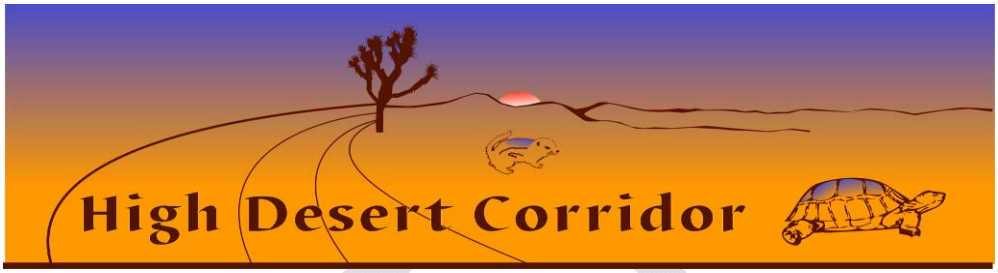
High Speed Rail Feeder Service Study

Rail Options Considered and Withdrawn Report



Palmdale to Apple Valley (SR-14 to SR-18)

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LIST OF ACRONYMS

BNSF	Burlington Northern Santa Fe
CAHST	California High Speed Train
CHSRA	California High Speed Rail Authority
Caltrans	California Department of Transportation
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
DMU	Diesel Multiple Unit
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMU	Electric Multiple Unit
FRA	Federal Railroad Administration
HDC	High Desert Corridor
HDCJPA	High Desert Corridor Joint Powers Authority
HOV	High Occupancy Vehicle
LADWP	Los Angeles Department of Water and Power
LRTP	Long Range Transportation Plan
LS	Lump Sum
METRO	Los Angeles County Metropolitan Transportation Authority
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
O&M	Operations and Maintenance
OMSF	Operations, Maintenance, and Storage Facility
NEPA	National Environmental Policy Act
PPP	Public-Private Partnership
RM	Route Mile
ROD	Record of Decision
ROW	Right-of-Way
RRIF	Railroad Rehabilitation Improvement Financing
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency
SAFETEA-LU	Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users
SANBAG	San Bernardino Associated Governments
SCAG	Southern California Association of Governments
SCLA	Southern California Logistics Airport
SCRRA	Southern California Regional Rail Authority
TPSS	Traction Power Substation
UPRR	Union Pacific Railroad
VFCC	Victorville Federal Correctional Complex

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1 Introduction

The High Desert Corridor (HDC) project is being undertaken by the California Department of Transportation (Caltrans) in coordination with the Los Angeles County Metropolitan Transportation Authority (METRO) and other partner agencies to improve east–west mobility within the High Desert region of Southern California. To comply with the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is being prepared. In March 2012, the HDC Project's environmental evaluation scope was expanded at the request of the High Desert Corridor Joint Powers Authority (HDCJPA) to include the current roadway elements, a green energy production/transmission facility, and a high speed rail feeder service concept. The high speed rail feeder service concept was developed to close the service gap between the planned California High-Speed Rail Project and the planned XpressWest high speed rail project. This Rail Options Considered and Withdrawn Report is a technical study that supports the project approval/environmental document and provides the documentation of the screening process used to define the conceptual design and cost elements of the added railway facility.

1.1 Project Setting

The High Desert region of Southern California consists of Antelope Valley and Victor Valley. The California High Speed Rail Authority (CHSRA) is currently planning and designing a high speed rail system connecting San Francisco to Los Angeles, the California High Speed Train (CAHST) Project. The CAHST project proposes to travel from northern California via the Central Valley and into the Los Angeles basin via the Antelope Valley with a planned station in the city of Palmdale near the existing Palmdale Metrolink Station, as shown in Figure 1-1.

Also in the planning and design stage is the XpressWest High Speed Rail network, connecting Las Vegas to Los Angeles via the Interstate 15 (I-15) corridor through the Victor Valley. The current proposed southern terminus of the XpressWest system is near the city of Victorville, as shown in Figure 1-2.

This project, the High Speed Rail Feeder Service, would close the gap between these two proposed high speed rail systems and provide a critical missing interregional rail link between two major infrastructure investments currently in the planning stages in Southern California and is shown in Figure 1-3.

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Figure 1-1: California High Speed Train Project Location

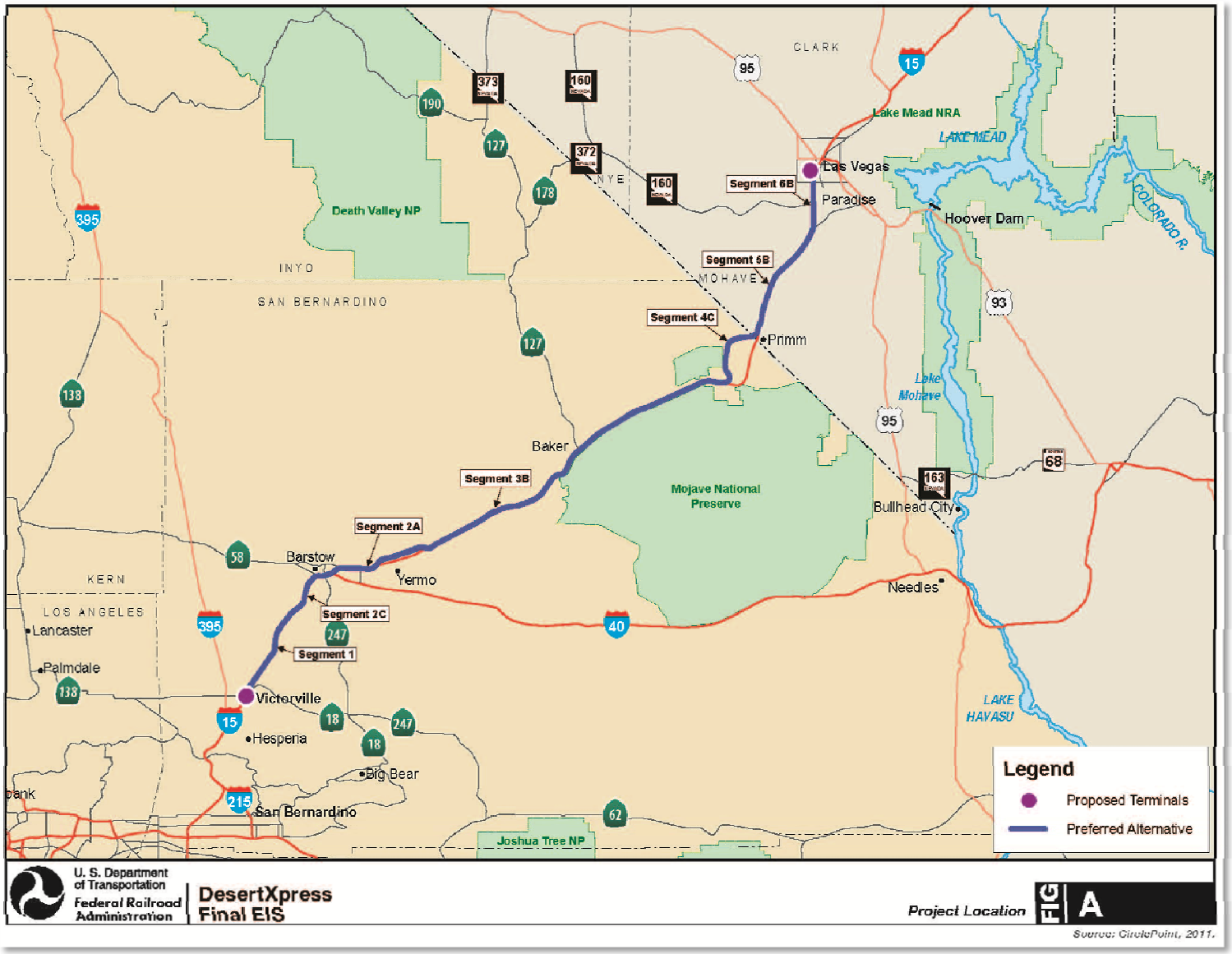

Figure 1-2: XpressWest Project Location

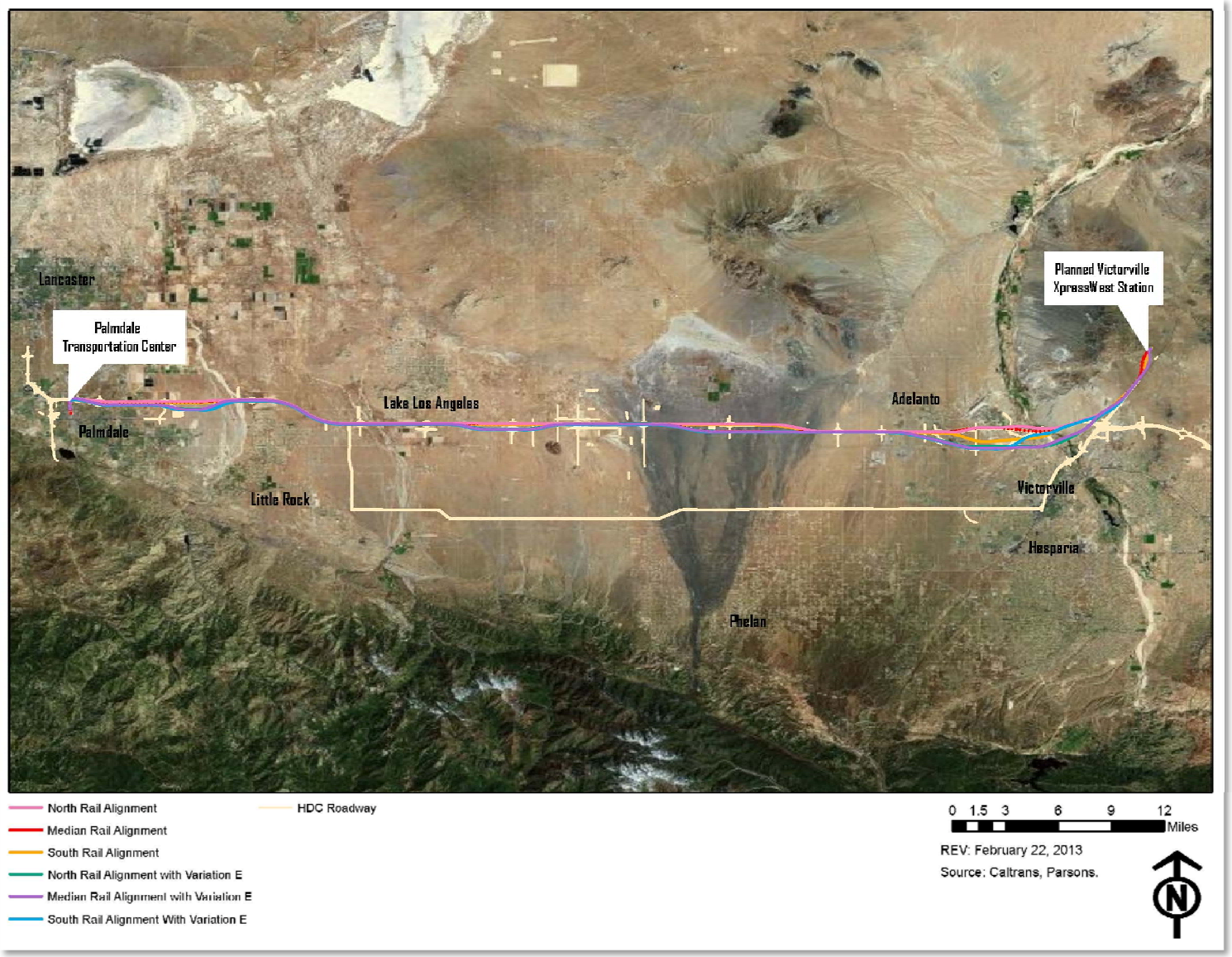

Figure 1-3: HDC High Speed Rail Feeder Service Project Location

2 Project Purpose and Need

2.1 Project Definition

The HDC project involves the construction of a new, approximately 63-mile long, east–west multi-modal transportation and green energy production/transmission corridor including freeway/expressway, toll lanes and/or High Speed Rail feeder service, between State Route 14 (SR 14) in Los Angeles County and State Route 18 (SR 18) in San Bernardino County. The general location of the project is illustrated in Figure 2-1. The HDC was originally identified as E-220 in the Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and is officially designated as a high-priority corridor on the National Highway System. The HDC project is proposed as a means of improving mobility and access for people and goods in the rapidly growing Antelope, Victor, and Apple Valley areas of Los Angeles and San Bernardino counties.

