Rev01 Right of Way Requirements Report (Volume II of IV) Palmdale to Burbank Project Section PEPD Record Set Rev01 Right of Way Requirements Report (Volume III of IV) Palmdale to Burbank Project Section PEPD Record Set Rev01 Right of Way Requirements Report (Volume IV of IV)

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
		Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A ROW Requirements Report	Report	Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A ROW Requirements Report
Construction Cost Estimate	<ul style="list-style-type: none"> ▪ PEPD level quantities Cost adjustments to reflect regional conditions 	<p>Palmdale to Burbank Project Section PEPD Record Set Rev01 Basis of Quantities Report</p> <p>Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Basis of Quantities Report</p> <p>Unit Price Elements and back-ups</p> <p>Unit Price Elements and back-ups for A Alternatives</p>	<p>Report</p> <p>Report</p> <p>Spreadsheet</p> <p>Spreadsheet</p>	<p>Palmdale to Burbank Project Section PEPD Record Set Rev01 Basis of Quantities Report</p> <p>Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Basis of Quantities Report</p> <p>PEPD_RECORD_SET_REV01_BOQ_DATA</p> <p>RECORD_SET_PEPD_ADDENDUM_BOQ_AUG_2020</p>
Systems - Traction Power - Utility / Electric Power Connections - Overhead Contact System (OCS)	<ul style="list-style-type: none"> ▪ Traction Power System Computer Model Analysis ▪ Traction Power site locations, alternatives, access and footprint requirements ▪ Possible power supply points ▪ Engineering requirements for Grid connections ▪ Site footprint and easement locations, access and footprint requirements ▪ Conceptual OCS Design 	<p>Palmdale to Burbank Project Section PEPD Record Set Rev02 Railway Systems Plans</p> <p>Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A</p>	<p>Drawings</p> <p>Drawings</p>	<p>Palmdale to Burbank Project Section PEPD Record Set Rev02 Railway Systems Plans</p> <p>Palmdale to Burbank Project Section PEPD Record Set Addendum SR14A/E1A/E2A Railway Systems Plans</p>

Discipline	Engineering Output	Document Title	Document Type	Hyperlink to Location on SharePoint
<ul style="list-style-type: none"> - Communications - Trackside Services / Train Control System 	<ul style="list-style-type: none"> ▪ Electrical Clearance Diagrams for specific location requested by PMT and other locations needed to support design variance requests ▪ Communications site locations, alternatives, access and footprint requirements to support CHSRS communications technology ▪ Footprint for trackside equipment including cabinets, troughs, manholes, duct banks, gantries and other wayside equipment, etc. identified within the corridor ▪ Traction power gantries and radio towers identified on the plans <p>Train control site locations, access and footprint requirements to support CHSRS train control technologies</p>	Railway Systems Plans		
Rolling Stock	N/A			
Operations	N/A			
Maintenance	N/A			

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4 SURVEY AND MAPPING

The base map used for the PEPD from Palmdale to Burbank is basically a set of DTMs generated by the previous Regional Consultant. These DTMs were generated by different LIDAR surveys also performed by the previous Regional Consultant, or from public LIDAR data generated by third parties, like LA County.

During this phase, an effort to homogenize these DTMs and to cover the gaps between them has been made. Figure 4-1 shows the covered areas of the DTMs being used.

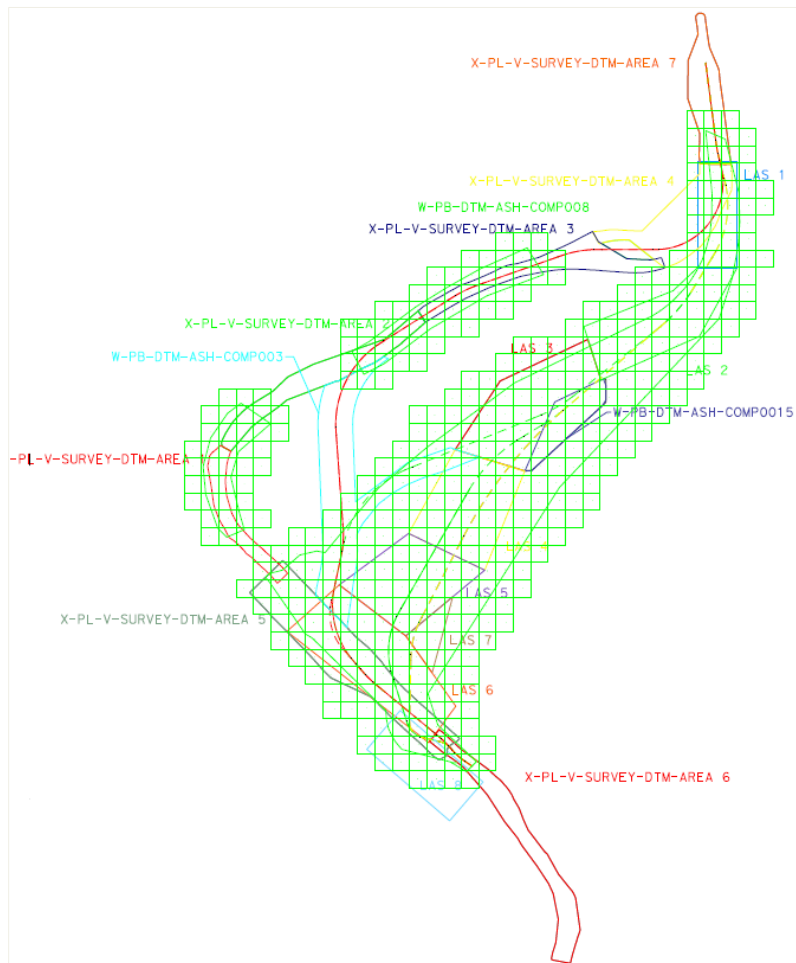


Figure 4-1 Cover Areas of the Several DTMs Used for the Palmdale to Burbank Section

Additional areas that were not converted from LIDAR scan to DTM were processed. Converting the LIDAR scan produced a very dense DEM, approximately 9 points per m², and it was performed without obtaining photography that could be used to confirm the horizontal accuracy of the data. VMR was used to trim out overlapping data that existed between DEM (LIDAR) files and DTM (Conventional Aerial Mapping) files. The trimmed files were used in the design of the project.

Vertical elevations checks were performed to verify the new DTMs generated. In performing these vertical elevation checks of the LIDAR data prior to performing the DEM to DTM transformation, the team used the Project Control Monuments established by the High-speed Rail

Engineering. These monuments are identified as D395P, D397P, D407P, D421P, and D437P. In this verification survey, the team found the DEM data to coincide with our survey information both in horizontal and vertical planes. Based upon this survey, it has been determined that it is probable that the prior Regional Consultant utilized the Project Control Monuments for the LIDAR scan flights, as well as conventional Aerial Mapping Control Surveys.

5 RIGHT-OF-WAY

The Palmdale to Burbank Right of Way Requirements Report Addendum for SR14A has identified:

- A list of properties affected by the proposed alignment including ownership and use
- A description of the property and/or easement rights required from each parcel
- The number of residential and non-residential properties that would be acquired in full, resulting in relocation of the occupants
- An estimate of the acquisition and relocation costs associate with each property

A total of 1,213 residential and non-residential parcels would be affected by the proposed alignment.

5.1 Residential Displacements

Table 5-1 shows the number of residential parcels that would need to be acquired, resulting in the displacement of single and multi-family residential units. The Palmdale to Burbank Project Section Relocation Impact Report (RIR) indicates there may be a lack of suitable replacement units available in Palmdale and the surrounding area to accommodate the multi-family displacements. However, the RIR identifies additional replacement sites within a reasonable distance from the Palmdale area that may be able to absorb some of the displacements. It is also anticipated that some eligible displaced tenants would use their Purchase Price Differential payments to purchase replacement single-family homes, thus reducing the number of rental units required to accommodate displaces. The RIR contains additional discussion regarding relocation challenges and resources available to address them.

Table 5-1 Residential Displacements by Type

Build Alternative	Type of Residential Displacement	# of Acquisitions Resulting in Residential Displacements
SR14A Build Alternative	Single Family Residential Parcels	42
	Multi-Family Residential Parcels	58 ¹

¹Number represents parcels that would be acquired, resulting in at least one displacement. Many parcels contain multiple units. The Right of Way Requirements Report Addendum provides additional detail regarding the number of units displaced.

5.2 Non-residential Displacements

Table 5-2 shows the number of non-residential parcels that would be acquired and result in the displacement of primarily businesses, but also community facilities and non-profit operations. Commonly displaced business types include automotive repair, warehousing, storage, light manufacturing, restaurants and fast food chains.

Table 5-2 Non-Residential Displacements

Build Alternative	# of Non Residential Displacements
SR14A Build Alternative	378

5.3 Right-of-Way Costs

Table 5-3 shows the estimated acquisition, relocation, and total right of way cost by Build Alternative.

Table 5-3 Total Right of Way Costs

Cost	Relocation Cost
SR14A Build Alternative Acquisition Cost	\$1,061,885,422
SR14A Build Alternative Relocation Cost	\$179,169,500
Total SR14A Build Alternative Right of Way Cost	\$1,241,054,922

Most costs associated with proposed acquisitions for the SR14A Build Alternative come from the full acquisition of residential and non-residential (primarily commercial and industrial) parcels resulting in the displacement of existing uses that would need to be relocated by the project.

Many of the displacements resulting from the Build Alternative would occur in the vicinity of the proposed Palmdale Station. Parking areas and reconfigured streets would have a significant effect on the residential neighborhood west of 6th St. between Ave. Q and Palmdale Blvd. Many of the businesses along 6th St. as well as several along Palmdale Blvd. East of Sierra Highway would be displaced.

Additionally, many businesses would be displaced in the San Fernando Valley along San Fernando Road. The RIR provides additional detail regarding the relocation of these businesses as well as anticipated challenges associated with relocation of displaced residences.

6 TRACK ALIGNMENT

The following section describes the track alignment for SR14A Build Alternative as the Preliminary Preferred Alternative in the Palmdale to Burbank Section and the constraints and design rationale that formed the current Build Alternative.

6.1 Overview

Refer to section 2.2.1 for a description of the alignment for the SR14A Build Alternative.

6.2 General Constraints

6.2.1 Track Alignment

Through Palmdale, the track alignment would follow the UPRR and SCRRA where possible. Whereas a perfectly straight, level path is the most desirable alignment for HSR track design.

Track alignment major constraint is the Palmdale Station. In this subsection, HSR main tracks run along the station at a different grade and elevation than platform tracks. These tracks are higher due to the future HDC station tracks, as the elevation of the platforms allows them to cross over the HSR main tracks north of the station.

Track centerline distance varies along the alignment between a minimum 16.5' and approximately 68' to accommodate twin tunnels and the required minimum distance between both tubes. This tunnel configuration drives in turn how nearby viaducts configuration must be, giving as result twin deck viaducts in the vicinity of twin tunnel arrangements.

Both southbound and northbound HSR tracks share the same vertical profile.

The trackbed formation is wider than regular in the area around the crossing with San Andreas Fault to be able to recover the high-speed alignment after a seismic event (track realignment). Something similar happens where tunnels cross other active faults (San Gabriel, Sierra Madre North & South); the need to allow realignments along significant distance after a fault displacement has led to the concept of Enlarged Tunnel Diameter.

In the stretch between Acton and Lang Station, the alignment would traverse a series of short tunnels, viaducts, and at-grade sections as it crosses hilly terrain. These topographic constraints, together with the proximity of the new alignment to the existing SR14 freeway, have also shaped the high-speed rail alternative.

Tunnel alignment underneath the Angeles National Forest has been also a significant constraint. Even being underground, segments length under the US Forest land has been minimized, which was something to be considered in the design of the horizontal alignment.

Avoiding the existing Pacoima Dam has been another constraint taken into account in the alignment design.

The alignment in San Fernando Valley runs east of SCRRA existing track. Some of the most significant constraints in the area are the Vulcan Mine track and unloading facility between Sheldon St and Tuxford St (track and unloading facility must be relocated), and the existing I-5 bridge (the new HSR tracks go through one of the spans underneath the structure, the one currently occupied by San Fernando Blvd).

It is worth mentioning the sharp horizontal curve required to transition from the San Fernando Blvd corridor to the Burbank Airport Station alignment. This curve radius limits the maximum speed of trains north of the proposed new station; also, given the fact of its proximity to the station platforms, it requires crossovers to be further away from the station itself if compared with the compact standard station scheme.

An effort has been made to reduce the tunnel length with high overburden, where high groundwater pressure is expected.

Meeting vertical alignment constraints gave also as a result an unavoidable low point within a tunnel, very close to the portal by Montague St.

Vertical clearances at specific crossing spots with other infrastructures or elements have also determined the vertical profile of the new alignment: crossing under proposed SCRRA and Sierra Highway alignments in Palmdale, structure over existing SCRRA's Antelope Valley Line, Sierra Hwy and the Soledad Siphon, viaduct over Santa Clara River and the existing SCRRA, bridge over Hansen Dam Spillway, crossing under the existing I-5 bridge in Burbank, to name some of the most significant ones.

6.2.2 Separation to Freight Railroads

Where the HSR runs parallel to the UPRR right-of-way, the minimum centerline of HSR track to UPRR right-of-way should be 102 feet minimum. Locations where the centerline of HSR track to UPRR right-of-way is less than 102 feet, an intrusion protection system would be provided.

Where required, conceptual realignments of the SCRRA or UPRR sidings and mainlines are included on the drawings. The design of the realignments would need to be developed with input from SCRRA or UPRR and relevant third parties.

6.2.3 UPRR and SCRRA Realignments

Where SCRRA or UPRR mainlines would be affected, realignments were designed –where feasible- for 79 miles per hour for passenger speeds. Freight speeds shall be 60 miles per hour for SCRRA tracks and 70 miles per hour for UPRR tracks where feasible. Wherever practical, the realignments were designed to be adjacent to HSR corridors to minimize land impacts. When sidings are impacted, they would also be relocated.

The SCRRA mainline would be realigned between approximately Mileposts 66.4 and 67.9, as well as in the vicinity of Sierra Highway and Avenue S in Palmdale. The connection between SCRRA and UPRR at Palmdale Jct. would also be realigned as part of this project.

SCRRA tracks, including an existing track serving a Vulcan mine in San Fernando Valley, would be also realigned between the Spreading Grounds and Clybourn St. The existing Metrolink Sun Valley station would be relocated as well just south of its current position to accommodate the new high-speed rail infrastructure.

6.2.4 Roadway Vertical Clearances

Where the HSR alignment crosses over a roadway, Caltrans Highway Design Manual (HDM) vertical clearance requirements were used. A minimum of 16.5 feet of vertical clearance is provided from of the finished roadway grade to the soffit of HSR structures.

6.3 Alignment Description

6.3.1 HSR Alignment Description

From Ave O heading south in Palmdale, the alignment would be adjacent to and on the west side of the UPRR corridor. The alignment would run parallel to the existing UPRR and SCRRA tracks, along one single tangent, with a total length of 3.75 miles.

Palmdale Transportation Center Station is located within this tangent, and the tracks related to this station, as well as those lead tracks that connects to the Lancaster LMF are part of this subsection.

South of Avenue R the alignment continues west of the existing UPRR and SCRRA tracks. The HSR alignment would cross underneath SCRRA, curving eastward and continuing south approximately 300 feet east of Una Lake. South of Una Lake, the SR14A Build Alternative would curve westward, cross over the Metrolink Antelope Valley Line, Sierra Highway, and the Soledad Siphon with elevated structures, and continue southwest and enter a tunnel portal approximately 0.5 mile northeast of the Sierra Highway/Pearblossom Highway intersection.

The SR14A Build Alternative would then continue westward in an approximately 13-mile-long tunnel before surfacing approximately 0.75 mile east of Agua Dulce Canyon Road. The alignment would transition between at-grade and elevated profiles closely paralleling SR 14 before entering an approximately 1-mile-long tunnel. Upon emerging from the tunnel, the alignment would continue at grade or on viaduct for approximately 1.7 miles, crossing the Santa Clara River, Soledad Canyon Road, and the existing Metrolink rail alignment on viaduct structures. Bents and columns of the viaducts would be placed to avoid/minimize disturbance within ecologically sensitive portions of the river.

Continuing from the Santa Clara River toward Lang Station Road, the alignment would enter approximately 0.5-mile-long, at-grade, covered twin tunnels that would be constructed to the south through the Soledad Canyon Mining Operations (Vulcan Mine), California Mine Identification Number 91-19-0038, which is within the boundaries of the ANF including SGMNM. From this point, the alignment would enter twin-bored tunnels for approximately 13 miles, which would be constructed underneath portions of the ANF including SGMNM, City of Santa Clarita, and Pacoima neighborhood of Los Angeles. These tunnels would have a maximum depth of 2,080 feet. The twin tunnels would pass through the San Gabriel Fault zone and the Sierra Madre Fault zone. Upon completion of the tunnels, the Vulcan Mine site would be regraded and restored to a condition better reflecting the surrounding topography.

The alignment would emerge east of the existing Antelope Valley Metrolink Corridor near Montague Street in the Pacoima neighborhood of Los Angeles. From Montague Street, SR14A would continue south for approximately 0.4 mile in a retained cut/trench, transitioning up to ground level, and passing over the existing Hansen Spreading Grounds on embankment before crossing over the Los Angeles County Flood Control Channel on a bridge and entering the existing Metrolink corridor near Sheldon Street. Continuing along the east side of the Metrolink Corridor, the alignment would continue southerly at grade for approximately 1.0 mile where it would cross over Tuxford Street and under the I-5 freeway. Continuing southeast from the I-5 undercrossing, the alignment would transition below-grade in an open trench to just north of Olinda Street. From just north of Olinda Street to just north of Sunland Boulevard, the alignment would be below-ground in a cut- and-cover box structure. Metrolink would remain on the surface, and the Sun Valley Metrolink Station would be reconstructed south of Olinda Street on the surface. South of Sunland Boulevard the alignment would continue in a mined or bored tunnel until reaching Lockheed Drive, the southern limit of this subsection. The SR14A Central Subsection would continue in the cut-and-cover tunnel adjacent to and underneath the realigned Metrolink rail alignment from Olinda Street until reaching the southern limit of this subsection, Lockheed Drive.

Lockheed Drive represents the northern limit of the Burbank Subsection. From Lockheed Drive, the alignment would continue in a cut-and-cover box until entering the Burbank Airport Station. The Burbank Airport Station would be an underground station, beginning near Kenwood Street and extending to just north of Winona Drive and the Burbank Airport east/west runway. South of the Burbank Airport Station, the Build Alternatives would join with the bored tunnel alignment proposed within the Burbank to Los Angeles Project Section.

6.3.2 SCRRRA Realignment

From the CHSR Palmdale Station platform heading south, the SCRRRA alignment would be adjacent to and on the east side of the HSR tracks and west of the UPRR corridor. The alignment would remain adjacent to the HSR and UPRR corridor, Sierra Highway, and continue south past Palmdale Blvd and E Avenue R.

The SCRRRA mainline would be realigned between approximately Mileposts 66.4 and 67.9 in Palmdale. This realignment is mainly on the vertical profile, maintaining the horizontal alignment of the existing SCRRRA track except for the initial part, between mileposts 67.5 and 67.9, where it has been moved to the west. The connection between SCRRRA and UPRR at milepost 67.6 would be relocated to the north of the intersection with Avenue R in Palmdale, so that the current UPRR mainline would not be affected by the realignment of SCRRRA.

South of Avenue R, the SCRRA mainline has been realigned –both horizontally and vertically- within the current SCRRA Right of Way to allow SR14A Build Alternative crossing under the SCRRA track with the required vertical clearance. This realignment extends between Avenue R and the vicinity of Una Lake. The connection from the SCRRA and UPRR at Palmdale Jct. would also be realigned as part of this change.

In the San Fernando Valley, SCRRA tracks, including an existing track serving a Vulcan mine in San Fernando Valley, would be also realigned between the Spreading Grounds and Clybourn St. The existing Metrolink Sun Valley Station would be relocated as well to accommodate the new high-speed rail infrastructure. SCRRA tracks would remain within the current Metrolink ROW.

6.4 Design Requirements

6.4.1 Standards

Design for the high-speed rail alignment is based on the Technical Memoranda (TM) included below, as issued by the California High-Speed Rail Authority:

TM 2.1.2 – Alignment Design Standards for High-Speed Train Operation, Rev 0, 26 Mar 09

TM 2.1.3 – Turnouts and Station Tracks, Rev 0, 29 June 09

TM 2.1.7 – Rolling Stock and Vehicle Intrusion Protection for HSR and adjacent transportation systems, 10 June 13

TM 2.1.8 – Turnouts and Yard Tracks, 17 July 09

TM 2.2.4 – High-Speed Train Station Platform Geometric Design, Rev 1, 30 Jun 10

Notice to Designers No. 10R1 – Special Track Work: Crossover and Turnouts

6.4.2 Design Speed

A design speed of 220 mph was considered along the Palmdale to Burbank Section except in the segment between Una Lake and Acton, where a design speed of 180 mph has been adopted due to alignment constraints, and in the San Fernando Valley, where 150 mph was directed by HSR.

6.4.3 Trackbed

Both ballasted and non-ballasted trackbed configurations can be accommodated by proposed geometric designs.

A ballastless track design might initially be considered for tunnels and elevated structures laid between close tunnel portals. However, the need to cross areas with risk of displacement in case of an earthquake event, like the San Andreas and San Gabriel fault areas, suggests that a rigid track system would be unadvisable in these segments because the reconstruction time could be affected significantly if a rigid ballastless track system is in place when a lateral displacement occurs during an earthquake. On the contrary, the rest of the alignment length where tunnels and/or elevated structures are in place, the recommendation would be to consider ballastless track to minimize LCC costs. This would include the tunnels outside the region of influence of the San Andreas and San Gabriel Faults, and the tunnels that connect with the Burbank Airport Station in the San Fernando Valley.

Taking into account the aforementioned, and trying to minimize the number of transitions between ballasted and non-ballasted track, the following segmentation is proposed in Figure 6-1 (Legend: [ballasted track](#) / [ballastless track](#)):

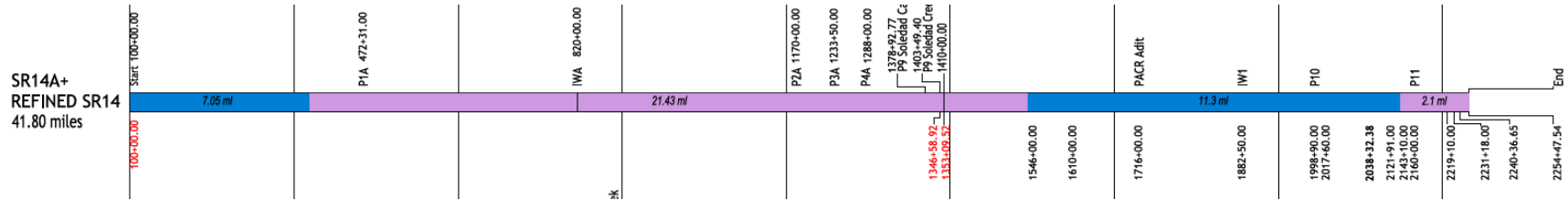


Figure 6-1 Ballasted and Non-Ballasted Track

6.5 Unique Design and Construction Considerations

Unique Design and Construction Considerations are addressed in section 9 Temporary Construction Facilities.

6.6 Alignment Construction Type

Table 6-1 and Table 6-2 represents the geophysical limits and stationing of the alignment's for HSR and SCRAA.

Table 6-1 HSR - Geophysical Limits and Stationing of Alignment Types

Alignment Type	Alignment	Geophysical Limits		Stationing		Miles
		Start	End	Start	End	
At-Grade	SB Platform Track	300' South of existing Rancho Vista Boulevard	500' North of existing E Avenue P-8	3000+00	3018+68	0.35
Retained Fill	SB Platform Track	500' North of existing E Avenue P-8	900' North of existing East Palmdale Boulevard (SR 138)	3018+68	3070+00	0.97
At-Grade	SB Platform Track	900' North of existing East Palmdale Boulevard (SR 138)	250' Northeast of existing East Avenue Q-12	3070+00	3092+83	0.43
TOTAL	SB Platform Track	-	-	-	-	1.76
At-Grade	NB Platform Track	300' South of existing Rancho Vista Boulevard	500' North of existing E Avenue P-8	4000+00	4018+68	0.35
Retained Fill	NB Platform Track	500' North of existing E Avenue P-8	900' North of existing East Palmdale Boulevard (SR 138)	4018+68	4070+00	0.97
At-Grade	NB Platform Track	900' North of existing East Palmdale Boulevard (SR 138)	250' Northeast of existing East Avenue Q-12	4070+00	4092+83	0.43
TOTAL	NB Platform Track	-	-	-	-	1.76
At-Grade	SB Refuge Track	650' South of existing East Palmdale Boulevard (SR 138)	580' North of existing East Avenue Q-12	5000+00	5004+23	0.08
Retained Cut	SB Refuge Track	580' North of existing East Avenue Q-12	Middle of existing Avenue R	5004+23	5019+00	0.28
TOTAL	SB Refuge Track	-	-	-	-	0.36
At-Grade	NB Refuge Track	1000' North of existing East Avenue P-8	860' South of existing Rancho Vista Boulevard	6000+00	6008+22	0.16

Alignment Type	Alignment	Geophysical Limits		Stationing		Miles
		Start	End	Start	End	
Retained Fill	NB Refuge Track	860' South of existing Rancho Vista Boulevard	100' North of existing Rancho Vista Boulevard	6008+22	6017+70	0.18
TOTAL	NB Refuge Track	-	-	-	-	0.34
Cut	SB LMF Track	1200' South of existing Rancho Vista Boulevard	Just South of existing East Avenue O	7000+00	7068+36	1.29
TOTAL	SB LMF Track	-	-	-	-	1.29
At-Grade	NB LMF Track	1200' South of existing Rancho Vista Boulevard	Middle of existing Rancho Vista Boulevard	8000+00	8011+75	0.22
Trench	NB LMF Track	Middle of existing Rancho Vista Boulevard	675' South of existing East Avenue O	8011+75	8062+16	0.95
Cut	NB LMF Track	675' South of existing East Avenue O	Just South of East Avenue O	8062+16	8068+48	0.12
TOTAL	NB LMF Track	-	-	-	-	1.3
Cut	Refined SR14/ Palmdale	Just South of existing East Avenue O	1050' South of existing Rancho Vista Boulevard	100+00	161+00	1.16
Embankment	Refined SR14/ Palmdale	1050' South of existing Rancho Vista Boulevard	500' South of existing Avenue R	161+00	265+00	1.97
TOTAL	SR14A/ Palmdale	-	-	-	-	3.13
Embankment	SR14A	500' South of existing Avenue R	1200' South of existing Avenue R	265+00	277+00	0.23
Cut	SR14A	1200' South of existing Avenue R	East of Una Lake	277+00	352+00	1.42
Embankment	SR14A	East of Una Lake	300' South of Soledad Siphon	352+00	401+00	0.93
Viaduct	SR14A	300' South of Soledad Siphon	800' South of Soledad Siphon	401+00	412+00	0.21

Alignment Type	Alignment	Geophysical Limits		Stationing		Miles
		Start	End	Start	End	
Cut	SR14A	800' South of Soledad Siphon	300' South of Antelope Fwy. and Sierra Hwy junction.	412+00	472+31	1.14
Tunnel	SR14A	300' South of Antelope Fwy. and Sierra Hwy junction	3850' NE of Agua Dulce Canyon Rd.	472+31	1170+00	13.21
Cut	SR14A	3850' NE of Agua Dulce Canyon Rd.	1450' NE of Agua Dulce Canyon Rd.	1170+00	1186+00	0.30
Viaduct	SR14A	1450' NE of Agua Dulce Canyon Rd.	2250' NE of Agua Dulce Canyon Rd.	1186+00	1194+00	0.15
Cut	SR14A	2250' NE of Agua Dulce Canyon Rd.	2100' NE of Escondido Canyon Rd.	1194+00	1204+50	0.20
Viaduct	SR14A	2100' NE of Escondido Canyon Rd.	250' NE of Escondido Canyon Rd.	1204+50	1223+00	0.35
Cut	SR14A	250' NE of Escondido Canyon Rd.	2384' SW of Escondido Canyon Rd.	1223+00	1233+50	0.20
Tunnel	SR14A	2384' SW of Escondido Canyon Rd.	Close to Soledad Canyon Rd.	1233+50	1288+00	1.03
Cut	SR14A	Close to Soledad Canyon Rd.	Close to Soledad Canyon Rd.	1288+00	1346+80	1.11
Viaduct	SR14A	Soledad Canyon Rd., Santa Clara River and SCRRA Antelope Valley Line	Soledad Canyon Rd., Santa Clara River and SCRRA Antelope Valley Line	1346+80	1373+52	0.51
Cut	SR14A	Soledad Canyon Rd., Santa Clara River and SCRRA Antelope Valley Line	Soledad Creek, Vulcan Mine	1373+52	1378+84	0.10
Cut and Cover	SR14A	Soledad Creek, Vulcan Mine	Soledad Creek, Vulcan Mine	1378+84	1403+49	0.47

Alignment Type	Alignment	Geophysical Limits		Stationing		Miles
		Start	End	Start	End	
Bored tunnel	SR14A ¹	Soledad Creek, Vulcan Mine	Montague St, Pacoima	1403+49	1410+00	12.35
	Refined SR14 ²			1353+10	1998+90	
Open Trench	Refined SR14	Montague St, Pacoima	500' South of Branford St., Pacoima	1998+90	2017+60	0.35
Embankment	Refined SR14	500' South of Branford St., Pacoima	Golden State Freeway (I-5)	2017+60	2121+91	1.98
Open Trench	Refined SR14	Golden State Freeway (I-5)	Olinda Street, Sun Valley	2121+91	2143+10	0.40
Cut and Cover	Refined SR14	Olinda Street, Sun Valley	Sunland Blvd, Sun Valley	2143+10	2160+00	0.32
Covered Tunnel	Refined SR14	Sunland Blvd, Sun Valley	Sancola Ave, Sun valley	2160+00	2219+10	1.12
Cut and Cover	Refined SR14/ Burbank	Sancola Ave, Sun valley	Burbank Airport	2219+10	2254+48	0.67

¹ Stationing referenced to SR14A alignment (SB track centerline)

² Stationing referenced to Refined SR14 alignment (SB track centerline)

Table 6-2 SCRRA - Geophysical Limits and Stationing of Alignment Types

Alignment Type	Alignment	Geophysical Limits		Stationing		Miles
		Start	End	Start	End	
New Track At-Grade	SCRRA	SCRRA Valley Sub MP 67.9 / South of Avenue R	900' South Of proposed Palmdale Blvd.	3583+05.12	3603+00.00	0.38
New Track At-Grade	SCRRA	Palmdale Jct.	SCRRA Valley Sub MP 67.9 / South of Avenue R	21+51.26	0+00.00	0.41
Track Shift	SCRRA	900' South Of proposed Palmdale Blvd.	0.33 Miles North of Proposed Palmdale Station	3603+00.00	3651+40.67	0.92
Shoofly	SCRRA	SCRRA Valley Sub MP 66.6	SCRRA Valley Sub MP 67.7	0+00.00	57+85.68	1.10
New Track At-Grade	SCRRA	SCRRA Valley Sub MP 67.9 / South of Avenue R	0.33 Miles North of Proposed Palmdale Station	3583+06.18	3648+51.21	1.24
New Track At-Grade	SCRRA	Palmdale Jct.	SCRRA Valley Sub MP 67.9 / South of Avenue R	9+00.91	0+00.00	0.17
New Track At-Grade	SCRRA	SCRRA Valley Sub MP 66.6	SCRRA Valley Sub MP 67.9	0+00.00	69+90.79	1.32
Track Shift	SCRRA	Existing Sierra Hwy. Crossing	SCRRA Valley Sub MP 69.75	3659+80.59	3680+79.11	0.40
Shoofly (2-Tracks)	SCRRA	Existing Sierra Hwy. Crossing	SCRRA Valley Sub MP 69.81	3653+24.65	3684+13.73	0.59
Renovation	SCRRA	Hansen Dam Spillway	Clybourn Ave	168+40.51	23+90.32	2.74
New Track At-Grade	SCRRA	Hansen Dam Spillway	Clybourn Ave	23+90.32	166+19.15	2.69
Diversion	Vulcan Mine	Sheldon St	420' East of Tuxford St	93+84.85	144+12.92	0.95

6.7 Special Trackwork

Table 6-3 depicts the special HSR trackwork and Table 6-4 presents the special SCRAA trackwork.

Table 6-3 Special HSR Trackwork

Trackwork Type	Purpose	Alignment	Location (STA)	Length (ft)	Direction	Design Speed
Crossover	Station/Universal	Refined SR14/ Palmdale	132+52.90	829.97	NB and SB	80
Crossover	Station/Universal	Refined SR14/ Palmdale	143+30.78	829.97	NB and SB	80

Trackwork Type	Purpose	Alignment	Location (STA)	Length (ft)	Direction	Design Speed
Turnout	Serves Station	Refined SR14/ Palmdale	159+32.92	407.49	NB and SB	60
Turnout	Serves Station	Refined SR14/ Palmdale	252+14.25	407.49	NB and SB	60
Crossover	Station/Universal	Refined SR14/ Palmdale	132+52.90	829.97	NB and SB	80
Crossover	Station/Universal	Refined SR14/ Palmdale	143+30.78	829.97	NB and SB	80
Turnout	Serves SB Platform Track	Palmdale SB Platform Track	3000+00.00	303.85	SB	60
Turnout	Serves NB Platform Track	Palmdale NB Platform Track	4000+00.00	303.85	NB	60
Turnout	Serves SB LMF	Palmdale LMF SB	7000+00.00	303.85	SB	60
Turnout	Serves NB LMF	Palmdale LMF NB	8000+00.00	303.85	NB	60
Turnout	Serves NB Refuge Track	Palmdale NB Platform Track	6000+00.00	124.58	NB	25
Turnout	Serves SB Refuge Track	Palmdale SB Platform Track	5000+00.00	124.58	NB	25
Turnout	Serves SB Platform Track	Palmdale SB Platform Track	3091+92.92	303.85	SB	60
Turnout	Serves NB Platform Track	Palmdale NB Platform Track	4091+92.92	303.85	NB	60
Crossover	Station/Universal	Refined SR14/ Burbank	2201+35.48	829.97	NB and SB	80
Crossover	Station/Universal	Refined SR14/ Burbank	2224+40.48	829.97	NB and SB	80
Turnout	Serves SB Platform Track	SB Burbank Airport Station Track	2287+78.55	303.85	SB	60
Turnout	Serves NB Platform Track	NB Burbank Airport Station Track	2287+78.55	303.85	NB	60
Turnout	Serves Refuge Track	Burbank NB Platform Track	5239+77.52	124.58	NB	25

Table 6-4 Special SCRRA Trackwork

Trackwork Type	Purpose	Alignment	Location (STA)	Length (ft)	Direction	Design Speed
Turnout	Connect to SCRRA MT/Palmdale	SCRRA	3607+90.62	No.24	SB	48
Turnout	Shift to new position Palmdale	SCRRA	UPRR Connection	No.20	SB/NB	40
Turnout	Station Track/Palmdale	SCRRA	9+00.91	No.20	NB	40
Turnout	Connect to SCRRA MT/Palmdale	SCRRA	21+51.26	No.20	NB	40
Turnout	Station Track/Palmdale	SCRRA	3649+10.37	No.24	SB	48
Turnout	UPRR Connection. San Fernando Valley	SCRRA	168+40.56	No.14	NB/SB	28
Turnout	Vulcan Mine Connection. San Fernando Valley	SCRRA	146+21.26	No.14	NB	28
Turnout	Vulcan Mine Connection. San Fernando Valley	SCRRA	93+49.47	No.10	NB	20

7 ROADWAY WORK (GRADE SEPARATIONS) AND OTHER THIRD-PARTY IMPROVEMENTS

7.1 Roadway Design Guidelines

The proposed High-Speed Rail alignment would require improvements for segments of local streets and highways. The guidelines followed for the preliminary design of these roadway improvements is summarized in Table 7-1.

Table 7-1 Roadway Design Guidelines

Design Feature	Design Guideline
Street classifications and standard street dimensions	<ul style="list-style-type: none"> ▪ City of Palmdale General Plan ▪ Los Angeles Citywide General Plan, Mobility Plan 2035
Horizontal alignments	<ul style="list-style-type: none"> ▪ Chapter 21, Part 2 of the County of Los Angeles Municipal Code ▪ AASHTO Greenbook ▪ HDM
Vertical alignments (profiles)	<ul style="list-style-type: none"> ▪ AASHTO Greenbook ▪ HDM
Super elevation rates & transitions (where applicable)	<ul style="list-style-type: none"> ▪ AASHTO Greenbook ▪ HDM
Tapers	<ul style="list-style-type: none"> ▪ MUTCD ▪ HDM
Horizontal clearances	<ul style="list-style-type: none"> ▪ HDM ▪ AASHTO Roadside Design Guide
Vertical clearances	<ul style="list-style-type: none"> ▪ AASHTO Greenbook ▪ HDM ▪ AREMA (Min clearance over RR tracks)
Side Slopes	<ul style="list-style-type: none"> ▪ AASHTO Greenbook ▪ HDM

7.2 Roadway Modifications

Table 7-2 provides a summary of the streets and highways to be modified and some of the design criteria and proposed design parameters.