The High Speed Rail Feeder Service would close the gap in two planned high speed rail networks in the high desert, connecting the CHSRA network at the Palmdale station to the XpressWest Network at the Victorville Station. This service would increase the connectivity and access to both planned high speed rail networks and facilitate the development of both systems.

2.2 Purpose and Need

The purpose of the proposed project is to improve east–west mobility within the High Desert region of Southern California by addressing present and future travel demand and mobility needs within the Antelope and Victor valleys. The proposed action is intended to achieve the following objectives:

- Increase capacity of east–west transportation facilities to accommodate existing and future transportation demand.
- Improve travel safety and reliability within the High Desert region.
- Improve the regional goods movement network.
- Provide improved access and connectivity to regional transportation facilities, including airports and the existing and future passenger rail systems, including the proposed California High Speed Rail system and the proposed XpressWest High Speed Rail system.
- Contribute to state greenhouse gas reduction goals through the use of green energy features.

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Figure 2-1: Project Location

The proposed action will address the following specific needs:

- Recent and future population growth within the High Desert region.
- Limited and unreliable east–west connectivity within the High Desert region.
- Regional demands for goods movement to support the growth of the regional economy.
- Future demands for the use of green energy, including sustainability and green energy provisions in state law and policy.

In addition, the high speed train feeder service will:

- Provide a multimodal alternative.
- Facilitate intercity and regional travel.
- Close the missing interregional link between planned major infrastructure improvements.
- Contribute to state greenhouse gas reduction goals.
- Use innovative financing to supplement traditional funding sources in order to achieve full funding for the project and accelerate project delivery.

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3 CEQA/NEPA Alternatives Analysis Guidelines

To comply with the requirements of CEQA and NEPA, an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is being prepared. This document serves to define a single railway option for inclusion in the EIR/EIS.

CEQA Guidelines Section 15126.6 requires that an EIR consider a range of reasonable alternatives that would feasibly attain most of the basic objectives of the project while avoiding or substantially reducing its significant impacts. It must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. CEQA allows for the elimination of those alternatives that:

- Fail to meet the basic project objectives.
- Are infeasible due to issues concerning:
  - Site suitability
  - Economic viability
  - Availability of infrastructure
  - General Plan consistency
  - Other plans or regulatory limitations
  - Jurisdictional boundaries
  - Ability to acquire, control or otherwise have access to the alternative site, or
  - Failure to avoid significant environmental impacts.

For NEPA, the U.S. Council on Environmental Quality (CEQ) has similar guidance. CEQ regulations require that an EIS a “reasonable range” of alternatives that covers a “full spectrum” of potential reasonable alternatives. Reasonable alternatives include those that are practical and feasible from a technical and economic standpoint and using common sense. Alternatives can be eliminated from consideration based on any factor that is relevant to reasonableness, including failure to satisfy the project purpose and need, environmental impacts, engineering, and cost.

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4 Rail Option Definition Process

4.1 Plans and Projects

To support regional and local goals and policies, the rail options were evaluated against relevant plans and policies. These plans and policies provide the framework for inclusion of the railway alternative in the HDC. This section presents the regional plans and projects identified as relevant to the railway portion of the HDC. Local plans and projects are presented in Section 6.2, Environmental Screening.

4.1.1 Plans

4.1.1.1 SCAG Regional Transportation Plan (RTP)

The Regional Transportation Plan (RTP) is a long-range transportation plan that is developed and updated by Southern California Association of Governments (SCAG) every 4 years. The most recent, RTP 2012, provides a vision for transportation investments throughout the region. Using growth forecasts and economic trends that project out over a 20-year period, the RTP considers the role of transportation in the broader context of economic, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address mobility needs. Federal and state regulations require SCAG, as the Regional Transportation Planning Agency (RTPA) and Metropolitan Planning Organization (MPO), to develop an RTP every 4 years in order for the Southern California region's transportation projects to qualify for federal and state funding. The HDC has been included in the RTP's strategic plan for high speed rail/passenger rail, and the DesertXpress (now XpressWest) is included as a strategic plan project.

4.1.1.2 METRO's Innovative Project Delivery Initiatives and Public-Private Partnership Program

In November 2007, METRO investigated opportunities to attract and incorporate the concept of Public-Private Partnerships (PPP) into METRO's Long Range Transportation Plan (LRTP) program of project delivery. This resulted in the development of a Framework and Work Plan for attracting partnerships with the private sector to help finance major transit and highway projects. The Board adopted the Public-Private Partnership Program Framework in June 2008 and the Work Plan in September 2008.

The centerpiece objective of METRO's Public-Private Partnership Program is as follows:

> *Creation of a permanent, programmatic approach to identifying, assessing, and implementing projects utilizing private sector participation, with the overall goal of accelerating METRO's delivery of transit and highway programs in Los Angeles County.*

METRO's Public-Private Partnership Program major goals are as follows:

- Improve mobility by accelerating project delivery.
- Use cost-effective procurement, contracting, and construction methods and reduce costs through earlier than otherwise project delivery.
- Develop projects integrated with existing transit and highway infrastructure.
- Allocate developmental, financial, construction, and operational risks fairly and effectively.
- Transfer certain project development and implementation risks to private partners while leveraging public resources.

A total of 81 LRTP projects (32 transit and 49 highway projects) were evaluated by METRO for potential participation by the private sector. Using a two-step screening process based on project readiness and specific project attributes, METRO selected three highways, including the HDC, and three transit projects for further assessment as candidates for the Public-Private Partnership Program. Public-private partnerships include the following benefits:

- New sources of capital
- Faster completion of projects
- Shifting construction and maintenance risks from taxpayers to private partners
- Lower costs and construction savings
- Reduced life-cycle costs
- Superior customer service

4.1.1.3 SANBAG's Victor Valley Long Distance Commuter Needs Assessment

San Bernardino Associated Governments' (SANBAG) Victor Valley Long Distance Commuter Needs Assessment (December 2009) provides a comprehensive analysis of the commuting habits and needs of residents living in the Victor Valley and working in various locations to the south accessed by the I-15 corridor and Cajon Pass. The study analyzed and tested various commute strategies to meet the needs identified.

The major focus is the I-15 corridor, which links the study area with the valley portion of San Bernardino County, as well as destinations in Riverside, Los Angeles, and Orange Counties.

The corridor is a major travel route for both autos and freight, and experiences significant congestion during peak commuting hours. The study was commissioned in response to continuing concerns from Victor Valley residents that the area currently lacks long-distance commute alternatives, forcing commuters to drive the congested I-15 corridor in their single-occupant autos.

This assessment recommended a 6-phase plan to improve carpool and vanpool services and develop an ultimate fixed route express bus service to San Bernardino Valley. The study notes that "45 to 50% of employed people who reside in Victor Valley make long commutes to worksites outside the Valley. 25% to 30% of all Victor Valley

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households contain a person who works outside the Valley. Of people who commute to jobs outside Victor Valley, 23% commute to Los Angeles County."

4.1.1.4 SCRRA Strategic Assessment

The Southern California Regional Rail Authority (SCRRA) is the joint powers authority that operates the Metrolink commuter rail system. Metrolink has the highest ridership of any commuter rail operation in California and is the fifth largest in the United States. The *Metrolink Commuter Rail Strategic Assessment*, prepared in January 2007, is a conceptual plan for the development of the Metrolink commuter rail system through 2030. Its purpose is to capture long-term growth options for Metrolink that balance the demand for growth with the operational and fiscal context in which that growth will occur.

The Antelope Valley line has the second highest ridership in the Metrolink service and is forecast to triple in ridership to 33,237 weekday passenger trips (boardings plus alightings) by 2030. The Strategic Assessment recommends service and capital improvements to the system, including siding and station improvements to the Antelope Valley line. Eighty percent of Metrolink trips are commutes to work, and ridership along the Antelope Valley Line is expected to triple over the life of the plan. As of the third quarter of FY 2012, 448 average daily boardings occur at the Palmdale Transportation Center.

4.1.2 Projects

4.1.2.1 California High Speed Train Project

The CAHST Project will be planned, designed, constructed, and operated under the direction of the CHRSA, a state governed board that was formed in 1996. The CHSRA statutory mandate is to develop a high-speed rail system that is coordinated with the state's existing transportation network, which includes intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports.

The CAHST is planned to provide an interregional, high speed train service over 800 miles of track throughout California, which will connect the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. The CAHST is envisioned as a state-of-the-art, electrically powered, high speed, steel-wheel-on-steel-rail technology, which will include state-of-the-art safety, signaling, and automated train-control systems. The trains will be capable of operating at speeds up to 220 mph over a fully grade-separated, dedicated track alignment, with an expected express trip time between San Francisco and Los Angeles of approximately 2 hours and 40 minutes. Construction contracts of the initial segment between Merced and Fresno have been issued and construction scheduling is under way.

Bakersfield to Palmdale Section

As shown in Figure 4-1, the planned Bakersfield to Palmdale CAHST project section is approximately 94 miles long and extends through a wide variety of land uses, including

rural, urban, densely populated cities, and mountainous terrain. This portion of the corridor begins at one of two station options identified in the Palmdale to Los Angeles Section description below and continues north through Lancaster and the Tehachapi Mountains to Bakersfield. An alternatives analysis and supplemental analysis have been completed and adopted as of January 2012, and environmental analysis and preliminary engineering is in progress.

Palmdale to Los Angeles Section

The planned Palmdale to Los Angeles CAHST project section is approximately 60 miles long and extends through a wide variety of land uses including rural, urban, densely populated cities, and mountainous terrain. As shown in Figure 4-2, The corridor for the Palmdale to Los Angeles CAHST project starts at Los Angeles Union Station, runs along the existing Metrolink Antelope Valley Line rail corridor northward through the San Fernando Valley, and then travels northeast on its own new route through the mountains from Santa Clarita to Palmdale, where it rejoins the existing Metrolink/Union Pacific Railroad (UPRR) rail corridor.

According to the California High-Speed Train Project Supplemental Alternatives Analysis for the Palmdale to Los Angeles Section Project EIR/EIS (April 2012), two alternative routes are currently being studied with two corresponding station locations in Palmdale. The western alignment alternative, State Route 14 West, would require a new station location northwest of the existing Palmdale Transportation Center; the eastern alignment alternative, State Route 14 East, would use the existing Palmdale Transportation Center. These alignment and station alternatives are being evaluated further in the CAHST Palmdale to Union Station EIR/EIS and are shown in Figure 4-1. The city of Palmdale is currently initiating a specific plan for the existing Palmdale Transportation Center as a potential high speed rail station.

Initial Operating Segment and CHSRA Business Plan

The 2012 California High Speed Rail Revised Business plan identified closing the gap in passenger rail service between Bakersfield and Los Angeles as a goal of the initial operating segment. Amtrak currently provides rail passenger service between Los Angeles and Bakersfield; however, track capacity is severely limited because the track is shared with freight providers crossing the Tehachapi Mountains. Because of track capacity and rail travel times between Los Angeles and Bakersfield, Amtrak operates bus service from Los Angeles to Bakersfield. The CHSRA has identified closing this gap in rail service as part of the initial operating segment shown in Figure 1-1**.**

4.1.2.2 XpressWest

Previously known as DesertXpress, XpressWest is a planned high-speed passenger train along the 185-mile corridor between Southern California (Victorville) and Las Vegas, Nevada as shown in Figure 4-3. The project would include stations and maintenance facilities at each end of the rail alignment in Victorville and Las Vegas. The purpose of the project is to provide reliable and safe passenger rail transportation between Southern California and Las Vegas.