Table 7-2 Roadway Modifications

No.	Type	Location	Third Party	Design Speed	% Grade	Clearance to HSR (vertical)	Length
1	Modification	East Avenue O	City of Palmdale	45 MPH	0.50%	N/A	700'
2	Modification/Underpass	Sierra Highway	City of Palmdale	60 MPH	3.80% Max	16'-6" Min	12,600'

No.	Type	Location	Third Party	Design Speed	% Grade	Clearance to HSR (vertical)	Length
3	Overpass (by others)	Rancho Vista Blvd	City of Palmdale	Work by others	Work by others	27'-0" Min	Work by others
4	Modification	Fifth Street East	City of Palmdale	50 MPH	4.03% Max	N/A	10,196'
5	Modification/Underpass	East Palmdale Boulevard (SR 138)	Caltrans / City of Palmdale	60 MPH	4.51% Max	27'-0" Min	3,000'
6	Modification	Fifth Place East	City of Palmdale	35 MPH	2.25% Max	N/A	652'
7	Modification	Avenue Q-9	City of Palmdale	35 MPH	2.59% Max	N/A	332'
8	Modification	Avenue Q-12	City of Palmdale	35 MPH	2.00% Max	N/A	317'
9	Modification	Sixth Street East	City of Palmdale	50 MPH	1.55% Max	N/A	4,015'
10	Overpass	East Avenue R	City of Palmdale	60 MPH	5.93% Max	27'-0" Min	3,000'
11	Modification/Underpass	East Avenue Q	City of Palmdale	40 MPH	6.00% Max	16'-6" Min	1,567'
12	Modification	East Avenue Q 7	City of Palmdale	-	4.49% Max	N/A	210'
13	Modification	8 th St E	City of Palmdale	-	-	N/A	1,800'
14	Modification	3 rd St E	City of Palmdale	-	-	N/A	800'
15	Modification	10 th St E	City of Palmdale	-	-	N/A	2,200'
16	Modification/Overpass	E Ave S	City of Palmdale	-	5.00% Max	27'-0" Min	3,500'
17	Modification/Overpass	Sierra Highway	City of Palmdale	60 MPH	5.60% Max	27'-0" Min	3,700'
18	Modification	Valley Forge Rd	Private	-	-	N/A	1,400'
19	Modification/Overpass	Branford St	Pacoima / Sun Valley	45 MPH	5.00% Max	27'-0" Min	1,824'

No.	Type	Location	Third Party	Design Speed	% Grade	Clearance to HSR (vertical)	Length
20	Modification	San Fernando Rd (Small)	Pacoima / Sun Valley	25 MPH	2.00% Max	N/A	800'
21	Modification	San Fernando Rd	Pacoima / Sun Valley	55 MPH	4.01% Max	N/A	2,160'
22	Modification/Underpass	Sheldon St	Pacoima / Sun Valley	45 MPH	5.43% Max	16'-6" Min	1,600'
23	Modification/Overpass	Tuxford St	Sun Valley	35 MPH	3.92% Max	16'-6" Min	865'
24	Modification	San Fernando Rd (Small) @ Olinda	Sun Valley	25 MPH	2.83% Max	N/A	1,600'
25	Modification	Olinda St	Sun Valley	25 MPH	4.22% Max	N/A	600'
26	Modification	San Fernando Rd @ Tuxford St	Sun Valley	55 MPH	N/A	N/A	400'
27	Modification	Transportation Center Drive	City of Palmdale	N/A	N/A	N/A	N/A
28	Modification	Clock Tower Plaza Drive East	City of Palmdale	N/A	N/A	N/A	N/A
29	Modification	Sierra Highway n/o Barrel Springs Rd	City of Palmdale	60 MPH	2.93% Max	N/A	7,500'
30	New Road	E Ave R-11	City of Palmdale	-	2.47% Max	N/A	850'
31	Modification	Harrold 3rd Street, Harrold 5th Street, Rozalee Drive	Unincorporated Los Angeles County	N/A	N/A	N/A	N/A
32	Modification	Burnwell Court Rd	Unincorporated Los Angeles County	N/A	N/A	N/A	N/A

No.	Type	Location	Third Party	Design Speed	% Grade	Clearance to HSR (vertical)	Length
33	New Road	Ralston Ave	Pacoima / Sun Valley	25 MPH	2.00% Max	N/A	1,450'
34	New Road	LADWP Road	Pacoima / Sun Valley	25 MPH	5.00% Max	N/A	700'

The following list includes a more descriptive narrative of the work required for the modifications at each street or highway listed in Table 7-2 above.

1. East Avenue O:
 - Realignment from Maravilla Drive to the east (700'), intersecting the realigned Sierra Highway.
2. Sierra Highway:
 - Widening and realignment between East Avenue O and E Palmdale Boulevard.
 - Grade adjustment at the intersection with Rancho Vista Boulevard.
 - Grade adjustment at the intersection with proposed Avenue Q.
 - Grade separation (underpass) at proposed High-Speed Rail, UPRR and Metrolink Tracks.
 - Minimum 16.5' vertical clearance. The Extra Legal Load Network (ELLN) with minimum clearance of 20' would need to be re-routed along other road.
3. Rancho Vista Boulevard: Not part of this project, the improvements for this street would be built as a separate project prior to the High-Speed Rail project.
 - Realignment between Fairway Drive and Tenth Street East.
 - Grade separation (overpass) at proposed High-Speed Rail, UPRR and Metrolink Tracks.
4. Fifth Street East:
 - Extension north of East Avenue Q to connect to the realigned Sierra Highway, approximately 1000' north of East Avenue P-8.
 - A new intersection would be developed at the realigned Sierra Highway.
 - Widening between the realigned Sierra Highway and 730' south of Avenue R.
 - Grade adjustment at the intersections with Sierra Highway, Palmdale Boulevard, and East Avenue R.
5. East Palmdale Boulevard (State Route 138):
 - Realignment between Third Street East and Tenth Street East.
 - Widening between Sixth Street East and Tenth Street East.
 - Grade separation (underpass) at proposed High-Speed Rail, UPRR, and SCRRA Tracks.
6. Fifth Place East:
 - Extension and realignment between Avenue Q-9 and the realigned Sixth Street East.
7. Avenue Q-9:
 - Extension between Fifth Place East and Fifth Street East.
 - Grade adjustment at the intersections with Fifth Street East and realigned Sixth Street East.
8. Avenue Q-12:
 - Grade adjustment at the intersections with Fifth Street East and realigned Sixth Street East.

9. Sixth Street East:
 - Removal between East Avenue Q and Palmdale Boulevard.
 - Realignment between Palmdale Boulevard and 1,170' south of Avenue R.
10. East Avenue R:
 - Realignment between Fifth Street East and Tenth Street East.
 - Widening between 830' west of Fifth Street East and Sixth Street East.
 - Widening between Ninth Street East and Tenth Street East.
 - Grade separation (overpass) at proposed High-Speed Rail, UPRR, Metrolink Tracks, and existing Sierra Highway.
11. East Avenue Q:
 - Realignment between Larkin Ave and Tenth Street East.
 - Widening between 5th Street East and Tenth Street East.
 - Grade separation (underpass) at proposed High-Speed Rail, UPRR, Metrolink Tracks.
12. East Avenue Q 7:
 - Vertical realignment east of Sierra Highway.
13. 8th St East:
 - Realignment between ¼ mi north of Rancho Vista Blvd and ¼ mi south of Rancho Vista Blvd.
 - Widening between ¼ mi north of Rancho Vista Blvd and ¼ mi south of Rancho Vista Blvd.
14. 3rd St East:
 - Realignment between Rancho Vista Blvd and East Ave P2.
 - Widening between Rancho Vista Blvd and East Ave P2.
15. 10th St East:
 - Realignment between E Ave S and ½ mile north of E Ave S.
 - Widening between E Ave S and ½ mile north of E Ave S.
16. East Ave S:
 - Realignment between 5th St E and Windy Creek St.
 - Grade separation (overpass) at Sierra Highway and proposed High-Speed Rail, Metrolink Tracks.
17. Sierra Highway:
 - Vertical realignment between 800' north of proposed Ave R11 and 1,000' south of East Ave S.
 - Grade separation (overpass) at proposed High-Speed Rail Tracks.
18. Valley Forge Rd:
 - Realignment between 200' north of Patrick Henry Pl and Jefferson Ave.
19. Branford St:
 - Widening between San Fernando Rd and 1,600' s/o Glenoaks Blvd.
 - Grade separation (overpass) at proposed High-Speed Rail Tracks.
20. San Fernando Rd (Small):
 - Grade adjustment at the intersection with Branford St.
21. San Fernando Blvd:
 - Widening between Truesdale St and Allegheny St.
 - Grade adjustment at the intersection with Sheldon St.

22. Sheldon St:
 - Realignment between El Dorado Ave and 1100' north of San Fernando Rd.
 - Widening between El Dorado Ave and 1100' north of San Fernando Rd.
 - Grade separation (underpass) at proposed High-Speed Rail, Metrolink Tracks.
23. Tuxford St:
 - Grade separation (Overpass) at proposed High-Speed Rail, Metrolink Tracks.
 - Grade adjustment at the intersection with San Fernando Rd.
24. San Fernando Rd (Small):
 - Grade adjustment at the intersection with Olinda St.
 - Realignment between Penrose St and Olinda St.
25. Olinda St:
 - Grade adjustment at the intersection with San Fernando Rd (Small).
 - Grade adjustment at the intersection with San Fernando Rd (Big).
26. San Fernando Rd:
 - Grade adjustment at the intersection with Tuxford St (North half of roadbed only).
27. Transportation Center Dr:
 - To be repurposed within new alignment of 5th St East between E Ave P-8 and E Ave P-14.
28. Clock Tower Plaza Dr E:
 - To be repurposed within new alignment of 5th St East between E Ave P-12 and E Ave Q.
29. Sierra Highway:
 - Realignment between proposed E Avenue R-11 and E Barrel Springs Rd.
30. E Ave R-11:
 - New Road between Sierra Hwy and 10th St E.
31. Harold 3rd St & Harold 5th St & Rozalee Dr:
 - Cul-de-sacs to be added as termini to these neighborhood streets; streets would no longer connect directly to E Barrel Springs Road.
32. Burnwell Ct Rd:
 - Cul-de-sac to be eliminated to make way for access road that connects existing neighborhood to E Barrel Springs Rd.
33. Ralston Ave:
 - New road to connect Sheldon St to Wicks St; replaces small San Fernando Rd.
34. LADWP Rd:
 - New road to connect Sheldon St to existing LADWP facility; secondary access.

Other minor improvements such as new curb returns, traffic control, signing & striping, cul-de-sacs, etc., would be required for local streets that intersect the roadways listed above.

8 EARTHWORK

The earthwork activity involves the movement of soil from one location to another and the process of forming the soil (or earth) into a desired shape. The earthwork component of the high-speed rail system would be extensive and involve the use of large construction machinery such as the following:

- Dozers
- Motor graders
- Scrapers
- Excavators
- Loaders used to load trucks from transfer stockpiles
- Off-road earth haul units (trucks)
- On-road earth haul units (trucks)
- Water trucks
- Earth compaction equipment

Within the job site, earthmoving would be done using conventional methods. For very short distances (less than 300 feet), dozers would be used to shift earth. For distances from 300 feet up to 2,500 feet, scrapers would be more efficient. For distances greater than 2,500 feet (e.g., when moving earth for underpasses and overpasses), the use of trucks is recommended. See Figure 8-1 below for the expected haul distances for various types of equipment as outlined in the Caterpillar Performance Handbook, Edition 44.

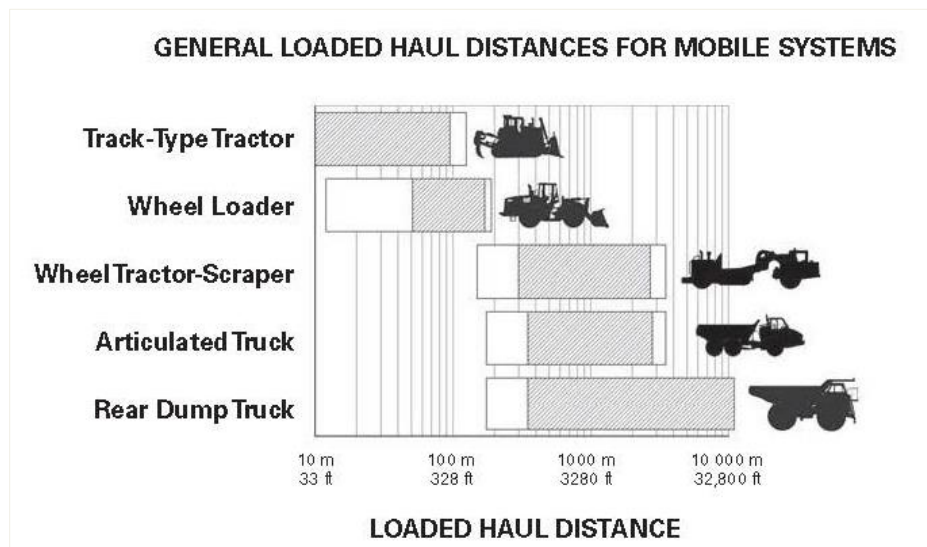


Figure 8-1 HSR General Haul Distances

8.1 Earthworks Quantities

Earthwork quantities are based on the best available survey data and topographical information.

Staging of civil works aims to balance the cut and fill as much as feasible. As much as possible, usable excavated materials would be reused on site to balance the overall earthworks movement.

8.1.1 HSR Alignment

Table 8-1 below presents the cut and fill volumes, not including tunnel or cut-and-cover volumes, for the SR14A Build Alternative in the Palmdale to Burbank Project Section.

Table 8-1 HSR Earthworks Summary Table for SR14A

SR14A - Earthworks Summary Table233					
Roadway / Location	Cumulative Fill Volume (yd ³)	Cumulative Cut Volume (yd ³)	Net Volume (yd ³)	Bank-to-Bulk Factor	Adjusted Volume (yd ³)
SR14A	2,815,655	12,682,690	9,867,035	Bank-to-Bulking factor 1.6 rock /1.25 soil	15,800,172

8.1.2 Roadways

Table 8-2 below presents below the overall earthworks' quantities for the roadways in the SR14A Build Alternative in the Palmdale to Burbank Project Section, including grade separations, other realigned roadways and access roads.

Table 8-2 Roadways Earthworks Summary Table for SR14A

Roadways - Earthwork Summary Table			
Subsection ⁽¹⁾	Cumulative Fill Volume (yd ³)	Cumulative Cut Volume (yd ³)	Net Volume (yd ³)
PALMDALE	828,004	1,243,870	415,866
CENTRAL	1,489,451	1,491,571	2,120
		TOTAL	417,986

8.1.3 SCRRA

Table 8-3 below presents below the overall earthworks' quantities for the SCRRA proposed and realigned tracks in the SR14A Build Alternative in the Palmdale to Burbank Project Section.

Table 8-3 SCRRA Earthworks Summary Table for SR14A

SCRRA Earthworks Summary Table			
Alternative	Cumulative Fill Volume (yd ³)	Cumulative Cut Volume (yd ³)	Net Volume (yd ³)
SCRRA (SPRUCE)	39,028	22,953	(16,075)
SCRRA (SIERRA)	88,460	7,400	(81,060)

8.1.4 Basins

Table 8-4 below presents below the overall earthworks quantities for the proposed basins located near Avenue O and Avenue R respectively (City of Palmdale), per the City of Palmdale Master Drainage Plan and as a result of HSR severing existing Basin at Avenue O.

Table 8-4 Basins Earthworks Summary Table for SR14A

Basin Earthworks Summary Table			
Location	Cumulative Fill Volume (yd ³)	Cumulative Cut Volume (yd ³)	Net Volume (yd ³)
Avenue O Basin	8,612	52,504	43,892
Avenue R Basins	50,186	1,932,148	1,881,962

8.2 Earthworks Balance

Large volumes of spoil would be generated. As the in-situ soil is excavated, the material would expand. A bulking factor must be applied to the bank volume to estimate the volume of loose spoil for transportation. Bank-to-bulking factors are generally 1.2 to 1.3 for soil excavation, and 1.6 for rock.

Spoil resulting from the excavations, provided is not classified as hazardous, can either be re-used on the project, disposed of on-site, or permanently disposed of at a designated site as appropriate. Guidance for on-site re-use of spoil for earthworks is provided in Clause 6.3.1 of TM 2.6.7, Earthwork and Track Bed Design Guidelines (PB, 2009c). As for re-use of excavated material for concrete and shotcrete production, no equivalent Technical Memorandum exists yet.

Staging of civil works aims to balance the cut and fill as much as feasible. As much as possible, usable excavated materials would be reused on site to balance the overall earthworks movement.

Table 8-5 below indicates the overall earthworks volume for the SR14A Build Alternative in the Palmdale to Burbank Project Section. For more detailed information on the construction sequencing, please refer to the Construction Assessment Memorandum.

Table 8-5 SR14A Earthwork Spoils Summary Table

SR14A Subsection Earthwork Summary Table			
Roadway/Location	Cumulative Fill Volume (yd ³)	Cumulative Cut Volume (yd ³)	Net Volume (yd ³)
SR14A	2,815,655	12,682,690	9,867,035
SCRRRA (SPRUCE)	39,028	22,953	(16,075)
SCRRRA (SIERRA)	88 460	7,400	(81,060)
Roadways	2,317,455	2,735,441	417,986
Avenue O Basin	8,612	52,504	43,892
Avenue R Basins	50,186	1,932,148	1,881,962
TOTAL	5,319,396	17,433,136	12,113,740

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9 TEMPORARY CONSTRUCTION FACILITIES

For the Palmdale to Burbank Project Section of the California HSR System, specific construction elements would include surface, underground, and elevated track; track work; grade separated roadway crossings; and installation of a Positive Train Control system.

Surface track sections would be built using conventional railroad construction techniques. A typical construction sequence includes clearing, grubbing, grading, and compacting the rail bed; applying crushed rock ballast; laying track; and installing electrical and communications systems.

Regarding the construction of structures, different methods may be feasible. Cast-in-place would be the preferred construction method.

The retained cuts or trenches would be constructed by open-cut excavation methods, with vertical retaining walls embedded in the terrain.

Tunnels would be constructed either mined or with the cut-and cover method. A cut-and-cover tunnel is constructed by open-cut methods, building the tunnel in open air and then burying it with soil to create a tunnel.

Pre-construction activities would be conducted during the development of the final design, and would include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures, among others. Additional studies and investigations to develop construction requirements and worksite traffic control plans would be conducted as needed.

The construction sequence and phasing has been conceived considering the constructability of the whole end-to-end alignment, but at the same time allowing the construction of the different subsections as independent stretches, and by different contractors, if necessary.

Major construction activities include earthworks and excavation support, tunnel, bridge and aerial structure construction, station construction, track work, railway systems installation (including traction electrification, signaling and communications) and testing and commissioning.

Construction Laydown/Staging Areas (CLA) are defined along the alignments, at locations where space is available while also complementing the expected construction activities in the immediate area.

The HSR track-laying and the installation of railway systems, including the systems operations testing and commissioning, constitutes the last construction phase, taking place after the civil works are completed.

9.1 Construction Phasing

Some activities defined in the different phases may overlap in time to reduce the overall duration of works.

Palmdale Subsection

The works in the Palmdale Area subsection are divided into one mobilization period plus three phases of construction. The three construction phases focus on constructing major improvements in a manner which allows a contractor to address local and regional traffic needs effectively while delivering infrastructure improvements in an organized way.

Phase 1

Improvements to take place in this first phase would primarily focus on the construction of Sierra Highway Realignment. It is anticipated that the Rancho Vista grade separation would be constructed by others through an ongoing City Capital Improvement Project.

A second new grade separated roadway crossing under the entire rail corridor would be created in the crossing with Avenue Q. In both cases, SCRRA (Metrolink) and UPRR shoofly tracks would be necessary for the construction of the proposed Avenue Q underpass.

CHSR construction efforts would include the realignment of Sierra Highway to the south to join what would become the future 5th Street intersection along the west side of the rail corridor. The existing at-grade crossing at Avenue R would be removed, and Avenue R would be grade separated over the existing and future CHSR, Metrolink and UPRR ROWs.

In addition to the major local roadway realignment work related to Realigned Sierra Highway, future 5th Street, and Avenue R, major drainage conveyance channels and pipe network installations would begin, along with the excavation of the first of three major stormwater basins located adjacent to Avenue R.

Excavation of the basin network would take place in three phases to develop a consistent local source of fill material for each defined phase of improvements.

Large scale utility relocations can be accomplished in this phase to establish a primary service network or utility backbone facilities to accommodate the placement of future roadway, railway, and Palmdale Station area infrastructure along the CHSR corridor. Early rail work associated with SCRRA (Metrolink) and UPRR would also be initiated in the form of a shoofly track to develop space to construct the critical rail structures.

Phase 2

Improvements in this phase would primarily focus on the construction of Sierra Highway Realignment from the intersection with 5th Street to the reconnection with existing Sierra Highway on the east side of the rail corridor.

Construction of the Sierra Highway Realignment would maintain Sierra Highway as the primary north-south route while eliminating the existing at-grade crossing of the existing SCRRA (Metrolink)/UPRR tracks. A second roadway crossing under the entire rail corridor would be created at the crossing with Avenue Q.

The existing at-grade crossings at Palmdale Boulevard (SR 138) and Sierra Highway would be removed after the completion of the Avenue R Grade Separation. Similarly, to the Avenue R Grade Separation, the Palmdale Boulevard (SR 138) Grade Separation would be grade separated with the roadway over the existing and future railroad ROWs.

The final effort in Phase 2 is related to completing local roadway realignments.

Excavation of the second major stormwater basin adjacent to Avenue R can be initiated in this phase of construction.

The new track configuration for SCRRA (Metrolink) would accommodate the track realignment onto the new rail structures completed in Phase 1 or in early stages of Phase 2 over Realigned Sierra Highway. The new SCRRA (Metrolink) track centerlines would allow SCRRA (Metrolink) to vacate the existing Palmdale Station platform and existing station ROW. The vacated SCRRA (Metrolink) platform would provide space for the new Palmdale Station area and CHSR track placement in Phase 3.

Phase 3

Improvements in this last phase would be nearly exclusive to CHSR related facilities including platforms, and the Palmdale Station. The third phase of the Avenue R basin excavation for stormwater management would be completed to provide the remaining fill for the CHSR track profiling, station area buildings, and parking areas. Local and regional traffic circulation would improve further with the opening of Palmdale Boulevard (SR 138) Grade Separation, in addition to local street improvements that would be completed for both 5th and 6th Street to serve as key routes for access to the Palmdale Station area for site construction. Completion of the Palmdale Station would lead to installation of remaining parking facilities and land-side transit amenities ending with the way-finding signage, hardscaping, and landscaping elements around the Palmdale Station area.

Central Subsection south of Palmdale and under ANF

In the Central Subsection, the major critical path construction activity of the end-to-end SR14A Build Alternative is anticipated to be the excavation of the tunnel under ANF (12.36 miles; 7.33 yrs.), which constitutes the critical path for the SR14A Build Alternative.

However, the SR14A Build Alternative would traverse a long tunnel, named Tunnel 1A, (13.22 miles) and a short tunnel, named 2A, (1.03 miles) in the 18.2 miles of alignment between Soledad Siphon and Lang Station. Tunnel 2A is comparable, by length and location, with Tunnel 4 of Refined SR14 Build Alternative.

For constructability purposes, Tunnel 1A is divided in two sections with an intermediate window (IWA) at Sta. 820+00: Tunnel 1A1 (6.59 miles) and Tunnel 1A2 (6.663 miles). The IWA would be used for launching northwards two TBMs and the retrieval of two others TBMs coming from south, from Portal 2A.

In the construction phasing defined, the excavation of the tunnels would start as soon as possible once the design phase and the Contractor's mobilization is completed.

The works in the Central subsection would be divided into one mobilization period plus four main distinct phases of construction.

Phase 1

During this phase preliminary works and the start of excavation of Portal P1A would take place. This portal involves a very large volume of spoils to be transported by road.

Some of the spoils would be used in the HSR embankments between Sta.355+00 and Tunnel Portal P1A, which includes the construction of the Barrel Springs Road underpass and the Soledad Siphon viaduct. That is the reason why these works would start simultaneously to the excavation of Portal P1A.

Due to the long duration of the excavation of Portal P1A and the need to start the works on Tunnel 1A1 as soon as possible, the IWA at Sta. 820+00 should be prepared during this phase to launch the two TBMs northwards, simultaneously to the procurement and fabrication of the two TBMs that would bore Tunnel 1A1 northwards.

Portals 2A of Tunnel 1A2 and Portal 3A of Tunnel 3A involve large volumes of spoils to be transported by road and, in order to decrease environmental impacts, it has been considered to start the works simultaneously with the works at IWA in case of the Portal 2A, and 3 months later in the case of the Portal 3A.

The procurement and fabrication of the two TBMs that would excavate Tunnel 1A2 northwards would start one year before the completion of Portal 2A.

Simultaneously to the excavation of the tunnels, the construction of the two HSR viaducts between Tunnel Portals 2A and 3A would start, as well as the earthworks between Sta. 1194+00 and 1204+50.

Tunnel Portal 9, in Soledad Canyon, constitutes the northern end of the second longest tunnel for SR14A Build Alternative (Tunnel 5). The works at this location would include the demolition of the old mine site facilities within the project footprint area, clearing and grubbing of the construction site area and the excavation of the portal, simultaneously to the procurement and fabrication of the two TBMs that would be launched from this end of the tunnel. HSR grading operations would occur between Portal 9 and the south end of Tunnel 4 (portal 8). The Santa Clara River Viaducts would also be constructed.

Also related to Tunnel 5 (between Soledad Canyon and Pacoima), the construction of the adit would occur during Phase 1, as well as the preliminary works and the excavation of the shaft in Pacoima, near the I-210 (intermediate window 1 for Tunnel 5), and Portal 10.

Phase 2

This second phase would begin with the supply and assembly of the TBMs that would excavate Tunnel 1A1 and Tunnel 5. After that, the TBMs would be launched from the IWA and from Portal 9, and also from the intermediate shaft and the adit planned for Tunnel 5.

During the excavation of Tunnel 5 from the intermediate window 1 the exhaust of the temporary ventilation system to evacuate the emissions from tunnel construction activities will be located at a point source in the north corner of the project site.

Once Portal 2A is finished, the supply and assembly of the TBMs that would excavate Tunnel 1A2 would be accomplished, and the TBMs would be launched northwards.

In parallel to the excavation of the tunnels, the construction of the two HSR viaducts between Tunnel Portals 2A and 3A would be finished, as well as the earthworks between Sta. 1194+00 and 1204+50, and the rest of infrastructure proposed between the adjacent tunnels started during Phase 1.

Once the construction of the viaducts over Santa Clara River is completed, the excavation of Tunnel Portal P4 would start. The spoils of this portal and of Tunnel 2A would be transported by conveyor belt through the viaducts to the Vulcan Mine (Lang Site) for disposal.

The fault chambers along Tunnel 5 would be excavated.

Phase 3

Phase 3 occurs simultaneous with Phase 4 but the construction works during Phase 3 affect the area between Sta. 265+00 and 355+00 while Phase 4 is a continuation in time and locations of Phase 2.

The improvements that would take place in Phase 3 primarily focus on the construction in Palmdale of a shoofly on the SCRRA track and the improvement of 10th Street and construction of Ave. R 11 to deviate SCRRA and Sierra Hwy traffic. Once the two traffics are deviated, HSR earthworks and the SCRRA and Sierra Hwy overheads and also the Ave S viaduct would be constructed.

When the overheads are completed, SCRRA and Sierra Hwy realignments would also be completed, the shoofly of SCRRA would be dismantled and traffic would be restored.

To complete the Sierra Hwy realignment the traffic could be diverted through the Antelope Valley Fwy and Ave. R, or Palmdale Blvd. These grade separations would already be completed.

Finally, the Avenue S grade separation would be finished, and HSR earthworks would be completed up to Sta. 355+00. The traffic in Ave S during the grade separation completion works would be deviated to Ave. R and Palmdale Blvd.

Phase 4

Once the excavation of Tunnel 1A1 is completed and the TBMs launched from IWA are disassembled and extracted through the portal P1A, the construction of the invert and walkway of this tunnel would start.

When the excavation of Tunnel 2A is completed, the construction of the invert and walkway of this tunnel would start.

After the excavation of Tunnel 1A2 is completed and the TBMs launched from Tunnel Portal P2A are disassembled and extracted through the IWAA, the construction of the invert and walkway of this tunnel would also start.

Once the excavation of the northern part of Tunnel 5 is completed and the TBMs launched from Portal 9 are disassembled and extracted through this same portal, the open air tunnel structures would be constructed, including the tunnel portal hoods, and other tunnel portal facilities. The original ground profile (or other approved profile) would be restored within ANF, and the final portal and FLS facilities, as well as the final access road to the portal would be constructed.

Central Subsection in the San Fernando Valley

The main construction activities that would take place in this urban part of Central Subsection, between Montague Street and Lockheed Street, in Burbank, are the construction of grade separations and at-grade crossing improvements in the City of Los Angeles and City of Burbank, the relocation of the Vulcan Mine track and the unloading facility associated, the relocation of the existing Sun Valley Metrolink Station, the construction of HSR at-grade, open trench and cut-and-cover sections, and the SEM tunnel under San Fernando Blvd.

This Subsection is divided into three different phases of construction. The three phases focus on constructing major improvements in a manner which allows a contractor to address local and regional traffic needs effectively while delivering infrastructure improvements in an organized manner.

As the SEM tunnel would be excavated from its south end, passed Cohasset Street, which is included in Burbank Subsection described in next section, to correctly describe the phasing, this subsection must be considered together with the Burbank Subsection, which continues from Lockheed Street until the end of Burbank Airport Station.

Phase 1

In this first phase, improvements would focus on grade separations at Branford Street and Tuxford Street in the vicinity of HSR alignment, as well as the new realignment of San Fernando Blvd at the intersection with Sunland Ave and also between Penrose St and Olinda St. Works related to these local roadway realignments would include the relocation of utilities and drainage systems.

Simultaneously, the trench that provides access to Portal P10, next to Montague St, would be excavated and prepared for the TBM launching facilities.

The new unloading facility and Vulcan Mine track between Sheldon St and Tuxford St would be executed in this phase while keeping the existing facilities and tracks in operation. Also, a SCRRA shoofly would allow construction of the new SCRRA bridge over the lowered Sheldon St.

The existing Sun Valley Metrolink Station would be relocated south of Olinda St to avoid interferences with the HSR construction activities included in the next phase.

At the same time, the Burbank Airport Station cut and cover would begin its construction from the north end, south of Cohasset Street (Sta. 2231+18), towards the north end of Burbank Airport Station.

Phase 2

The improvements that would take place in Phase 2 would complete the construction of the grade separation at Sheldon St, which includes lowering San Fernando Rd in the vicinity of the intersection with Sheldon St. This grade separation also includes three other minor roadways that would connect the lowered Sheldon St profile with the surroundings. The new SCRRA bridge over Sheldon St would allow SCRRA track back to its original location.

HSR cut and cover tunnel at Olinda St would be built. SCRRA Sun Valley Station would be relocated south of the intersection with Olinda St.

In the station area, the Burbank Airport Station cut and cover would continue progressing to the south end of the station box. The new HSR bridge over Tuxford St would be built in this phase too.

The excavation of the SEM tunnel north of Burbank Airport Station would begin from the Cohasset end face using the cut and cover box excavated in the Phase 1 as a construction access, while continuing the excavation of Burbank Airport Station cut and cover.

During the excavation of the tunnel the exhaust of the temporary ventilation system to evacuate the emissions from tunnel construction activities will be located south of Cohasset St.

The civil works for the HSR infrastructure, from tunnel Portal P10, next to Montague St, to the north end of the SEM tunnel would take place also in Phase 2. This includes the open trench and cut and cover that ends in Portal P11 (at Olinda St).

In this phase the Vulcan Mine trains would start using the new unloading facility built in the previous phase, so that the new structures over the mine facilities can be executed (a new HSR bridge and a short aqueduct part of the longitudinal drainage design).

Sunland Blvd would remain accessible in each construction phase since it would remain unchanged by the HSR SEM tunnel underneath.

Phase 3

In this phase, the excavation of the last section of the SEM tunnel would take place, and the tunnel infrastructure including lining, invert, walkways and drainage would be finished.

Burbank Subsection

As mentioned before, construction phases of this Burbank Subsection have been already considered in the Central Subsection in Burbank.

To summarize, the main construction activities that would be required in this subsection would include the cut and cover section from Cohasset Street towards the north end of the station box (Phase 1), and also the rest of the station box; and as soon as enough room is available, the start of the excavation of the SEM tunnel to the north (Phase 3)

The Burbank Airport Station buildings would be constructed, and remaining parking facilities and land-side transit amenities would be installed, ending with the way finding signage, hardscaping, and landscaping elements around the Burbank Airport Station Area (Phase 3).

9.2 Construction Laydown/Staging Areas

Construction Laydown/Staging Areas (CLA's) are included to provide flexibility to the Contractor to stage this work more efficiently. The proposed areas are preliminary and contingent on further detailed investigations for suitability. The Contractor would be ultimately responsible to acquire and make available these sites.

These construction areas are not mandatory to build the project, but that the use of these areas is considered one feasible way to build the project.

Table 9-1 shows the proposed CLA's in the Palmdale to Burbank Project Section.

Table 9-1 Proposed Construction Laydown/Staging Areas

CLA #	Purpose of the Construction Staging Area	Size (Acres)
130	Support during construction of LMF structures.	20.7
185	Support during construction of Sierra Hwy underpass.	2.6
190A	Support during construction of Sierra Hwy underpass.	4.2
190B	Support during construction of Sierra Hwy underpass.	11.7
195	Support during construction of Sierra Hwy underpass.	4.6
234	Support during construction of HSR Palmdale Station.	6.3
260A	Support during construction of drainage channel.	3.8
260B	Support during construction of drainage channel.	4.2

CLA #	Purpose of the Construction Staging Area	Size (Acres)
260C	Support during construction of drainage channel.	2.6
100A	Support during construction of Avenue S overpass.	11.0
105A	Support during construction of Soledad Siphon viaducts.	12.0
110A	Support during construction of Portal 1A of Tunnel 1A1.	18.0
115A	Intermediate window access support area for construction of Tunnel 1A1 and retrieval of TBMs of Tunnel 1A2.	18.0
120A	The tunnel staging area is partially defined within the permanent footprint, and partially within the temporary footprint. In any case, the impact duration would be more than 5 years.	12.6
125A	Support during construction of Tunnel 2A (portal 3A) and viaducts.	25.7
1255	Support during construction of Tunnel 4 (portal 8) and viaducts	27.9
1320	Support during construction of Tunnel 5 (portal 9) and Santa Clara River Viaduct	36.5
1345	Support during construction of Tunnel 5 (portal 9)	24.1
1649	Support during construction of ADIT option 1 to Tunnel 5	32.8
1730	Support during construction of ADIT option 2 to Tunnel 5	16.2
1734	Support during construction of ADIT option 2 to Tunnel 5	10.6
1752	Support during construction of ADIT option 2 to Tunnel 5	20.7
1860	Support during construction of intermediate access to Tunnel 5	6.7
1865	Support during construction of intermediate access to Tunnel 5	2.0
1866	Support during construction of intermediate access to Tunnel 5	4.6
1872	Support during construction of intermediate access to Tunnel 5	2.9
1875A	Support during construction of intermediate access to Tunnel 5	1.9
1875B	Support during construction of intermediate access to Tunnel 5	1.6
1883	Support during construction of intermediate access to Tunnel 5	2.0
OPB1	Support during construction of Tunnel 5/portal 10 (SR14A) — Tunnel 2/portal 4 (E1).	35.8
OPB2	Support during construction of Tunnel 5/portal 10 (SR14A) — Tunnel 2/portal 4 (E1).	7.4
OPB3	Support during construction of Tunnel 5/portal 10 (SR14A) — Tunnel 2/portal 4 (E1).	10.2
OPB5	Support during construction of viaduct over Spreading grounds.	3.2
OPB6	Support during construction of viaduct over Spreading grounds.	10.2
20165	Support during construction of Burbank Airport Station.	43.0

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10 STATIONS

10.1 Palmdale Station

The Palmdale Station would be located along the proposed rail alignment within the Palmdale Subsection. The Palmdale Station would be bound by East Avenue Q to the north and Palmdale Boulevard to the south, adjacent to Sierra Highway, the Metrolink Antelope Valley line, and Union Pacific Railroad.

The Palmdale Station has excellent regional access with two major highways in close vicinity. The SR 14 freeway can be accessed via East Palmdale Blvd. to the south and Rancho Vista Blvd. to the north. Highway 14 leads to Santa Clarita and further south to downtown Los Angeles. Highway 138 to the east of the station connects to Interstate 15 Freeway which goes to Las Vegas, Nevada. In addition, the proposed realignment of Sierra Highway would run adjacent to the proposed HSR alignment and provides direct access to the Palmdale Airport to the north.

Immediately east of the platforms is the Palmdale Sheriff's Station and to the south is City Hall. The Palmdale Station is about four miles from the Palmdale Regional airport and less than a mile from City Hall. The properties west of the proposed HSR platforms and north of Avenue Q include undeveloped parcels, the existing Palmdale Transportation Center, and a mix of single family residential and multi-family residential uses. The adjacent neighborhoods east of the proposed HSR platforms are a mix of established single-family subdivisions, multi-family residential, commercial uses, and civic facilities. The proximity of the HSR station to the City of Palmdale's Civic Center and City Hall provides a strong opportunity to strengthen the connection to the City's core.

The Palmdale Station would consist of station facilities, train platforms, pedestrian walkways, pick-up/drop-off zones for private autos, surface parking areas, and two transit centers (one on either side of the HSR alignment) to house bus terminals for buses and shuttles. Train platforms would be constructed along either side of the proposed rail alignment, beginning approximately 0.04 miles south of East Avenue Q. The southbound platform would be west of the southbound tracks, and the northbound platform would be east of the northbound tracks. Each platform would be approximately 1,410 feet long. In addition, a Metrolink platform approximately 700 feet in length would be constructed east of the HSR platform, running north-south along the Metrolink railway. The design of the Palmdale Station would not preclude the implementation of the High Desert Corridor (HDC) project. HDC tracks have been considered in the design, with HDC and HSR sharing platforms.

Pedestrian access to the station would be provided through a transit plaza and pedestrian overcrossings spanning the rail alignments. The pedestrian overcrossings connect the train station/platforms to surrounding parking areas. Surface parking lots would be located immediately to the north and south of the station, as well as on parcels east of the HSR alignment along Palmdale Boulevard. Consistent with the EIR/EIS goal of minimizing parking areas, the number of proposed parking spaces provided for day-of-opening operations is consistent with the Authority's ridership projections.

Horizontal elements such as pedestrian walkways, mid-block crossings, sidewalks, trails, and overcrossings would be used to move people around the station while also allowing them to access parking lots and transit services. Two elevated passenger boarding platforms would flank the guideway on both sides and have, in addition to vertical circulation connecting to the station building, emergency exit stairs that lead to egress walkways terminating at ground level exits. The site is configured in such a way that depends on the use of various vertical and horizontal circulation elements. Vertically, the site is served by elevator shafts and stairwells that are contained in structural elements which physically and aesthetically relate to the pedestrian bridges used to connect both ends of the station area.

The station building to the west of the HSR at-grade guideway of the alignment would be a free-standing structure. The station would be fronted to the west by a public plaza that would provide a gathering space along 5th Street. The station's interiors would be configured to place the public

serving functions, inclusive of future concessions, ticket sales office, ticket vending machines, security and restrooms, immediately adjacent to the concourse area. The concourse area also would contain seating for the public and waiting passengers. From the concourse, passengers would access trains by passing through fare gates and then, once in the station's paid zone, would walk on pedestrian bridges to reach elevators and escalators that lead to the platforms. The proposed station's operations functions, consisting of trains control facilities, operations maintenance, mechanical rooms and staff spaces, would be placed behind the passenger-facing functions and out of the public view, and would be readily accessible by maintenance vehicles.

A station facility on the east side of the HSR alignment would accommodate passengers to the train platforms from Sierra Highway and the Palmdale Civic Center. The station facility would be located next to a transit center and pick-up/drop-off zone at the intersection of Sierra Highway and Avenue Q-6. This would include a ticket sales office, ticket vending machines, security and restrooms.

Table 10-1 provides a summary of the configurations for the Palmdale Transportation Center Station.

Table 10-1 Palmdale Station Configuration

Name	Location	Configuration	# Of Platforms	Length/Width	Square Footage of Platform Area
Palmdale Transportation Center Station	Palmdale, Los Angeles County, CA	At-Grade	2	1,410 feet in length, 40 feet in width	112,800 Sq. Ft.

10.2 Burbank Airport Station

The Burbank Airport Station would be located underground, just south of San Fernando Road, generally to the east and roughly parallel to the Burbank Airport's north-south runway. The station would be bound by San Fernando Rd. to the north, and Winona Ave. to the south, the planned Airport Terminal relocation to the west, and Hollywood Way to the east.

The Burbank Airport Station has excellent regional access with three major highways in close vicinity. Interstate 5 (Golden State Freeway) can be accessed via San Fernando Rd. to the north and south of the station. Interstate 5 makes a northern connection and cuts through the San Fernando Valley and Glendale while also making a southern connection to downtown Los Angeles. To the south of the station is Highway 134, which connects to US 101 (Hollywood Freeway) and SR 170 Freeways continuing to Hollywood and North Hollywood respectively.

In addition to vehicular connections, the proposed airport adjacent station locations would allow for an intermodal connection between rail and air travel. Immediately south of the platforms is the planned airport terminal relocation for the Hollywood Burbank Airport. The station's above and below ground facilities would be largely located on existing airport parking lots, vacant lots, and industrial properties southwest of the Hollywood Way and San Fernando Road intersection.

The Burbank Airport Station would be located along the proposed rail alignment within the Burbank Subsection. The Burbank Airport Station would consist of subterranean train platforms, pedestrian walkways/connectors, transit and station plazas, pick up/drop off facilities for private autos, and surface parking areas.

Train platforms would be constructed along either side of the proposed rail alignment, beginning approximately 1,200 feet south of San Fernando Rd. The northbound platform would be north of the northbound tracks, and the southbound platform would be south of the southbound tracks. Each platform would be approximately 1,410 feet long and 30 feet in width.

The station site is configured to accommodate three pedestrian access points to the station platforms. Vertical and horizontal circulation elements emphasize patron safety and security

measures, such as the shortest practical length, ample width, bright lighting, and security monitoring.

Due to the station’s subterranean design, the site is heavily dependent on vertical circulation elements. Vertically, the site is served by elevator shafts and stairwells contained within station portals located to the west of N. Hollywood Way. These station entry portals help provide a visual guide to the subterranean platforms while also protecting passengers as they descend or ascend from the station platforms. The station portals also assist in efficiently and safely connecting passengers to both ends of the station area. Horizontal elements such as pedestrian walkways, mid-block crossings, sidewalks, trails, and linear plazas would be used to move people around the station while also allowing them to access parking lots and transit services. Two passenger boarding platforms would flank the guideway on both sides and have, in addition to vertical circulation connecting to the station facilities, emergency exit stairs that lead to egress walkways terminating at ground level exits.

The station building is a free-standing structure that connect passengers to the HSR alignment guideway located below-grade. The station’s interiors would be configured to place the public serving functions, inclusive of future concessions, ticket sales office, ticket vending machines, security and restrooms, immediately adjacent to the concourse area. The concourse area also would contain seating for the public and waiting passengers. From the concourse, passengers would access trains by passing through fare gates and then, once in the station’s paid zone, would walk to reach stairs, escalators, and elevators that lead to the train platforms. The proposed station’s operations functions, consisting of trains control facilities, operations maintenance, mechanical rooms and staff spaces, would be placed behind the passenger-facing functions and out of the public view, and would be readily accessible by maintenance vehicles.

The station building would open onto a station entry plaza and would be near a shared transit center and pick-up/drop-off zone located directly to the east of the station. Parking facilities would, as currently assumed, be entirely at-grade surface parking lots located in close proximity to the station building and the platforms as much as possible and equally balanced to the east and to the west sides of the HSR corridor. Bicycle parking would be accommodated at the station facilities and located close to the station plazas.

Table 10-2 provides a summary of the configurations for the Burbank Airport Station.

Table 10-2 Burbank Airport Station Configuration

Name	Location	Configuration	# Of Platforms	Length/Width	Square Footage of Platform Area
Burbank Airport Station	City of Burbank, Los Angeles County, CA	Above and below-grade	2	1,410 feet in length, 30 feet in width	84,600 Sq. Ft.

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11 BRIDGES AND ELEVATED STRUCTURES

Structures carrying elevated HSR tracks are required at grade separations over water, freeway crossings, deep canyons, and existing infrastructures. Structure types as shown in the design drawings are selected to provide the most practical and economical, and least impacting design and construction solution at each site.

The SR14A Build Alternative includes, approximately, 9,200 feet of High-Speed Rail structures, 1,600 feet of SCRRA/UPRR structures and 3,500 feet of roadway structures.

The main typology used for SCRRA/UPRR is steel plate girders, and for roadway structures is a prestressed concrete multi-cell box girder.

However, for HSR structures, multiple typologies have been implemented due to the variety of site constraints along the alignment, being the preferred typology the prestressed concrete box.

11.1 HSR Structures

The typical cross sections used along SR14A Build Alternative are shown below:

11.1.1 Typical High-Speed Train Aerial Structure

This is the typical section adopted for CHSR aerial structures in accordance with TM 1.1.21 and TM 2.3.3. With a prestressed concrete single cell box girder, simply supported and spanning approximately 120 feet. This type is divided into two subtypes depending on the support of one or two tracks, giving two widths (30 & 50 feet).

This typology has been used as well for some parts of the bridges where a continuous deck is necessary in order to cross roadways or whichever other site constraints. In those locations, haunched girders would be designed. However, in some cases the maximum thermal unit length is exceeded (330'). Figure 11-1 shows the typical aerial structure cross section.

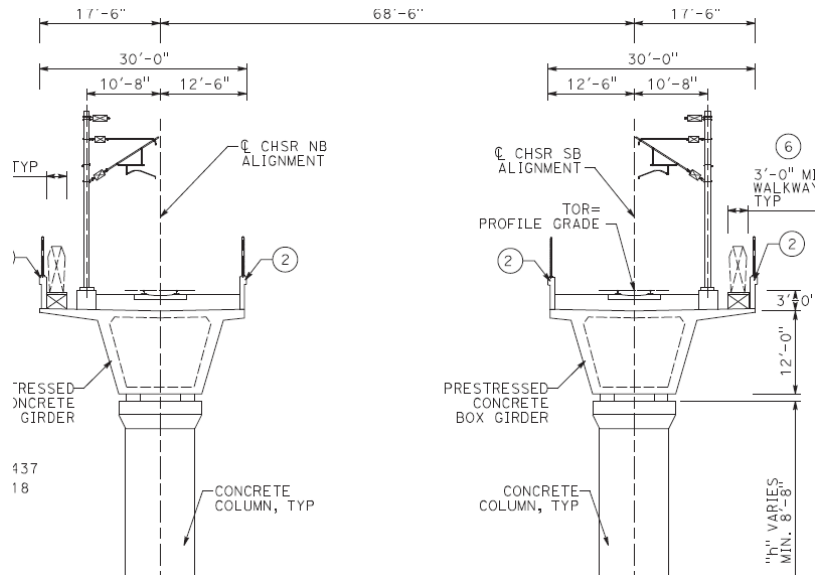


Figure 11-1 Typical Aerial Structure Cross Section

Each of the simply supported spans would be fixed to one of the piers and would be free on the other pier. This configuration allows the span to expand or contract freely, and each pier would bear the tributary mass of the span under seismic loading.

11.1.2 Pergola/ Straddle Bent

This typology is used mainly for three locations or crossing layouts:

- LMF Crossing
- SCRRA and Sierra Highway crossings

LMF Crossing

In this case, as the ground level is at the same elevation as the HSR tracks, and the crossing is under the HSR tracks, the solution could be also defined as cut and cover solution.

Both soldier pile walls cross the tracks with a highly skewed angle and the precast girders on the top make the bracing of the walls and the deck for the high – speed train, at the same time.

Besides, given the skew angle, an extra piled slab is provided before- and after the crossing with the soldier pile walls as the ties need the same stiffness underneath them. Figure 11-2 shows the plan view and cross section of the LMF crossing.

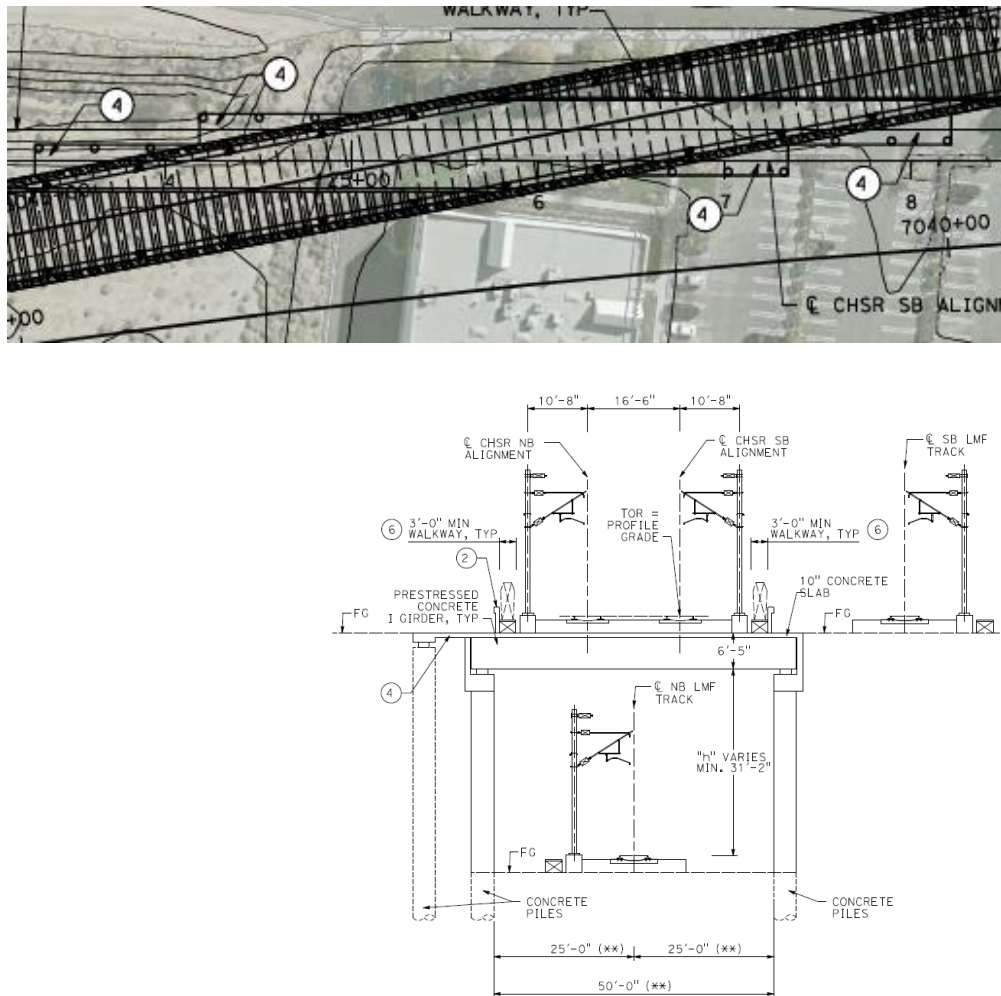


Figure 11-2 Plan View and Cross Section of LMF Crossing

SCRRA and Sierra Highway Crossings

In this case, the ground level is slightly over the top of rail of the HSR tracks, and the crossing is over the HSR tracks. Due to the skew of the crossing, the best option in order to avoid excessive span lengths is the pergola/straddle bent. Reference Figure 11-3 for the plan view and cross section of the SCRRA crossing and Figure 11-4 for the Sierra Highway crossing.

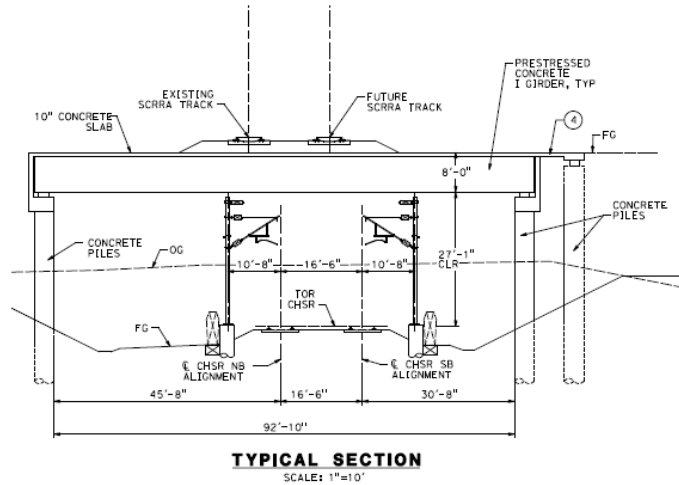
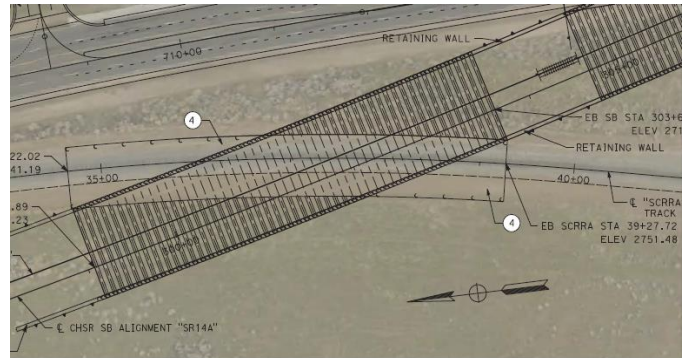


Figure 11-3 Plan View and Cross Section of SCRRA Crossing

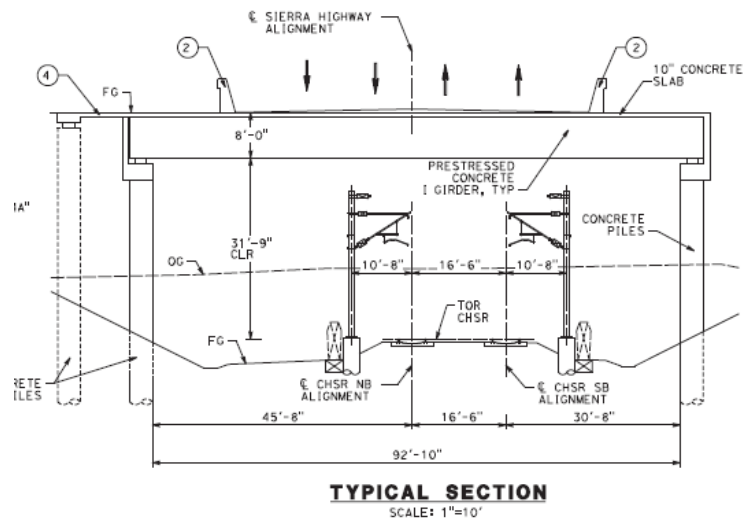


Figure 11-4 Plan View and Cross Section of Sierra Highway Crossing

11.1.3 Trusses

This typology is used in two designs where excessive length and simply supported solutions are required:

- Sierra Highway
- Soledad Siphon

Sierra Highway

This is the case of the crossing over Sierra Highway shown below in Figure 11-5 and Figure 11-6, in which several tracks cross over the highway:

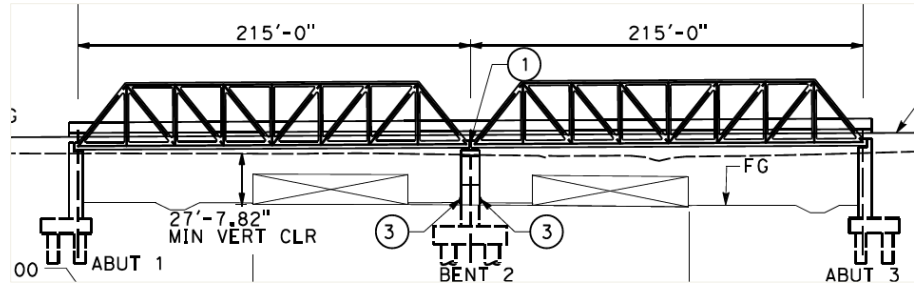


Figure 11-5 Elevation of Steel Trusses (Sierra Hwy)

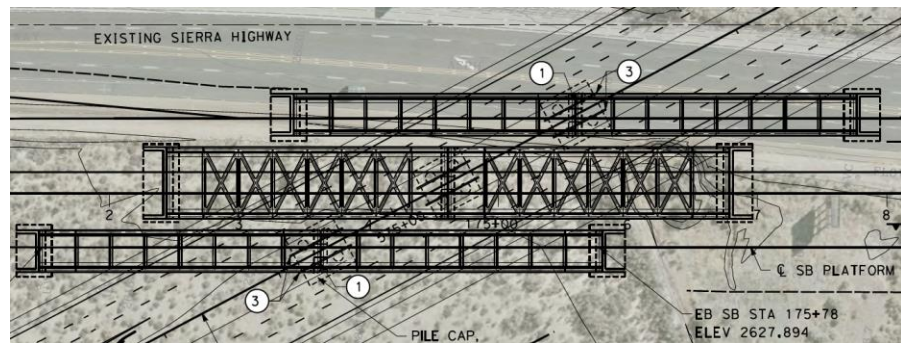


Figure 11-6 Plan View of Steel Trusses for All Tracks (Sierra Hwy)

The height of the truss allows the 27' clearance, shown in Figure 11-7:

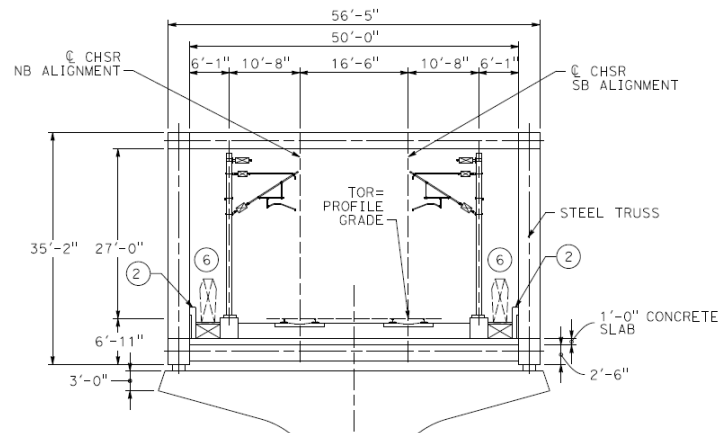


Figure 11-7 Cross Section Steel Truss Double Track (Sierra Hwy)

The maximum thermal unit length would be 215' just over the bent (<330'), as both spans are simply supported.

Soledad Siphon

In this case, such typology applies to Soledad Siphon structure. The trusses do cross over Sierra Highway and the Soledad Siphon as shown in the following plan view in Figure 11-8:

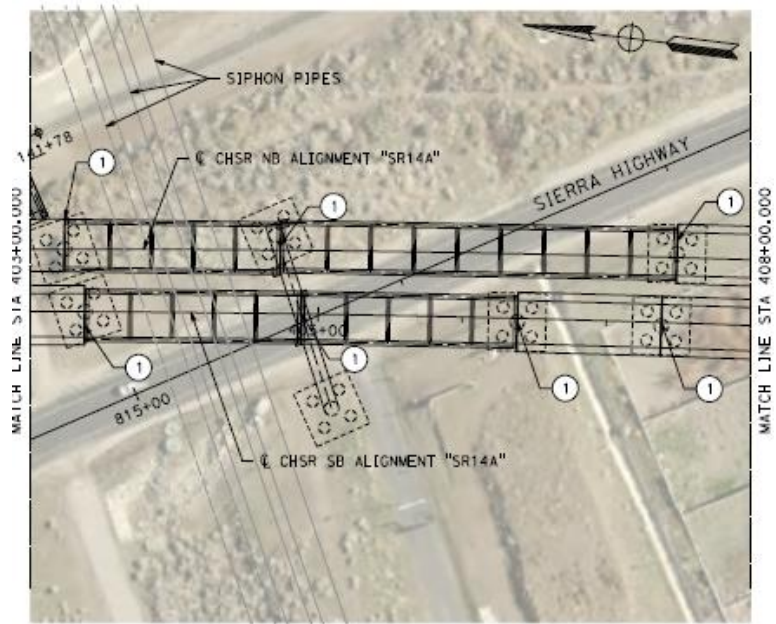
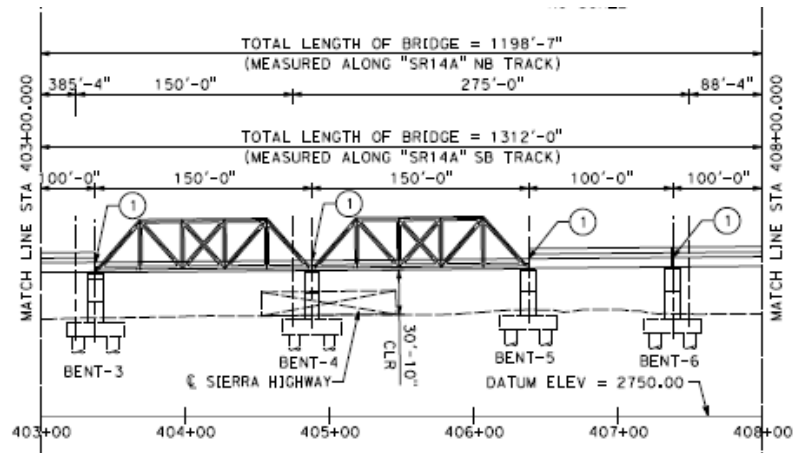


Figure 11-8 Plan View & Elevation of Steel Trusses (Soledad Siphon)

The height of the truss allows more than the prescriptive 16.5' vertical clearance over Sierra Hwy and the maximum thermal unit length would be $150/2' + 275/2 = 212.50 (<330')$ just over Sierra Highway crossing, as shown in Figure 11-9.

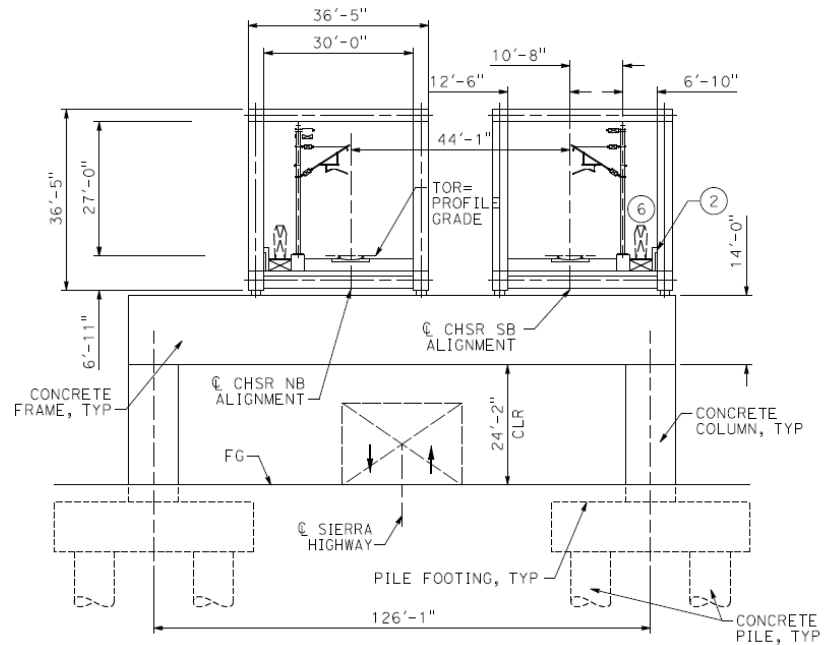


Figure 11-9 Cross Section of Steel Trusses (Soledad Siphon)

11.1.4 U – Shape Section

Due to special site constraints, as clearance or freeboard needed in some places, a U-shape concrete cross section has been designed for some viaducts or bridges.

The main advantage of this typology is to provide the structural depth mainly over the TOR instead of under it. Only the ballast thickness as well as the bottom slab thickness shall be provided under TOR.

This typology has been implemented at three locations:

- Sierra Highway near Soledad Siphon
- Hansen Dam spillway
- Tuxford Street crossing

Sierra Highway near Soledad Siphon

This crossing combines this typology together with steel trusses at some spots, as shown in the Figure 11-10:

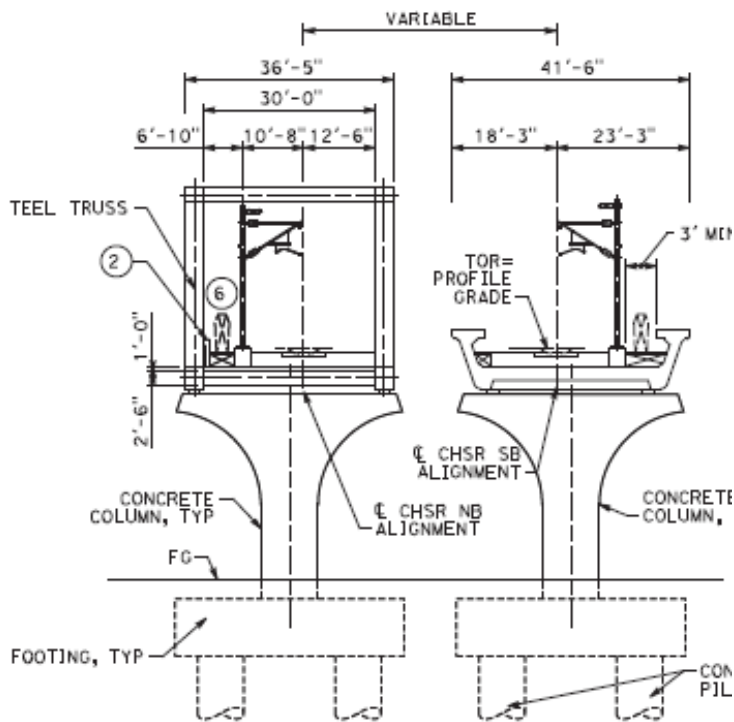
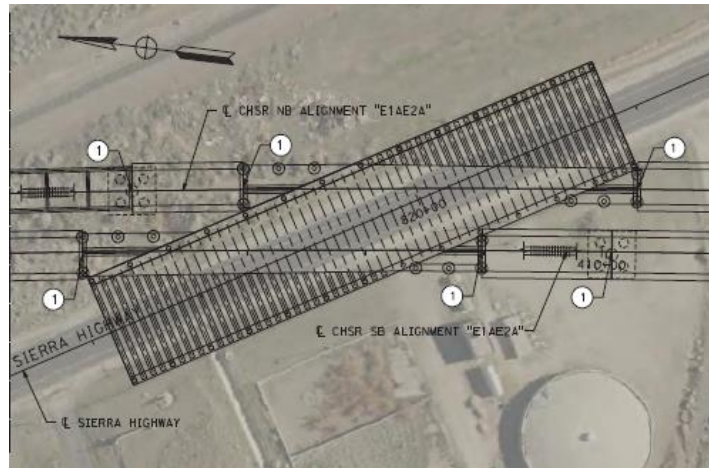


Figure 11-10 U Shape Cross Section (Sierra Highway near Soledad Siphon)

Tuxford Street and Hansen Dam Spillway

Crossings at Tuxford Street or the crossing over the Hansen Dam spillway are examples of spots where this typology has been implemented, shown in Figure 11-11. Also, single- and double-track solutions have been designed depending on the track-center line spacing.

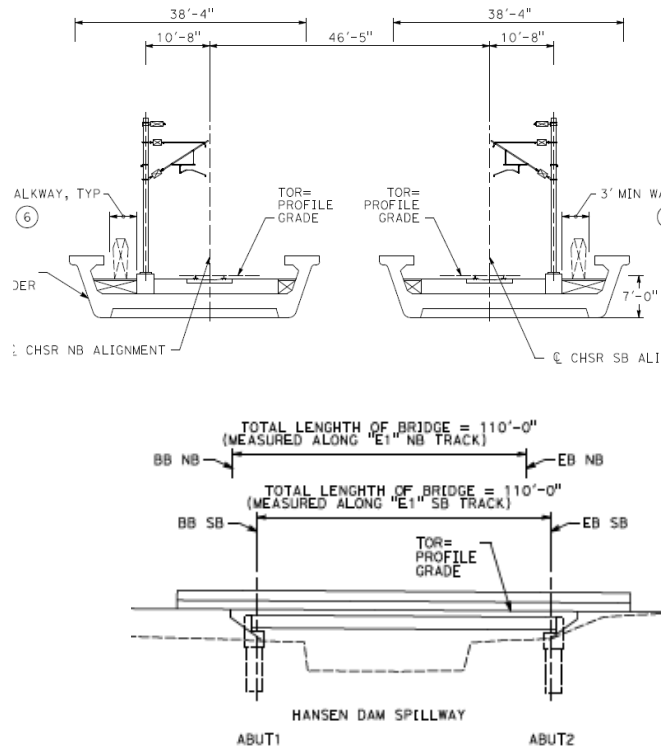


Figure 11-11 U Shape Cross Section (Hansen Dam Spillway)

11.1.5 Santa Clara River Special Design

The viaduct crossing Santa Clara River has the following main site constraints:

- Crossing over SCRRA ROW (skewed)
- Crossing over Santa Clara River
- Crossing over Soledad Canyon Road (skewed)

After an analysis carried out in order to define the possible habitat of the fully protected UTS (unarmored threespine stickleback), it was required to design a span much longer than the required to barely span the current floodway, as shown in Figure 11-12, but also the rest of the floodplain:

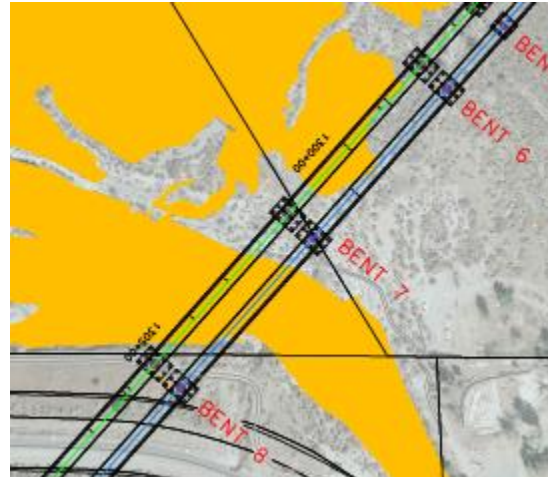


Figure 11-12 Santa Clara Viaduct Flood Zone Analysis

For this reason, and to avoid continuous girder solutions that would eventually require rail expansion joints, special bents were designed so the maximum thermal unit length is less than 330'. Therefore, no rail expansion joints are required.

The arches have a span length of approximately 315' and the upper part of the bents 85', so this configuration provides deck expansion joints at the beginning and end of the bent as well. This way an "artificial" span is created between the arches without increasing the number of foundation/supports, and the real span between foundations center line can reach 395'. Figure 11-13 depicts the Santa Clara viaduct elevation on main spans.

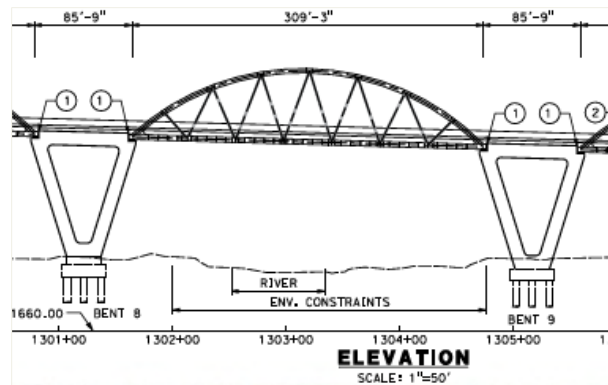


Figure 11-13 Santa Clara Viaduct Elevation on Main Spans

Special bents work as an upper tie and both struts conforming a triangle of forces. At the base, both supports/legs are separated to resist uneven loading with a couple. Under seismic loading, inelastic behavior is foreseen in both bottom and upper part of the legs. The deck of the special bents would remain elastic.

On the other side, the crossing over Soledad Canyon Road is designed as a continuous haunched concrete girder (120+200+120=440'). This way, the maximum thermal length reaches 220' on the abutment deck expansion joint, and $440/2 + 112'/2 = 276'$ over bent 4. Both values are under 330'. Therefore, no rail expansion joint is required. However, a special analysis (track-structure-interaction) would be carried out in further stages of design, in order to check this solution. Figure 11-14 represents the Santa Clara viaduct elevation over Soledad Canyon Road.

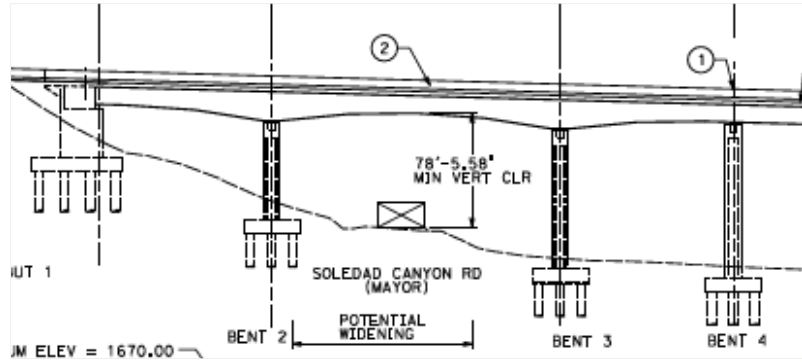


Figure 11-14 Santa Clara Viaduct Elevation Over Soledad Canyon Rd

11.1.6 Barrel Springs Underpass Concrete Vaults

The crossing between Barrel Springs Road and the HSR tracks is located within the San Andreas Fault zone. Figure 11-15 shows the Barrel Springs plan view for E1 and E2.