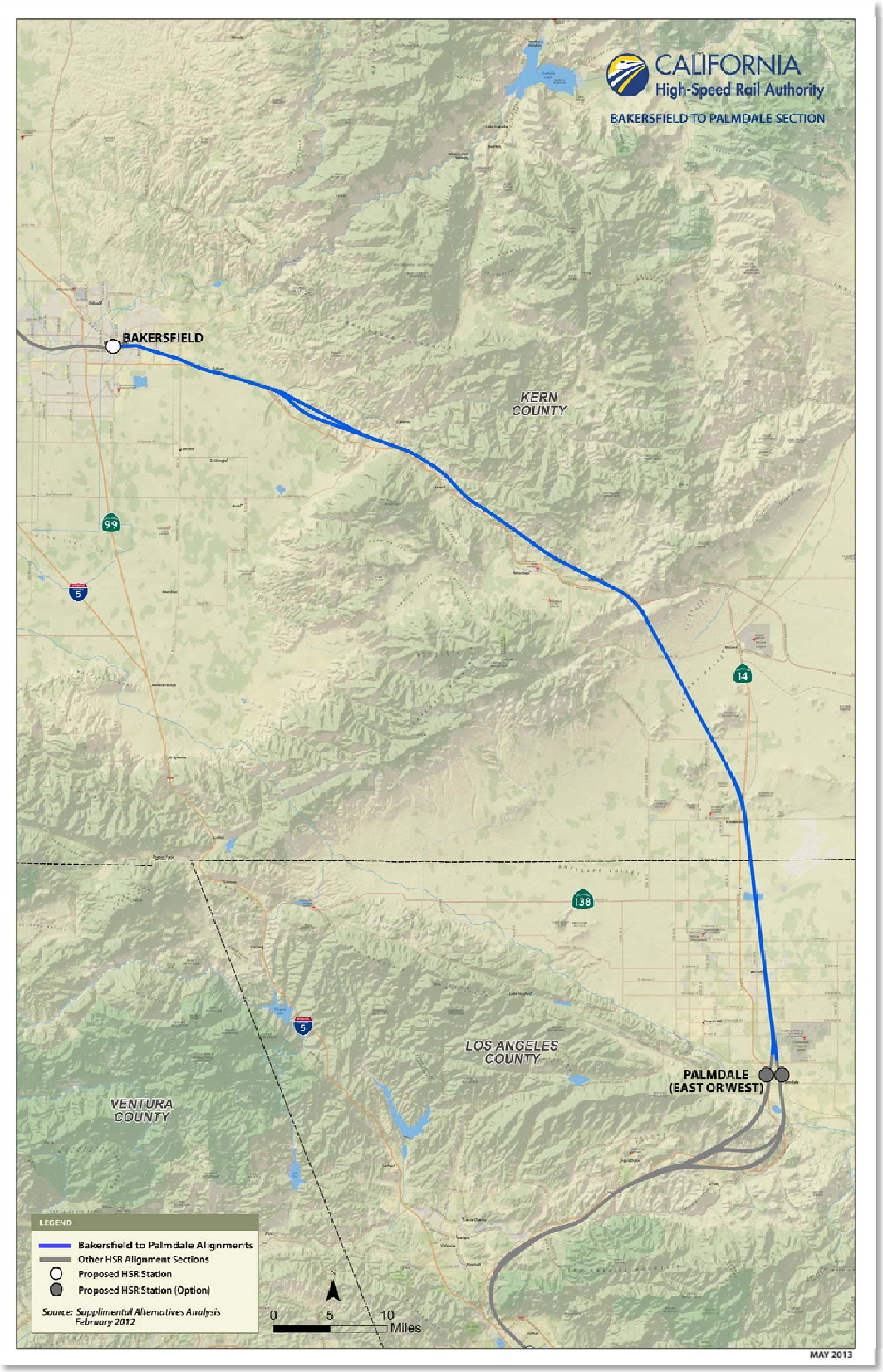

Figure 4-2: CAHST Bakersfield to Palmdale Project Location

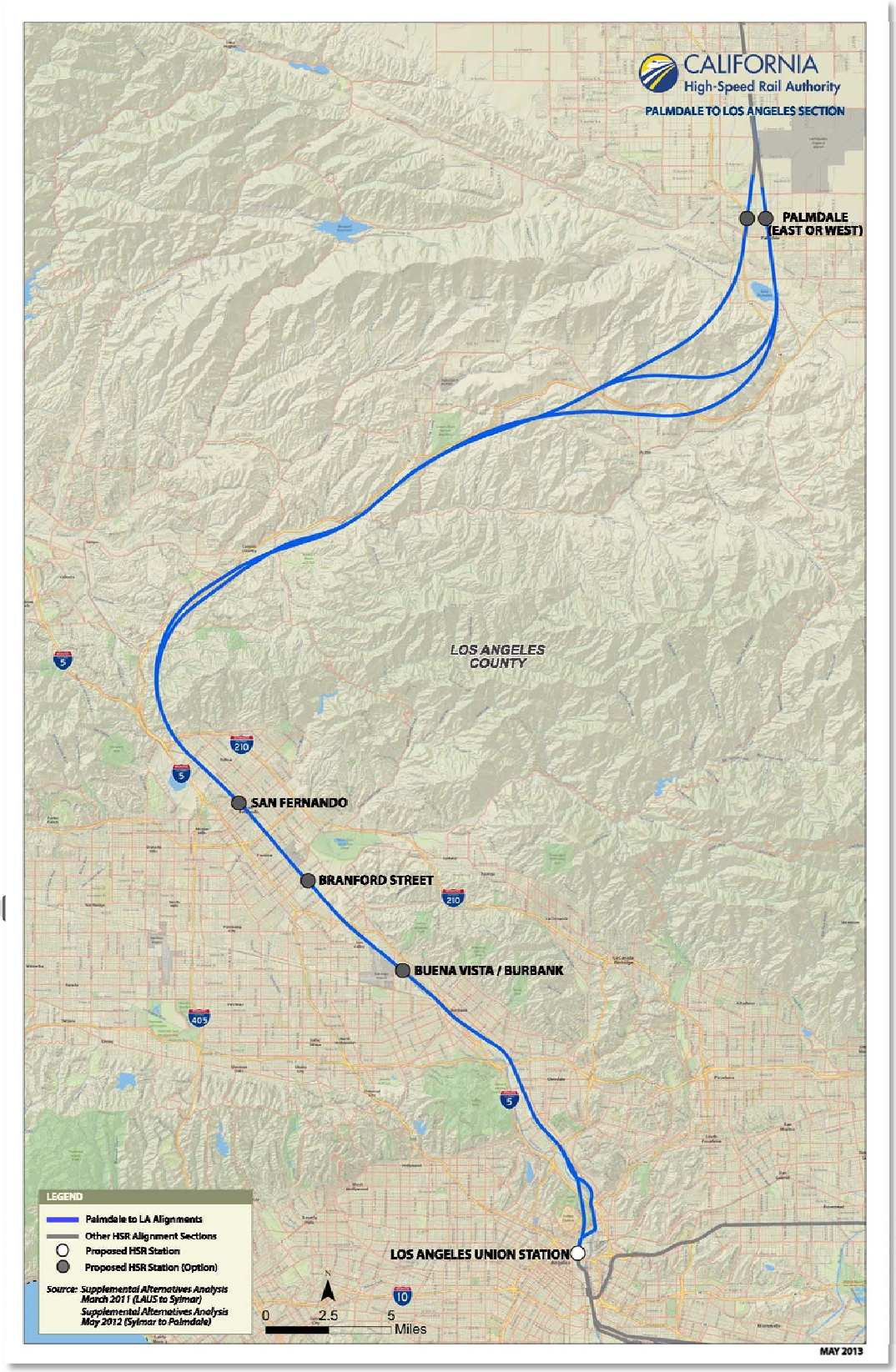

Figure 4-2: CAHST Palmdale to Los Angeles Project Location

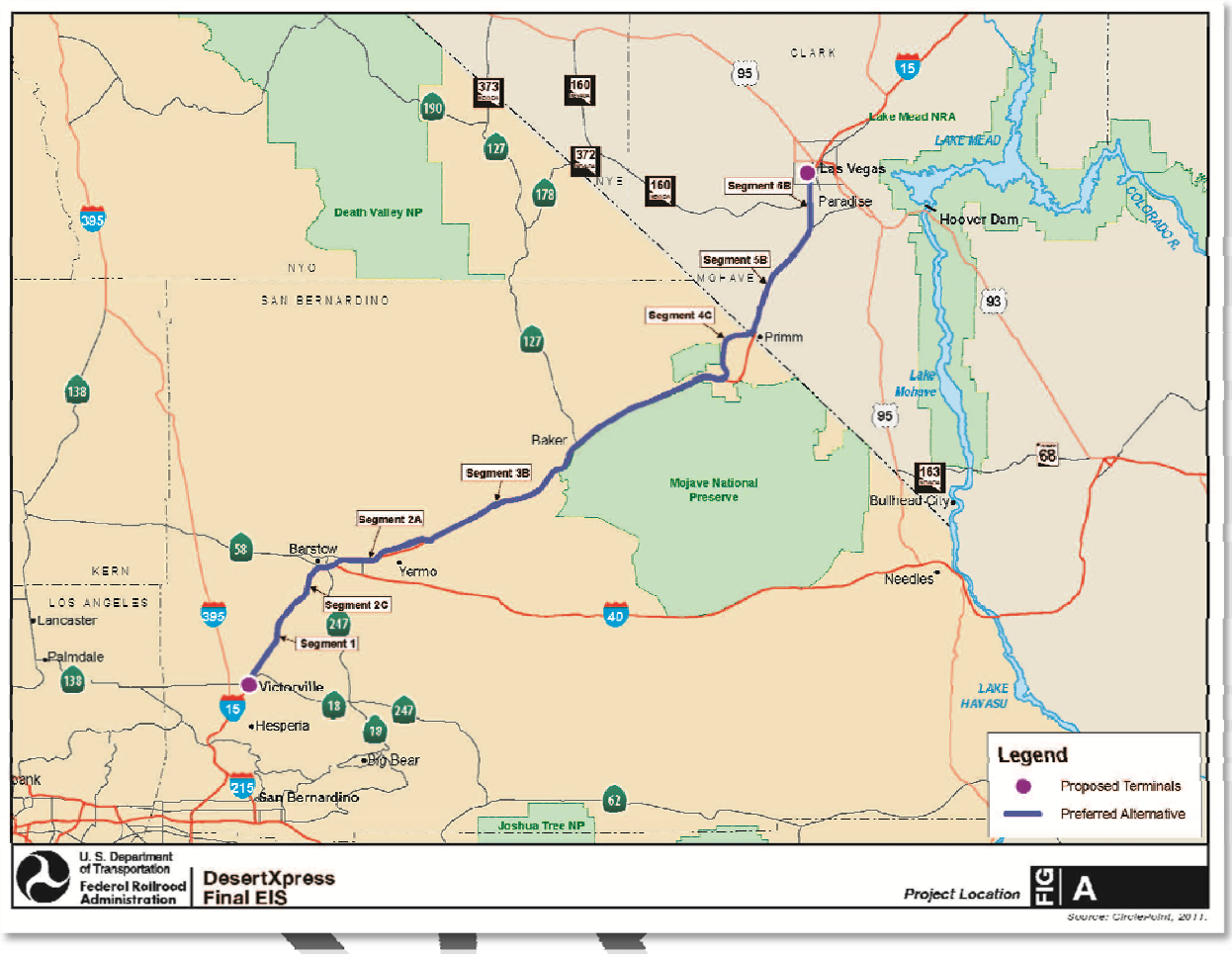

Figure 4-3: XpressWest Project Location

XpressWest would connect Las Vegas to Victorville using steel-wheel-on-steel-rail technology and electric multiple unit (EMU) train technology. EMU uses electricity to power the train motors, and rolling stock is planned to be compatible with the CAHST project. No on-board fuel would be required, and the trains themselves would have no exhaust/emissions. Overhead contact power lines on pole supports (also referred to as an overhead catenary system) would be required along the length of the rail alignment to provide continuous electric power to the trains.

The trains would operate at 125 mph and would travel at speeds up to 150 mph. Trains would operate at top speeds in areas where the curve radii are minimal and elevation changes are gradual. Where tracks curve substantially, train speeds would be lower; near stations, accelerating and decelerating speeds would be lower still. No intermediate stops are planned between Victorville and Las Vegas. The Victorville station also incorporates an operations and maintenance (O&M) facility.

The project has completed the environmental process: the Federal Railroad Administration (FRA) issued a Record of Decision (ROD) on July 8, 2011, and the Federal Highway Administration (FHWA) issued a ROD on November 18, 2011. The Project has applied to the FRA's Railroad Rehabilitation Improvement Financing (RRIF)

program for a loan to start and complete construction of the project. In addition to the RRIF loan, private debt and equity will be included in the project financing.

The XpressWest project is ultimately planned to connect Victorville to Palmdale, thereby connecting with the CAHST project and the Metrolink Antelope Valley Line. This ultimate project was not included in DesertXpress' environmental process, nor is it part of its FRA loan application. The HDC high speed rail feeder service is not part of the XpressWest ultimate project and no operator has been identified in the corridor. There is the potential for XpressWest and/or CHSRA trains to operate on the railway facility; but the HDC high speed rail feeder service study does not anticipate who the operator of the HDC rail facility would be.

4.2 Tier 1 Analysis and Options Considered

The rail option definition process began in September 2011, when the HDC's environmental evaluation scope was expanded to include a "high speed rail feeder service." This process has three steps, or tiers of analysis, with two tiers already completed (these tiers do not correspond with tiered environmental documents allowable under CEQA and NEPA). Tier 1, undertaken by Caltrans, identified a set of initial options. Tier 2, also performed by Caltrans, narrowed the set of options to eliminate those with the greatest environmental impacts. This analysis studied the entire set of roadway and railway options over the entire length of the HDC corridor from SR-13 to SR-18. All options were developed through agency consultation and were presented to the public in December 2012 as part of the HDC environmental process outreach.

This report documents the third analysis step or tier, identifying the preferred High Speed Rail Feeder service, including the preferred alignment and mode. This report builds upon the previous steps of analysis and documents the engineering, operational, environmental, and cost aspects associated with the options considered.

The Tier 1 analysis provided the first stage of analysis in providing a rail connection between the planned CAHST Project and the proposed XpressWest station in Victorville while following the proposed HDC alignment. To identify potential areas for further environmental surveys, the HDC was divided into the following three segments for analysis of the rail system:

- Connection between the CAHST project and the HDC
- Main HDC alignment between approximately 20th Street East and Koala Road
- Connection between the HDC alignment and the XpressWest Victorville station

The following alignment options were then developed for each of the above segments:

- Four potential alignments for connecting the CAHST project to the HDC alignment

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- Three potential alignment options for running parallel to the highway were identified: north of the highway; south of the highway; and within the median
- Six potential alignments between the HDC alignment and the XpressWest Victorville station

All alignment options were developed based on consideration of known environmental resources in the area including cultural, biological, and human resources. Archaeological surveys were conducted to delineate the boundaries of known cultural sites, and known biological resources were also identified.

4.3 Tier 2 Analysis and Results

A secondary screening was conducted to eliminate those options with the greatest impacts. Caltrans evaluated each alignment option for potential impacts to various environmental resource areas. General engineering feasibility was also considered. The rail options with the greatest potential impacts were eliminated from future consideration; those that remained were carried forward to the Tier 3 analysis. In addition, the secondary screening considered the operation of both a high speed rail feeder system and a commuter rail system. Both systems were evaluated for potential impacts and feasibility.

Based on the Tier 2 analysis, a high speed rail mode, a median alignment, and multiple options for station connections were carried forward. This Tier 2 analysis provided the framework for further environmental and engineering analysis based on conceptual engineering activities.

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5 Rail Option Definition

A range of options were developed through agency consultation and were presented to the public in December 2012 as part of the HDC environmental process outreach. The options included two modes: commuter rail service and high speed rail service, and two standard sections; median or side. Based on the standard sections and connection to station locations a range of alignment options have been developed.

5.1 Definition of Alignment and Modes

The project limits have been defined with the western terminus at the Palmdale Transportation Center in the city of Palmdale, California, and the eastern terminus at the planned Victorville XpressWest Station. All alignments would serve to close this gap between rail services.

The rail alignment would start at the existing Palmdale Transportation Center and join the HDC alignment. The railway would use the same right-of-way (ROW) as the HDC roadway facility. Following the roadway alignment, the rail facility would head east, leaving the roadway alignment at either (1) west of I-15 near the Mojave River, or (2) east of the Southern California Logistics Airport (SCLA; formerly George Air Force Base)/Victorville Federal Correctional Complex (VFCC) area following the Variation E roadway alignment. The alignment would then connect to the I-15 corridor and head north to the planned XpressWest station just west of I-15 at Dale Evans Parkway.

Two modes were initially considered for operation in this rail corridor: commuter rail and high speed rail.

5.1.1 Commuter Rail

Commuter rail service in Los Angeles and San Bernardino Counties is operated by Metrolink. Metrolink currently operates along the Antelope Valley Line from Los Angeles Union Station north to the City of Lancaster, with 11 stations including a stop at the existing Palmdale Transportation Center. The Antelope Valley Line express train currently departs from Lancaster, north of Palmdale, and stops at Santa Clarita, Downtown Burbank, and Los Angeles Union Station, with a total commute time of 88 minutes. METRO owns the rail ROW, the SCRRA operates the Metrolink commuter rail service, and UPRR holds trackage access rights and operates freight trains in the corridor, continuing north past the terminus Metrolink station in Lancaster. Metrolink operates diesel locomotive train sets, and a central maintenance facility is located north of downtown Los Angeles. More than 6,000 riders board the Metrolink Antelope Valley Line on an average weekday, and the Palmdale Transportation Center currently has 448 average daily boardings. According to the 2007 SCRRA Strategic Assessment, ridership on the line is anticipated to triple by 2030.

This option would follow the basic alignment described in Section 5.1. Extending the Metrolink commuter rail service onto this new corridor segment would extend the use of diesel locomotives. In addition, extending commuter rail service onto this corridor might

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also drive the decision to provide for additional station locations. Possible future commuter rail station locations have not been identified as part of this study.

5.1.2 High Speed Rail

This operating mode would serve as a gap closure of two high speed rail systems, the CAHST project with a planned station in Palmdale and XpressWest with a planned station in Victorville. Design standards including track geometry and station track and platform configuration for both systems are currently proposed to be the same based on CAHSR standards. Design for track grades and 220-mph speeds are also based on CAHSR standards.

Neither system has purchased rolling stock (all vehicles that move on the railway); however, the systems are planned to operate EMU trains (FRA Tier III compliant vehicles), which would require an overhead catenary system and traction power substations (TPSS) at locations along the alignment to power the train. Both trainsets are currently planned to be compatible; however, technical interoperability issues with communication systems and signaling systems would have to be coordinated during later design phases. Both the CAHST project and XpressWest would therefore be technically able to operate in the HDC.

The railway corridor is planned to be a 100-foot width, which would consist of an embankment supporting two tracks, a maintenance road, overhead catenary poles for traction power, communication towers, and 2 crash barriers. Both systems would require TPSS approximately every 6 to 10 miles, as well as a maintenance-of-way and/or layover facility near the Palmdale Transportation Center. XpressWest has a planned O&M facility near the Victorville station location, which would remain as the primary O&M facility even if its operations extended to Palmdale on the new HDC. If operations were extended to Palmdale, a shared or smaller layover and maintenance facility could be located near the new Palmdale station.