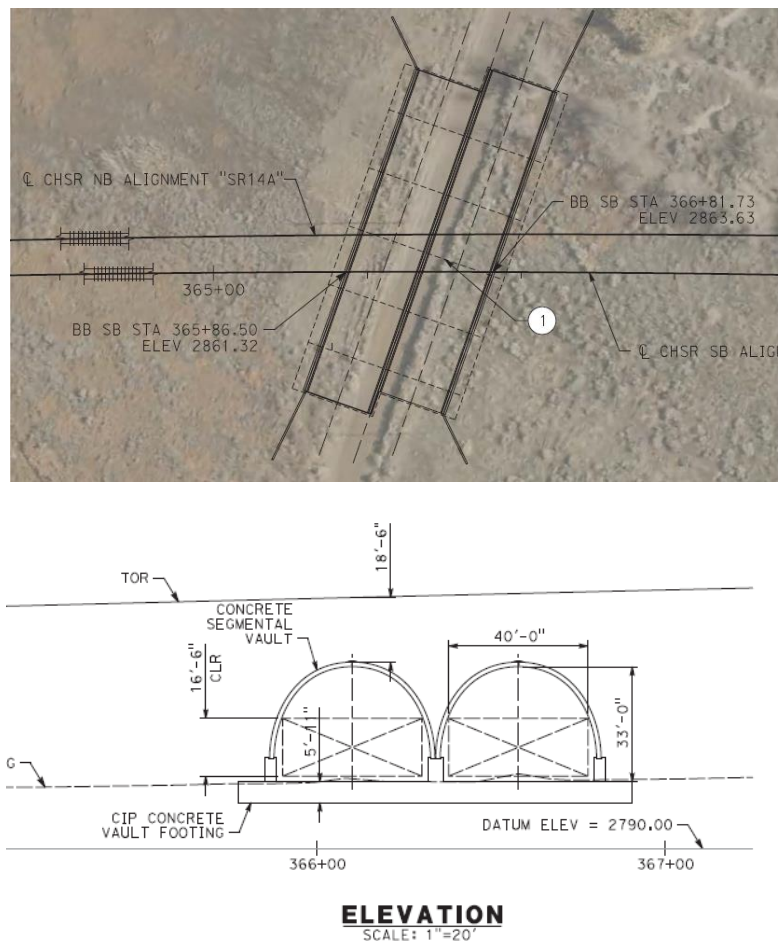


Figure 11-15 Barrel Springs Plan View (E1/E2)

According to the TM 2.10.6. Fault rupture analysis and mitigation, the first measure to be taken should be to avoid an elevated structure and design a standard embankment. However, the

relocation of the road over the HSR would lead to a long structure, which would be significantly troublesome given the special constraints of the fault zone and length and height of the new roadway bridge. Therefore, an underpass “inserted” in the HSR embankment is proposed as this structure is small and a better approach in order to deal with the seismic movements. Figure 11-16 depicts the Barrel Springs approach embankment for SR14A Build Alternative.

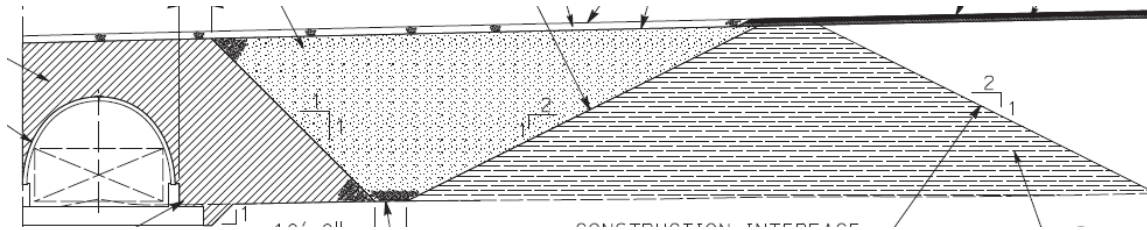


Figure 11-16 Barrel Springs Approach Embankment (SR14A)

This avoids a rigid layout that could lead to a brittle collapse of the structure. Relocation of some elements may be needed after a seismic event.

11.1.7 Train Detention Zones

Due to the length of the train detention zones (approximately 1,400'), in terms of emergency and evacuation of the passengers, in some cases some portions of the viaducts are affected and have to be designed to provide the adequate surface. The total width to be provided in this case is 120'.

The typical configuration of these train detention zones is shown below in Figure 11-17:

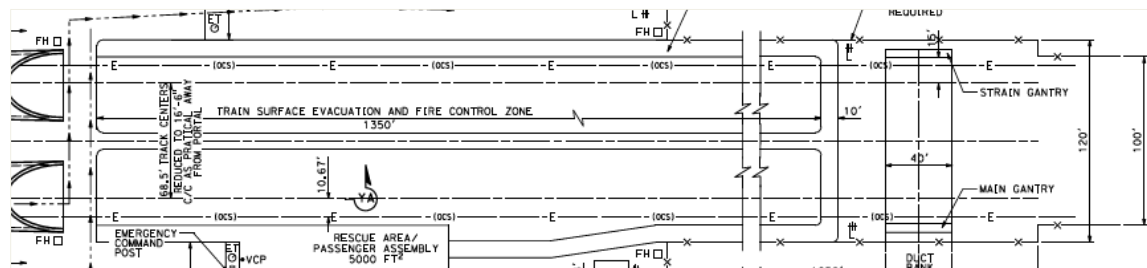


Figure 11-17 Train Detention Zone Layout

The design of the typical cross section of the viaducts, in order to accommodate this width, is as follows in Figure 11-18:

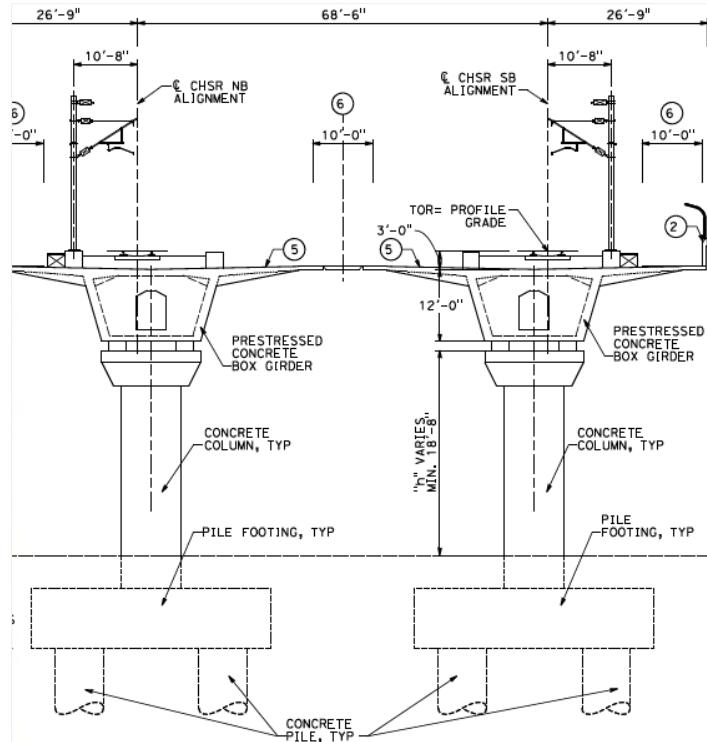


Figure 11-18 Train Detention Zone Cross Section for Viaducts

This design allows evacuation on both sides of the superstructure, as well as through the zone in between the tracks. For this purpose, a slab is designed which would be simply supported (sliding) on one of the decks and fixed to the other. This way both superstructures are still independent with regard to the seismic performance and the typology of the prestressed concrete box girder remains the same. Only the width of the boxes has been increased, so the center line of the tracks does not match the center line of the substructure, unlike the rest of the typical girders.

As span distribution, length and rigidity of both parallel structures is similar, no big differences in seismic performance are foreseen. However, the slab in the middle would slide on one side (fixed on the other) so differences in transversal movement can be absorbed and further design stages would ensure sufficient seat width for this intermediate slab.

11.1.8 Vulcan Mine Unloading Facility

Approximately, at station 1958+25, there is an unloading facility that needs to be re-designed. As the Vulcan Mine branch would eventually cross to the other side of the HSR tracks to reach the aforementioned unloading facility and, in order to avoid complex grade-separations, this branch shall run parallel to HSR instead and a new unloading pit has to be excavated towards the existing SCRRA/UPRR tracks, as shown in the following sketch in Figure 11-19:



Figure 11-19 Excavation of the New Unloading Pit (Picture of Existing Facility, GE)

This implies the following new structures:

- Walls to conform the pit, itself
- HSR structure, over the pit
- Drainage channel, over the pit (Figure 11-20)
- New unloading facility (demolition of the previous)

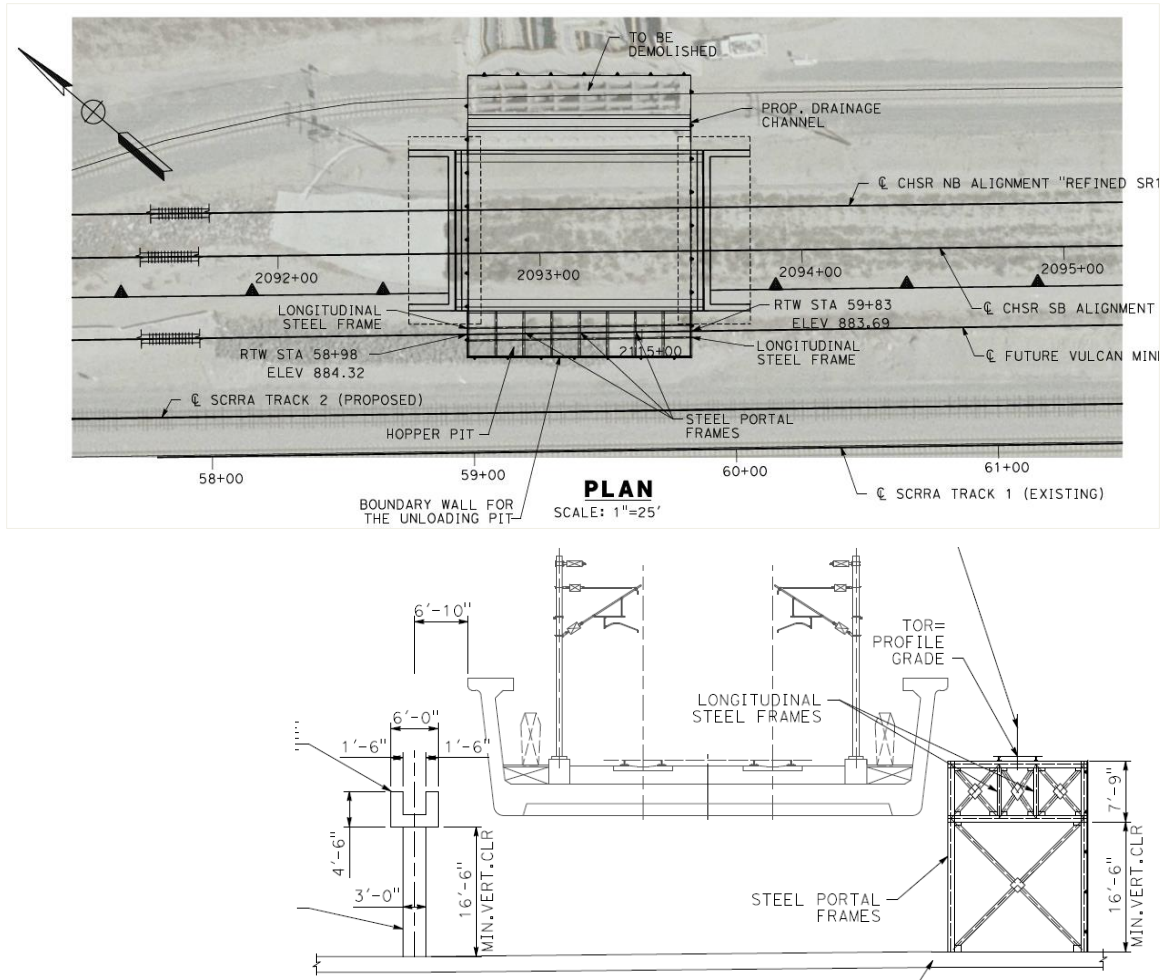


Figure 11-20 From Left to Right: Drainage Channel, HSR Structure & Unloading Facility

11.1.9 Substructure and Foundations

The typical substructure is formed by a 10' circular column, supported on a 40' x 40' x 10' pile cap with four 8' diameter piles. This typology would be supporting typical 120' spans.

Although this size has been used also for single track superstructures, it is the purpose to provide a conservative approach to the design at this stage so there is room for optimization.

However, due to the uncertainties on geotechnical information, the most reasonable approach is to consider the size mentioned at the beginning of this section, and for cost estimation purposes at this 15 percent design stage. Figure 11-21 depicts the typical substructure for single track decks.

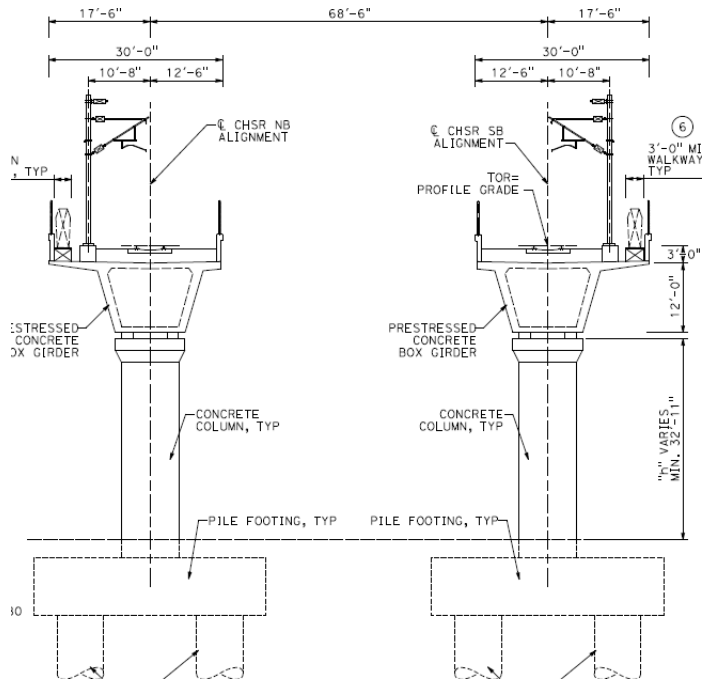


Figure 11-21 Typical Substructure for Single Track Decks

There are some special cases at some spots along the project where a bigger foundation would eventually be required. As no specific calculations have been carried out, the size of the pile cap and number of piles are based on experience with bridges of similar spans and typologies located in countries with high seismicity and taking into account the conservative approach at this stage. These are cases like the Santa Clara River shown in Figure 11-22:

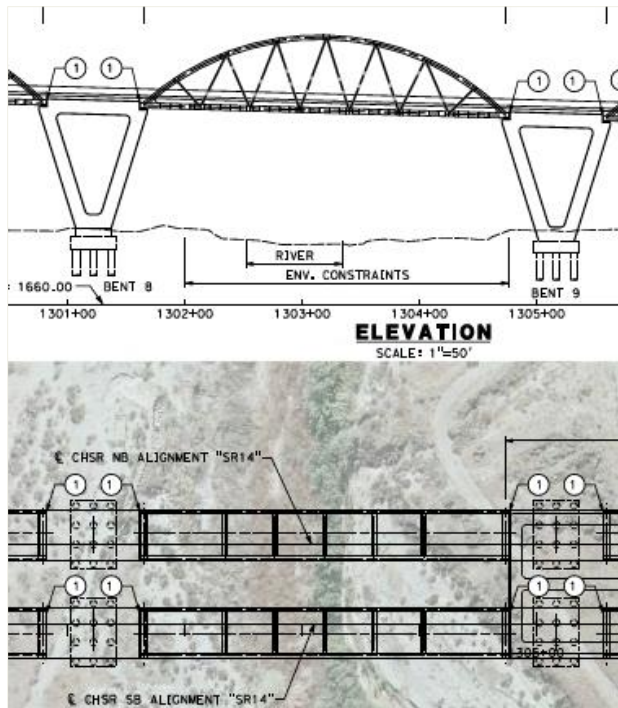


Figure 11-22 Special Substructures (Santa Clara)

11.1.10 HSR Structures Summary Table

As a summary, the types of structures used along this section are summarized as follows in Table 11-1:

Table 11-1 SR14A HSR Structures Summary Table

No.	Location	Purpose	Structural Type	Length (ft)	Avg. Height (ft)	No. of Bents	No. of Spans
1	(STA 123+49)	LMF NB RAIL CROSSING	CUT & COVER	544	34.18	0	1
2	(STA 173+24)	SIERRA HW UNDERPASS (SB PLATFORM TRACK)	TRUSS SINGLE TRACK	430	27.83	1	2
3	(STA 173+91)	SIERRA HW UNDERPASS (MAIN TRACKS)	TRUSS DOUBLE TRACK	430	27.83	1	2
4	(STA 174+77)	SIERRA HW UNDERPASS (NB PLATFORM TRACK)	TRUSS SINGLE TRACK	430	34.98	1	2
5	(STA 209+36)	AVENUE Q UNDERPASS (SB PLATFORM TRACK)	BOX GIRDER SINGLE TRACK d12	105	23.42	0	1
6	(STA 209+40)	AVENUE Q UNDERPASS (MAIN TRACKS)	CONCRETE U BEAM DOUBLE TRACK	110	18.33	0	1
7	(STA 209+48)	AVENUE Q UNDERPASS (NB PLATFORM TRACK)	BOX GIRDER SINGLE TRACK d12	105	27.58	0	1
8	(STA 236+43)	PALMDALE BOULEVARD UNDERPASS (SB PLATFORM TRACK)	TRUSS SINGLE TRACK	160	16.75	0	1
9	(STA 236+57)	PALMDALE BOULEVARD UNDERPASS (MAIN TRACKS)	TRUSS DOUBLE TRACK	160	16.75	0	1

No.	Location	Purpose	Structural Type	Length (ft)	Avg. Height (ft)	No. of Bents	No. of Spans
10	(STA 236+70)	PALMDALE BOULEVARD UNDERPASS (NB PLATFORM TRACK)	TRUSS SINGLE TRACK	160	16.75	0	1
11	STA 365+87	BARREL SPRINGS ROAD	TWIN VAULT UNDERPASS	96	33.00	0	1
12	STA 398+24	SOLEDAD SIPHON	STRADDLE BENT, TRUSS & U-SHAPE	1,314	27.00	8	9
13	STA 1186+10	ST 1186+10 near BURKE ROAD	2 BOX GIRDER SINGLE TRACK	770	57.00	6	7
14	STA 1204+53	AGUA DULCE	2 BOX GIRDER SINGLE TRACK	1,857	57.00	15	16
15	STA 1346+85	SANTA CLARA	2 BOX GIRDER VARIABLE DEPTH	2,667	62.00	16	17
16	(STA 1983+54)	HANSEN DAM SPILLWAY	2 CONCRETE U BEAM SINGLE TRACK	100	4.00	0	1
17	(STA 2005+96)	SHELDON STREET	CONCRETE U BEAM DOUBLE TRACK	110	19.67	0	1
18	(STA 2042+15)	VULCAN MINE HOPPER	CONCRETE U BEAM DOUBLE TRACK	110	16.50	0	1
19	(STA 2063+72)	TUXFORD STREET	CONCRETE U BEAM DOUBLE TRACK	110	16.50	0	1

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

11.2 Roadway and Grade Separation Structures

HSR crossings of roadways and other rail lines must be grade separated. In several locations the preference is for the roadway or rail alignment to cross over the HSR alignment. In some locations, the changes to surrounding roadway alignments introduce additional grade separations where Metrolink or UPRR tracks cross over realigned roadways. The overhead structures developed for the PEPD phase for the Palmdale subsection segment have been selected based on typical economical design procedures for these types of structures. Table 11-2 shows a

summary of the Build Alternative SR14A roadway structures and Table 11-3 depicts the grade separation structures.

The typical cross sections used along this subsection are shown below in Figure 11-23, Figure 11-24 and Figure 11-25:

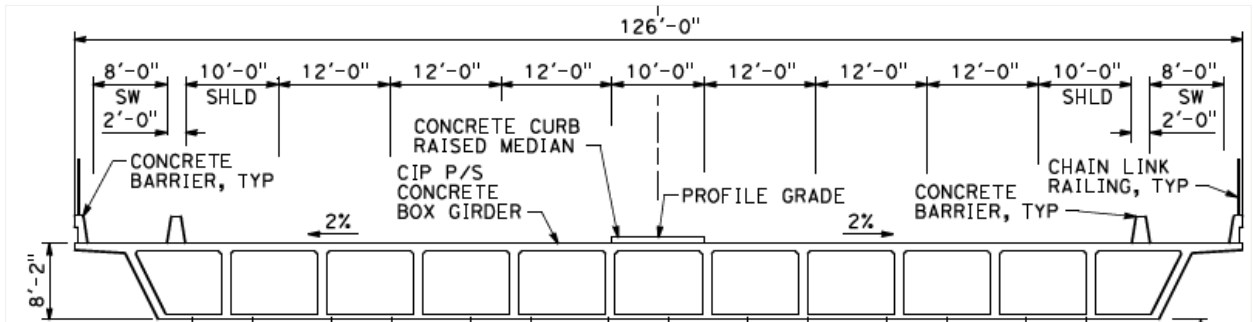


Figure 11-23 Roadway Structure: CIP PS Concrete Box Girders

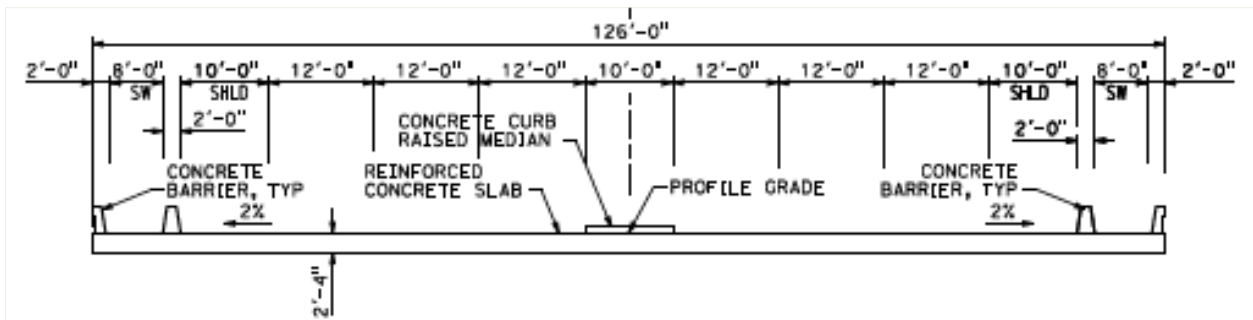


Figure 11-24 Roadway Structure: RC Slab

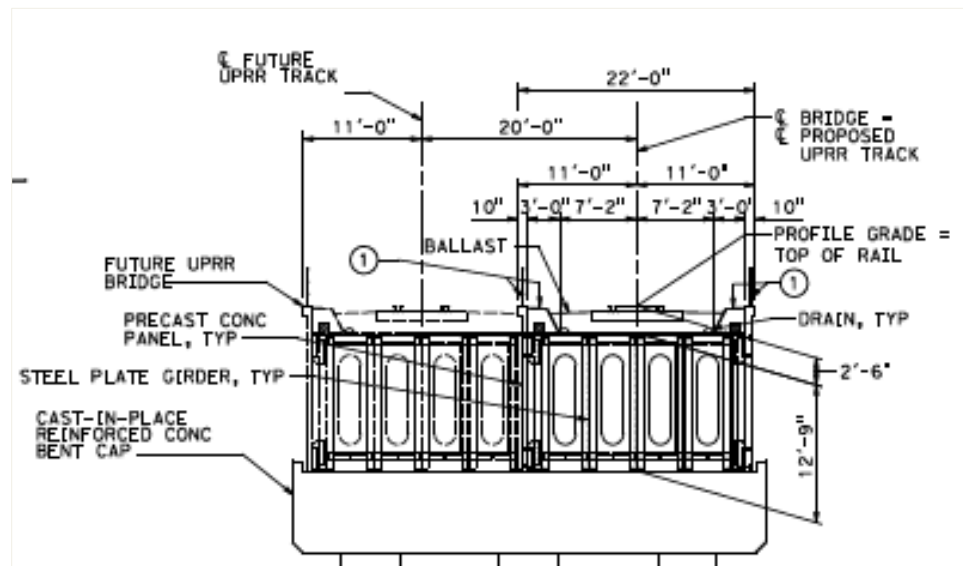


Figure 11-25 Grade Separation Structure: Steel Plate Girders

Table 11-2 SR14A Roadway Structures Summary Table

N o.	Location	Purpose	Structural type	Length (ft)	Min Height (ft)	No. of Bents	No. of Spans
1	(STA 264+00)	AVENUE R OVERHEAD	CONCRETE MULTIBOX GIRDER	708	29.01	5	6
2	STA 304+68	SIERRA HIGHWAY OVERHEAD	STRADDLE BENT	664	33.00	2	1
3	STA 315+00	AVENUE S OVERCROSSING	CONCRETE MULTIBOX GIRDER	830	25.92	8	7
4	(STA 2069+97)	BRANFORD STREET OVERHEAD	CONCRETE MULTIBOX GIRDER	64	37.81	0	1

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

Table 11-3 SR14A Grade Separation Structures Summary Table

No.	Location	Purpose	Structural Type	Length (ft)	Min Height (ft)	No. of Bents	No. of Spans
1	(STA 176+70)	SIERRA HIGHWAY UNDERPASS (SCRRA)	STEEL PLATE GIRDER	380	17.17	1	2
2	(STA 177+00)	SIERRA HIGHWAY UNDERPASS (UPRR)	STEEL PLATE GIRDER	372	16.83	1	2
3	(STA 210+00)	AVENUE Q UNDERPASS (UPRR)	STEEL PLATE GIRDER	105	17.50	0	1
4	(STA 210+00)	AVENUE Q UNDERPASS (SCRRA TRACK 2)	STEEL PLATE GIRDER	110	17.50	0	1
5	(STA 210+00)	AVENUE Q UNDERPASS (SCRRA TRACK 1)	STEEL PLATE GIRDER	105	17.50	0	1
6	(STA 237+00)	PALMDALE BOULEVARD UNDERPASS (SCRRA TRACK 2)	TRUSS SINGLE TRACK	160	18.25	0	1
7	(STA 237+00)	PALMDALE BOULEVARD UNDERPASS (SCRRA TRACK 1)	TRUSS SINGLE TRACK	160	18.25	0	1

No.	Location	Purpose	Structural Type	Length (ft)	Min Height (ft)	No. of Bents	No. of Spans
8	(STA 237+00)	PALMDALE BOULEVARD UNDERPASS (UPRR)	TRUSS SINGLE TRACK	160	18.67	0	1
9	STA 299+07	METROLINK OVERHEAD	STEEL PLATE GIRDER	463	28.00	2	1
10	STA (2092+07)	VULCAN MINE HOPPER FACILITY	STEEL PLATE GIRDER	110	24.50	0	1

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

11.3 Existing Structures

The only existing structure that the alignment of the project is crossing is the bridge at the I-5, shown in Table 11-4:

According to the current available information, none of the foundations nor substructure element seem to be affected by the new HSR line and neither the superstructure would be affected by change of shape, length or loads.

Table 11-4 SR14A Existing Structures Summary Table

No.	Bridge Name	Bridge Owner	Bridge number	Inventory Route or Feature	Sufficiency Rating	Recommendation
1	I-5	Caltrans	53C1344	I-5	--	--

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12 TUNNELS

The SR14A Build Alternative includes 27.95 miles of tunnels plus 1.23 miles of cut and cover and trench sections, completing 71 percent of the alignment below grade (underground and open trench).

SR14A Build Alternative would involve 7.56 miles of tunneling beneath the ANF including portions within the SGMNM.

Twin tunnels with a typical center-to-center spacing of 66 feet would be considered except in the final section before Burbank Airport Station where it would be a single tunnel configuration.

Cross-passages between twin tunnels would be built for two purposes: for emergency egress (not further than 800 ft apart), and for technical rooms. For not invading the egress clearance, a provision is included for additional cross-passages exclusively dedicated to technical equipment that would not be accessible as escape routes. In total, there would be needed 204 cross-passages along the twin tunnels.

The SR14A Build Alternative in the Central Subsection would begin at Spruce Court at grade, curving eastward and continuing south approximately 300 feet east of Una Lake. South of Una Lake, the SR14A Build Alternative would curve westward, cross over the SCRRA Antelope Valley Line, Sierra Highway and the Soledad Siphon, and continue southwest to enter a tunnel portal approximately 0.5 miles northeast of the Sierra Highway/Pearblossom Highway intersection. The SR14A Build Alternative would then continue westward, in a long tunnel before surfacing approximately 0.75 mile east of Agua Dulce Canyon Road. Tunnel #1A is a 13.22-mile-long twin tunnel that can be bored with four Tunnel Boring Machines (TBMs). This tunnel is divided at STA 820+00 (Intermediate Window) in two stretches designated as Tunnel #1A1 and Tunnel #1A2. At this Intermediate Window (IW) the ground cover is approximately 150 ft. This IW has been designed for constructability purposes. This IW allows splitting the Tunnel #1A into two drives of very similar length. Two TBMs would be launched to drive the twin tunnel #1A from the IW and, also in that IW, the other two TBMs would be retrieved after driving the twin tunnel #1B. A typical section of the twin tunnels bored with TBM is shown in Figure 12-1:

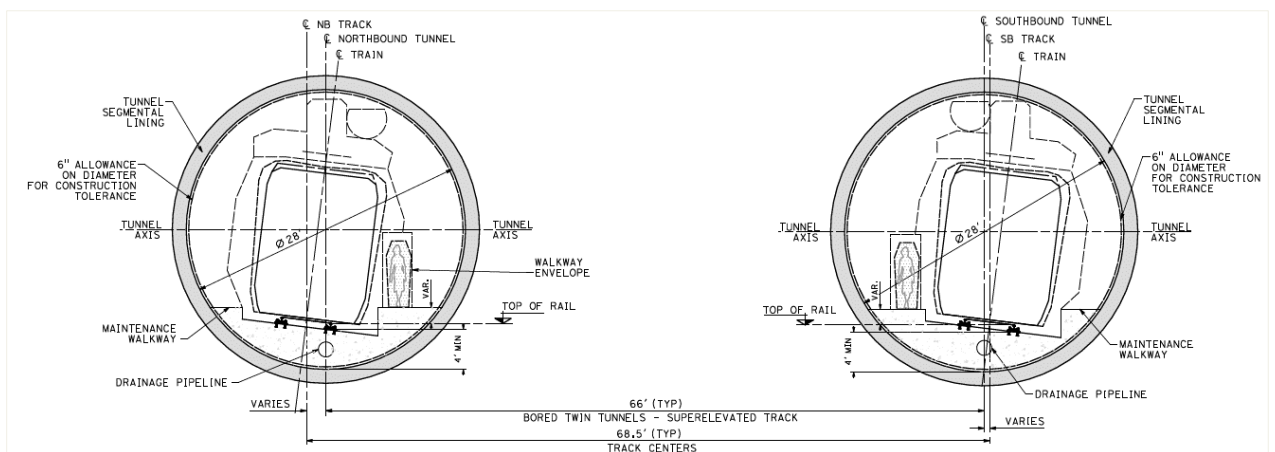


Figure 12-1 Twin Tunnels Bored with TBM Typical Section

After this long tunnel, the alignment would transition between at-grade and elevated profiles closely paralleling State Route (SR) 14 before entering an approximately 1-mile-long tunnel: Tunnel #2A. Transitioning from tunnel to at grade, the SR14A Build Alternative would converge with the Refined SR14 Build Alternative at the Soledad Canyon Mining Operations (Vulcan Mine).

Tunnel #2A is roughly one-mile length and it would be mined in rock with conventional methods like drill and blast, or roadheaders. A typical section of the twin tunnels mined is shown in Figure 12-2.

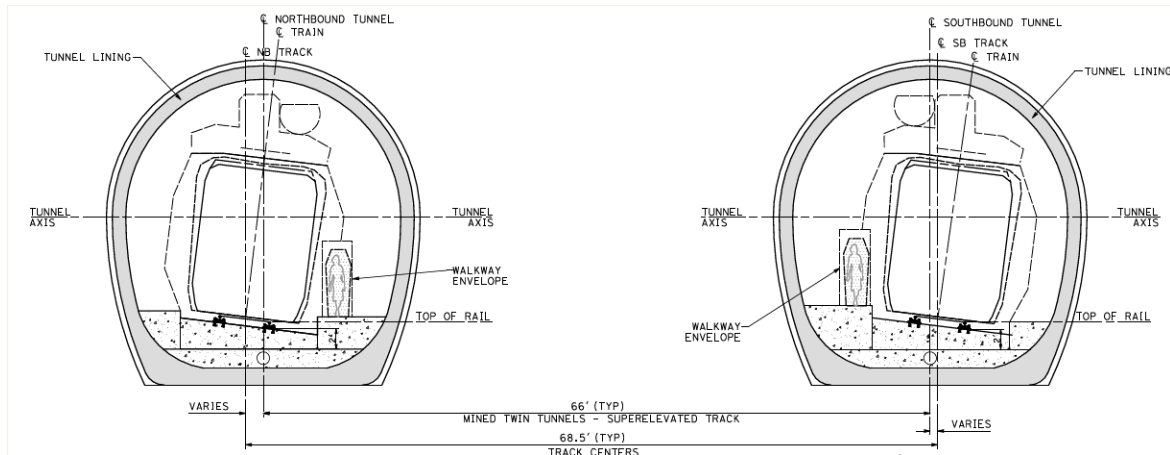


Figure 12-2 Twin Tunnels Mined in Rock Typical Section

These two tunnels would have a maximum overburden less than 1,000 ft.

Tunnel #1A1 has a maximum ground cover of 573.4 ft, and tunnel #1A2 a maximum ground cover of 878.5 ft. Both tunnels, but mainly Tunnel #1A1, also have long stretches with cover under 150 ft as it passes under Sierra Hwy and Antelope Valley Fwy (SR14) with 57 ft and 66 ft ground cover respectively over TOR. Although they are expected to be driven also through sound hard rock, the tunnels exceptional length and variable depth indicate that there are many uncertainties and risks that need to be mitigated through further geotechnical investigations and design.

The support of the ground in the TBM tunnels would be done with a one-pass precast concrete segmental lining of reinforced concrete. Rubber gaskets would assure the water tightness of lining up to 25 bars of water head.

Primary support of mined tunnels would combine shotcrete, dowels and steel arches and it would be built simultaneously with the excavation. A sheet of PVC installed between the primary support and the permanent in situ concrete lining would achieve water tightness of mined tunnels.

After crossing the Vulcan Mine in at-grade-covered twin tunnels, the SR14A Build Alternative would go through 12.35-mile-long twin tunnels with a maximum depth of 2,080 feet beneath the ANF including SGMNM, the City of Santa Clarita and the Pacoima neighborhood of the City of Los Angeles. The twin tunnels would pass through the San Gabriel Fault Zone (SGFZ) and the Sierra Madre Fault Zone (SMFZ).

Tertiary-age and younger sedimentary rock deposits are located at the boundaries of the ANF, so no high overburden or groundwater heads are expected in the first 3.78 miles of the long twin tunnels where, on the other hand, rock quality is poor and expected hydraulic conductivity is high to very high. Tunnels under SGFZ combines very high overburden (>1,500 ft), very poor rock quality and risk of heavy squeezing. Also, groundwater head over 25 bar is expected. South of SGFZ, the estimates suggest that the predominant rock quality is fair although groundwater head would get its maximum around 50 bar.

Each tube of the 12.35-mile-long twin tunnel under the ANF will have three mined fault chambers (2.39 miles in total length) and a mined dismantling chamber for the TBMs. The rest of the tunnels' length will be driven with TBMs and one-pass lining, except for one section 1.89 mile-long of two-pass lining to cope with the higher groundwater heads. The internal diameter (ID) of

the TBM driven twin tunnels will be 31.5 ft during the last 8.57 miles to accommodate expected fault displacements instead of the regular 28 ft ID used in the rest of the TBM driven tunnels.

A vertical binocular shaft, 160 ft depth, would be excavated to increase the number of accesses for construction purposes. The shape of the shaft consists of two intersecting circles separated by a diaphragm wall. After tunnel construction is finished, the shaft would be filled and sealed.

The long tunnels under ANF must accommodate some underground traction power facilities, namely paralleling and switching stations.

The cross-passages and underground traction power facilities could be constructed using conventional methods similarly to the mined tunnels.

When the water head were higher than 25 bar a sheet of PVC installed between the primary support and the permanent in situ concrete lining would achieve water tightness.

A conceptual design has been done for the fault chambers with a highly compressible buffer of cellular concrete that allows large deflections and assures a very low permeability. The primary support of these fault chambers, as well as that of the dismantling chambers and two intermediate adits would be the same as in the mined tunnels.

The SR14A Build Alternative would emerge at grade east of the existing Antelope Valley Metrolink Corridor just after Montague Street in the Pacoima neighborhood of Los Angeles.

The area between the limit of the ANF and the launching shaft foreseen south of I-210 is unevenly urbanized with, mostly, family houses concentrated in some stretches. The vertical alignment is around 225 ft deep and the settlements risk to buildings within the influence zone of the tunnels is low to moderate.