5.1.3 Other Modes and Services

The three rail services described above are currently planned for operation in the direct vicinity of the project location. No other modes of rail transport are planned for inclusion in this analysis because they are not identified in the regional planning process and are not currently planned to operate in the vicinity of the project. Interregional rail service is provided by Amtrak and crosses the project near the Mojave River; however, it has been considered and withdrawn from further consideration because it does not meet the purpose and need of the project and has no current or long-range plans to operate in the HDC. Competing transit services between the Metropolitan Los Angeles and Las Vegas areas, such as maglev and the X-train, have also been considered and withdrawn because they do not meet the project purpose and need, are not in the regional planning process, and do not provide a gap closure between the Palmdale Transportation Center and the XpressWest Victorville station.

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5.2 Standard Sections

Three standard sections have been developed based on the ultimate roadway cross section as shown in Appendix A. The median and the side running options are considered in the analysis. Due to cost implications a viaduct option was not considered except where required to maintain grade separations for high speed trains.

Since there are no long range plans for commuter rail to operate in the corridor, and high speed rail is identified in the RTP, ultimate standard sections have been developed based on high speed rail standards. High speed rail standards would not preclude commuter rail to operate in the corridor, but would not represent an ultimate configuration. The standard section preserves 48 feet of ROW for high-occupancy vehicle (HOV) lanes or a tollway facility, a 4:1 outside grade and a 10:1 median grade, and it is elevated an average of 12 feet to place the roadway facility above the floodplain. Standard sections for the railway and roadway corridors are also shown in Appendix A. The 2011 Caltrans Highway Design Manual, Section 309.1 (4), states the following requirements for high speed rail facilities: "…the nearest fixed object or feature associated with the operation of the rail facility should be located a minimum of 52 feet horizontally from the planned ultimate edge of the traveled way." This clear zone requirement can be waived by the use of concrete type 60 barriers to prevent automobiles from entering the high speed rail facilities. These cross sections provide a basis for cost comparisons in Section 6.

5.2.1 Median Railway Alignment

The standard section incorporating a median located railway alignment would require a minimum 288-foot-wide section from edge of shoulder to edge of shoulder. This section includes HOV lanes or a tollway facility and a 100-foot rail facility. The rail facility would be located in the graded median, which would require approximately 5 feet of subgrade.

5.2.2 Side-Running Railway Alignment

The standard section for a side-running rail alignment would require a minimum of 320 feet from edge of shoulder to edge of shoulder. This section includes HOV lanes or a tollway facility and a 100-foot rail corridor. This side-running alignment standard section would be applicable for locating the rail corridor on either the north or south side of the roadway. The rail facility would be located outside of the graded area for the roadway and would therefore require a rail facility subgrade of approximately 15 feet to place the railway facility above the floodplain.

5.2.3 Viaduct Railway Alignment

To enable the rail facility to transition into and out of the median alignment, a third standard section has been prepared. The viaduct standard section would use the median of the roadway and would elevate the railway facility above the median and reduce the ROW required for the railway facility from 100 feet to a 20 foot column, resulting in a 218-foot minimum section including HOV lanes or a tollway facility. This section would require maintenance crews for the rail facility to access the track from

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specialized vehicles located below the structure or from specialized vehicles on the tracks. Due to cost implications this is not an option for the railway alignment except where required to maintain grade separations for high speed trains.

5.3 Interface with Interchanges

Interchange design varies by the standard section proposed. For this analysis, a standard interchange design was developed at 170th Street in Palmdale and was analyzed for comparison purposes across alternative options. The typical local street overcrossing developed for this analysis shows a ROW width ar 100 feet wide, and a standard interchange design including on-and-off ramps was assumed. Undercrossings may be considered as design progresses. Vertical clearance for the roadway alignment is 16 feet 6 inches, and the vertical clearance for the railway facility is 27 feet from the top of the rail to the bottom of the overhead roadway structure per CHSRA Design Criteria. These options, including plan layouts and profiles, are shown in Appendix B and are summarized in Table 5-1.

5.3.1 Median Railway Alignment

The median rail alignment would not alter the roadway mainline other than widening the standard roadway section. This alignment would widen the interchange design and increase the span size of the local street overcrossing, the fill required over the current roadway design, and the ROW area required for interchanges. This alignment would place the peak height of the interchange structure over the rail corridor, and is thus centered over the roadway.

5.3.2 Side-Running Alignment Options

The side alignments would require additional ROW at interchanges to accommodate both rail and roadway corridors and on- and off-ramps. Locating the rail facility between the roadway and the on- and off-ramps was not included in this analysis because this configuration is a nonstandard design. Two options exist to accommodate the interchanges: a bulb out of the rail corridor away from the roadway or a bulb out of the roadway away from the rail corridor. Both alignments would require two separate structures, one crossing the roadway and one crossing the railway. An area of fill between the roadway and railway overcrossing structures would be required to maintain the local overcrossing profile and to reduce the length and therefore cost of a single span structure. The net increase in ROW required for interchanges would be minimal if the roadway alignment bulbs away from the interchange; conversely, the railway bulb out would require the largest ROW area.

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Table 5-1: Local Interchange Definitions

Description	HDC Length* (ft)	Rail Corridor Length* (ft)	Total Overcrossing Length (Struct.) (ft)	ROW Area (sf)
Roadway Facility without Rail	11,600	—	260	7,263,000
Roadway Facility with Median Rail Alignment	11,600	11,600	404	8,224,000
Roadway Facility with Side Rail Alignment (Roadway Bulbout Option)	11,733	11,600	475**	8,694,000
Roadway Facility with Side Rail Alignment (Railway Bulbout Option)	11,600	11,650	475**	8,824,000

* Length of alignment considered is from STA 1068+00 to STA 1184+00.
** Two structures would be required.

5.4 Alignment Options

In addition to the location of the railway corridor in the roadway alignment, alignment options are available to avoid constrained areas.

5.4.1 Palmdale Airport and Variation A

In the city of Palmdale, the HDC alignment traverses the southern boundary of the Palmdale airport along an existing easement. A variation south of the easement was developed to reduce geometries required by wye connections to the CAHST project and to the Palmdale Transportation Center, as discussed in Section 5.5.1 below.

5.4.2 Variations B and D

East of the Los Angeles county line, two roadway variations have been developed. Variation B2 would flare out slightly south of the main alignment between Oasis Road and Caughlin Road to avoid impacts to an existing dairy and airport. Variation B would be at the same location but would flare out a little less and pass through the Krey airfield.

Variation D is east of variation B near the community of Lake Los Angeles, the freeway/expressway would dip slightly south of the main alignment, just south of Avenue R approximately between 180th Street East and 230th Street East.

Variations B and B2, and Variation D would maintain geometries that would allow for a High Speed Rail Facility along the side or median of the HDC.

5.4.3 SCLA and Variation E (Victorville Constrained ROW area) Option

Due to the constrained ROW area between the SCLA and the federal prison, as shown in Figure 5-1, the location of the railway corridor with respect to the roadway corridor may change from the western portions of the alignment in this location. The ROW is

currently estimated to be 290 feet from the VFCC to the existing industrial properties north of the prison. The project may require a design exception from Caltrans to reduce the cross section width of the overall facility. Two interchanges in the immediate vicinity, Phantom Road East and Phantom Road West, would also have to be accommodated in the constrained ROW area. These interchanges present significant challenges to the roadway design in the area due to ROW conflicts. Viaducts in this area would decrease the size of the interchanges; however, they would conflict with SCLA runway protection zone height restrictions near the airport runway. Industrial properties, as part of the SCLA, are located near the planned HDC location, and access to these properties would have to be maintained.

The western portion of the constrained ROW area contains a number of identified constraints. The roadway has been designed to avoid the constraints described below:

- **Industrial Lead Track:** The city of Victorville has recently graded a new industrial lead track off the Burlington Northern Santa Fe (BNSF) tracks near the National Trails Highway that heads west into the SCLA area, as shown in Figure 5-1. This rail track will provide freight access to existing and planned industrial developments. The city of Victorville is planning to extend the track north and west from its existing terminus to provide additional track access to industrial land closer to SCLA. Parcels surrounding the industrial lead track are planned for industrial uses, and locating the HDC to the south of the industrial lead track would isolate these parcels from the planned development.
- **Known Environmentally Sensitive Areas:** North of the industrial lead track are areas of both protected migratory bird habitat and known cultural resources. These sites have been surveyed and mapped.
- **Rockview Park:** Approximately 800 feet north of the industrial lead track and immediately east of the known environmentally sensitive areas is Rockview Park. Rockview Park is bounded by National Trails Highway to the west, the Mojave River and BNSF tracks to the north and east, and a Los Angeles Department of Water and Power (LADWP) parcel of land to the south.

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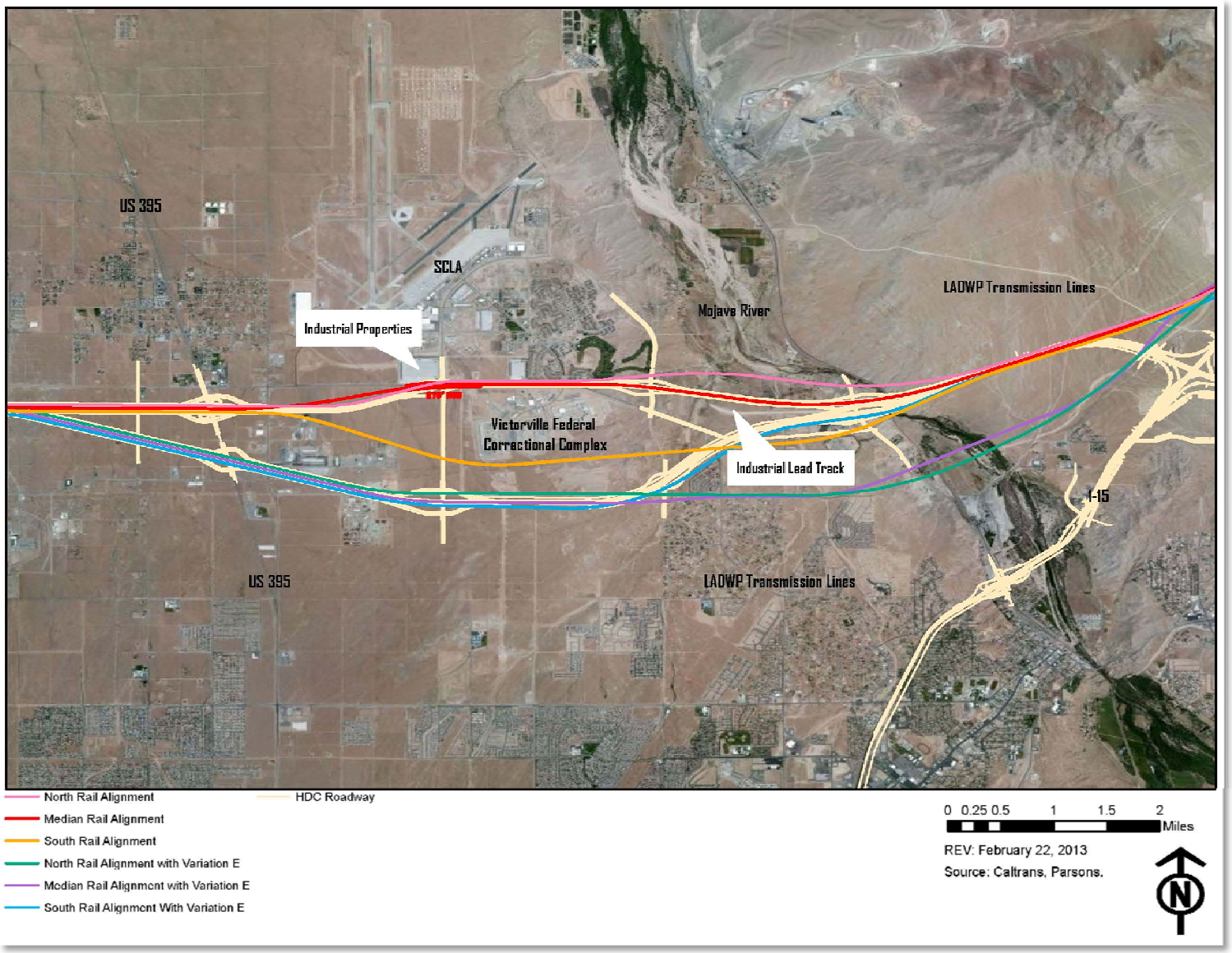

Figure 5-1: SCLA Constrained ROW Area

- **Critical Habitat Area:** Just north of Rockview Park and along the Mojave River are areas of critical habitat for protected migratory birds and other sensitive species.
- **LADWP Transmission Lines:** LADWP transmission lines also cross the Mojave River in this area just east of Rockview Park; these lines present vertical obstacles.
- **SCLA Runway Protection Zone:** the SCLA runway protection zone is located just north of this area and presents vertical restrictions on the height of structures in this runway protection zone.