From the crossing under I-210 to Montague St (2.20 miles), the twin tunnels run under residential and industrial facilities at Pacoima. Most of the tunnels in the San Fernando Valley would be excavated through alluvium, although some stretches of these 2.20 miles could be excavated in bedrock. The alluvium consists primarily of fine–medium grain sand with silt and some gravel. Cobbles and boulders are expected locally. The alluvium shows increasing strength and stiffness with depth as the SPT blow count increases. Groundwater is generally reported deeper than the designed tunnels. This stretch underpasses zones of family houses and the risk to buildings within the influence zone of the tunnels is low to moderate, although particular attention should be paid to the zone immediate close to the portal at Hansen Spreading Grounds as the tunnels groundcover and axes separation are smaller here. Strict control of the tunnel-driving operations would be required during construction to keep the settlements at surface within acceptable limits.

TBM tunnels in Burbank would be excavated with closed face earth pressure balance or slurry machines capable of exerting a positive pressure at the tunnel face to control the ground loss. This increases the stability of the tunnel face and decreases the settlements over them to very small values.

From Montague Street, SR14A Build Alternative would continue 0.35 miles south in a retained cut/trench and crosses the Los Angeles County Flood Control Channel on viaduct. Continuing along the Metrolink Corridor East to the Metrolink track, SR14A Build Alternative would then proceed southeast at-grade to the I-5 undercrossing. Continuing from the I-5 undercrossing, the alignment would transition to a 0.40-mile open trench that turns into a cut-and-cover, two-track, and single-box tunnel just before the crossing with Olinda St. Figure 12-3 shows a typical cross section of this cut and cover single cell tunnel.

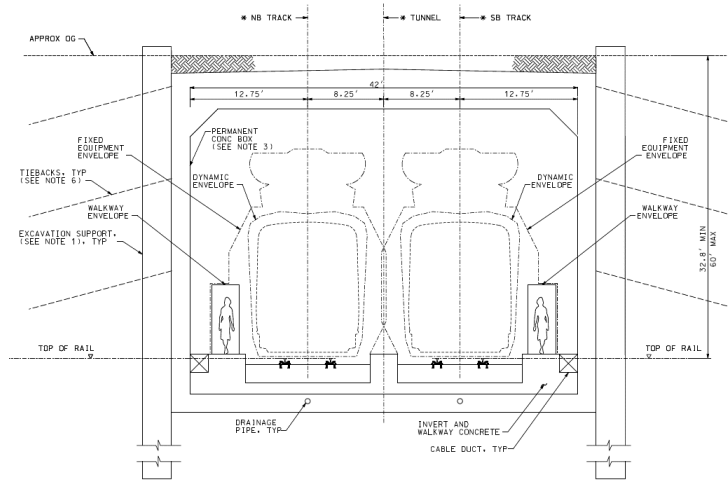


Figure 12-3 Single Cell Cut and Cover Typical Section

The cut-and-cover stretch connects, after 0.32 miles, with a two-track single tunnel built with the Sequential Excavation Method (SEM). The equivalent internal diameter of this tunnel is 45 feet and its length is 1.12 mile. It runs around 105 ft deep east and parallel to the existing Metrolink Corridor. A typical section of the SEM single tunnel is shown in Figure 12-4.

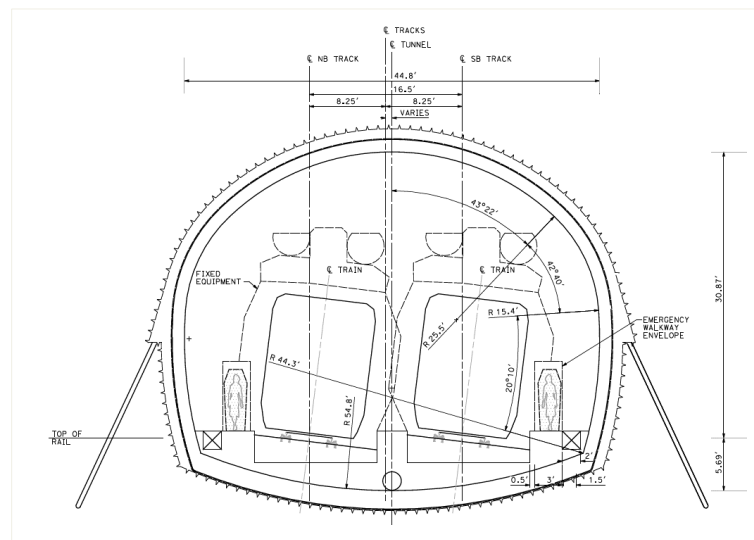


Figure 12-4 SEM 2-Track Tunnel Typical Section

There is low settlement risk for buildings, given that most of them are located far away from the tunnel centerline. However, at the end of the alignment, there is a horizontal curve where the alignment leaves the Metrolink Corridor, and runs under some buildings with a higher risk of settlement damage. Although the buildings potentially affected are inside the ROW, this zone would have to be analyzed in more detail at a more advanced stage of design.

Three proposed emergency exit stairways would be located along this tunnel no further than 2,500 feet from each other or from portals or stations to comply with Safety Standards.

A SEM cavern with equivalent internal diameter 64 ft and 0.23 mile-long, would cross under San Fernando Road and Lockheed Drive, finishing after crossing Cohasset St. Because soft ground conditions are expected in Burbank, the excavation stability of the face of SEM tunnels requires

dividing the cross section in successive smaller phases of excavation with simultaneous support with shotcrete, welded meshes and steel arches or lattice girders. Once the excavation of the complete cross section is finished, a watertight secondary lining of cast-in place concrete would be built. A typical section of the SEM cavern is shown in Figure 12-5.

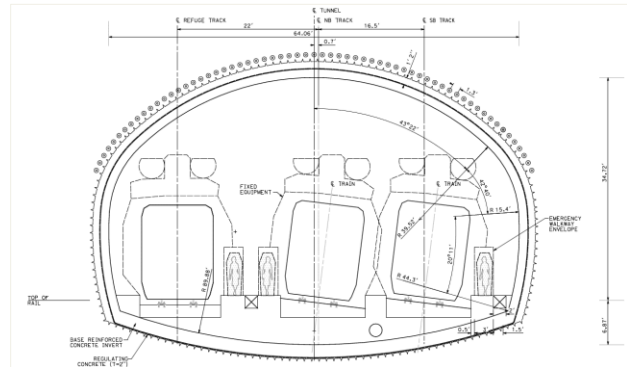


Figure 12-5 SEM Cavern Typical Section

From Cohasset St to the Burbank Airport Station, the SR14A Build Alternative would continue in a cut and cover to the end of the Palmdale-Burbank Section (Burbank Airport Station’s platform’s south edge). First, a box 0.17 mile-long with a width of excavation between 78 ft and 104 ft and up to 105 ft deep, and finally, Burbank Airport Station, 0.27 mile-long with a width of excavation of 198.5 ft and between 93 ft and 75 ft deep. Because the great width and height of the excavations, ground improvement is anticipated in this area before installing the rigid excavation support system, as well as tiebacks or ground anchors.

Table 12-1 summarizes the tunnel sections of the SR14A Build Alternative.

Table 12-1 Summary of Proposed Tunnels

N°	Drive	Location	Tunnel Length	Drive Length	ID / Width	Type	Location and Consideration of Support Facilities
Tunnel #1A	#1A1	From 820+00.00 (launch) to 472+31.00 (end of drive)	13.22 mi	6.59 mi	28'	Twin tunnels. TBM	43 Cross passages (every 800ft) 1 Underground traction power station 6 Technical rooms 2 portals (P1A-Dismantling TBMs and IWA Launching TBMs)
	#1A2	From 1170+00.00 (launch) to 820+00.00 (end of drive)		6.63 mi	28'	Twin tunnel. TBM	43 Cross passages (every 800ft) 1 Underground traction power station 6 Technical rooms 2 Portals (IWA-Dismantling TBMs and P2A-Launching TBMs)
Tunnel #2A		From 1288+00.00 (mining portal) to 1233+50.00 (end of mining)	1.03 mi	1.03 mi	28'	Twin tunnels. MINED	6 Cross passages (every 800ft) 1 Technical rooms 2 Portals (P3A and P4A)
Tunnel #5		From 1378+92.77 to 1403+49.40	12.82 mi	0.47 mi	28'	Twin tunnels. C&C AT GRADE	83 Cross passages (every 800ft) 1 Underground traction power station 12 Technical rooms 1 pumping station 3 Fault chambers totalizing 2.39 miles 1 Dismantling chamber for TBMs 2 Portals for launching TBMs (P-9 and P10) 1 Adit IW1 STA (1882+50) (vertical shaft for construction). Launching and dismantling TBMs 1 Potential Adit for shortening
		From 1403+49.40 (1346+58.92) (launch) to (1546+00.00) (dismantling chamber)		3.78 mi	28'	Twin tunnels. TBM (Two-pass lining between (1600+00.00) and (1700+00.00)).	
		From (1546+00.00) (mining start) to (1610+00.00) (mining end)		1.21 mi	31.5'	Twin tunnels. MINED	
		From (1882+50.00) (launch) to (1610+00.00) (retrieving)		5.16 mi	31.5'	Twin tunnel. TBM. 2 MINED enlarged fault chambers.	

N°	Drive	Location	Tunnel Length	Drive Length	ID / Width	Type	Location and Consideration of Support Facilities
		From (1998+90.00) (launch) to (1882+50.00) (retrieving)		2.20 mi	31.5'	Twin tunnel. TBM-EPB	construction time. 2 possible locations for descending galleries and launching and dismantling chambers for TBMs near Pacoima reservoir.
Tunnel #6		From (2231+18.00) mining portal to (2160+00.00) mining end.	1.35 mi	1.12 mi	45'	SEM Single tunnel	3 Emergency Egress (2,500ft apart) 1 Portal (P11)
				0.23 mi	64'	SEM cavern	
CC1		(1546+00.00)	0.35 mi	0.35 mi	120'	Open trench	Launching TBMs and permanent portal facilities
CC2		(2121+91.00)	0.72 mi	0.40 mi	42'	Open trench	Access to SEM single tunnel excavation
				0.32 mi	42'	C&C Single cell box	
CC3		(2231+18.00)	0.44 mi	0.17 mi	78'-125.5'	C&C Single cell box	Access to SEM cavern excavation
				0.27 mi	198.5'	C&C Burbank Station	

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

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13 FLOODPLAIN IMPACTS, HYDROLOGY/HYDRAULICS, AND STORMWATER MANAGEMENT

13.1 Floodplain Impacts

FEMA regulatory floodplain review, hydrologic analyses, and hydraulic analyses were completed to identify areas of floodplain impact and quantify the impacts from proposed project improvements for the Palmdale to Burbank Project Section.

The impacts to the regulatory floodplains of the Federal Emergency Management Agency (FEMA) caused by the proposed improvements to the project have been analyzed.

In the summary table, bridges are listed with the maximum rise in the water surface elevations for the 100-year event. For the floodplain crossings analyzed, FEMA criteria is met.

Table 13-1 below summarizes the recommendations.

Table 13-1 Floodplain Crossing Recommendations

Crossing	Maximum WSEL Rise (ft)	Recommendation
Agua Dulce Canyon Creek	0.95	Meets FEMA Criteria*
Agua Dulce Canyon Creek Side Channel	0.54	Meets FEMA Criteria*
Santa Clara River	0.02	Meets FEMA Criteria*
Burbank Area	N/A	No change in FEMA BFE with LOMR

*Meets FEMA criteria assuming the existing and future development in the floodplain combined with the proposed HSR improvements would create less than 1-ft cumulative rise in the base flood elevation.

A majority of the crossings analyzed in this report are composed of braided or multiple meandering low-flow channels traversing flat floodplain areas. This creates a number of flow paths and inundation limits depending on flow splits. Future phases of work could capture these split flow conditions more accurately with a two-dimensional model.

Additionally, most of these systems appear to have fairly large sediment loads with depositional trends and multiple channel avulsions. Inundated areas represent a snapshot in time and are based on topographic data that is likely changing with each major storm event.

Results presented should be considered preliminary and liable to change as advanced design information is available and the hydraulic modelling is refined. Analysis completed in this document is intended for comparison purposes only and is not based on FEMA effective models. FEMA floodplain inundation mapping and design would require additional information from hydraulic modelling and more detailed design information. Additionally, project development would need to consider the impacts of Presidential Executive Order 13690 for addressing climate change and project resiliency.

13.2 Hydrology and Hydraulics analysis

The hydrological and hydraulic analysis performed consists of the following items:

1. Identifying drainage crossings along the HSR alignment.
2. Estimating the design flows at identified drainage crossings using United States Geological Survey (USGS) regional regression equations.
3. Estimating the size of proposed storm drainage facilities (such as culverts) needed to safely convey the design flows across the HSR.

4. Identifying existing major storm drainage facilities that may need to be realigned or reallocated to function properly with the installation of the HSR.
5. Estimating change in design storm runoff produced by proposed impervious areas and within the entrenched segments of the HSR.

As the design continues to progress, the Hydrological and hydraulic studies would require updates and refinements. Refinements to the hydrology and hydraulic analyses are recommended to compute flow rates and hydraulic performance of drainage facilities more accurately.

The evaluation of the Palmdale to Burbank Project Section for the 15 percent design consisted of identifying existing facilities and conflicts with proposed HSR improvements. The 15 percent H&H analysis did not include an evaluation of the adequacy of these facilities. Future analyses should include a closer consideration of the impacts that the capacity of existing drainage facilities may have on HSR alignments.

The hydrology and hydraulics performed are consistent with a 15 percent level of design. These analyses were carried out with best available data; some of which was developed using approximate methods. Also, design parameters such as dimensions for proposed facilities are based on current estimates which are reasonable but should be refined for a design level analysis. This study is only intended to assess the feasibility of the facilities currently being considered for design. Ultimately, it is recommended that a detailed hydrologic and hydraulic analysis be performed using detailed modeling methods.

13.3 Stormwater Management Plan

The water quality impacts of the proposed project have been analyzed and measures to mitigate effects on existing water resources have also been provided, while meeting applicable regulatory requirements for stormwater discharge.

Implementation of the SR14A Build Alternative would result in a permanent increase of impervious surfaces, runoff, and pollutant loading. Pollutants of concern from the proposed railroad mainline include sediments, heavy metals, oil and grease, trash and debris, pesticides, and organic compounds. The total new impervious surface area would be approximately 126 acres (ac).

Construction activities, such as grading and filling, increase the potential for soil erosion. Soil erosion from construction sites is a significant source of sediment and other suspended solids in runoff, which reduces water quality. In addition, chemicals, liquid products, petroleum products (such as paints, solvents, and fuels), and concrete-laden waste may spill during construction, and could reach receiving waters via stormwater runoff. The total disturbed soil area (DSA) during construction of the SR14A Build Alternative would be approximately 2,702 acres.

During the Plans, Specifications, and Estimates (PS&E) phase of the project, qualified personnel shall prepare a Storm Water Pollution Prevention Plan (SWPPP), which would be implemented during construction of the proposed project. The SWPPP identifies specific Best Management Practices (BMPs), such as Good Housekeeping and Erosion and Sediment Control BMPs, to be implemented during each construction phase in order to not cause or contribute to an exceedance of applicable water quality standards. Water quality standards for specific water bodies are outlined within the site's respective Regional Water Quality Control Board's (RWQCB) Basin Plan for the Los Angeles or the Lahontan regions. Selected BMPs would be designed to meet requirements set under the respective RWQCB's basin plan and of the associated Municipal Separate Storm Sewer System (MS4) jurisdictions within the project limits.

There are multiple MS4 jurisdictions within the HSR Project limits. The stormwater quality regulations must adhere to applicable requirements within each respective MS4 jurisdiction, and in cases where the jurisdictional requirements conflict, the more prescriptive requirement must be met. The areas of the project that do not fall under a specific MS4 jurisdictional permit would follow the California High-Speed Rail Authority MS4 Phase II Permit. The City of Palmdale,

including local right-of-way (ROW) improvements and Metrolink (Southern California Regional Rail Authority- SCRRA) would follow the Post Construction Stormwater Standard of the National Pollutant Discharge Elimination System (NPDES) of the Construction General Permit (CGP). The HSR Project is covered under the NPDES Phase II Small MS4 General Permit. A portion of the Project encroaches within the California Department of Transportation (Caltrans) ROW, namely State Route 138 (SR 138). This portion would need to comply with the Caltrans MS4 Permit. Discussion of requirements and recommended BMPs for SR 138 is provided within the Storm Water Data Report (SWDR), which is contained as an appendix to the CHSRA Palmdale to Burbank Project PEDP Record Set Stormwater Management Report.

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14 UTILITIES

14.1 Utility Impacts

The project identifies the impacts to existing utilities from the proposed HSR alignment and improvements associated with the project. The preliminary investigation for the Palmdale to Burbank Project Section shall identify High Risk and Major utilities affected by the proposed HSR track corridor, HSR station and systems facilities, upgraded UPRR and Metrolink facilities, bridge structures overcrossings, roadway grade changes and alignments, and drainage, as defined in TM 2.7.4.

Table 14-1 lists the pertinent impacted facilities in the SR14A Build Alternative:

Table 14-1 Utility Impacts

	SR14A Build Alternative
High Risk	247
Major Low Risk	143
TOTAL	390

14.2 High Risk Utilities

High Risk utilities are defined as existing facilities transporting the following materials, whether or not they are encased: petroleum products (jet fuel, crude oil, gas oil, gasoline, etc.), oxygen, chlorine, toxic or flammable gases or liquids, all sizes of natural gas pipelines, underground electric supply lines that conduct greater than 300 Volts (without effectively grounded metal sheaths), pressurized water pipelines, and pressurized sewer and storm water pipelines.

Table 14-2 lists the impacted High Risk Utility facilities in the SR14A Build Alternative:

Table 14-2 High Risk Utilities

	SR14A Build Alternative
Oil	13
Natural Gas	79
Water Lines	153
UG Power Lines	2

14.3 Major Utilities

Major Utilities are defined as subsurface, above ground or overhead facilities used for transmission (or subtransmission) regardless of size, shape or method of conveyance, including overhead and subsurface power transmission lines, 66 kV or greater, fiber optic/telecommunications transmission lines, and sanitary sewer trunk lines. Based on the utility research conducted, two types of major utilities were identified in SR14A Build Alternative: overhead power line and sanitary sewer pipelines.

Table 14-3 lists the impacted Major utilities in the SR14A Build Alternative:

Table 14-3 Major Utilities

	SR14A Build Alternative
OH Power Lines	65
Sanitary Sewer Lines	78

14.4 Relocation of Impacted Utilities

The preferred proposed realignment of utilities within the Authority Right of Way is a Transverse Encroachments that shall not have no less than 60° between utility line and rail alignment. Maintenance Access area or appurtenances needs to be outside of the California High-Speed Train Project (CHSTP) Right of Way. Longitudinal Encroachments of non-CHSTP utilities are not permitted to be installed within the Right of Way.

Existing Utility with in the newly acquired CHSTP Right of Way are to be considered on a case-by-case basis. Existing longitudinal utilities shall be relocated outside of the Right of Way unless it meets the requirements below (TM 2.7.4, page 15):

- Alternate location is not feasible, from the standpoint of providing efficient utility services in a manner conducive to safety, durability, and economy of maintenance and operations.
- The accommodation would not adversely affect the design, construction, operation, maintenance, safety, or stability of the railway facility.
- The accommodation would not interfere with or impair the proposed use or future expansion of the railway facility.
- The disapproval of the use of the right of way would result in an immitigable impact to the owner, the environment, or the public.
- The utility be located in such a manner that it can be serviced, maintained, and operated without being accessed from the railroad right of way and would not adversely affect safety or cause damage to the Authority facility.

14.5 Sectional Clearance for Proposed Utilities Crossing CHSTP

Underground utilities within the Right of Way must have 3/8" thickness welded joint steel casing with exception for electrical and communication lines. End sealed casing must extend a minimum of 25 feet from the nearest track centerline or 45 feet without end sealed. In addition, the casing must continue three feet from the Right of Way line and appurtenances must be 5 feet from the casing end.

Vertical clearance of utilities must be a minimum of five feet from track bottom base, three feet minimum from track drainage ditch, and three feet minimum from drainage pipeline.

High and Low risk clearance requirements per TM2.7.4:

High Risk Utilities

- Maintain 500 feet minimum horizontal separation from other High Risk facilities.
- Maintain 5 feet minimum horizontal separation from other Low Risk facilities.
- Maintain 20 feet minimum horizontal separation from load carrying structural elements.

Low Risk Utilities

- Maintain 3 feet minimum horizontal separation from other Low Risk facilities.
- Maintain 5 feet minimum horizontal separation from load carrying structural elements and 3 feet minimum horizontal separation from other structures.
- Maintain 1 foot minimum vertical separation from drainage conduits.

For underground utilities within the overpass shall be within the bridge structure or attached to the outside of the overpass structure encased with steel casing sleeve. The design shall be governed by the requirements of CPUC General Orders.

14.6 Los Angeles Department of Water and Power Electric Lines Crossing Railroad, Light Rail and Busway

For Los Angeles Department of Water and Power (LADWP) electrical lines to be proposed or relocated crossing the CHSR Alignment, it is the Agencies policy to underground the electrical facility to benefit transportation services by eliminating track or busway closures when LADWP facilities need to be accessed and provides a safe working environment for LADWP working crews. Whenever existing overhead lines are crossing a new railroad, or a transit project located in a dedicated right-of-way, the overhead lines should be replaced with an underground system.

Guidelines

- The underground electrical infrastructure shall be constructed in accordance with the California Public Utilities Commission, General Order 128, LADWP specification #104 (underground conduit and substructures), LADWP construction standards, and other applicable codes, regulations, and standards that apply.
- At crossing, vaults should be located a minimum of 25' away from the outside edge of the railroad or transit project right-of-way.
- At crossing, dip poles should be located a minimum of the height of the pole away from the railroad or transit project right-of-way.
- Transition dip poles should be made of an alternative material other than wood.
- For replacement of overhead with underground Electric facilities, refer to LADWP's Rules for Governing Water and Electric Service – Rule 20

14.7 Utility Matrix

Table 14-4 summarizes the existing High Risk and Major utility conflicts, with the information of locations, owner, size, and proposed disposition.

Table 14-4 Utility Matrix

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
1	SOCAL GAS	REFINED SR14	102+50	Sierra Hwy/ E Ave O	NATURAL GAS	10" H SL	715'	TO BE RELOCATED
2	SOCAL GAS	REFINED SR14	122+50 to 156+35	Sierra Hwy/ Lockheed Way	NATURAL GAS	4" PA	4583'	TO BE REMOVED
3	SOCAL GAS	REFINED SR14	129+16	Lockheed Way	NATURAL GAS	3" PA	484'	TO BE REMOVED
4	CITY OF PALMDALE	REFINED SR14	129+20	Lockheed Way	SEWER	18" VCP	1704'	TO BE RELOCATED
5	CITY OF PALMDALE	REFINED SR14	129+50	Lockheed Way	SEWER	12" VCP	1738'	TO BE REMOVED
6	LACWD	REFINED SR14	129+80	Lockheed Way	WATER	20" DIP	1015'	TO BE RELOCATED
7	SCE	REFINED SR14	153+10	Sierra Hwy/ Rancho Vista Blvd	OH POWER	12/6 6 kV	5360'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
8	PALMDALE WD	REFINED SR14	156+50	Sierra Hwy /Rancho Vista Blvd	WATER	12" STL	2750'	TO BE RELOCATED
9	PALMDALE WD	REFINED SR14	175+20 to 198+00	Sierra Hwy/ 5th St	WATER	12" ACP	943'	TO BE RELOCATED
10	PALMDALE WD	REFINED SR14	190+00 to 196+00	Sierra Hwy	WATER	8" DIP	747'	TO BE REMOVED
11	LACSD	REFINED SR14	191+70	Sierra Hwy	SEWER	42" VCP	1370'	TO BE RELOCATED
12	PALMDALE WD	REFINED SR14	196+50 to 210+00	Sierra Hwy/ 5th St	WATER	12" DIP	2037'	TO BE RELOCATED
13	PALMDALE WD	REFINED SR14	202+50	Clock Tower Plaza Dr/ Ave P-14	WATER	8" DIP	710'	TO BE REMOVED
14	SCE	E1	208+50	E Ave O-8/ Sierra Hwy	OH POWER	66 KV	1000'	TO BE RELOCATED
15	SCE	REFINED SR14	208+50	Sierra Hwy/ Ave Q	OH POWER	66 kV	2846'	TO BE RELOCATED
16	LACSD	REFINED SR14	209+90	5th St/ Ave Q/ Sierra Hwy	SEWER	15" VCP	1220'	PROPOSED JACK AND BORE WITH CASING
17	LACSD	REFINED SR14	209+90	5th St/ Ave Q/ Sierra Hwy	SEWER	18" VCP	1184'	PROPOSED JACK AND BORE WITH CASING
18	PALMDALE WD	REFINED SR14	210+20	5th St/ Ave Q/ Sierra Hwy	WATER	12" DIP	1800'	RELOCATED W/JACK AND BORE
19	PALMDALE WD	REFINED SR14		Sierra Hwy	WATER	12" ACP		PROTECT IN PLACE
20	CITY OF PLAMDALE	REFINED SR14	210+00 to 240+50	Sierra Hwy	SEWER	10" VCP	3090'	TO BE REMOVED
21	SOCAL GAS	REFINED SR14	209+80	Ave Q/ Sierra Hwy	NATURAL GAS	6"	1725'	RELOCATE PROPOSED JACK AND BORE WITH CASING
22	PALMDALE WD	REFINED SR14	220+00 to 245+00	Sierra Hwy	WATER	12" STL	2400'	TO BE REMOVED
23	CITY OF PALMDALE	REFINED SR14	240+60	Ave 9	SEWER	8" VCP	3041'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
24	PALMDALE WD	REFINED SR14	240+50	6th St/ Ave Q-9	WATER	8" DIP	190'	TO BE RELOCATED
25	PALMDALE WD	REFINED SR14	238+50	6 th St	WATER	12" DIP	2515'	TO BE RELOCATED
26	PALMDALE WD	REFINED SR14	237+90	Palmdale Blvd	WATER	12" PVC	1393'	TO BE REMOVED
27	PALMDALE WD	REFINED SR14	237+50 to 240+00	Palmdale Blvd/ Sierra Hwy	WATER	16" DIP	205'	TO BE RELOCATED
28	PALMDALE WD	REFINED SR14		Ave Q	WATER	12"	4703'	TO BE RELOCATED
29	AT&T	REFINED SR14	195+00 to 220+00	Sierra Hwy	FIBER OPTIC	4-1.5"	4012'	PROTECT IN PLACE
30	AT&T	REFINED SR14	220+00 to 245+00	Sierra Hwy	FIBER OPTIC	4-1.5"	3012'	PROTECT IN PLACE
31	PALMDALE WD	REFINED SR14	156+50	3rd St E/ Rancho Vista Blvd/ Fairway Dr	WATER	14" STL		PROTECT IN PLACE
32	PALMDALE WD	REFINED SR14		East Ave R	WATER	12" DIP		PROTECT IN PLACE
33	SCE	REFINED SR14		East Ave R	OH POWER	66 kV		PROTECT IN PLACE
34	PALMDALE WD	REFINED SR14		Technology Dr/8th St	WATER	12" DIP		PROTECT IN PLACE
35	SCE	REFINED SR14	110+00 to 130+00	Ave Q	OH POWER	66 kV	2000'	TO BE RELOCATED
36	LACSD	REFINED SR14	210+00	Ave Q/ Sierra Hwy W of CL	SEWER	10"	1200'	TO BE RELOCATED
37	LACSD	REFINED SR14	145+00	Ave Q/ Sierra Hwy E of CL	SEWER	8" VCP	500'	TO BE REMOVED
38	AT&T	REFINED SR14	100+00 to 145+00	Sierra Hwy	FIBER OPTIC	4-1.5"	4500'	PROTECT IN PLACE
39	AT&T	REFINED SR14	100+00 to 145+00	Sierra Hwy	FIBER OPTIC	UNK N	4500'	PROTECT IN PLACE
40	CITY OF PALMDALE	REFINED SR14	122+00 to 145+00	6th St/ Ave Q/ Sierra Hwy	SEWER	15" VCP	2300'	TO BE REMOVED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
41	PALMDALE WD	REFINED SR14	125+00 to 134+00	Sierra Hwy/ Ave Q/ Palmdale Blvd	WATER	16" DIP	900'	TO BE REMOVED
42	SOCAL GAS	REFINED SR14	120+00 to 130+00	Sierra Hwy/ E Ave O	NATURAL GAS	10" H SL	1000'	PROTECT IN PLACE
43	SCE	REFINED SR14	153+00	Sierra Hwy / Rancho Vista Blvd	UG POWER	12/6 6 kV	591'	TO BE RELOCATED
44	TWC	REFINED SR14	156+75	Rancho Vista Blvd	TELE	6-2"	1303'	TO BE RELOCATED
45	LACSD	REFINED SR14	210+00	Sierra Hwy/ E Ave O-8	SEWER	18" VCP	1704'	PROTECT IN PLACE
46	CITY OF PALMDALE	REFINED SR14		5th St/ Ave Q/ Sierra Hwy	SEWER	8" V CP		TO BE RELOCATED
47	PALMDALE WD	REFINED SR14	146+00	Sierra Hwy/ Ave Q/ Palmdale Blvd	WATER	4"	3000'	TO BE REMOVED
48	CITY OF PALMDALE	REFINED SR14	220+00 to 245+00	6 th St E/ E Palmdale Blvd	SEWER	10"	5000'	TO BE REMOVED
49	CITY OF PALMDALE	REFINED SR14	240+50	6 TH St E/ E Palmdale Blvd	SEWER	8"	250'	TO BE RELOCATED
50	LACSD	REFINED SR14	238+00	E Palmdale Blvd	SEWER	8"	400'	TO BE REMOVED
51	PALMDALE	REFINED SR14	230+20	Ave Q Six/ Fifth St E	WATER	6"	900'	TO BE REMOVED
52	CITY OF PALMDALE	REFINED SR14	230+20	Ave Nine	SEWER	8"	300'	TO BE RELOCATED
53	PALMDALE WD	REFINED SR14	221+00	Ave Q Three	WATER	10"	580'	TO BE REMOVED
54	PALMDALE WD	REFINED SR14	264+00	East Ave R	WATER	8"	3000'	TO BE RELOCATED
55	CITY OF PALMDALE	REFINED SR14	265+00	Sierra Hwy	SEWER	8"	300'	TO BE RELOCATED
56	CITY OF PALMDALE	REFINED SR14	264+00	Sierra Hwy	SEWER	8"	300'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
57	PALMDALE WD	REFINED SR14		Rancho Vista Blvd	WATER		1100'	PROTECT IN PLACE
58	CITY OF PALMDALE	REFINED SR14		Rancho Vista Blvd	SEWER		1850'	PROTECT IN PLACE
59	SCE	REFINED SR14		Rancho Vista Blvd	OH POWER	12/6 6 KV	3000'	PROTECT IN PLACE
60	TWC	REFINED SR14		Rancho Vista Blvd	TELECOM	6-2"	2440'	PROTECT IN PLACE
61	UNKNOWN	REFINED SR14		Third St	SEWER	UNK NO WN	1310'	PROTECT IN PLACE
62	CITY OF PALMDALE	REFINED SR14		Rancho Vista Blvd	SEWER	15"	2300'	PROTECT IN PLACE
63	PALMDALE WD	REFINED SR14		Rancho Vista Blvd	WATER	12"	2000'	PROTECT IN PLACE
64	TWC	REFINED SR14		Rancho Vista Blvd	TELE	6-2"	1500'	PROTECT IN PLACE
65	TWC	REFINED SR14		Rancho Vista Blvd	TELE	6-2"	50'	TO BE RELOCATED
66	CITY OF PALMDALE	REFINED SR14		Rancho Vista Blvd	SEWER	15"	1275'	PROTECT IN PLACE
67	LACSD	REFINED SR14		Technology Dr	SEWER	42"	3000'	PROTECT IN PLACE
68	CITY OF PLAMDALE	REFINED SR14		E Palmdale Blvd/ Tenth St	SEWER	8"	980'	TO BE REMOVED
69	CITY OF PALMDALE	REFINED SR14		E Palmdale Blvd/ Tenth St	SEWER	8"	1000'	TO BE RELOCATED
70	CITY OF PALMDALE	REFINED SR14		East Ave R	SEWER	10"	660'	PROTECT IN PLACE
71	CITY OF PALMDALE	REFINED SR14		East Ave R	SEWER	10"	2000'	PROTECT IN PLACE
72	CITY OF PALMDALE	REFINED SR14		Ave R	SEWER	8"	620'	TO BE RELOCATED
73	CITY OF PALMDALE	REFINED SR14		Av R	SEWER	8"	280'	PROPOSED
74	SCE	REFINED SR14		Ave Q	OH POWER	66 KV	150'	TO BE RELOCATED
75	CITY OF PALMDALE	REFINED SR14	224+00 to 227+00	Ave Q/ 5 th St	SEWER	8"	750'	TO BE REMOVED
76	UNKNOWN	REFINED SR14	237+80	Palmdale Blvd	UG ELECTRIC	UNK NO WN	700'	TO BE RELOCATED
77	PALMDALE WD	REFINED SR14	237+80	Palmdale Blvd	WATER	12" STL		TO BE REMOVED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
78	AT&T	REFINED SR14	120+00 to 145+00	Sierra Highway	FIBER OPTIC	UNK NO WN	1600'	PROTECT IN PLACE
79	CITY OF PALMDALE	REFINED SR14	127+00 to 134+00	Sierra Highway	SEWER	15"	450'	TO BE REMOVED
80	AT&T	REFINED SR14	129+00	Lockheed Way	FIBER OPTIC	4-1.5"	1000'	TO BE RELOCATED
81	AT&T	REFINED SR14	175+00	Sierra Highway	FIBER OPTIC	4-1.5'	1000'	TO BE RELOCATED
82	PALMDALE WD	REFINED SR14	210+00 to 220+00	Sierra Highway	WATER	12"	1500'	TO BE REMOVED
83	SCG	REFINED SR14		Rancho Vista Blvd	GAS	4"	200'	TO BE REMOVED
84	PALMDALE WD	REFINED SR14		Palmdale Blvd	WATER	12"	1100'	PROTECT IN PLACE
85	PALMDALE WD	REFINED SR14		Palmdale Blvd	WATER	12"	900'	TO BE RELOCATED
86	AT&T	SR14A	263+70 to 283+00		FIBER OPTICS	4-1.5"	1300'	PROTECT IN PLACE
87	PALMDALE WD	SR14A	265+57	Avenue R	WATER	12" H SL	2844'	TO BE RELOCATED
88	CITY OF PALMDALE	SR14A	263+72	Avenue R	SEWER	8"	2095'	TO BE RELOCATED
89	AT&T	SR14A	266+00	Avenue R	FIBER OPTICS	4-1.5"	985'	TO BE RELOCATED
90	PALMDALE WD	SR14A	263+27	Avenue R	WATER	12"	42'	PROTECT IN PLACE
91	CITY OF PALMDALE	SR14A	263+70 to 270+00		SEWER	8" VCP	600'	TO BE RELOCATED
92	SCE	SR14A	265+57	Avenue R	OH POWER	69 KV	3225'	TO BE RELOCATED
93	PALMDALE WD	SR14A	290+50 to 295+00		WATER	18" STL	469'	PROTECT IN PLACE
94	PALMDALE WD	SR14A	291+00 to 295+00		WATER	16" STL	361'	PROTECT IN PLACE
95	CITY OF PALMDALE	SR14A	270+00 to 275+00	6th St East	SEWER	8" VCP	500'	TO BE RELOCATED
96	PALMDALE WD	SR14A	270+00 to 276+00	6th St East	WATER	12" DIP	600'	TO BE RELOCATED
97	PALMDALE WD	SR14A	290+50	Ave R Eight	WATER	12" STL	602'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
98	PALMDALE WD	SR14A	291+00 to 296+80		WATER	8"	535'	REMOVE - ABANDONED
99	SPRINT	SR14A	284+40 to 323+00		FIBER OPTICS	UNK NO WN	4045'	TO BE RELOCATED
100	PALMDALE WD	SR14A	299+00 to 318+50		WATER	16"	1982'	TO BE RELOCATE
101	SCG	SR14A	318+75	Avenue S	GAS	4"	1395'	TO BE RELOCATED
102	PALMDALE WD	SR14A	299+00 to 318+50		WATER	18"	1972'	TO BE RELOCATE
103	PALMDALE WD	SR14A	298+00 to 318+00		WATER	8"	1959'	REMOVE - ABANDONED
104	PALMDALE WD	SR14A	318+75	Avenue S	WATER	42"	312'	TO BE RELOCATED
105	PALMDALE WD	SR14A	318+75	Avenue S	WATER	12"	2128'	TO BE RELOCATED
106	SCG	SR14A	318+75	Sierra Highway	GAS	4"	474'	REMOVE
107	AT&T	SR14A	318+75	Avenue S	TELEPHONE	UNK NO WN	3188'	TO BE RELOCATED
108	SCG	SR14A	318+75	Avenue S	GAS	30"	3991'	TO BE RELOCATED
109	PALMDALE WD	SR14A	314+00 to 318+50		WATER	48"	353'	TO BE RELOCATED
110	PALMDALE WD	SR14A	314+00 to 318+50		WATER	30"	307'	TO BE RELOCATED
111	PALMDALE WD	SR14A	314+00 to 318+50		WATER	36"	259'	TO BE RELOCATED
112	SCE	SR14A	318+75	Avenue S	OH POWER	UNK NO WN	2423'	TO BE RELOCATED
113	PALMDALE WD	SR14A	318+75	Avenue S	WATER	24"	916'	TO BE RELOCATED
114	PALMDALE WD	SR14A	318+75	Avenue S	WATER	20"	304'	TO BE RELOCATED
115	PALMDALE WD	SR14A	318+75	Avenue S	WATER	8"	642'	PROTECT IN PLACE
116	PALMDALE WD	SR14A	318+75	Avenue S	WATER	20"	893'	TO BE RELOCATED
117	PALMDALE WD	SR14A	318+75	Avenue S	WATER	8"	33'	REMOVE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
118	PALMDALE WD	SR14A	318+75	Avenue S	WATER	8"	303'	REMOVE
119	LACSD	SR14A	305+00 317+00	E Ave 10th	SEWER	10"	1165'	TO BE RELOCATED
120	SCG	SR14A	305+00 317+00	E Ave 10th	GAS	4"	1510'	TO BE RELOCATED
121	SCG	SR14A	305+00 317+00	E Ave 10th	GAS	10"	1580'	TO BE RELOCATED
122	PALMDALE WD	SR14A	318+75	E Ave 10th	WATER	12"	1708'	TO BE RELOCATED
123	PALMDALE WD	SR14A	318+75	Avenue S	WATER	24"	1355	TO BE RELOCATED
124	PALMDALE WD	SR14A	318+75	E Ave 10th	WATER	24"	1872'	TO BE RELOCATED
125	AT&T	SR14A	318+75	E Ave 10th	TELEPHON E	UNK NO WN	1350'	TO BE RELOCATED
126	PALMDALE WD	SR14A	318+75	Avenue S	WATER	16"	1104	TO BE RELOCATED
127	AT&T	SR14A	305+00 to 317+00	E Ave 10th	TELEPHON E	UNK NO WN	1379	TO BE RELOCATED
128	CITY OF PALMDALE	SR14A	318+75	Avenue S	SEWER	8"	932	PROTECT IN PLACE
129	PALMDALE WD	SR14A	324+50 to 328+50	Valley Forge	WATER	UNK NO WN	389	TO BE RELOCATED
130	PALMDALE WD	SR14A	318+00 to 323+50	Sierra Hwy	WATER	24"	578	TO BE RELOCATED
131	PALMDALE WD	SR14A	318+00 to 323+50	Sierra Hwy	WATER	6"	445	TO BE RELOCATED
132	AT&T	SR14A		Sierra Hwy	TELEPHON E	UNK NO WN	933	TO BE RELOCATED
133	PALMDALE WD	SR14A	405+52	Sierra Hwy	WATER	20"	998'	PROTECT IN PLACE
134	PALMDALE WD	SR14A	405+53	Sierra Hwy	WATER	20"	990'	PROTECT IN PLACE
135	U.S. SPRINT	SR14A	406+05 to 407+70	Sierra Hwy	FIBER OPTIC	4"	175'	RELOCATE
136	AT&T	SR14A	404+22 to 409+00	Sierra Hwy	TELEPHON E	UNK NO WN	775'	PROTECT IN PLACE
137	SCE	SR14A	405+26 to 408+00	Sierra Hwy	OH POWER	12 KV	425'	RELOCATE
138	PALMDALE WD	SR14A	404+60	Sierra Hwy	WATER	8"	430'	RELOCATE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
139	PALMDALE WD	SR14A	404+88	Sierra Hwy	WATER	8"	395'	PROTECT IN PLACE
140	PALMDALE WD	SR14A	402+95	Sierra Hwy	SD	8"	196'	PROTECT IN PLACE
141	PALMDALE WD	SR14A	409+05	Sierra Hwy	WATER	20"	163'	RELOCATE
142	PALMDALE WD	SR14A	409+10	Sierra Hwy	WATER	20"	179'	RELOCATE
143	PALMDALE WD	SR14A	409+80	Sierra Hwy	WATER	20"	140'	RELOCATE
144	AUTHORITY	SR14A	461+65 to 587+00	Sierra Hwy/ W Carson Mesa Rd/ Harbea Carson Mesa Rd	TP-POWER	230 KV	11046'	PROPOSED
145	AVEK	SR14A	484+00 to 491+00	Sierra Hwy	WATER	20"	130'	PROTECT IN PLACE
146	UNKNOWN	SR14A	486+90 to 520+00	Sierra Hwy	FIBER OPTIC	UNK NO WN	3620'	PROTECT IN PLACE
147	SCE	SR14A	481+90 to 488+50	Sierra Hwy	OH POWER	12 KV	1100'	PROTECT IN PLACE
148	AVEK	SR14A	506+50 to 545+00	Sierra Hwy	WATER	20"	4827'	PROTECT IN PLACE
149	UNKNOWN	SR14A	520+00 to 545+00	Sierra Hwy	FIBER OPTIC	UNK NO WN	2511'	PROTECT IN PLACE
150	SCE	SR14A	520+00 to 545+00	Sierra Hwy	OH POWER	12 KV	600'	PROTECT IN PLACE
151	SCE	SR14A	524+70 to 525+65	Sierra Hwy	OH POWER	(2) 12 KV	1200'	PROTECT IN PLACE
152	SCE	SR14A	548+95 to 551+70	Sierra Hwy	OH POWER	(3) 230 KV	1500'	PROTECT IN PLACE
153	SCE	SR14A	556+70 to 557+10	Sierra Hwy	OH POWER	(2) 500 KV	1100'	PROTECT IN PLACE
154	AVEK	SR14A	561+10 to 566+00	Sierra Hwy	WATER	(3) 20"	1000'	PROTECT IN PLACE
155	UNKNOWN	SR14A	545+00 to 565+16	Sierra Hwy	FIBER OPTIC	UNK NO WN	2116'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
156	AVEK	SR14A	594+00 to 600+00		WATER	(2) 20"	400'	PROTECT IN PLACE
157	LACDPW	SR14A	639+60	San Gabriel Ave	WATER	8"	300'	PROTECT IN PLACE
158	LACDPW	SR14A	648+50 to 649+50	Sierra Hwy	WATER	12"	420'	PROTECT IN PLACE
159	UNKNOW	SR14A	670+00 to 681+00	Sierra Hwy	FIBER OPTIC	UNK NO WN	1250'	PROTECT IN PLACE
160	LACDPW	SR14A	670+00 to 695+00	Sierra Hwy	WATER	24"	810'	PROTECT IN PLACE
161	LACDPW	SR14A	674+00 to 681+00	Sierra Hwy	WATER	12"	850'	PROTECT IN PLACE
162	SCG	SR14A	671+50 to 674+00	Sierra Hwy	GAS	3"	200'	PROTECT IN PLACE
163	SCG	SR14A	674+00 to 679+50	Santiago Rd	GAS	4"	615'	PROTECT IN PLACE
164	LACDPW	SR14A	677+20 to 682+00	Santiago Rd	WATER	30"	400'	PROTECT IN PLACE
165	SCG	SR14A	679+00 to 685+00	Sierra Hwy	GAS	6"	600'	PROTECT IN PLACE
166	LACDPW	SR14A	685+00 to 689+00	Santiago Rd	WATER	8"	620'	PROTECT IN PLACE
167	LACDPW	SR14A	784+00 to 795+00	Crown Valley Rd	WATER	8"	1096'	PROTECT IN PLACE
168	LACDPW	SR14A	795+00	Crown Valley Rd	WATER	12"	650'	PROTECT IN PLACE
169	LACDPW	SR14A	795+00	Crown Valley Rd	WATER	12"	450'	RELOCATE
170	AUTHORITY	SR14A	795+00 to 818+48	Crown Valley Rd	TP-POWER	UNK NO WN	9983'	PROPOSED
171	AUTHORITY	SR14A	821+00 to 844+00	Crown Valley Rd	WATER	16"	10225'	PROPOSED
172	SCE	SR14A	1174+00 to 1195+00	-	OH POWER	(3) 230 KV	2450'/ 2140'/ 1750'	PROTECT IN PLACE
173	AUTHORITY	SR14A	1175+50 to 1220+00	-	WATER	16"	6780'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
174	AUTHORITY	SR14A	1183+00 to 1195+02	-	TP-POWER	UNK NO WN	1189'	PROPOSED
175	SCE	SR14A	1196+28 to 1220+00	Agua Dulce Canyon Rd.	OH POWER	(3) 230 KV	2235'/1720'/1110'	RELOCATE
176	SCE	SR14A	1210+00 to 1212+40	Agua Dulce Canyon Rd.	OH POWER	16 KV	570'	REMOVE
177	AUTHORITY	SR14A	1213+73 to 1229+52	Agua Dulce Canyon Rd.	TP-POWER	UNK NO WN	2138'	PROPOSED
178	SCE	SR14A	1206+00 to 1210+50	Agua Dulce Canyon Rd.	OH POWER	16 KV	1400'	RELOCATE
179	AUTHORITY	SR14A	1195+00 to 1230+00	-	WATER	16"	6012'	PROPOSED
180	AUTHORITY	SR14A	1288+00 to 1346+57	Soledad Canyon Rd.	WATER	16"	11611'	PROPOSED
181	AUTHORITY	SR14A	1301+80 to 1346+11	Soledad Canyon Rd.	TP-POWER	UNK NO WN	4623'	PROPOSED
182	SCE	SR14A	1352+58	Soledad Canyon Rd.	OH POWER	16 KV	2484'	PROTECT IN PLACE
183	SCE	SR14A	1379+34	Lang Station Rd.	OH POWER	16 KV	1745'	PROTECT IN PLACE
184	AUTHORITY	SR14A	1382+20	Lang Station Rd.	WATER	16"	3603'	PROPOSED
185	AUTHORITY	SR14A	1381+82	Lang Station Rd.	TP POWER	UNK NO WN	3139'	PROPOSED
186	SCE	SR14A	545+00 to 568+20	W Carson Mesa Rd.	OH POWER	230 KV	4517'	PROTECT IN PLACE
187	SCE	SR14A	545+00 to 587+01	W Carson Mesa Rd.	OH POWER	500 KV	2353'	PROTECT IN PLACE
188	SCE	SR14A	587+00	Rockyford Rd.	OH POWER	230 KV	500'	PROTECT IN PLACE
189	LACDPW	SR14A	795+00	Crown Valley Rd.	WATER	8"	3500'	PROTECT IN PLACE
190	LACDPW	SR14A	795+00	Crown Valley Rd.	WATER	12"	679'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
191	SCG	SR14A	795+00	Crown Valley Rd. & Sierra Hwy	GAS	4"	3572'	PROTECT IN PLACE
192	LACDPW	SR14A	795+00	Crown Valley Rd.	WATER	8"	1799'	PROTECT IN PLACE
193	LACDPW	SR14A	795+00	Crown Valley Rd.	WATER	6"	859'	PROTECT IN PLACE
194	LACDPW	SR14A	806+80 to 822+70	Escondido Canyon Rd.	WATER	8"	2452'	PROTECT IN PLACE
195	UNKNOWN	SR14A	806+80 to 822+70	Escondido Canyon Rd.	OH POWER	UNK NO WN	811'	PROTECT IN PLACE
196	UNKNOWN	SR14A	822+70 to 845+00	Escondido Canyon Rd.	OH POWER	UNK NO WN	200'	PROTECT IN PLACE
197	AUTHORITY	SR14A	1140+40 to 1164+00	Escondido Canyon Rd./ Agua Dulce Canyon Rd.	WATER	16"	10828'	PROPOSED
198	SCE	SR14A	1200+20 to 1205+00	Agua Dulce Canyon Rd.	OH POWER	16 KV	2243'	PROTECT IN PLACE
199	SCE	SR14A	1176+00 to 1186+00	Agua Dulce Canyon Rd.	OH POWER	UN KNO WN	730'	PROTECT IN PLACE
200	SCE	SR14A	1346+00 to 1383+00	Soledad Canyon Rd.	OH POWER	16 KV	3848'	PROTECT IN PLACE
201	AUTHORITY	SR14A	1305+00 to 1347+00	Soledad Canyon Rd.	TP POWER	UNK NO WN	4200'	PROPOSED
202	SCE	SR14A	1376+00 to 1395+20	Lang Station Rd.	OH POWER	16 KV	3630'	PROTECT IN PLACE
203	LADWP-PS	REFINED SR14	2013+9	Branford St.	OH POWER	UNK	1419'	TO BE RELOCATED
204	CITY OF LA	REFINED SR14	2013+39	Branford St.	SEWER	12" VCP	1308'	TO BE RELOCATED
205	SCG	REFINED SR14	2013+27	Branford St.	NATURAL GAS	2"	1150'	TO BE RELOCATED
206	CITY OF LA	REFINED SR14	2015+0	Branford St.	SEWER	18"	80'	PROTECT IN PLACE
207	LADWP WS	REFINED SR14	2015+0	San Fernando Rd.	WATER	8"	240'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
208	LADWP-PS	REFINED SR14	2044+07	San Fernando Rd.	OH POWER	230 Kv	638'	TO BE RELOCATED
209	LADWP-PS	REFINED SR14	2044+54	San Fernando Rd.	OH POWER	230 Kv	618'	TO BE RELOCATED
210	AT&T-SPRINT	REFINED SR14	2045+18 To 2077+00	San Fernando Rd.	TELECOM	4-2"	1264'	TO BE RELOCATED
211	QWEST	REFINED SR14	2045+20 To 2070	San Fernando Rd.	FIBER OPTICS	2-2"	1264'	TO BE RELOCATED
212	QWEST	REFINED SR14	2045+20 To 2070	San Fernando Rd	FIBER OPTICS	2-2"	1235'	PROTECT IN PLACE
213	PLAINS ALL AMERICAN PIPELINE	REFINED SR14	2045+22 To 2070	San Fernando Rd.	OIL	20"	1264'	TO BE RELOCATED
214	CITY OF LA	REFINED SR14	2054+00 to 2057+32	San Fernando Rdwy/ Sheldon St.	SEWER	15" VCP	343'	TO BE RELOCATED
215	CITY OF LA	REFINED SR14	2045+50 to 2063+00	San Fernando Rdwy/She ldon St.	SEWER	8" VCP	1950'	TO BE RELOCATED
216	CITY OF LA	REFINED SR14	2054+00 to 2057+32	San Fernando Rdwy/ Sheldon St.	SEWER	15" VCP	123'	TO BE REMOVED
217	CITY OF LA	REFINED SR14	1950+02 to 1951+62	San Fernando Rdwy	SEWER	8" VCP	160'	TO BE REMOVED
218	CITY OF LA	REFINED SR14	1949+93	Sheldon St/ San Fernando Rdwy/San Fernando Rd.	SEWER	18" VCP	178'	TO BE RELOCATED
219	SCG	REFINED SR14	2056+92 to 2071+66	Sheldon St/ San Fernando Rdwy/ Wicks St.	NATURAL GAS	3"	160'	TO BE RELOCATED
220	SCG	REFINED SR14	2057+50	Sheldon St.	NATURAL GAS	12' (AB AN)		PROTECTED IN PLACE
221	SCG	REFINED SR14	2057+50	Sheldon St	NATURAL GAS	3"		PROTECTED IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
222	SCG	REFINED SR14	2057+50 to 2064+60	San Fernando Rd.	NATURALG AS	4"	710'	PROTECT IN PLACE
223	SCG	REFINED SR14	2015+00	Branford St.	NATURALG AS	2"	2100'	PROTECT IN PLACE
224	SCG	REFINED SR14	2012+50 to 2017+50	San Fernando Rd.	NATURALG AS	3"	480'	PROTECT IN PLACE
225	LADWP-WS	REFINED SR14	2045+0 to 2065+00	Sheldon S.t/ San Fernando Rdwy	WATER	24" DIP	1264'	PROTECT IN PLACE
226	LADWP-WS	REFINED SR14	2045+0 to 2065+00	Sheldon St/ San Fernando Rdwy	WATER	8" DIP	1235'	PROTECT IN PLACE
227	LADWP-WS	REFINED SR14	2057+43 to 2071+70	Sheldon St/ San Fernando Rdwy/ Wicks St	WATER	8" DIP	1444'	TO BE RELOCATED
228	CITY OF LA	REFINED SR14	2061+00 to 2071+76	San Fernando Roadway	SEWER	8" VCP	1072'	PROTECT IN PLACE
229	CITY OF LA	REFINED SR14	2064+50	Allegheny St. Across	SEWER	8" VCP	100'	TO BE REMOVED
230	QWEST	REFINED SR14	2070+00	San Fernando Rd.	FIBER OPTICS	2-2"	2.62 Miles	TO BE RELOCATED
231	LADWP-PS	REFINED SR14	2100+00	San Fernando Rd./ Pendleton Ave.	OH POWER		323'	TO BE RELOCATED
232	SCG	REFINED SR14	2112+00	North of Tuxford St./ San Fernando Rd.	NATURALG AS	12"	865'	TO BE RELOCATED
233	SCG	REFINED SR14	2114+50	South of Tuxford S.t/ San Fernando Rd.	NATURALG AS	4"	323'	TO BE RELOCATED
234	SCG	REFINED SR14	2114+50	North of Tuxford	NATURALG AS	8"	523'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
235	CITY OF LA	REFINED SR14	2114+50	Tuxford St./ San Fernando Rd.	SEWER	12" VCP	193'	TO BE RELOCATED
236	CITY OF LA	REFINED SR14	2115+00	North of Tuxford St./ San Fernando Blvd.	SEWER	18" VCP	411'	TO BE REMOVED
237	LADWP-WS	REFINED SR14	2115+00	Tuxford St./ San Fernando Rd.	WATER	12"	861'	PROTECT IN PLACE
238	LADWP-WS	REFINED SR14	2115+00	San Fernando Blvd.	WATER	12"	1442'	TO BE RELOCATED
239	MWD	REFINED SR14	2115+00	Tuxford St./ San Fernando Blvd./ Sunland Blvd.	WATER	48"	2551'	TO BE RELOCATED
240	LADWP-PS	REFINED SR14	2129+00	San Fernando Blvd./ Penrose St.	OH POWER		640'	TO BE RELOCATED
241	SCG	REFINED SR14	2129+00	San Fernando Blvd./ Penrose St.	NATURALG AS	4"	966'	TO BE RELOCATED
242	CITY OF LA	REFINED SR14	20052+53	San Fernando Blvd./ Penrose St.	SEWER	10" VCP	853'	TO BE RELOCATED
243	GAS	REFINED SR14	20067+18	Olinda St/ San Fernando Blvd./ San Fernando Rd.	NATURALG AS	2"	187'	TO BE RELOCATED
244	LADWP-PS	REFINED SR14	2145+00 to 2170+00	Sunland Blvd/San Fernando Blvd./ San Fernando Rd.	OH POWER		2524'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
245	LADWP-WS	REFINED SR14	2145+00 to 2161+46	Sunland Blvd./San Fernando Blvd./San Fernando Rd.	WATER	8"	1670'	PROTECT IN PLACE
246	CITY OF LA	REFINED SR14	2085+09	Sunland Blvd./San Fernando Blvd./San Fernando Rd.	SEWER	24" VCP	314'	PROTECT IN PLACE
247	PALMDALE WD	REFINED SR14		Sierra Hwy /Ave. R Eight	WATER	8" (AB AN)	370'	TO BE REMOVED
248	SPRINT	REFINED SR14		Sierra Hwy /Ave. R Eight	FIBER OPTIC		1150'	PROTECT IN PLACE
249	AUTHORITY	REFINED SR14	1539+40	Sand Canyon Rd.	WATER	8"	2200'	PROPOSED
250	AUTHORITY	REFINED SR14	1545+00 to 1560+00	Sand Canyon Rd.	WATER	8"	1580'	PROPOSED
251	VERIZON	REFINED SR14	1739+42	Pacoima Canyon	TEL (OH)		3011'	PROTECT IN PLACE
252	LADWP	REFINED SR14	1738+25		WATER	8"	450'	PROTECT IN PLACE
253	CITY OF LA	REFINED SR14	1738+20		SEWER	8"	1096'	PROTECT IN PLACE
254	SCG	REFINED SR14	1738+30		GAS	4"	172'	PROTECT IN PLACE
255	SCE	REFINED SR14	1738+40		OH POWER	33 KV	466'	PROPOSED
256	AUTHORITY	REFINED SR14	1736+30		WATER	8"	259'	PROPOSED
257	SCG	REFINED SR14	1761+00 to 1770	Gavina Ave.	GAS	2"	5012'	PROTECT IN PLACE
258	SCG	REFINED SR14	1761+00 to 1770	Gavina Ave.	GAS	3"	1900'	PROTECT IN PLACE
259	SCG	REFINED SR14	1749+70	Gavina Ave.	GAS	4"	1200'	PROTECT IN PLACE
260	VERIZON	REFINED SR14	1765+00 to 1770+00		TELECOM		1000'	PROTECT IN PLACE
261	LADWP	REFINED SR14	1749+59		WATER	12"	780'	PROTECT IN PLACE
262	AUTHORITY	REFINED SR14	1749+59		WATER	12"	1025'	PROPOSED
263	AUTHORITY	REFINED SR14	1749+59		OH POWER	33K V	910'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
264	CITY OF LA	REFINED SR14	1779+00	Pacoima Canyon Rd.	SEWER	8"	3100'	PROTECT IN PLACE
265	SCG	REFINED SR14	1770+50 to	Pacoima Canyon Rd.	GAS	2"	5000'	PROTECT IN PLACE
266	SCG	REFINED SR14	1773+60	Pacoima Canyon Rd.	GAS	3"	800'	PROTECT IN PLACE
267	VERIZON	REFINED SR14	1778+30	Pacoima Canyon Rd.	TELECOM		1000'	PROTECT IN PLACE
268	SCG	REFINED SR14	1797+30		GAS	2"	1200'	PROTECT IN PLACE
269	SCE	REFINED SR14	1861+00	I-210	OH POWER	230 KV	900'	PROTECT IN PLACE
270	AUTHORITY	REFINED SR14	1863+70	I-210	TP-POWER		1810'	PROPOSED
271	VERIZON	REFINED SR14	1858+62	I-210	TELECOM		850'	PROTECT IN PLACE
272	CITY OF LA	REFINED SR14	1877+50		SEWER	8"	850'	PROTECT IN PLACE
273	LADWP	REFINED SR14	1893+51		WATER	14"	800'	PROTECT IN PLACE
274	LADWP	REFINED SR14	1778+26		WATER	30"	800'	PROTECT IN PLACE
275	SCG	REFINED SR14	1877+73		GAS	4"	1000'	PROTECT IN PLACE
276	SCE	REFINED SR14	1877+52		OH POWER		1000'	PROTECT IN PLACE
277	AUTHORITY	REFINED SR14	1872+67		TP-POWER		1363'	PROPOSED
278	CITY OF LA	REFINED SR14	1896+82 1901+43 1913+10 1916+22		SEWER	8"	2000'	PROTECT IN PLACE
279	LADWP	REFINED SR14	1901+60 to 1902+00		WATER	6"	900'	PROTECT IN PLACE
280	LADWP	REFINED SR14	1897+00		WATER	8"	800'	PROTECT IN PLACE
281	SCG	REFINED SR14	1901+28		GAS	2"	800'	PROTECT IN PLACE
282	CITY OF LA	REFINED SR14	1922+75 1924+00 1936+80 1937+70		SEWER	8"	2400'	PROTECT IN PLACE
283	CITY OF LA	REFINED SR14	1932+15		SEWER	18"	800'	PROTECT IN PLACE
284	LADWP	REFINED SR14	1932+30		WATER	12"	800'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
285	SCG	REFINED SR14	1922+49 1940+50 1942+29 1944+00		GAS	2"	2400'	PROTECT IN PLACE
286	SCG	REFINED SR14	1932+00 1936+70		GAS	4"	1600'	PROTECT IN PLACE
287	SCG	REFINED SR14	1937+15		GAS	6"	800'	PROTECT IN PLACE
288	SCG	REFINED SR14	1937+65 1937+90		GAS	16"	1600'	PROTECT IN PLACE
289	LADWP	REFINED SR14	1937+36		WATER	8"	800'	PROTECT IN PLACE
290	CITY OF LA	REFINED SR14	1951+00 1954+38 1959+09 1962+05		SEWER	8"	3200'	PROTECT IN PLACE
291	SCG	REFINED SR14	1958+95		GAS	1"	800'	PROTECT IN PLACE
292	SCG	REFINED SR14	1947+82 1950+80 1954+26		GAS	2"	2400'	PROTECT IN PLACE
293	SCG	REFINED SR14	1981+94 1993+74		GAS	3"	1000'	PROTECT IN PLACE
294	SCG	REFINED SR14	1982+28		GAS		800'	PROTECT IN PLACE
295	SCG	REFINED SR14	1993+74		GAS	2"	300'	PROTECT IN PLACE
296	CITY OF LA	REFINED SR14	1993+37 1993+85		SEWER	8"	1000'	PROTECT IN PLACE
297	SCE	REFINED SR14	1982+65		OH POWER		800'	PROTECT IN PLACE
298	AT&T-SPRINT	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	TEL	4-2"	500'	PROTECT IN PLACE
299	PPS	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	OIL	20"	500'	PROTECT IN PLACE
300	QWEST	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	FIBER	2X2"	500'	PROTECT IN PLACE
301	CITY OF LA	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	OIL	8"	500'	PROTECT IN PLACE
302	LADWP	REFINED SR14	2034+14	San Fernando Rd.	WATER		800'	PROTECT IN PLACE
303	SCG	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	GAS	12" (AB AN)	500'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
304	LADWP	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	OH POWER		500'	PROTECT IN PLACE
305	SCG	REFINED SR14	2040+00 to 2045+00	San Fernando Rd.	GAS		500'	PROTECT IN PLACE
306	LADWP	REFINED SR14	2035+80 , 2043+00	San Fernando Rd.	OH POWER		1000'	TO BE RELOCATED
307	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	1200'	PROPOSED
308	UNKNOWN	REFINED SR14		Sand Canyon Rd.	WATER	8"	970'	PROTECT IN PLACE
309	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	2600'	PROPOSED
310	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	2805'	PROPOSED
311	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	3750'	PROPOSED
312	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	3930'	PROPOSED
313	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	3550'	PROPOSED
314	VERIZON	REFINED SR14		Sand Canyon Rd.	TELECOM		1000'	PROTECT IN PLACE
315	AUTHORITY	REFINED SR14		Sand Canyon Rd.	TP-POWER		2030'	PROPOSED
316	VERIZON	REFINED SR14		Sand Canyon Rd.	TELECOM		2250'	PROTECT IN PLACE
317	AUTHORITY	REFINED SR14		Sand Canyon Rd.	WATER	8"	700'	PROPOSED
318	AUTHORITY	REFINED SR14		Sand Canyon Rd.	TP-POWER		1865'	PROPOSED
319	VERIZON	REFINED SR14		Sand Canyon Rd.	TELECOM		2500'	PROTECT IN PLACE
320	AUTHORITY	REFINED SR14		Sand Canyon Rd.	TP-POWER		2310'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
321	VERIZON	REFINED SR14		Sand Canyon Rd.	TELECOM		500'	PROTECT IN PLACE
322	AUTHORITY	REFINED SR14		Sand Canyon Rd.	TP-POWER		2120'	PROPOSED
323	VERIZON	REFINED SR14		Sand Canyon Rd.	TELECOM		800'	PROTECT IN PLACE
324	AUTHORITY	REFINED SR14			TP-POWER		1925'	PROPOSED
325	VERIZON	REFINED SR14			TELECOM		500'	PROTECT IN PLACE
326	AUTHORITY	REFINED SR14		Little Tujunga Canyon Rd.	TP-POWER		1970'	PROPOSED
327	VERIZON	REFINED SR14		Little Tujunga Canyon Rd.	TELECOM		500'	PROTECT IN PLACE
328	AUTHORITY	REFINED SR14		Little Tujunga Canyon Rd.	TP-POWER		1700'	PROPOSED
329	VERIZON	REFINED SR14		Little Tujunga Canyon Rd.	TELECOM		500'	PROTECT IN PLACE
330	LADWP	REFINED SR14		Little Tujunga Canyon Rd.	OH POWER	500 kv	600'	PROTECT IN PLACE
331	SCG	REFINED SR14		Gavina Ave. / Rajah St.	GAS	2"	770'	PROTECT IN PLACE
332	CITY OF LA	REFINED SR14		Gavina Ave. / Rajah St.	SEWER	8"	1800'	PROTECT IN PLACE
333	SCG	REFINED SR14		Gavina Ave. / Rajah St.	GAS	4"	300'	PROTECT IN PLACE
334	VERIZON	REFINED SR14		Gavina Ave. / Rajah St.	TELECOM		500'	PROTECT IN PLACE
335	LADWP	REFINED SR14		Gavina Ave. / Rajah St.	WATER	12"	2000'	PROTECT IN PLACE
336	AUTHORITY	REFINED SR14		Gavina Ave. / Rajah St.	WATER	12"	1100'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
337	AUTHORITY	REFINED SR14		Gavina Ave. / Rajah St.	OH POWER	33 KV	385'	PROPOSED
338	SCE	REFINED SR14		I-210 / Foothill Blvd.	OH POWER	230 KV	500'	PROTECT IN PLACE
339	AUTHORITY	REFINED SR14		I-210 / Foothill Blvd.	TP-POWER		225'	PROPOSED
340	CITY OF LA	REFINED SR14		I-210 / Foothill Blvd.	SEWER	8"	600'	PROTECT IN PLACE
341	SCG	REFINED SR14		I-210 / Foothill Blvd.	GAS	4"	100'	PROTECT IN PLACE
342	SCG	REFINED SR14		San Fernando Rd. / Bromwhic h St.	GAS	3"	1500'	PROTECT IN PLACE
343	CITY OF LA	REFINED SR14		San Fernando Rd. / Bromwhic h St.	SEWER	8"	1500'	PROTECT IN PLACE
344	UNKNOWN	REFINED SR14		San Fernando Rd. / Bromwhic h St.	WATER		1500'	PROTECT IN PLACE
345	UNKNOWN	REFINED SR14		San Fernando Rd / Bromwhic h St	TEL		1500'	PROTECT IN PLACE
346	SCG	REFINED SR14		San Fernando Rd. / Bromwhic h St.	OH POWER		700'	PROTECT IN PLACE
347	SCG	REFINED SR14		El Dorado Ave. / Truesdale St.	OH POWER	230 KV	800'	PROTECT IN PLACE
348	CITY OF LA	REFINED SR14		El Dorado Ave. / Truesdale St.	SEWER	8"	600'	PROTECT IN PLACE
349	SCG	REFINED SR14		El Dorado Ave. / Truesdale St.	GAS		600'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
350	LACDPW	REFINED SR14		SR14	WATER	16"	800'	PROTECT IN PLACE
351	LACDPW	REFINED SR14		SR14	WATER	12"	800'	PROTECT IN PLACE
352	CITY OF ACTON	REFINED SR14		SR14	GAS	4"	800'	PROTECT IN PLACE
353	LACDPW	REFINED SR14		SR14	WATER	16"	182'	PROPOSED
354	SCG	REFINED SR14	2070+00 to 2095+00	San Fernando Rd	GAS	12" (AB AN)	2500'	TO BE REMOVED
355	AT&T	REFINED SR14	2070+00 to 2095+00	San Fernando Rd	TEL		2500'	PROTECT IN PLACE
356	LADWP	REFINED SR14	2088+50 to 2095+00	San Fernando Rd	WATER	20"	650'	PROTECT IN PLACE
357	SCG	REFINED SR14	2090+00 to 2095+00	San Fernando Rd	GAS	4"	500'	PROTECT IN PLACE
358	VERIZON	REFINED SR14	2070+00 to 2095+00	San Fernando Rd	TEL		2500'	PROTECT IN PLACE
359	CITY OF LA	REFINED SR14	2080+66 to 2084+24	San Fernando Rd	SEWER	12"	415'	TO BE REMOVED
360	WILLIAMS	REFINED SR14	2070+00 to 2095+00	San Fernando Rd	TELECOM	12"	2500'	PROTECT IN PLACE
361	AT&T-SPRINT	REFINED SR14			TEL	4-2"		TO BE RELOCATED
362	PPS	REFINED SR14			OIL	20"		TO BE RELOCATED
363	QEST	REFINED SR14			FIBER	2X2"		TO BE RELOCATED
364	CITY OF LA	REFINED SR14			OIL	8"		TO BE RELOCATED
365	CITY OF LA	REFINED SR14			SEWER	12"		PROTECT IN PLACE
366	SCG	REFINED SR14			GAS	12" (AB AN)		TO BE REMOVED
367	AT&T	REFINED SR14			TEL			PROTECT IN PLACE
368	LADWP	REFINED SR14			WATER	20"		TO BE RELOCATED
369	CITY OF LA	REFINED SR14			SEWER	8"		PROTECT IN PLACE
370	SCG	REFINED SR14			GAS	4"		PROTECT IN PLACE
371	LADWP	REFINED SR14			POWER			TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
372	LADWP	REFINED SR14			WATER	6"		TO BE RELOCATED
373	CITY OF LA	REFINED SR14			SEWER	10" ABA N"		TO BE REMOVED
374	LADWP	REFINED SR14			OH POWER			PROTECT IN PLACE
375	WILLIAMS	REFINED SR14			TELECOM	12"		PROTECT IN PLACE
376	SCG	REFINED SR14	2145+00 to 2157+50	San Fernando Blvd.	GAS	4"	1250'	PROTECT IN PLACE
377	CITY OF LA	REFINED SR14	2145+00 to 2162+00	San Fernando Blvd. / Sunland Blvd.	SEWER	13"	2000'	PROTECT IN PLACE
378	LADWP	REFINED SR14	2161+71 to 2170+00	San Fernando Blvd. / Sunland Blvd.	WATER	48"	830'	PROTECT IN PLACE
379	SCG	REFINED SR14	2145+00 to 2170+00	San Fernando Blvd.	GAS	12" (AB AN)	2500'	TO BE REMOVED
380	AT&T	REFINED SR14	2145+00 to 2170+00	San Fernando Blvd.	TEL		2500'	PROTECT IN PLACE
381	LADWP	REFINED SR14	2158+50 to 2170+00	San Fernando Blvd. / Sunland Blvd.	WATER	27"	1200'	PROTECT IN PLACE
382	LADWP	REFINED SR14	2145+00 to 2161+50	San Fernando Blvd. / Sunland Blvd.	WATER	20"	1680'	PROTECT IN PLACE
383	SCG	REFINED SR14	2161+50	Sunland Blvd.	GAS	3"	300'	PROTECT IN PLACE
384	WILLIAMS	REFINED SR14	2145+00 to 2170+00	San Fernando Blvd.	TELECOM	12"	2500'	PROTECT IN PLACE
385	LADWP	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd.	WATER	48"	2500'	PROTECT IN PLACE
386	SCG	REFINED SR14	2179+20 to 2190+70	San Fernando Blvd. / Clybourn Ave.	GAS	2"	1500'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
387	CITY OF LA	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd. / San Fernando Rd.	OIL	8"	2500'	PROTECT IN PLACE
388	SCG	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd. / San Fernando Rd.	GAS	12" (AB AN)	2550'	TO BE REMOVED
389	AT&T	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd. / San Fernando Rd.	TEL		2500'	PROTECT IN PLACE
390	LADWP	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd. / San Fernando Rd.	WATER	22"	2500'	PROTECT IN PLACE
391	SCG	REFINED SR14	2179+21	San Fernando Blvd. / Clybourn Ave.	GAS	6"	400'	PROTECT IN PLACE
392	LADWP	REFINED SR14	2189+00	San Fernando Blvd. / Wheatland Ave.	WATER	12"	1000'	PROTECT IN PLACE
393	CITY OF LA	REFINED SR14	2171+30 to 2179+50	San Fernando Blvd.	SEWER	8"	1000'	PROTECT IN PLACE
394	CITY OF LA	REFINED SR14	2192+66	San Fernando Blvd.	SEWER	21"	800'	PROTECT IN PLACE
395	LADWP	REFINED SR14	2170+60 to 2186+00	San Fernando Blvd. / White St.	OH POWER		1200'	PROTECT IN PLACE
396	SCG	REFINED SR14	2181+92 to 2195+00	San Fernando Blvd.	GAS	4"	1400'	PROTECT IN PLACE
397	WILLIAMS	REFINED SR14	2170+00 to 2195+00	San Fernando Blvd.	TELECOM	12"	2500'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
398	SCG	REFINED SR14	2204+40 to 2215+46	San Fernando Blvd. / Ledge Ave.	GAS	3"	1200'	PROTECT IN PLACE
399	LADWP	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	WATER	8"	2050'	PROTECT IN PLACE
400	CITY OF LA	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	SEWER	8"	2200'	PROTECT IN PLACE
401	SCG	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	GAS	4"	2200'	PROTECT IN PLACE
402	LADWP	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	WATER	48"	2100'	PROTECT IN PLACE
403	PPS	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	OIL	20"		TO BE RELOCATED
404	AT&T-SPRINT	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	TEL	4-2"	2100'	PROTECT IN PLACE
405	CITY OF LA	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	OIL	8"	2100'	PROTECT IN PLACE
406	WILLIAMS	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	TELECOM	12"	2100'	PROTECT IN PLACE
407	SCG	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	GAS	12" (AB AN)	2200'	TO BE REMOVED
408	WILLIAMS	REFINED SR14	2211+40	San Fernando Blvd. / Arvila Ave.	TELECOM		300'	PROTECT IN PLACE
409	LADWP	REFINED SR14	2211+40	San Fernando Blvd. / Arvila Ave.	WATER	6"	300'	PROTECT IN PLACE
410	LADWP	REFINED SR14	2205+00 to 2215+46	San Fernando Blvd. / Arvila Ave.	OH POWER		2000'	PROTECT IN PLACE
411	SCG	REFINED SR14	2205+50	San Fernando Blvd.	GAS	2"	300'	PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
412	LADWP	REFINED SR14	2211+40	San Fernando Blvd. / Ferncola Ave.	WATER	12"	400'	PROTECT IN PLACE
413	LADWP	REFINED SR14	2204+17 to 2209+06	San Fernando Blvd. / Ledge Ave.	POWER		800'	PROTECT IN PLACE
414	LADWP	REFINED SR14			WATER	20"		PROTECT IN PLACE
415	AT&T	REFINED SR14	2195+00 to 2215+46	San Fernando Blvd.	TEL		2100'	PROTECT IN PLACE
416	SCG	REFINED SR14	2229+80	Lockheed Dr.	GAS	2"		PROTECT IN PLACE
417	BWP	REFINED SR14	2229+75	Lockheed Dr.	WATER	10"		PROTECT IN PLACE
418	LADWP	REFINED SR14	2226+90	Lockheed Dr.	WATER	UNK NO WN		PROTECT IN PLACE
419	WILLIAMS	REFINED SR14	2222+40	San Fernando Blvd.	TELECOM	12"		PROTECT IN PLACE
420	PPS	REFINED SR14	2218+80	San Fernando Blvd.	OIL	20"		PROTECT IN PLACE
421	QWEST	REFINED SR14	2230+00	San Fernando Blvd.	FIBER OPTIC	UNK NO WN		PROTECT IN PLACE
422	CITY OF LA	REFINED SR14	2219+10	San Fernando Blvd.	OIL	8"		PROTECT IN PLACE
423	LACDPW	REFINED SR14	2230+00	Cohasset St.	SEWER	8"		PROTECT IN PLACE
424	SCG	REFINED SR14	2216+05	San Fernando Blvd.	GAS	4"		PROTECT IN PLACE
425	SCG	REFINED SR14	2221+40	San Fernando Blvd.	GAS	12" (AB AN)		PROTECT IN PLACE
426	AT&T- SPRINT	REFINED SR14	2217+70	San Fernando Blvd.	TELEPHON E	UNK NO WN		PROTECT IN PLACE
427	LADWP	REFINED SR14	2218+05	San Fernando Blvd.	WATER	16"		PROTECT IN PLACE
428	LADWP	REFINED SR14	2228+60	Lockheed Dr.	OH POWER	UNK NO WN		PROTECT IN PLACE
429	LACDPW	REFINED SR14	2225+90	Lockheed Dr.	SEWER	8"		PROTECT IN PLACE