With consensus from the city of Victorville, Caltrans has developed a roadway alignment that crosses through these constraints. Given the number and magnitude of the constraints already identified by Caltrans, the railway facility will follow the roadway alignment in this area, either in the median or along either side of the roadway. A viaduct will also be considered in this area to further limit the area of impact of the pier locations to the sensitive areas. Modification of the roadway design may be required to maintain rail design speeds in this area.

Caltrans has also developed a roadway alignment, Variation E, which would travel south of the VFCC to reduce conflicts within this constrained area. The railway alignment option would closely follow the roadway alignment; however, this option could occur with or without the roadway facility as the railway alignment could depart from the HDC ROW and travel south of the VFCC. This variation would start immediately west of the VFCC where the rail alignment would leave the HDC and travel south around the complex then head north meeting the constrained ROW alignment along the existing I-15 corridor to reach the planned Victorville XpressWest Station at Dale Evans Parkway. This variation would reduce conflicts with all constraints identified in the area, except the LADWP transmission lines and the city of Victorville's proposed industrial development, and would allow for the standard design speeds.

5.5 Station Connections

5.5.1 Palmdale Station Locations

The city of Palmdale is currently a planned location for a high speed train station as part of the CAHST Project. As shown in Figure 5-2, two location options currently exist for the station: one at the existing Palmdale Transportation Center (the current Metrolink station, local and commuter bus transit center) and the other northwest of the existing Palmdale Transportation Center on an undeveloped parcel of land. Both station locations are included for environmental clearance in the CHSRA Palmdale to Union Station EIR/EIS, and the HDC rail facility would connect to the current Palmdale Transportation Center, to connect to the current Metrolink service. If the CAHST project proceeds with the development of the west Palmdale station option, then a connection to that station location would be studied as part of the CAHST project or as a separate project. All alignment options would use the CAHST station and platforms. Multiple

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connection concepts, including wye configurations, have been prepared and are described in detail below.

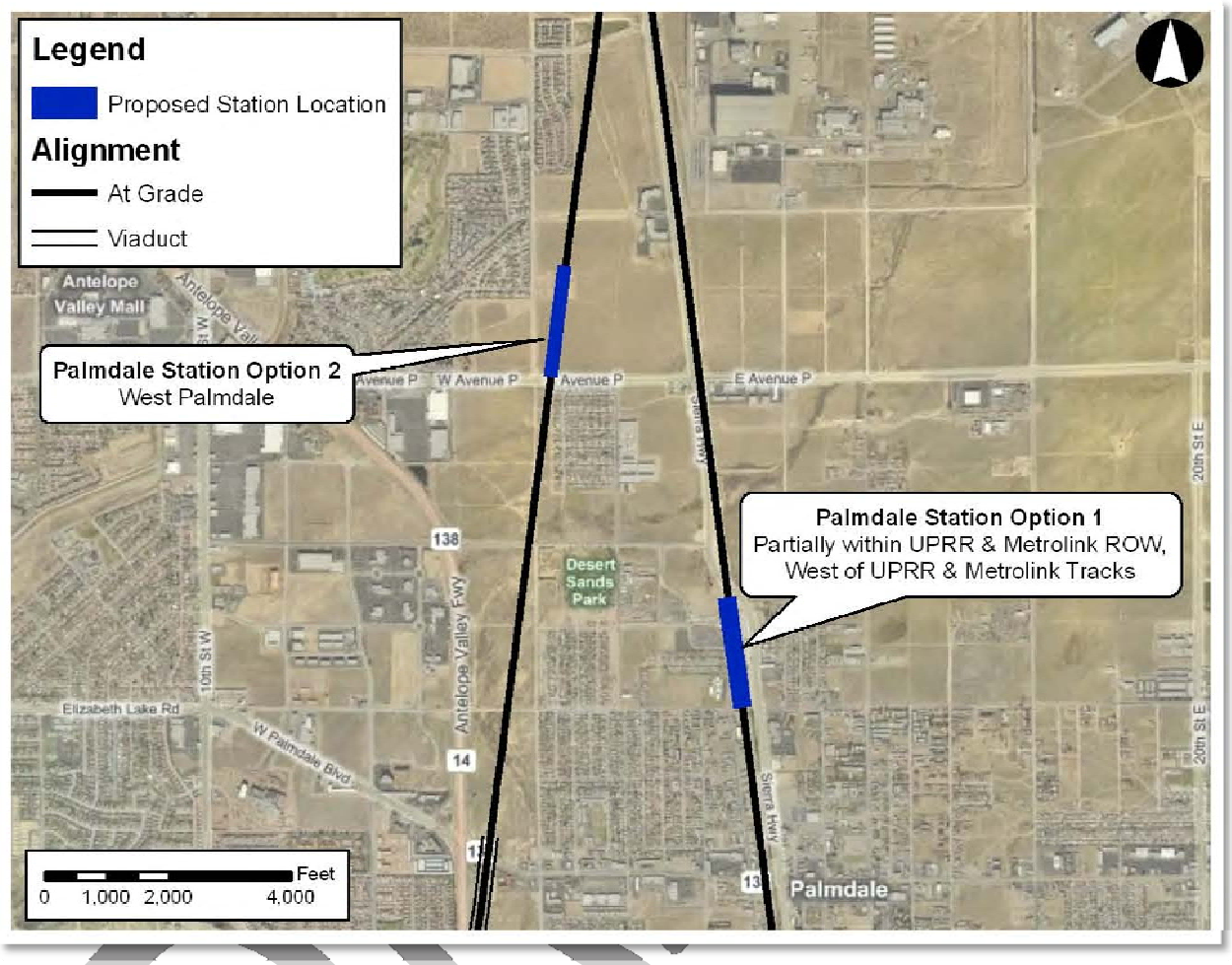

Figure 5-2: Palmdale Station Options for the CAHST Project

5.5.1.1 Existing Palmdale Transportation Center

The existing Palmdale Transportation Center is north of Avenue Q and west of Sierra Highway in the city of Palmdale. Metrolink operates the Antelope Valley Line adjacent to UPRR tracks. The planned CAHST project east alignment option would require an at-grade station abutting the west side of the UPRR and the Metrolink ROW between Avenue Q and Technology Drive and partially located within the existing UPRR and Metrolink ROW. Two platforms 1,380 feet long on gradients not steeper than 0.25 percent and four tracks extending 6,000 feet are necessary to accommodate the HST at the Palmdale station.

Multiple conceptual options for the Palmdale Transportation Center location have been developed as part of an extensive station planning and programming exercise. These efforts are continuing with stakeholder participation as the design process progresses.

The options include multiple transfer stations; direct connections or wye connections on aerial and/tunnel alignments to allow for a “one seat ride” between the CAHST project and XpressWest, and Variation A that would use the existing easement for the HDC at the Palmdale Airport.

5.5.1.2 Western CAHST Station

The CAHST project is also studying a western alignment and station option, at a vacant parcel of land on Avenue P and Division Street, to avoid alignment and station constraints along the current Metrolink Antelope Valley Line. Because the station would be located north of the Metrolink station, this station option would not provide a direct connection to Metrolink services at this location.

5.5.2 Victorville Station

The HDC rail facility would connect into the planned Victorville XpressWest Station, shown in Figure 5-3, which is located adjacent to Interstate 15 at Dale Evans Parkway. This station area has been environmentally cleared as part of the XpressWest Project. Adjacent to the station is the planned operations, maintenance, and storage facility (OMSF) that would serve as the primary maintenance facility for the XpressWest service.

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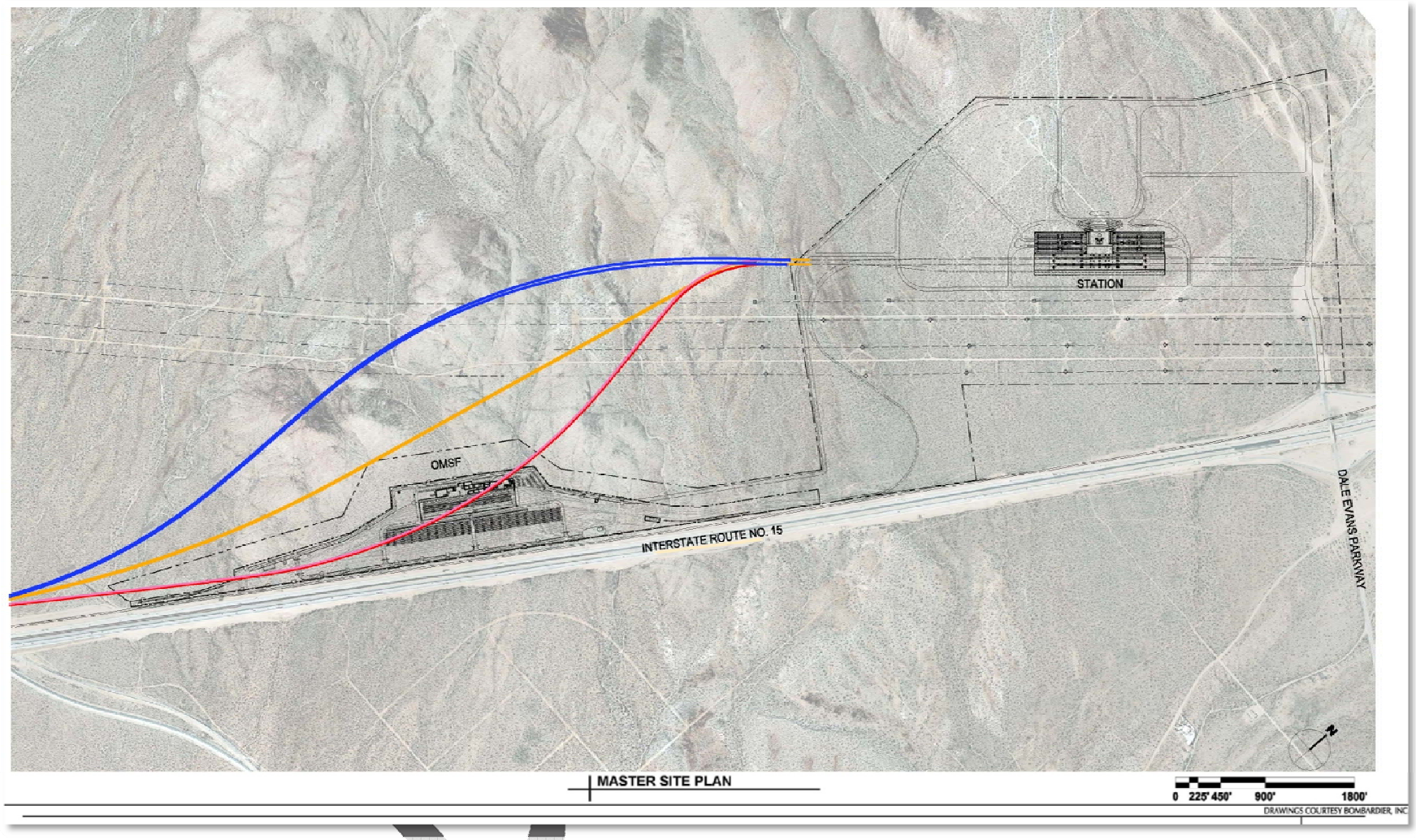