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
430	BWP	REFINED SR14	2232+00	Cohasset St.	WATER	10"		PROTECT IN PLACE
431	LADWP	REFINED SR14	2231+50	Cohasset St.	OH POWER	UNK NO WN		PROTECT IN PLACE
432	LACDPW	REFINED SR14	2230+30	Cohasset St.	SEWER	8"		PROTECT IN PLACE
433	CITY OF BURBANK	REFINED SR14	2230+05	Cohasset St.	WATER	12"		PROTECT IN PLACE
434	CITY OF BURBANK	REFINED SR14	2230+10	Cohasset St.	OH POWER	UNK NO WN		PROTECT IN PLACE
435	SCG	REFINED SR14	2230+05	Cohasset St.	GAS	2"		PROTECT IN PLACE
436	SCG	REFINED SR14		Tuxford St. / Telfair Ave.	GAS	4"	100'	PROTECT IN PLACE
437	LADWP	REFINED SR14		Tuxford St. / Telfair Ave.	OH POWER		100'	PROTECT IN PLACE
438	LADWP	REFINED SR14		Tuxford St. / Telfair Ave.	POWER		100'	PROTECT IN PLACE
439	LADWP	REFINED SR14		Tuxford St. / Bradley Ave.	WATER	6"	150'	PROTECT IN PLACE
440	CITY OF LA	REFINED SR14		Tuxford St. / Bradley Ave.	SEWER	12"	150'	PROTECT IN PLACE
441	SCG	REFINED SR14		Tuxford St. / Bradley Ave.	GAS	12"	150'	PROTECT IN PLACE
442	SCG	REFINED SR14		Tuxford St. / Bradley Ave.	GAS	8"	150'	PROTECT IN PLACE
443	LADWP	REFINED SR14		Tuxford St. / Bradley Ave.	OH POWER		150'	PROTECT IN PLACE
444	AT&T	REFINED SR14	270+00 to 290+00	Sierra Hwy.	FIBER OPTIC	4-1.5"	2000'	PROTECT IN PLACE
445	CITY OF PALMDALE	REFINED SR14	270+00 to 276+00	6 th St.	SEWER	8" VCP	500'	TO BE RELOCATED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
446	PALMDALE WD	REFINED SR14	270+00	6 th St.	WATER	12"D IP	600'	TO BE RELOCATED
447	U.S SPRINT	REFINED SR14	295+00 to 320+00	Sierra Hwy.	FIBER OPTIC	UNK NO WN	2500'	TO BE RELOCATED
448	AT&T	REFINED SR14	345+00	Sierra Hwy.	FIBER OPTIC	UNK NO WN	2500'	TO BE RELOCATED
449	SCE	REFINED SR14	376+20	Barrel Springs Rd.	OH POWER	UNK NO WN	1700'	TO BE RELOCATED
450	LADWP	REFINED SR14	520+00		OH POWER	550 KV	900'	PROTECT IN PLACE
451	PG	REFINED SR14	518+00		OH POWER	500 KV	900'	PROTECT IN PLACE
452	SCE	REFINED SR14	515+10		OH POWER	230 KV	1000'	PROTECT IN PLACE
453	LACDPW	REFINED SR14	637+00		WATER	8"	1600'	PROTECT IN PLACE
454	LACDPW	REFINED SR14	628+50		WATER	12"	1000'	PROTECT IN PLACE
455	SCG	REFINED SR14	628+30		GAS	3"	3000'	PROTECT IN PLACE
456	CITY OF LA	REFINED SR14	2005+20	San Fernando Rd.	SEWER	8"	600'	TO BE REMOVED
457	CITY OF LA	REFINED SR14	1998+00	Montague St.	SEWER	8"	2000'	PROTECT IN PLACE
458	LADWP	REFINED SR14	1998+00	Montague St.	WATER	6"	2000'	PROTECT IN PLACE
459	AT&T	REFINED SR14	2020+00 to 2045+00	San Fernando Rd.	TELE		2000'	PROTECT IN PLACE
460	VERIZON	REFINED SR14	2045+00 to 2070+00	San Fernando Rd.	TELE		2000'	PROTECT IN PLACE
461	LADWP	REFINED SR14	2045+00 to 2070+00	San Fernando Rd.	OH POWER		2500'	RELOCATE
462	LADWP	REFINED SR14	2057+00	Sheldon St.	OH POWER		1800'	PROTECT IN PLACE
463	CITY OF LA	REFINED SR14	2057+00	Sheldon St.	SEWER	15"	400'	PROTECT IN PLACE
464	LADWP	REFINED SR14	2057+30	Sheldon St.	WATER	6"	700'	PROTECT IN PLACE
465	CITY OF LA	REFINED SR14	2069+00	San Fernando Rd.	OIL	8"	2000'	RELOCATE
466	PALMDALE WD	REFINED SR14		5 TH St.	WATER	20"	150'	TO BE RELOCATED
467	AUTHORITY	REFINED SR14			TP-POWER	230 KV	2500'	PROPOSED

No.	Owner	HSR Alignment	Station	Location	Facility Type	Size	Length	Disposition
468	SCG	REFINED SR14			GAS	2"	1800'	PROTECT IN PLACE
469	LADWP	REFINED SR14			WATER	8"	500'	PROTECT IN PLACE
470	LADWP	REFINED SR14			OH POWER		700'	PROTECT IN PLACE
471	FRONTIER	REFINED SR14			TEL OH		800'	PROTECT IN PLACE
472	CITY OF LA	REFINED SR14			SEWER	12"	2000'	PROTECT IN PLACE
473	LADWP	REFINED SR14	2135+00	San Fernando/ Goss St.	WATER	8"	3000'	PROTECT IN PLACE
474	MWD	REFINED SR14	2137+00	San Fernando Blvd.	WATER	48"	1000'	TO BE RELOCATED
475	PPS	REFINED SR14	2130+00	San Fernando Blvd.	OIL	20"	1500'	TO BE RELOCATED
476	QWEST	REFINED SR14	2131+20	San Fernando Blvd.	FIBER OPTIC	2X2"	1500'	TO BE RELOCATED
477	AT&T-SPRINT	REFINED SR14	2144+00	San Fernando Blvd.	TELE	4-2"	400'	TO BE RELOCATED
478	CITY OF LA	REFINED SR14	2134+00	San Fernando Blvd.	OIL	8"	2000'	TO BE RELOCATED
479	WILLIAMS	REFINED SR14	2121+00	San Fernando Blvd.	TELE	12"	2500'	PROTECT IN PLACE
480	LAWD	REFINED SR14	2121+80	San Fernando Blvd.	WATER	8"	2500'	PROTECT IN PLACE
481	LADWP	REFINED SR14	2140+70	San Fernando Blvd.	WATER	20"	700'	PROTECT IN PLACE
482	SCG	REFINED SR14	2140+00	San Fernando Blvd.	GAS	4"	800'	PROTECT IN PLACE
483	SCG	REFINED SR14	2141+60	San Fernando Blvd.	GAS	12" ABA N	800'	TO BE REMOVED

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15 MAINTENANCE AND SUPPORT FACILITIES

The California HSR System includes four types of maintenance facilities: light maintenance facilities (LMF), maintenance of infrastructure facilities (MOIF), maintenance of infrastructure sidings (MOIS), and heavy maintenance facilities (HMF). The Palmdale to Burbank Project Section would include one Maintenance Facility site in the event that this section were built and operated independently, which could be configured to accommodate one or more of the maintenance operations listed above (LMF/MOIF/MOIS/HMF). If the Palmdale to Burbank Project Section is constructed independent of the statewide system, the Maintenance Facility could be configured to provide both LMF and MOIF operations. However, the Palmdale to Burbank Project Section would likely be constructed and operated as part of the statewide HSR System and, in this case, use of the Maintenance Facility may or may not be necessary, depending on the location and types of maintenance facilities constructed in other project sections.

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16 RAILWAY SYSTEMS FACILITIES

Table 16-1 summarizes the existing Railway Systems Facilities for the SR14A Build Alternative.

Explanation of the acronyms:

- TPF: Traction Power Facilities:
 - PS: Paralleling Station
 - SWS: Switching Station
 - SS: Traction Power Substations
- ATC: Automatic Train Control site
- SRS: Standalone Radio Site
- TUNP: Tunnel Portal Facilities

Table 16-1 Railway Systems Facilities in the Palmdale to Burbank Section (SR14A)

Build Alternative	Location (Station)	Type	Spacing from Adjacent In-Kind Facility (mi)	Distance between TPFs	Distance between Radio Antennas	Distance to nearest TC Site	Access Road Confirmation	Special Design Considerations
Refined SR14	(103+00)	SRS #1	1.87		1.87		Yes	None
Refined SR14	(135+50)	ATC Site B	0.62			0.62	Yes	None
Refined SR14	(142+00)	ATC Site A	0.12			0.12	Yes	None
Refined SR14	(147+50)	ATC Site B	0.1			0.1	Yes	None
Refined SR14	(159+50)	ATC Site A	0.23			0.23	Yes	None
Refined SR14	(168+00)	ATC Site A (B + C)	0.16			0.16	Yes	None
Refined SR14	(206+00)	TPF – PS #1	0.72	3.82	1.95		Yes	None
Refined SR14	(245+00)	ATC Site A (B+C)	0.74			1.46	Yes	None
Refined SR14	(252+00)	ATC Site A	0.13			0.13	Yes	None
Refined SR14	259+50	ATC Site B	0.14			0.14	Yes	None
SR14A	265+50	ATC Site A	0.11			0.11	Yes	None
SR14A	270+00	ATC Site B	0.09			0.09	Yes	None
SR14A	305+00	SRS #2	0.66		1.88		Yes	None
SR14A	460+00	TPF – SS #17A	2.94	4.81	2.94		Yes	None
SR14A	472+31	TUNP	0.23		0.23		Yes	None
SR14A	540+00	ATC Site D	1.28			5.11	N/A	Underground facility
SR14A	700+00	TPF – PS #2	3.03	4.55	N/A		N/A	Underground facility

Build Alternative	Location (Station)	Type	Spacing from Adjacent In-Kind Facility (mi)	Distance between TPFs	Distance between Radio Antennas	Distance to nearest TC Site	Access Road Confirmation	Special Design Considerations
SR14A	820+00	ATC Site D	2.27			5.3	N/A	Underground facility
SR14A	940+00	TPF – PS #3	2.27	4.55	N/A		Yes	Underground facility
SR14A	1090+00	ATC Site D	2.84			5.11	N/A	Underground facility
SR14A	1170+00	TPF – SWS	1.52	4.36	N/A		Yes	None
SR14A	1170+00	TUNP	0		N/A		Yes	None
SR14A	1233+50	TUNP	1.2		1.2		Yes	None
SR14A	1288+00	TUNP	1.03		1.03		Yes	None
SR14A	1378+93	TUNP	1.72		1.72		Yes	None
SR14A	1381+90	TPF – PS #4	0.06	4.01	0.06		Yes	None
Refined SR14	(1485+90)	ATC Site D	1.97			7.5	N/A	Underground facility
Refined SR14	(1590+00)	TPF – PS #5	3.05	5.02	N/A		N/A	Underground facility
Refined SR14	(1880+00)	TPF – SS #18A	0.55	5.49	N/A		Yes	None
Refined SR14	(1907+90)	ATC Site D	4.94			7.99	N/A	Underground facility
Refined SR14	(1998+90)	TUNP	2.25		N/A		Yes	None
Refined SR14	(2037+00)	TPF – PS #6	0.72	2.97	0.72		Yes	None
Refined SR14	(2143+10)	TNP	2.01		2.01		Yes	None

Build Alternative	Location (Station)	Type	Spacing from Adjacent In-Kind Facility (mi)	Distance between TPFs	Distance between Radio Antennas	Distance to nearest TC Site	Access Road Confirmation	Special Design Considerations
Refined SR14	(2231+00)	TPF – PS #7	1.65	3.66	N/A		Yes	None
Refined SR14	(2240+00)	ATC Site AA	0.19			7.37	N/A	Underground facility

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

16.1 Traction Power

As stated in the Project Description on the previous chapters, the power for the HSR System would be drawn from California's existing electricity grid. The HSR line would be an electrified line with traction power for Electric Vehicles being supplied and distributed using a 2 x 25 kV Autotransformer Feed Type Power Supply System and an Overhead Contact System.

The Traction Power Facilities (TPFs) needed for performing the voltage transformation and distribution of the electricity would be the following:

Traction Power Substations (SS) transform high-voltage electricity supplied by public utilities to the voltage necessary for operating the train. SS are located next to the HSR alignment, approximately every 30 miles along the alignment. Each SS would be about 35,200 square feet (generally 220 feet by 160 feet) in size.

Switching Stations (SWS) connect and balance the electrical load between tracks and switch power on or off tracks in the event of a power outage or emergency. Switching stations would be located midway between, and approximately 15 miles from the SS. Each switching station would be approximately 14,400 square feet (generally 160 feet by 90 feet) in size and would be located adjacent to the HSR alignment.

Paralleling Stations (PS), or autotransformer stations, provide voltage stabilization and equalize electric current flow. These stations would be located approximately every 5 miles between the SS and the switching stations. Each paralleling station would be approximately 9,600 square feet (generally 120 feet by 80 feet) in size and would be located adjacent to the HSR alignment.

The Palmdale to Burbank Project Section has 2 Traction Power Substations (SS) (#17A & #18A). They have been distributed according to the directions received from the HSR Engineering. This distribution complies with the 30 miles mean interval established by the High-Speed Rail Engineering, and the rest of the TPFs (PS, SS) have been distributed accordingly to what the TMs 3.1.1.1, 3.1.1.3 and 3.1.3.1 request. New PUC lines connecting to the existing electricity grid have been designed.

Paralleling Stations (PS) #1, #4, #6 & #7 of the section are located on surface areas adjacent to the alignment. PS #2, #3 & #5 are located in underground facilities, adjacent to the main tunnel bores. These facilities comprise transformers and electrical equipment necessary for the 2 x 25 kV traction power system to operate. No PUC lines are needed, as this type of facilities are only connected to the Overhead Contact System (OCS).

No traction power simulation has been performed or has been accounted for the design of this section, as the High-Speed Rail Engineering has not updated yet the TM 3.1.3.1 to reflect the alignments being considered.

16.2 Utility/Electric Power Connections

As stated before, the power for the HSR System would be drawn from California's existing electricity grid. Upgrades to the existing electricity grid may be required and could include the extension or improvement of power lines and electrical infrastructure to a series of power substations positioned along the HSR corridor. In the Palmdale to Burbank Project Section, two new PUC lines are needed:

For SS 17A—a 2.6 miles long PUC 230 kV line connecting to SoCal Edison Vincent Substation.

For SS 18A—a 0.65 miles long PUC 230 kV line to the grid in San Fernando Valley.

16.3 Overhead Contact System (OCS)

The CHSTP Overhead Contact System on dedicated high-speed sections shall permit a maximum operations speed of 220 mph with consideration that faster operation would not be unnecessarily precluded in the future. Figure 16-1 depicts the typical OCS clearances on an open route on tangent tracks.

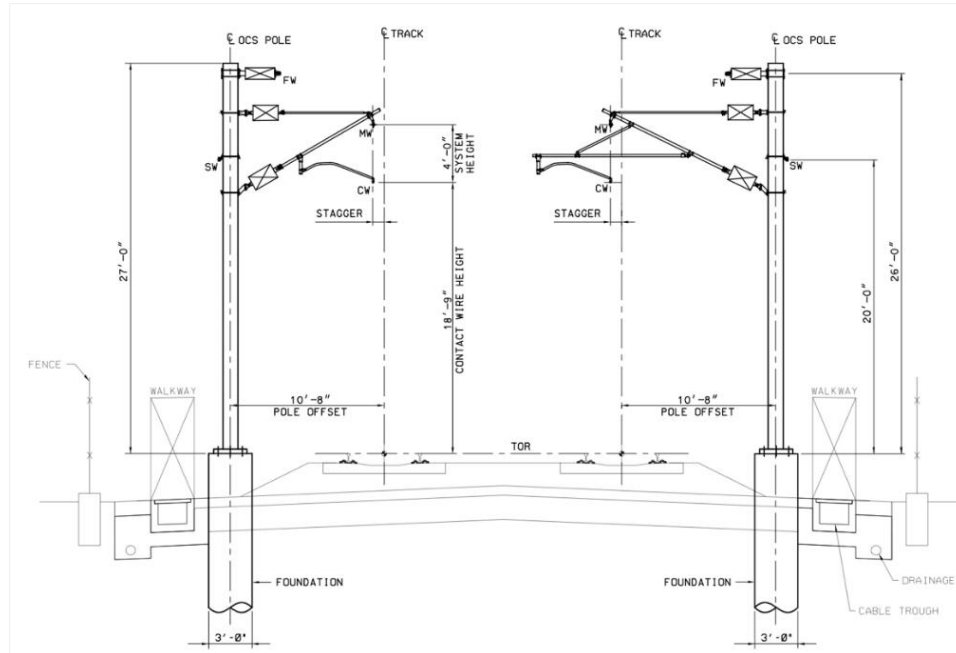


Figure 16-1 Typical OCS Clearances on Open Route, Tangent Tracks (TM 3.2.1)

It is anticipated that the type of rolling stock for the CHSTP together with the pantograph type and the Overhead Contact System would not be selected prior to the completion of the 30 percent Design Level (PE4P). Therefore, no specific OCS system has been selected yet, as the design guidelines included the TMs are intended to accommodate the CHSTP preliminary engineering needs without precluding high-speed system technology.

In this document, the only considerations that have been taken into account regarding the OCS systems are the geometric clearances depicted on the TM 3.2.1. No special situations different from what is considered in this TMs are foreseen regarding this issue within the subsection limits.

16.4 Communications / Train Control Systems

The CHSTP requires the deployment of an Automatic Train Control (ATC) system that supports the performance goals of the project including maximum speeds, trip times, and headway and that meets federally mandated practices and functions for a signaling system including Positive Train Control (PTC). The ATC system must ensure the following key safety functions; safe train separation, prevention of overspeed derailments, fail safe train detection, broken rail detection, interlocking rules enforcement, hazard response and work zone protection. The overall ATC system must incorporate the functions of Automatic Train Protection (ATP), Automatic Train Operation (ATO), and Automatic Train Supervision (ATS). These three functional areas of the ATC can be briefly described as:

- ATP – Automatic Train Protection – subsystem responsible for the safety-critical functions including PTC.
- ATO – Automatic Train Operation – subsystem responsible for the automatic operation of throttle and brake commands to move trains between stations and other stopping locations.
- ATS – Automatic Train Supervision – subsystem responsible for the centralized supervision and control of train movements including the back-office server functions associated with PTC.

As stated in the project description, the ATC system would use a radio-based communications network that would include a physically redundant fiber-optic backbone and communications towers approximately every 2 to 3 miles, depending on the terrain and selected radio frequency.

The towers would be located along the HSR corridor in a fenced area of approximately 20 feet by 15 feet, including a 10-foot-by-8-foot communications shelter and a 6- to 8-foot diameter, 100-foot-tall communications pole. These communications facilities could be co-located within the Traction Power Facilities (TPFs).

Where communications towers cannot be located with TPFs or other HSR facilities as portal areas, the communications facilities would be in Standalone Radio Sites (SRSs) near the HSR corridor in a fenced area measuring approximately 20 feet by 15 feet.

Therefore, the Refined SR14A Build Alternative includes the following railway systems sites:

1. Communications:
 - a. Standalone Radio Sites (SRS): there are 2 independent SRS I along the alignment, per Table 16-1.
 - b. Traction Power facilities (TPFs): all surface traction power facilities include communications equipment and an antenna with the same capabilities as the SRS.
 - c. Tunnel Portal facilities (TUNP): all tunnel portals include communications equipment and an antenna with the same capabilities as the SRS.
2. Train control systems: sites type A, B and C are located along the tracks on each turnout and crossover of the station, fulfilling the Notice to Designers #11 requirement. These sites could include an additional radio antennas, if necessary. Tunnel portal facilities account also for space for trackside equipment to serve these functions. There are also additional site allocations inside dedicated cross passages in tunnels (ATC site D).

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17 DESIGN VARIANCES

17.1 HSR Design Variances

Table 17-1 to Table 17-4 summarize the design variances where standard design would not be accomplished.

Table 17-1 HSR Alignment Design Variances

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
1	SR14A	2.1.2	3.1.1	Minimum Segment Length. TM states "Where alignment segments overlap, each change shall be treated as a separate alignment element for the purpose of calculating minimum segment lengths."	RC is providing a minimum segment length based on speed for continuous horizontal and vertical elements as well as 100' minimum between vertical curves and nearest horizontal spiral (Sec. 6.1.6.1).	RC has been providing a minimum segment length based on speed for continuous elements as well as 100' minimum between vertical curves and nearest horizontal spiral (Sec. 6.1.6.1). Design is constrained in many aspects including stations in Palmdale and Burbank, High Desert corridor coordination in Palmdale, crossing with California Aqueduct, crossing with major fault zones, to name a few.	N/A	
2	Palmdale Station Tracks	N/A	N/A	Per NTD 10, the distance between cross-overs shall be: Preferred: 1400' Minimum: 1000'	RC is considering less than 1000' between consecutive crossovers in some cases.	Constraints including horizontal and vertical curves combined with an urban environment prevent getting minimum 1000' between crossovers.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
3	SR14A Approx. STA 270+00 to STA 298+00 (San Andreas Fault Zone)	2.10.6 R1	6.8.2 6.8.5.2	Place the alignment at-grade with ballasted track, oriented as near to perpendicular (90deg± 30deg) as feasible to the fault trace. At HFZs, the following track features shall not be permitted: switches or crossings, structures crossing over tracks, track-side structures or improvements within increased width of ROW.	Crossing San Andreas hazardous fault zone at angle below 60 degrees. One 80 mph Crossover (STA 265+87) and its trackside systems facilities are lying within fault hazard zones.	Alignment crosses the San Andreas fault hazard zone at grade at an angle of approximately 50 to 56 degrees. Due to the Palmdale Station location (according to urban planning criteria agreed with the City of Palmdale) and alignment constraints south of the station (such as Palmdale Lake and Una Lake), the southern crossover for the station should be placed within the San Andreas Fault Zone. If this crossover is removed from the design the HSR Operation for this station would be negatively impacted. Shifting the crossover to the north would have the following undesired implications: - It would push the station northwards, causing urban planning problems and compromising the connection with HDC. - It would reduce the length of the platforms to 800'. Other options would be: - Design all station tracks at the same elevation (different station concept). - Replace the crossover with a scissors crossover out of the fault area.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
4	SR14A STA 275+80.96 to STA 669+81.39	0.3	3.2	220 mph design speed	180 mph design speed	The design speed has been downgraded to 180-mph from STA 275+80.96 up to the end of the curve #2 at STA 669+81.39. This reduced design speed is linked to the curve radius necessary to avoid Una Lake.	N/A	
5	SR14A STA 289+86 to STA 324+71	2.1.2	6.1.2	Minimum Curve Radius: Minimum: 22,000' for 220 mph Exceptional: 19,500' for 220 mph Minimum: 16,600 for 180 mph Exceptional: 14,000 for 180 mph	R = -15,000' for 180mph	This is the maximum radius that allows for allocating the curve without displacing the crossover at STA 265+87 and avoiding Una Lake.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
6	SR14A STA 295+86 to STA 312+19	2.1.2	6.1.6.2	Vertical curve length: Minimum: 2,400' for 220 mph Exceptional: 1,600' for 220 mph Minimum: 1600' for 180 mph	1,633' for 180 mph	This vertical curve is within a 1,500-foot radius horizontal curve that is geometrically confined by a crossover on the north and Lake Palmdale on the south. The horizontal curve could only be lengthened, as well as the vertical curve, if the Palmdale station location were shifted further to the north. In addition, 600 feet is maintained on the north side of the vertical curve to the nearest horizontal spirals to prevent overlaps and to provide a minimum element length. Besides, a 2.5% exit grade for this vertical curve is necessary to cross under Avenue S with a minimum impact to the urban area, so flattening the exit grade is not possible.	N/A	
7	SR14A STA 338+76 to STA 345+20	2.1.2	6.1.1	Minimum Segment Lengths (2.4 s): Minimum: 774' for 220 mph Exceptional: 581' for 220 mph Minimum: 655' for 180 mph	590.35' for 180 mph	This straight element is to connect curve #1 (-15,000' radius horizontal curve) and curve #2 (+15,325' radius horizontal curve). The length of the connecting element is the maximum that can be fitted between these two elements.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
8	SR14A STA 338+76 to STA 345+20	2.1.2	6.1.2	Minimum Curve Radius: Minimum: 22,000' for 220 mph Exceptional: 19,500' for 220 mph Minimum: 16,600 for 180 mph Exceptional: 14,000 for 180 mph	R = +15,325' for 180mph	The radius of the curve #2 is the maximum that allows a connection between the R=-15,000' curve and the straight element at Acton complying with the minimum element length that connects the curve #1 and the curve #2. The straight element at Acton location is fixed because is the position that minimizes the disturbances to the neighborhood.	N/A	
9	SR14A STA 365+60 to STA 381+60	2.1.2	6.1.6.2	Vertical curve length: Minimum: 2,400' for 220 mph Exceptional: 1,600' for 220 mph Minimum: 1600' for 180 mph	1,600' for 180 mph	This vertical curve is within a 15,325-foot radius horizontal curve. A 689 feet grade is maintained on the north side of the vertical curve to the nearest horizontal spirals to provide a minimum element length. Besides, a 0.86% exit grade for this vertical curve is the minimum necessary to cross over Soledad Siphon, Sierra Highway and SCRRA line but minimizing the earthworks through the wetlands around Una Lake.	N/A	
10	Refined SR14 STA 1890+99 to STA 2203+75.16	0.3	3.2	220 mph design speed	150 mph design speed	HSR has directed RC to maintain a 150-mph design speed through San Fernando Valley area to stay within the existing UPRR/Metrolink corridor as much as feasible.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
11	Refined SR14 STA 2208+12.62 to STA 2224+01.97	0.3	3.2	Design speed of 220 mph	Design speed of 70 mph	A limited 70 mph design speed is needed by the alignment following San Fernando Blvd to tie into the Burbank Airport Station alignment. The location of the station itself is also constrained by the HSR alignment south of it.	N/A	
12	Burbank Airport Station Tracks	N/A	N/A	Per NTD 10, the distance between cross-overs shall be: Preferred: 1400' Minimum: 1000'	RC is considering less than 1000' between consecutive crossovers.	Constraints including horizontal and vertical curves combined with a complex urban environment prevent getting 1000' between consecutive crossovers.	N/A	

Table 17-2 Tunnels Design Variances

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
1	Crossing of fault zones @ SR14A STA 980+00 to STA 1080+00 (Agua Dulce East) STA 1200+00 to STA 1260+00 (Agua Dulce West)	2.10.6 R1	6.8.2	Place the alignment at-grade with ballasted track, oriented as near to perpendicular (90deg ± 30deg) as feasible to the fault trace	Alignment is sub-parallel to Agua Dulce / Little Escondido faults (0 to 50 degrees) and crosses them at grade, on embankment, and in tunnel.	No variance needed if faults are declassified as hazardous. Declassification would require limited geological investigations of the faults to confirm return interval and slip rate as recommended in TM 2.10.6. In-progress 15% design would continue pending geological investigations of fault during 15%. Estimated rupture displacement is around 1.5 ft. It is recommended that these faults be declassified as capable because of apparent lack of quaternary slip and relatively low slip rate.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
2	Approx Refined SR14 STA 2029+00 to STA 2198+50 (Verdugo Fault Zone)	2.10.6 R1	6.8.2 6.8.5.2	Place the alignment at-grade with ballasted track, oriented as near to perpendicular (90deg±30deg) as feasible to the fault trace	Trench, SEM tunnel and cut-and cover tunnel in fault zone; alignment crossing fault zone in subparallel orientation.	Alignment is sub-parallel to Verdugo Fault (0 to 15 degrees) and crosses it at grade, on embankment, in trench, and in cut-and-cover tunnel. Estimated rupture displacement is approximately 2.6 ft. Urban planning constraints make impossible to avoid this situation.	N/A	
3	All tunnels	2.4.2 R1	B	Bored tunnel internal diameter as function of Design Speed and Tunnel length	Tunnel cross section not designed taking into account an aerodynamic analysis in this stage.	Design speed to be defined/confirmed for each tunnel internal diameter design. An aerodynamic analysis must be performed in later design stages to confirm or modify tunnel free sections accordingly. At this stage, only constructability criteria and alignment recovery criteria have been considered in the tunnel cross section design.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
4	All tunnels	N/A	N/A	Pending issue not addressed in TMs: Post-Earthquake infrastructure performance	To be confirmed once updated design criteria are available	Post-earthquake infrastructure performance. Tunnel shall be repairable after a major earthquake with significant fault displacement <u>Definition of major earthquake</u> · MCE-2475 year return period? · 950 year return period? · 475 year return period? <u>Possible Definitions for “repairable”:</u> · Alignment can be adjusted after repair works without losses in journey time · Alignment can be adjusted with 1 min maximum loss in journey time - Design speed at the “realigned” zone · Alignment can be adjusted with “n” min maximum loss in journey time - Design speed at the “realigned” zone	N/A	
5	Approx. Refined SR14 STA 1546+00 to STA 1610+00 (San Gabriel Fault Zone)	2.10.5	6.5	Numerical analysis for special cases in Geology and fault crossings.	No numerical analysis has been performed.	As a sufficient site investigation has not yet been completed, there is not enough subsurface information to perform numerical analyses at fault crossings or other special geologic cases.	N/A	

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section					
6	Long tunnel under ANF and Burbank. (Approx. Refined SR14 STA 1322+02 to STA 1998+90)	TM 2.10.6 R1	3.4	3.4.3.6 Fault chambers Where tunnels cross HFZs, local use of a larger tunnel cross section shall be considered. The larger cross section shall be sized based upon the predicted direction and amount in order to allow clear passage and realignment of the track after a surface rupture event.	Proposed design to be confirmed once additional site investigations are available.	Preliminary enlargements of tunnel cross section and fault chambers have been included in the design. Expected fault displacement to be confirmed for enlarged cross-section design South of San Gabriel fault zone. Larger tunnel diameter to adapt to Sierra Madre fault system expected displacement	N/A	
7	Refined SR14 STA 1971+25	2.1.2	3.3.1	Low points and very flat grades should not be used in cuts or tunnels (including cut-and-cover) due to drainage considerations	At the exit of the South Bound Tunnel in Alignment Refined SR14 (Sta. 1971+25) there is a low point in the tunnel	Due to the requirement of a deeper alignment for diminishing the settlement risk adjacent to the portal at Hansen Spreading Grounds (from Sta.1980+00 to Sta. 1996+50). A pumping station is proposed.	N/A	
8	SEM single tunnel and cavern Approx. Refined SR14 STA 2160+00 to STA 2231+18	TM 2.4.2 R1	B	Tunnel internal diameter as function of Design Speed and Tunnel length	Tunnel cross section not designed taking into account an aerodynamic analysis in this stage.	Design speed to be defined/confirmed for each tunnel internal diameter design	N/A	
9	SEM single tunnel and cavern Approx. Refined SR14 STA 2160+00 to STA 2231+18	TM 2.4.2 R1	App. A	Basic Tunnel Configuration. Mined Tunnel with separation wall	Separation wall not to be considered	Separation wall not to be considered in these sections because of separation between tracks (16.5') and the proximity to Burbank Airport Station and consequent turnouts requirements. Emergency egress to ground surface designed instead.	NA	

Table 17-3 HSR Underground Structures Design Variances

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date
		TM	Section				
1	Approx. SR14A 260+00 to 380+00 (San Andreas Fault Zone)	2.10.6 R1	6.8.2 6.8.5.2	Place the alignment at-grade with ballasted track, oriented as near to perpendicular (90deg± 30deg) as feasible to the fault trace. At HFZs, the following track features shall not be permitted: switches or crossings, structures crossing over tracks, track-side structures or improvements within increased width of ROW.	Crossing hazardous fault zone at angle below 60 degrees. Trackside systems facilities in fault hazard zones.	Alignment crosses the San Andreas fault hazard zone at grade at an angle of approximately 50 to 56 degrees. The following grade separation structures are planned within the SAF zone: E. Barrel Springs Road, Sierra Hwy, and E. Avenue S. Trackside systems facilities, traction power, train control, communications, buildings and huts would be potentially located in fault hazard zones. Other primary structures like embankment fills, viaduct, and radio tower, to be located within the fault zone as well. Estimated rupture displacement across the entire fault zone is approximately 18 ft.	N/A
2	Approx. Refined SR14 STA 2029+00 to STA 2198+50 (Verdugo Fault Zone)	2.10.6 R1	6.8.2 6.8.5.2	Place the alignment at-grade with ballasted track, oriented as near to perpendicular (90deg±30deg) as feasible to the fault trace	Trench and cut-and cover tunnel in fault zone; alignment crossing fault zone in subparallel orientation.	Alignment is sub-parallel to Verdugo Fault (0 to 15 degrees) and crosses it at grade, on embankment, in trench, and in cut-and-cover tunnel. Estimated rupture displacement is approximately 2.6 ft.	N/A
3	Approx. Refined SR14 STA 2029+00 to STA 2198+50 (Verdugo Fault Zone)	2.10.6 R1	6.8.3.7	Where U-walls exist at hazardous fault zones, consideration shall be made for increased width in recognition of anticipated damage to walls	Reduced ROW	Adequate width of ROW to minimize risk from wall collapse as result of fault rupture is not available based on constraints on adjacent residential property takes. Conceptual design of a dual wall trench with collapsible material between minimizes additional width, while reducing risk of inner trench U-wall collapse impacting rail.	N/A
4	C&C single tunnel Approx. Refined SR14 STA 2143+10 to STA 2160+00	1.1.21	Drawing TM 1.1.21- C	Two track formation tunnel structures	Separation wall not to be considered	Separation wall not to be considered in these sections because of separation between tracks (16.5') and the proximity to Burbank Airport Station and consequent turnouts requirements. Emergency egress to ground surface designed instead. Separation wall not to be considered in these sections because separation between tracks is 16.5' and the proximity to Burbank Airport Station and consequent turnouts requirements.	