Figure 5-3: Planned Victorville XpressWest Station and OMSF with Potential HDC Rail Alignments

6 Rail Option Screening

The rail option screening process presents the engineering and operational analysis, the environmental analysis, and cost comparisons across the rail options presented in Section 5.

6.1 Engineering/Operational Analysis

All designs presented in this report are standard designs based on Caltrans, CHSRA, or XpressWest Design Standards. Operation in the corridor of either the railway or the roadway would not be affected by the concurrent operation of each service. Metrolink uses diesel locomotive technology, which would require transfers at both Palmdale and Victorville if both high speed rail modes are constructed or shared track agreements and specialized diesel/electric infrastructure allow the diesel locomotives and trainsets to use the electrified tracks. Transfers would add significant travel time and delay when traveling between the two higher speed rail services, and any extension of Metrolink would require a transfer for passengers using either the CAHST project or the XpressWest project. Providing a high speed rail link would allow for a transfer free ride between the two networks.

The Palmdale station location and an O&M facility are currently being studied as part of the CAHST project, and will be included in the CAHST project environmental reports. All facilities would serve as a joint facility for trains using the CAHST alignment, the XpressWest alignment, or both in the case of a wye connection. Connections to the CAHST Project and the Palmdale station could occur in a number of options that have been developed and are included in Appendix C. Challenges include tunneling and viaduct construction and cost with the wye connection; however, the wye connection would allow for one-seat rides, reducing the need for transfers at the Palmdale station from the HDC to northbound or southbound trains.

The addition of the railway and modifications to the roadway design could present challenges to any phasing or sequential development of the roadway. The inclusion of the railway could introduce constructability challenges that would require coordination of construction activities, although it is unclear at this point how construction activities would be scheduled. Currently, the construction plans for the HDC would require interchanges to be phased as demand warrants on local streets. Therefore, the roadway and the rail facility will have to accommodate the future construction of these interchanges. In general, ROW requirements for side-running rail alignments would be greater than for a median alignment. Modifying the roadway design to bulb out at interchanges to accommodate a side-running rail system would be less than desirable once operation of the roadway facility begins. Similarly, construction of any rail bulb outs would not be desirable once operation of the railway facility begins. Therefore, both side-running options would have to be constructed to accommodate all future interchanges, thus limiting the future expansion capabilities of the roadway and/or the phased construction of interchanges.

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Conversely, a rail bulb out at interchanges would require substantial amount of ROW in order to maintain track geometry standards. A side-running rail facility on the south side of the HDC would require a longer viaduct crossing the HDC in the Victorville area.

In the Victorville constrained ROW area, both median and side-running standard rail sections could fit within the constrained ROW section with a reduced clear recovery zone, which would require a Caltrans design exception. However, the interchange at Phantom Road West would have to be redesigned to accommodate a wider interchange under both options. A side-running rail corridor would require the acquisition of the large industrial facility to accommodate either the rail bulbout or the roadway bulbout to the north, and a rail or roadway bulbout on the south side at this location would require additional property from the VFCC in this location. East of Phantom Road West, the SCLA runway protection zone limits the vertical height of structures in this area. Placing the rail facility on a viaduct would require the local roadway overcrossing to be raised higher, potentially restricting access to the industrial property north of the roadway and conflicting with SCLA's runway protection zone. There will also be a limit on the height of the viaduct as controlled by the rail profile in order to maintain rail speeds as planned.

Variation E would operate on its own ROW or with a shared roadway alignment and would present no additional operational or engineering challenges. Variation E would shorten the length of the viaduct crossing at the Mojave River. It would also straighten the curves and allow the railway to maintain a 180-mph design speed; however, travel times would be similar among the options due to the additional length added to the alignment. Table 6-1 summarizes the various railway alignment lengths in route miles (RM).The median alignment would require the most viaduct structure due to the need to transition both in and out of the median.

Table 6-1: Railway Alignment Lengths

	At-Grade Length (RM)	Tunnel Length (RM)	Viaduct Length (RM)	Total Length (RM)	Length on Shared ROW
HSR in Center	54.39	1.89	10.95	76.29	47.70
HSR in Center with Variation E	60.3	1.89	12.47	85.24	42.15
HSR on Side with Rail Bulb	54.55	1.89	10.38	75.31	47.70
HSR on Side with Roadway Bulb	55.26	1.89	10.38	76.02	47.70
HSR on North Side with Variation E	57.26	1.89	11.90	81.06	42.15

6.2 Environmental Screening

An environmental analysis of the rail options identified in Section 5 was performed to differentiate environmental impacts between rail options. The results of this environmental screening process are considered preliminary and are based on conceptual, rather than project-level, data. The preferred rail option will be fully analyzed in the EIR/EIS.

6.2.1 Mode Options

Two modes have been considered in the Tier 2 environmental analysis for operation in the HDC: commuter rail and high speed rail. For this screening process, the two modes' definitions differ in terms of propulsion systems, trainsets, design speeds, station requirements, O&M requirements, and O&M facility requirements. Because there are no plans to extend commuter rail in this corridor and because of the higher potential for environmental impacts identified in the tier 2 analysis for commuter rail, station locations have not been identified, nor has a timeframe been developed for any potential station locations to be identified.

An initial screening in the Tier 2 environmental analysis of the two modes identifies the variance between commuter rail and high speed rail in environmental impacts for air quality, noise, and traffic impacts from stations. Commuter rail uses diesel locomotives, which would result in greater air quality impacts, as compared with EMU technology (electrically powered) used by the high speed rail systems. In addition, electric trains are generally quieter than diesel trains. According to the CHSRA Sound Fact Sheet prepared in October 2010, a high speed train has to travel about 150 mph before it makes as much sound as a commuter train at 79 mph. Station impacts would be generally greater for high speed rail systems: such systems require longer platforms and larger parking areas, and involve a higher level of traffic volumes at station locations than would be expected for a commuter rail system. In addition, commuter rail stations would be located on shorter spacing along the HDC, requiring additional ROW at these locations.

6.2.2 Alignment Options

Both median and side running rail options would result in many similar environmental effects. The location of the rail facility in the standard roadway section is discussed in this section and areas where potential differences occur, including any impact from Variation E, these potential impacts have been identified in Table 6-2 and discussed in detail below.

6.2.2.1 Median and Side-Running Options

Aesthetics

A number of parks and natural resource areas are either adjacent to the various project alignments or are within the proposed project alignments. These areas include Rockview Park and the Mojave River in Victorville and Richardson Park in Adelanto. Mountain ranges and Joshua trees exist along much of the project alignment. Most jurisdictions along the proposed alignment have policies in place to protect Joshua trees.

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Table 6-2: Environmental Rail Option Evaluation

Environmental Category	Alignnment Option	Variation E
Aesthetics	No measureable difference	
Land Use and Development	No measureable difference	Potential impacts to residences
Socioeconomics	No measureable difference	Potential impact to economic development
Cultural Resources	No measureable difference	Lower impact potential to known resources
Agricultural Resources	No measureable difference	
Biological Resources	No measureable difference	
Traffic and Circulation	No measureable difference	
Air Quality	No measureable difference	
Noise	Median alternative likely to result in lower noise levels to sensitive receptors	
Geology and Soils	No measureable difference	
Water Quality and Hydrology	No measureable difference	
Hazardous Waste	No measureable difference	

Light pollution from ambient light and train headlights would exist for all rail options. Further advancement of the rail design is necessary to understand any conflicts between train headlights and automobile traffic on the HDC.

All project options or alignments would disrupt views of the mountain ranges along the project alignment. Because all options for a new transportation corridor introduce similar effects, no measurable differences in aesthetic impacts are anticipated for the various alignment options.

Land Use and Development

The proposed project as a whole is consistent with the Los Angeles County General Plan, the “Town and Country” plan for Antelope Valley, and the San Bernardino County General Plan. All three plans are in favor of projects that facilitate efficient movement of people and goods. The City of Palmdale’s General Plan supports the HDC. The City of Lancaster’s General Plan of 2030 has identified the HDC as a vital east–west thoroughfare for goods and traffic circulation. The proposed project is consistent with the City of Adelanto’s traffic circulation improvement plan. The proposed project is consistent with the “Circulation Element” in the City of Victorville’s General Plan. The Victorville Desert Gateway Specific Plan calls for a freeway and a railway connection that would link the XpressWest Station and the HDC; therefore, the HDC and rail facility would support the development of the Specific Plan. The proposed project is also consistent with Apple Valley’s plan of preserving land for a future transportation corridor that would enhance the movement of motorists and goods.

In the Victorville constrained ROW area, the corridor narrows and contains approximately 290 feet of ROW for project construction. The railway would follow the chosen roadway alternative or would travel south of the VFCC along Variation E. Variation E would also run through or adjacent to the industrial park near Adelanto Road and would conflict with the city of Victorville's proposed industrial lead track development. The median and side-running options would run adjacent to Rockview Nature Park (17800 National Trails Highway). If the project would require acquisition of land within the park, Section 4(f) issues would have to be resolved in order for this option to be acceptable. Variation E would also avoid this potential 4(f) issue. At the eastern end of the HDC, all proposed options would travel on a viaduct across the Mojave River.