Table 17-4 HSR Elevated Structures Design Variances

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date
		TM	Section				
1	Viaduct STA 1186+10	2.10.10 (2.1.5)*	2.1.2	<p>Rail Expansion Joint (REJ), Damping & Isolation devices</p> <p>Avoid the use of non-standard elements</p> <p>Exceptional: Use is allowed under unique circumstances</p>	<p>Applicability of non-standard elements to long and continuous viaducts due to special constraints</p>	<p>Due to the height of the deck and the unbalanced stiffness of the substructure, a simply supported solution yields an oversized foundation due to the forces absorbed by the piers. A continuous superstructure with sliding bearings would reduce forces and size of foundations, requiring, however, rail expansion joint devices.</p> <p>In case the continuous solution is adopted, due to the length of the superstructure, damping devices in combination with isolation devices might be needed in final design.</p> <p>Current simply supported design makes RSI difficult to verify due to substructure displacements and relative displacements between superstructure and rail.</p>	N/A
2	Agua Dulce Viaduct STA 1204+53	2.10.10 (2.1.5)*	2.1.2	<p>Rail Expansion Joint (REJ), Damping & Isolation devices</p> <p>Avoid the use of non-standard elements</p> <p>Exceptional: Use is allowed under unique circumstances</p>	<p>Applicability of non-standard elements to long and continuous viaducts due to special constraints</p>	<p>Due to the height of the deck and the unbalanced stiffness of the substructure, a simply supported solution yields an oversized foundation due to the forces absorbed by the piers. A continuous superstructure with sliding bearings would reduce forces and size of foundations, requiring, however, rail expansion joint devices.</p> <p>In case the continuous solution is adopted, due to the length of the superstructure, damping devices in combination with isolation devices might be needed in final design.</p> <p>Current simply supported design makes RSI difficult to verify due to substructure displacements and relative displacements between superstructure and rail.</p>	N/A

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date
		TM					
3	Barrel Springs Road STA 365+87	2.10.6	3.5, 3.6	Special materials/configuration of the isolation system. Avoid use of elevated structure Exceptional: Embankments may be used as a structural improvement.	Applicability of non-standard elements to provide isolation for the whole structure.	Barrel springs road is an underpass near San Andres fault zone. Due to the height of the track an elevated structure is unfeasible and shall be avoided. Instead, two concrete vaults are inserted into the embankment and flexibility to absorb large fault displacements without rigid body effects is provided. The isolation shall also avoid tie-back effects between the track and the concrete vaults underneath. Further analysis shall be carried out to confirm such design.	N/A
4	Viaduct STA 1186+10 Near Burke Road	2.10.10 (2.1.5)*	2.1.2	Rail Expansion Joint (REJ), Damping & Isolation devices Avoid the use of non-standard elements Exceptional: Use is allowed under unique circumstances	Applicability of non-standard elements to long and continuous viaducts due to special constraints	Due to the height of the deck and the unbalanced stiffness of the substructure, a simply supported solution yields an oversized foundation due to the forces absorbed by the piers. A continuous superstructure with sliding bearings would reduce forces and size of foundations, requiring, however, rail expansion joint devices. In case the continuous solution is adopted, due to the length of the superstructure, damping devices in combination with isolation devices might be needed in final design. Current simply supported design makes RSI difficult to verify due to substructure displacements and relative displacements between superstructure and rail.	N/A

No.	Locations/Station	Design Criteria Reference		Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date
		TM	Section				
5	Agua Dulce Viaduct STA 1204+53	2.10.10 (2.1.5)*	2.1.2	Rail Expansion Joint (REJ), Damping & Isolation devices Avoid the use of non-standard elements Exceptional: Use is allowed under unique circumstances	Applicability of non-standard elements to long and continuous viaducts due to special constraints	Due to the height of the deck and the unbalanced stiffness of the substructure, a simply supported solution yields an oversized foundation due to the forces absorbed by the piers. A continuous superstructure with sliding bearings would reduce forces and size of foundations, requiring, however, rail expansion joint devices. In case the continuous solution is adopted, due to the length of the superstructure, damping devices in combination with isolation devices might be needed in final design. Current simply supported design makes RSI difficult to verify due to substructure displacements and relative displacements between superstructure and rail.	N/A

* TM 2.1.5 (Track Design) is mentioned in several TMs but it is not available on the website. TM 2.10.10 has been used.

17.2 Third Parties Design Variances

Table 17-5 through Table 17-7 summarize the design variances where standard design was not accomplished for SCRRA, roadways and utilities.

Table 17-5 Third Party Design Variances - SCRRA

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date
1	SCRRA Palmdale Station Track Sta. 3582+71-3597+84 (CHSR Sta 249+87 – 265+00)	SCRRA Design Criteria Manual Table 4-1 Centerline to Centerline distance between HSR and SCRRA	Centerline to Centerline distance between HSR and SCRRA should be at least 120'.	Reduction of Centerline-to-Centerline Distance to 113'. Intrusion Protection Barrier needed	Geometry restrictions at Palmdale Junction result in this narrower track spacing.	N/A
2	SCRRA Palmdale Realignment STA 55+69 to STA 69+90	ES2203 Curve Design Procedure - 6	For design speeds greater than 35 mph, curves in opposite directions shall be separated by a tangent with a minimum length equal to 3 times the maximum speed.	Reduction of tangent length to a minimum of 148' for a maximum speed of 55 mph (less than 79 mph)	The realignment is mainly done on the vertical profile, the horizontal alignment follows the current horizontal geometry, which does not meet the minimum tangent length in some places.	N/A
3	SCRRA between Hansen Dam Spillway and Olinda St	Centerline to Centerline distance between HSR and SCRRA	Centerline to Centerline distance between HSR and SCRRA should be at least 120'.	Reduction of Centerline to Centerline Distance to less than 120'.	Geometry restrictions at existing railway corridor in the San Fernando Valley result in this narrower track spacing.	N/A

Table 17-6 Third Party Design Variances - Roadways

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
Fifth Street East (Design Speed 50 MPH)							
1	160+80.00 to 163+00.00	Stopping Sight Distance on Sag Vertical Curve AASHTO Table 3-36	430'	430'	285'	Short vertical curve and steep grade needed to lower profile quickly and minimize impacts to Avenue Q-7. Street lighting to be used to mitigate reduced sight distance during nighttime.	N/A
2	163+00.00 to 169+00.00	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	430'	430''	355'	Proposed LVC=600' Desirable LVC for SSD 430' =875': The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
3	191+50.00 to 196+50.00	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	430'	430''	357'	Proposed LVC=500' Desirable LVC for SSD 430' =726': The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
Palmdale Boulevard (Design Speed 60 MPH)							
4	96+17.95 to 100+57.95	Stopping Sight Distance on Sag Vertical Curve AASHTO Table 3-36	580'	580'	359.58'	Short vertical curve and steep grade needed to lower profile quickly and minimize impacts. Street lighting to be used to mitigate reduced sight distance during nighttime.	N/A

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
5	101+18.06 to 120+18.06	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	580'	580''	480'	Proposed LVC=1900' Desirable LVC for SSD 580' =2751': The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
6	121+75.41 to 126+15.41	Stopping Sight Distance on Sag Vertical Curve AASHTO Table 3-36	580'	580'	365'	Short vertical curve and steep grade needed to lower profile quickly and minimize impacts. Street lighting to be used to mitigate reduced sight distance during nighttime	N/A
7	100+59.37 to 105+46.71	Superelevation rate HDM 202.2(1)	+2%	-	-2% (crowned section)	No super elevation applied to this road since the City of Palmdale may take ownership from Caltrans	N/A
8	114+59.42 to 119+45.73	Superelevation rate HDM 202.2(1)	+2%	-	-2% (crowned section)	No super elevation applied to this road since the City of Palmdale may take ownership from Caltrans	N/A
9	96+17.95 to 105+70.00	Side slopes HDM 304.1	4:1	2:1	2:1	Steeper slopes designed to avoid impacts to adjacent existing properties	N/A
Avenue R (Design Speed 60 MPH)							
10	95+20.00 to 100+80.00	Stopping Sight Distance on Sag Vertical Curve AASHTO Table 3-36	580'	580'	365'	Short vertical curve and steep grade needed to lower profile quickly and minimize impacts to Fifth Street East. Street lighting to be used to mitigate reduced sight distance during nighttime	N/A

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
11	100+82.85 to 120+22.85	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	580'	580''	485'	Proposed LVC=1940' Desirable LVC for SSD 580' =2767': The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
12	122+94.79 to 127+94.79	Stopping Sight Distance on Sag Vertical Curve AASHTO Table 3-36	580'	580'	360'	Short vertical curve and steep grade needed to lower profile quickly and minimize impacts to Tenth Street East. Street lighting to be used to mitigate reduced sight distance during nighttime	N/A
13	100+50.00 to 108+92.00	Side Sloped HDM 304.1	4:1	2:1	2:1	Steeper slopes used to minimize impacts to adjacent properties	N/A
14	91+53.00 to 128+55.38	Street Width City of Palmdale Table C-1 & Exhibit C-1	88' (Std Section B1) 98' (Std Section B2)	-	62' to 76'	Per discussion with High-Speed Rail Engineering two lanes in each direction would be recommended. The median along the bridge was reduced to 4' as no turning movements take place there. Typical sections were presented to the City of Palmdale during a meeting on 3/8/2016 and the City had no comments on the proposed design.	N/A
Sierra Highway (Design Speed 60 MPH)							
15	500+50.00 to 503+50.00	Length of Vertical Sag Curve HDM 201.4	10xV = 600''	3xV=180'	300	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (600"). AASHTO recommend using as a minimum of 3xV =150' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
16	540+00.00 to 544+00.00	Length of Vertical Sag Curve HDM 201.4	10xV = 600"	3xV=180'	300'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (600"). AASHTO recommend using as a minimum of 3xV =150' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A
E Avenue S (Design Speed 60 MPH)							
17	80+37.03 to 85+37.03	Length of Vertical Sag Curve HDM 201.4	10xV = 600"	3xV=180'	500'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (600"). AASHTO recommend using as a minimum of 3xV =150' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A
18	93+96.90 to 103+51.90	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	580'	580'	455'	Proposed LV=:955 Desirable LVC for SSD 580' = 1,549' : The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
Sierra Highway (Design Speed 60 MPH)							

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
19	700+80.59 to 705+64.80	Length of Vertical Crest Curves HDM 204.4	$10 \times V = 600'$	$3 \times V = 180'$	484'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to $10V$ (600"). AASHTO recommend using as a minimum of $3xV = 180'$ Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A
20	712+99.23 to 726+54.23	Stopping Sight Distance on Crest Vertical Curve HDM 201.1	580'	580'	450'	Proposed LVC=1,355' Desirable LVC for SSD 580' = 2,202' : The AASHTO recommends values for the height of the eye and the height of the object of 3.5ft and 2ft respectively to calculate SSD. The AASHTO guidelines for crest vertical curve length results in a shorter vertical curve length compared to the HDM equation. This shorter vertical curve minimizes the footprint in the most constrained areas of the project.	N/A
21	726+54.23 to 730+15.24	Length of Vertical Crest Curves Sag HDM 204.4	$10 \times V = 600''$	$3 \times V = 180'$	361''	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to $10V$ (600"). AASHTO recommend using as a minimum of $3xV = 180'$ Short vertical curve and steep grade needed to lower profile quickly and minimize impacts.	N/A

East Avenue R11 (Design Speed 30 MPH)

No.	Locations/Station	Design Criteria Reference	Minimum or Exceptional Standard	Minimum AASHTO	Variance Requested	Constraint/ Justification	Approval Date
22	17+39.40 to 18+89.40	Length of Vertical Curve Sag HDM 201.4	200"	3xV=90'	150'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (300"). AASHTO recommend using as a minimum of 3xV =90' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A
Service Road Ave S (Design Speed 30 MPH)							
23	10+62.511 to 11+62.54	Length of Vertical Curve Sag HDM 201.4	200"	3xV=90'	100'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (300"). AASHTO recommend using as a minimum of 3xV =90' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A
24	14+92.64 to 16+92.64	Length of Vertical Curve Sag HDM 201.4	200"	3xV=90'	100'	HDM recommends that for algebraic grade differences of 2 percent and greater, and design speeds equal to or greater than 40 miles per hour, the minimum length of vertical curve in feet should be equal to 10V (300"). AASHTO recommend using as a minimum of 3xV =90' Short vertical curve and steep grade needed to lower profile quickly and minimize impacts	N/A

Table 17-7 Third Party Design Variances - Utilities

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
1	(STA 129+15)	2.7.4	2.2.3; 2.5.3	Relocation of 18" COP sewer utility to Transverse: crossing the CHSR, Above Ground Utilities	CHSTP policy is to exclude access to public and private utilities from within the access controlled high-speed rail right of way at locations where it is feasible and reasonable.	To allow sewer pump station to be proposed within the CHSR R/W	To allow Transverse: utility crossing to the Authority R/W with appurtenances outside R/W: 1) An alternate location is not feasible, from the standpoint of providing efficient utility services in a manner conducive to safety, durability, and economy of maintenance and operations. 2) The accommodation would not adversely affect the design, construction, operation, maintenance, safety, or stability of the railway facility. 3) The accommodation would not interfere with or impair the proposed use or future expansion of the railway facility. 4) The disapproval of the use of the right of way would result in an immitigable impact to the owner, the environment, or the public. 5) The utility be located in such a manner that it can be serviced, maintained, and operated without being accessed from the railroad right of way and would not adversely affect safety or cause damage to the Authority facility. The required appurtenance would require to be proposed outside of project footprint east of Metrolink R/W.	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
2	(STA 153+21)	2.7.4	2.2.3; 2.5.1	Relocation of 12 & 66 kV SCE distribution and transmission power utility to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 330' horizontal clearance from 12" waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Rancho Vista Blvd. See Constraint/Justification No. 1.	N/A	
3	(STA 156+48)	2.7.4	2.2.3; 2.5.1	Relocation of 12" Palmdale WD waterline to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 330' horizontal clearance from 12 & 66 kV UG powerline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Rancho Vista Blvd. See Constraint/Justification No. 1.	N/A	
4	(STA 175+27)	2.7.4	2.2.3	Relocation of 12" Palmdale WD waterline to transverse crossing the CHSR	Transverse: Greater than 60° from rail longitudinal alignment.	To allow 12" waterline utility to cross at 28° from rail longitudinal alignment	The 12" waterline utility is proposed at grade separated Sierra Highway (Realigned) and would not interfere with CHSR facility. See Constraint/Justification No. 1.	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
5	(STA 208+57)	2.7.4	2.2.3	Relocation of 66 kV OH SCE power transmission to transverse crossing the CHSR.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 160' horizontal clearance from 12" waterline.	See Constraint/Justification No. 1.	N/A	
6	(STA 209+73)	2.7.4	2.2.3; 2.5.1	Relocation of 6" SCG gas utility to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 40' horizontal clearance from 12" waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Avenue Q. See Constraint/Justification No. 1.	N/A	
7	(STA 210+14)	2.7.4	2.2.3; 2.5.1	Relocation of 12" Palmdale WD waterline to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 40' horizontal clearance from 12" waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Avenue Q. See Constraint/Justification No. 1.	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
8	STA 318+75	2.7.4	2.2.3; 2.5.1	Relocation of 30" SCG gas transmission line to transverse crossing the CHSR at Ave S ; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 22' horizontal clearance from 30" SCG gas transmission line within Ave S. Clearance from ground level: 7' from 18" waterline, 9' from 12' waterline, 11' from 20" water line and 10' from 42" effluent water.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Avenue S. See Constraint/Justification No. 1	N/A	
9	STA 408+76	2.7.4	2.2.3; 2.5.1	Relocation of 20" Palmdale WD waterline to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 20' horizontal clearance from 20" water distribution line and 105' from 20" water distribution line.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Barrel Springs Rd. See Constraint/Justification No. 1	N/A	
10	STA 405+60	2.7.4	2.2.3	Relocation of 12kV SCE power transmission to transverse crossing the CHSR	Transverse: Greater than 60° from rail longitudinal alignment	To allow 12Kv SCE power transmission to cross at 22° from rail longitudinal alignment	The 12Kv OH SCE power transmission line is proposed to relocate underground. See Constraint/Justification No. 1.	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
11	STA 1196+30	2.7.4	2.2.3; 2.5.1	Relocation of 230kV OH SCE power transmission to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 234' horizontal clearance from the relocation of 230kV SCE OH power transmission.	See Constraint/Justification No. 1	N/A	
12	STA 1200+71	2.7.4	2.2.3; 2.5.1	Relocation of 230kV OH SCE power transmission to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 442' horizontal clearance from the relocation of 230kV SCE OH power transmission, 239' from the relocation of 230kV SCE OH power transmission.	See Constraint/Justification No. 1	N/A	
13	STA 1203+10	2.7.4	2.2.3; 2.5.1	Relocation of 230kV OH SCE power transmission to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 239' horizontal clearance from the relocation of 230kV SCE OH power transmission, 463' from the relocation of 16kV SCE power distribution.	See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
14	STA 1203+10	2.7.4	2.2.3; 2.5.1	Relocation of 230kV OH SCE power distribution to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 239' horizontal clearance from the relocation of 230kV SCE OH power transmission.	See Constraint/Justification No. 1	N/A	
15	STA 1207+73	2.7.4	2.2.3	Existing 16kV OH SCE power distribution to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 463' horizontal clearance from the relocation of 230kV SCE OH power transmission.	See Constraint/Justification No. 1	N/A	
16	(STA 2013+21)	2.7.4	2.2.3; 2.51	Relocation of 2" SCG gas to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 34' horizontal clearance from the relocation of 8" LADWP waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Bradford St. See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
17	(STA 2013+56)	2.7.4	2.2.3; 2.51	Relocation of 8" LADWP waterline to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 34' horizontal clearance from the relocation of 2" SCG gas.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Bradford St. See Constraint/Justification No. 1	N/A	
18	(STA 2013+65)	2.7.4	2.2.3; 2.51	Relocation of LADWP OH power to transverse crossing the CHSR.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 34' horizontal clearance from the relocation of OH.	See Constraint/Justification No. 1	N/A	
10	(STA 2042+39)	2.7.4	2.2.3; 2.51	Existing Unknown LADWP water along Tujunga Channel to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 172' horizontal clearance from the relocation to UG the LADWP power.	See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
20	(STA 2044+06)	2.7.4	2.2.3; 2.51	Relocation to UG thef 230kV LADWP transmission power to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 30' horizontal clearance from the relocation to UG 230kV the LADWP transmission power.	See Constraint/Justification No. 1	N/A	
21	(STA 2044+36)	2.7.4	2.2.3; 2.51	Relocation to UG the 230kV LADWP transmission power to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow 30' horizontal clearance from the relocation to UG 230kV the LADWP transmission power.	See Constraint/Justification No. 1	N/A	
22	(STA 2078+00)	2.7.4	2.2.3; 2.5.1	Relocation to UG of LADWP power to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of 500kV power transmission with 50' horizontal clearance from relocation to UG LADWP power.	See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
23	(STA 2114+10)	2.7.4	2.2.3; 2.5.1	Relocation to UG of LADWP power at grade separated Tuxford St Underpass to transverse crossing the CHSR at Tuxford St underpass; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 17' horizontal clearance from relocation of 12" SCG gas, 53' from LADWP UG power, 61' from 6" LADWP waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Tuxford St. See Constraint/Justification No. 1	N/A	
24	(STA 2078+00)	2.7.4	2.2.3; 2.5.1	Relocation of 12" SCG gas utility at grade separated to transverse crossing the CHSR at Tuxford St underpass; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 17' horizontal clearance from relocation of LADPW UG power, 36' from LADWP UG power, 43' from 6" LADWP Waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Tuxford St. See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
25	(STA 2114+10)	2.7.4	2.2.3; 2.5.1	Relocation of LADWP power utility at grade separated Tuxford St Underpass to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 53' horizontal clearance from relocation of LADPW UG power, 36' from 12" SCG gas, 7' from 6" LADWP Waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Tuxford St. See Constraint/Justification No. 1	N/A	
26	(STA 2114+15)	2.7.4	2.2.3; 2.5.1	Relocation of 6" LADWP waterline at grade separated Tuxford St Underpass to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 53' horizontal clearance from relocation of LADPW UG power, 36' from 12" SCG gas, 7' from 6" LADWP Waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Tuxford St. See Constraint/Justification No. 1	N/A	

No.	Locations/Station	Design Criteria Reference		Description	Minimum or Exceptional Standard	Variance Requested	Constraint/ Justification	Approval Date	Comments
		TM	Section						
27	(STA 2129+50)	2.7.4	2.2.3;2.5.1	Relocation of LADWP power utility at Penrose St to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 17' horizontal clearance from relocation of LADPW UG power.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Penrose St. See Constraint/Justification No. 1	N/A	
28	(STA 2129+50)	2.7.4	2.2.3;2.5.1	Relocation of LADWP power utility at Penrose St to transverse crossing the CHSR; closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of LADWP power with 17' horizontal clearance from relocation of LADPW UG power.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Penrose St. See Constraint/Justification No. 1	N/A	
29	(STA 2144+50)	2.7.4	2.2.3;2.5.1	Relocation of 48" MWD water conveyance to transverse crossing the CHSR. Closer horizontal clearance of high risk to high risk utilities.	Transverse: Maintain 500' minimum horizontal separation from other high risk facilities.	To allow the relocation of 48" MWD water conveyance with 16' horizontal clearance from relocation of 12" LADWP waterline.	The request for closer horizontal clearance to allow utilities to maintain within designated corridor at Sunland Blvd. See Constraint/Justification No. 1	N/A	

Note: Stations referred to SR14A alignment. Stations shown in parenthesis are referred to Refined SR14 alignment.

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18 DESIGN AND CONSTRUCTION PERMITS

The February 2015 version of TM 0.1 calls for inclusion in the DBR of a “preliminary listing of the anticipated design/construction permits that may be required from regulatory, resource, state, and federal agencies.” Therefore, this section now includes a summary of the environmental permits that could influence the 15 percent preliminary design, in addition to a preliminary list of construction permits that could be required for the Palmdale to Burbank Section.

18.1 Influence of Environmental Permits and Approvals on 15% Design

The following environmental permits and approvals influenced the 15 percent design effort:

Federal Clean Water Act Section 404 permit from U.S. Army Corps of Engineers (USACE)

Consultation with U.S. Fish and Wildlife Service (USFWS) under Section 7 of the federal Endangered Species Act

Consultation with the National Park Service (NPS) and US Forest Service (USFS) under 36 CFR 251.54 initial screening

Rivers and Harbors Act Section 14 (408) permission from USACE

The regulatory requirements of these permits and approvals and the way in which they influenced the 15 percent design are discussed below.

Additional agency consultations and agreements also affected 15 percent design, including requirements under Section 106 of the National Historic Preservation Act and Sections 4(f) and 6(f) of the Department of Transportation Act. These and other such statutory consultations and agreements, though not permits per se, are listed in Table 18-1.

404 Permits

Section 404 permitting or authorization is required from USACE for an activity that would result in the discharge of fill material (including re-depositing dredged material but not including incidental fallback) into waters of the United States. The Palmdale to Burbank Section requires an individual 404 permit, for the impact to Lake Una which means that USACE may only permit the Least Environmentally Damaging Practicable Alternative (LEDPA) as determined through a 404(b) (1) alternatives analysis. Additional crossing of the waters of the United States may either be added to the individual permit or to the Nationwide Permit.

Following identification of alignment alternatives, design efforts were made to minimize the width of the right of way of each alternative where it would cross waters of the United States.

Section 7 Consultation

Section 7 of the Endangered Species Act states that, federal agencies must ensure that their actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat. Consultation under Section 7 can result in an incidental take permit for activities that would not jeopardize the continued existence of a protected species. For take authorization to be granted, a project proponent must submit a plan that, among other things, outlines the steps that would be taken to minimize and mitigate adverse effects on protected species.

The Palmdale to Burbank Section crosses a migratory corridor used for habitat connectivity by a variety of sensitive species, including American badger, California mountain kingsnake, two-striped garter snake, western pond turtle, and California spotted owl. While much of the alignment

is proposed to be constructed via subsurface tunnel, areas where the proposed alternative alignments cross the migratory corridor at grade could generate significant barriers to wildlife movement. The engineering team, in consultation with local wildlife experts, have identified specific wildlife crossing locations designed to facilitate wildlife movement and minimize impacts to wildlife migration within this corridor.

Section 408 Permission

In accordance with Section 14 of the Rivers and Harbors Act (33 U.S.C. 408), USACE must approve a proposed modification that affects a federal flood control project. A Section 408 permit would be required if the project encroaches on a federal facility or if project construction modifies a federal levee. Encroachments include levee systems and waterways regulated by the USACE. A Section 208.10 permit would be required where the project crosses the right of way of a federal flood control facility or interferes with its operation or maintenance without changing the system's structural geometry or hydraulic capacity.

Coordination has occurred with the USACE Los Angeles District regarding the Hanson Dam Spillway and Big Tujunga Creek channel. The Refined SR14 Build Alternative would span this facility via viaduct and would thus avoid modifications or alternations to this facility.

18.2 Influence of Environmental Permits and Approvals on Final Engineering Design

Prior to the approval of a Record of Decision to proceed with the project, a Biological Opinion (BO) from the USFWS would be required for the Palmdale to Burbank Section. The Authority expects to obtain approved Treatment Plans for cultural resources under Section 106 of the federal Historic Preservation Act prior to initiating final engineering design for the project. The BO and Treatment Plans may contain project conditions that may influence final engineering design.

The Authority would submit applications for the following permits during final engineering design:

USACE Section 404 permit

- California State Water Resources Control Board (SWRCB) 401 Water Quality Certification
- California Department of Fish and Wildlife (CDFW) 1602 Streambed Alteration Agreement
- CDFW Section 2081 incidental take permit

These permits must be approved before the start of construction. The permits would contain project conditions that may influence final design.

18.3 Construction Permits

Table 18-1 provides a list of permits, approvals, consultations, and agreements that may need to be in place prior to construction.

Table 18-1 Preliminary List of Design and Construction Permits, Consultations, and Requirements

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
Federal Agencies			
1.	Federal Railroad Administration	NEPA Department of Transportation Act Sections 4(f) and 6(f) 49 CFR Part 200-299	<ul style="list-style-type: none"> • Lead federal agency responsible for implementation of NEPA, and coordination with other federal agencies. • Responsible for coordination with federally recognized tribes under NHPA Section 106. • Responsible for use determinations for project impacts on properties protected under Section 4(f) or 6(f). Project designed to avoid use wherever feasible. • Regulations related to high-speed train operation and safety • Responsible for coordination with USFWS to obtain compliance under Section 7 of the Endangered Species Act
2.	Advisory Council on Historic Preservation	NHPA Section 106	Oversees compliance with NHPA; elected to participate as a signatory to the Palmdale to Burbank Section Memorandum of Agreement, per Section 106.
3.	Department of Homeland Security	N/A	N/A
4.	Federal Aviation Administration	14 CFR 77.24 (aka Part 77)	Air space clearance for aircraft facilities (e.g., landing strips, heliports)
5.	Federal Communications Commission	47 CFR 17.7	Manages antenna structure registration, including for standalone radio sites for HSR - requires TOWAIR analysis.
6.	Federal Emergency Management Agency	N/A	N/A
7.	National Marine Fisheries Service (NMFS)	Federal Endangered Species Act	The NMFS determined that California Steelhead Trout habitat exists in the Santa Clara River downstream of project impacts. While the agency has no specific issues or concerns a NMFS representative has been invited to participate in agency discussions.

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
8.	Natural Resources Conservation Service	NRCS-CPA-106	N/A
9.	U.S. Army Corps of Engineers (USACE)	Federal Clean Water Act, Section 404/Section 10 Rivers and Harbors Act, Section 408	<ul style="list-style-type: none"> Oversees and issues permits governing projects that dredge or fill waters of the U.S. in waterways. Party to the Checkpoint A MOU among Authority, FRA, USACE, and EPA. Makes major or minor Section 408 determinations for projects that affect flow
10.	U.S. Environmental Protection Agency (EPA), Region 9	Federal Clean Air Act, Section 176(c)(4)	<ul style="list-style-type: none"> Oversees completion of the United States Environmental Protection Agency General Conformity Determination process. Party to the Checkpoint A MOU among Authority, FRA, USACE, and EPA.
11.	U.S. Fish and Wildlife Service (USFWS), Region 8	Federal Endangered Species Act	Implementation of avoidance and minimization measures to avoid take of the species. Otherwise requires a USFWS biological opinion authorizing incidental take of a listed species. This includes a list of reasonable and prudent measures to minimize the take and terms and conditions that must be observed when implementing those measures.
12.	U.S. Forest Service	36 CFR Part 251	The U.S. Forest Service is a NEPA Cooperating Agency and would require a Special Use Authorization for activities with the Angeles National Forest and San Gabriel Mountains National Monument.
13.	Bureau of Land Management	DOI/USDA/DOT P.L. 96-487 and Federal Register Notice 5-22-95	Approve right-of-way and use of properties under the jurisdiction of the BLM.
14.	U.S. Department of Interior	Section 4(f) of the Department of Transportation Act of 1966	If needed, Section 4(f) consultation (in addition to FRA, as listed above).

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
15.	U.S. Department of Interior/National Park Service	Section 6(f) of the Land and Water Conservation Fund Act of 1965	If needed, approval of replacement parkland per Section 6(f).
State & Regional Agencies			
16.	California High-Speed Rail Authority	CEQA	Lead state agency responsible for implementation of CEQA for the California HSR System and responsible for coordination with other state and federal agencies.
17.	California Air Resources Board	<ul style="list-style-type: none"> Indirect Source Review (ISR) Voluntary Emissions Reduction Agreement (VERA) 	<ul style="list-style-type: none"> Responsible for completing project ISR. Administers VERA program
18.	California Department of Fish and Wildlife, Region 5	<ul style="list-style-type: none"> California Endangered Species Act (CESA) California Fish and Game Code Section 2081 – Incidental Take Permit Title 14 Memorandum of Agreement California Fish and Game Code Section 1602 – Streambed Alteration Agreement Programmatic Permit 	<ul style="list-style-type: none"> Administers CESA Reviews applications and issues Incidental Take Permit and incidental "take" authorization. Reviews applications and issues Streambed Alteration Agreement programmatic permits
19.	Department of Transportation, District 7	Highway Design Manual	Prepare project reports and fact sheets for intersection of HSR with state highway facilities; obtain encroachment permits for activity within Caltrans right of way.
20.	California Public Utilities Commission	<ul style="list-style-type: none"> General Orders Application to Construct 	<ul style="list-style-type: none"> Establishes design and safety requirements for electric utilities Approves construction of new/modification of existing high-voltage power lines

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
21.	California State Water Resources Control Board	<ul style="list-style-type: none"> • Federal Clean Water Act: Section 401 - State Water Quality Certification • Section 402 – NPDES Permit (Construction General Permit and Municipal Separate Storm Sewer Permit) 	<ul style="list-style-type: none"> • Issues Water Quality Certifications • Administers National Pollutant Discharge Elimination (NPDES) permitting for discharge of stormwater from construction sites and/or impacts on the beneficial uses of state jurisdictional waters. • Issues orders and waste discharge requirements for effluent discharge surface or groundwater.
22.	CalEPA Department of Toxic Substances Control	California Health and Safety Code	Regulates hazardous and toxic substances and oversees cleanup, management, transport, treatment and disposal of contaminated and hazardous materials and coordinate disruption of remediation systems at known contaminated sites and coordinate disposal of hazardous or toxic substances
23.	Native American Heritage Commission	California Public Resources Code (PRC) 5097.98	Must be notified in the event human remains are encountered during construction.
24.	Office of the State Fire Marshal	NFPA 101	Oversees development and enforcement of fire prevention engineering.

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
25.	State Historic Preservation Office	<ul style="list-style-type: none"> • Section 106 Consultation (National Historic Preservation Act of 1966) • PRC 5024 and 5024.5 	<ul style="list-style-type: none"> • Ensures that the compliance obligations under Section 106 of the NHPA are followed, which requires the lead federal agency of an undertaking to consider the effects of their actions on the properties that are listed or may be eligible for listing in the National Register of Historic Places. Requires preparation of a Section 106 report that evaluates the significance of archaeological, historical, and architectural properties, and develops treatment plans in accordance with the Secretary of the Interior Standards for Treatment of Historic Properties and Cultural Landscapes. To be executed through a programmatic agreement and a memorandum of agreement with the project proponents and other consulting or concurring parties. Oversees Native American consultations. • Manages CEQA compliance for historical resources.
26.	Cities of Palmdale, Los Angeles, and Burbank	City ordinances and General Plans	<p>Implement city ordinances and manages development in accordance with their respective General Plan, including the issuance of ministerial permits and the following:</p> <ul style="list-style-type: none"> • Encroachment permits • Demolition permits • Construction Management Plan • Transportation Management Plans • Maintenance Agreements • Water connection permit • Wastewater discharge permits • Must concur with FRA use determinations for city owned Section 4(f) and 6(f) properties

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
27.	Los Angeles County	County code and Master Plans	Implement county ordinances and manage development in accordance with the County Master Plan, including: <ul style="list-style-type: none"> • Encroachment permits • Easement abandonment permits • Well permits for wells, piezometers, and exploratory borings that intersect the saturated zone. • Transportation Management Plans • Maintenance agreements • Wastewater discharge permits
28.	Antelope Valley Air Quality Management District	AVAQMD Rule 402— Nuisance AVAQMD Rule 403— Fugitive Dust. AVAQMD Rule 404— Particulate Matter Concentration. AVAQMD Rule 1108— Cutback Asphalt. AVAQMD Rule 1113— Architectural Coatings. AVAQMD Rule 1300— New Source Review. AVAQMD Regulation IX - Standards of Performance for New Stationary Sources AVAQMD Regulation XIII - New Source Review AVAQMD Regulation XIV -Toxics and Other Non-Criteria Pollutants AVAQMD Regulation XXX – Title V Permits	Permits (Permit to Construct and Permit to Operate) for stationary-source emissions sources associated with the Palmdale station and light maintenance facilities may be required from AVAQMD.
29.	South Coast Air Quality Management District	SCAQMD Rule 402— Nuisance. SCAQMD Rule 403— Fugitive Dust. SCAQMD Rule 1403— Asbestos Emissions from Demolition/Renovation Activities. SCAQMD Regulation XIV - Toxics and Other Non-Criteria Pollutants SCAQMD Regulation XIII - New Source Review SCAQMD Regulation XXX – Title V Permits XXXV - Railroads and Railroad Operations	Permits (Permit to Construct and Permit to Operate) for stationary-source emissions sources associated with the Burbank Airport Station may be required from SCAQMD

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
30.	Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification Section 402 National Pollutant Discharge Elimination System (NPDES) Water Discharge Permit Dewatering permit (Order No. 98-67) Spill Prevention, Control, and Countermeasure (SPCC) Plan (part of Section 402 process) Stormwater Construction and Operation Permit	RWQCBs are responsible for ensuring implementation and compliance with the provisions of the Clean Water Act and Porter-Cologne Act by setting water quality standards for surface waters and groundwater, implementing the NPDES program, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions.
Water Agencies			
31.	<ul style="list-style-type: none"> • California Water Service • Sunnyside Farms MWC • Los Angeles Department of Water and Power (LADWP) • Antelope Valley East Kern Water Agency (AVEK) • Metropolitan Water District (MWD) • Palmdale Water District (PWD) • Burbank Water and Power (BWP) 	License Agreements	<ul style="list-style-type: none"> • Encroachment permits • Maintenance agreements • Operations agreements (e.g., minimum flow requirements) • Seasonal restrictions on construction
Stormwater			
32.	<ul style="list-style-type: none"> • Palmdale Department of Public Works • Los Angeles County Department of Public Works • Burbank Department of Water and Power 	N/A	<ul style="list-style-type: none"> • Encroachment permits • Maintenance agreements • Seasonal restrictions on construction
Other Agencies			

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
33.	UPRR	<ul style="list-style-type: none"> • Operational • Guidelines • Safety controls 	<ul style="list-style-type: none"> • Encroachment permits for work within UPRR owned right-of-way • Operations coordination • Responsible for design and construction of relocations
34.	SCRRA/METROLINK	<ul style="list-style-type: none"> • Operational • Guidelines • Safety controls 	<ul style="list-style-type: none"> • Encroachment permits • Operations coordination • Responsible for design and construction of relocations
35.	Underground Service Alert (USA)	<ul style="list-style-type: none"> • California Law • California Business Professions Code Section 7110, page 22 • California • Government Code (CGC) 4216 requirements, pages 23 - 31 	Must call (800) 227-2600 2 working days or up to 14 calendar days prior to digging.
36.	Utility owners (electric, gas, pipelines, etc.)	Various	Must coordinate relocations and service interruptions

Note: This table is based on information available at the 15 percent level of design. Not all listed entities may be affected by construction or operation of the California HSR System, and other entities not listed may be affected. This list is not intended as a basis for construction planning. The Authority and/or contractors shall be responsible for identifying and complying with applicable federal, state, and local requirements.

19 SPECIAL AND UNUSUAL CONDITIONS

No special or unusual conditions beyond those described in the previous sections have been identified in the SR14A Build Alternative in the Palmdale to Burbank Project Section.

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20 SUSTAINABILITY CHECKLIST FOR PUBLIC FACILITIES

The Sustainability Checklist for Public Facilities would not be addressed in this DBR.

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Appendix A – Location of Proposed Soundwalls

Noise Barrier ¹	Side of Track	Type of Barrier	Length (feet)	Height ² (feet)	Surface Area (square feet)
Central Subsection (SR14A Build Alternative)					
North of East Barrel Springs Road to Sierra Hills Lane	SB	At grade	2,685	14	37,950

¹ Impervious noise barriers have a setback of approximately 12 feet from the proposed near track centerline.

² Height is measured in feet above top of the rail.

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