Viewing the proposed project options using aerial analysis, none of the options are anticipated to have a large number of residential acquisitions. The north side-running option runs immediately adjacent to the neighborhood residences at 10th Street in Palmdale. In addition, the south-side option comes closest to the Unity Church, which may result in an acquisition (see Figure 6-1). Wye connections to the CAHST project would increase the potential conflict with industrial land uses near the Palmdale Station and with the residences on the north side of the HDC. Lone residences dot the project area between Adelanto and Palmdale. The north side-running option would run closer to the residential neighborhoods of Adelanto but would not necessarily result in any residential acquisitions. Variation E would have the greatest effect on the residential neighborhood at Village Drive and Rancho Road near Victorville but would not necessarily result in any residential acquisitions.

Because all proposed options have are constraints and potential land use impacts, the options studied present no measurable differences except for Variation E, which would conflict with the city of Victorville's proposed industrial developments. As shown in Figure 6-1, because the south side-running option could affect the Unity Church in Palmdale and also the greatest number of residences, it would be the least desirable option among those under consideration in this area. The median and north side-running option would create the fewest land use impacts.

Socioeconomics

U.S. Census data (2010) were gathered for the jurisdictions analyzed as part of the project area, including Los Angeles County, San Bernardino County, the cities of Palmdale, Adelanto, Victorville, and the town of Apple Valley. Table 6-3 summarizes the data.

In terms of socioeconomics, little difference is anticipated between the median and the side-running options. None of the project options run through major developed areas, nor would they cause substantial community divisions. Variation E would cause a greater disruption to communities in the Victorville area because it runs closer to the residential neighborhood near Rancho Road and Village Drive, and the north side-running option runs closer to residential neighborhoods along the proposed alignment west of Victorville. In addition, Variation E would disrupt the city of Victorville's planned industrial track development, which could result in an economic impact.

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Except for Variation E, no measurable differences in socioeconomic impacts are anticipated by alignment option.

Table 6-3: U.S. Census Data for Project Area Jurisdictions

Jurisdiction	Area, mi^2	Total Population	Hispanic Population, %	Total Housing Units	Owner-Occupied Units, %
County of Los Angeles	4,084	~9,800,000	47	~3,500,000	48
County of San Bernardino	20,056	~2,000,000	~50	~700,000	63
City of Palmdale	106	~152,750	54	46,544	68
City of Victorville	73	~116,000	48	36,655	62
City of Adelanto	56	31,765	58	9,086	58
City of Apple Valley	73	69,135	29	26,117	69

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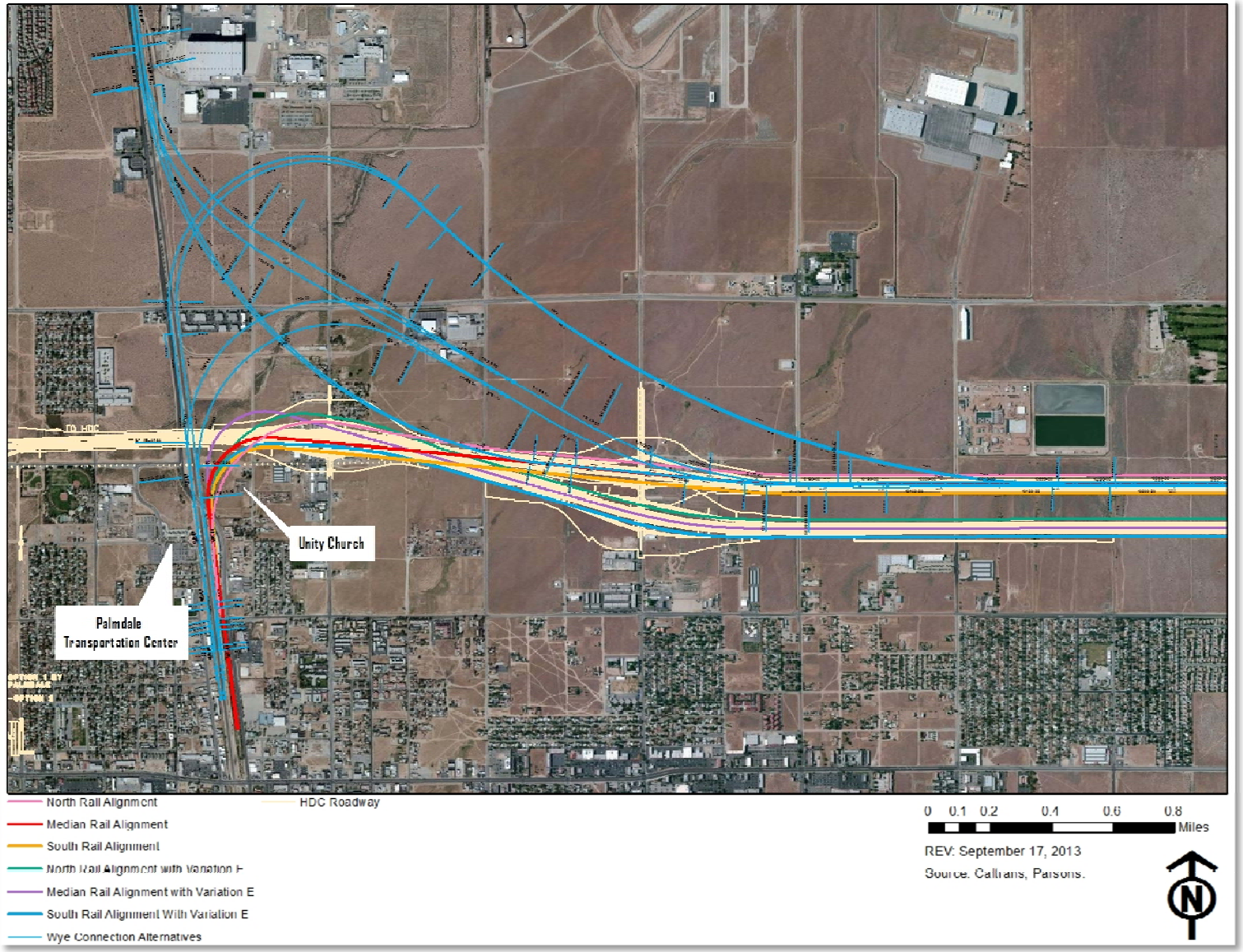

Figure 6-1: Proposed Options in Relation to Unity Church

Cultural Resources

Based on current Caltrans investigations, the Victorville area of the project contains the majority of environmentally sensitive areas for cultural resource impacts. The remainder of the project area does not contain known cultural resource issues. Some of the known archaeological resource sites within the vicinity of the project options may be eligible for the National Register of Historic Places (subject to later determination). Variation E would likely avoid the majority of the known archaeological sites. The median and side-running options would create a greater potential for disruption to the archaeological sites near Victorville. The Variation E alignment would likely result in the least disruption of potential cultural resources.

Agricultural Resources

At some locations south of Lake Los Angeles and El Mirage, the median and side-running options would run through or adjacent to agricultural land, thus disrupting activity at these farms. In the city of Adelanto, the project alignment runs directly through Meadowbrook Dairy, located at 17900 Sheep Creek Road. In addition, an agricultural property at 165th Street East and East Avenue R would be affected by all options, requiring a full or partial acquisition of the properties and relocation within reasonable proximity to the existing location. No Williamson Act properties are located within the project area. The alignment options have no anticipated measurable differences in agricultural resource impacts.

Biological Resources

Similar to the effects on cultural resources, the Victorville area of the proposed project contains the major environmentally sensitive areas for biological resource impacts, particularly because all project options cross the Mojave River at this location. In addition, the Southwestern Willow Flycatcher may inhabit the riparian zone along the Mojave River.

Traffic and Circulation

The alignment options have no anticipated measurable differences in traffic impacts. A complete traffic analysis will be performed for the proposed project and is anticipated to be completed in spring 2013.

Air Quality

All alignment options could result in near- and long-term beneficial effects on air quality because they would foster greater use of public transportation instead of individual cars. The options providing the most direct routes would also produce some long-term minor benefits to air quality. Diesel multiple unit (DMU) technology relies on the use of diesel fuel and would provide less air quality benefits than electric multiple unit (EMU) technology used on high speed rail systems.

Noise

Existing noise levels were recorded at 53 locations and modeled at 25 locations along the proposed project corridor. These locations were judged to be acoustically

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representative of the entire area within the limits of the project. The existing ambient noise levels measured were between 42 and 70 decibels (dBA). Five long-term (24-hour) noise level readings were conducted to determine the noisiest hour within the project limits.

Most of the noise-sensitive land uses are residences located along the HDC alignment. These residences would benefit from the addition of soundwall mitigation. The land use discussion above identifies the location of potentially affected residential neighborhoods. Other than the residences, the Noise Study Report (NSR) prepared for the HDC identified that the Unity Church (39149 8th Street East, Palmdale) could benefit from a soundwall with the construction of the HDC. Specific soundwall locations will be identified in the NSR for the HDC roadway. An updated NSR will be prepared to analyze the rail facility in detail.

Because the south side-running option would affect the Unity Church and the north side-running option could affect the greatest number of residences, they would not be desirable options. The median option would be the environmentally superior option in terms of noise impacts.

Geology and Soils

No major fault lines run through or near the alignment options proposed in this study; however, the San Andreas Fault is located approximately five miles from the Palmdale segment of the project. Assuming the application of appropriate design criteria, the alignment options present no anticipated measurable differences in geology or soil impacts.

Water Quality and Hydrology

The project options lie within the Antelope Valley Watershed at the west side of the alignment and within the Mojave River Watershed on the east side of the alignment. The following streams and channels cross the project alignment: Mojave River, Bell Mountain Wash, Fremont Wash, Mescal Wash, Big Rock Creek, and Little Rock Creek. To prevent flooding of the proposed roadway and rail facilities, the project will be designed for a 100-year storm. The O&M facility must be raised in elevation to address a 100-year storm. All culverts and lateral lines must be extended to accommodate the increased ROW. The alignment options present no anticipated measurable differences in water quality or hydrology impacts.

Hazardous Waste

Groundwater on the former SCLA site was contaminated; however, it has been undergoing remediation to prevent discharge to the Mojave River. There is also the potential for hazardous waste at Krey Field airport south of the Meadowbrook Dairy. The alignment options present no anticipated measurable differences in hazardous waste impacts.

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6.2.2.2 Viaduct Interface

Viaducts would be required for both median and side running options to maintain grade separations of high speed rail trains. Viaducts may increase the potential impact of a rail facility on the following areas.

Aesthetics

Locations of viaducts for rail track would create a more substantial visual presence in the area than would the at-grade options, particularly near the Mojave River area. In addition, these effects would be greater at some locations, such as interchanges or viaduct portions of the railway, where the railway would be elevated above an already elevated roadway. Wye connections that require viaducts would also introduce a more substantial visual presence in the area near the Palmdale Transportation Center.

Socioeconomics

Community residents may perceive a greater division because of the scale of the structure. Otherwise, the construction of the viaduct would have little measurable difference in terms of socioeconomic impacts.

Noise

Greater noise impacts would be associated with an elevated viaduct compared with an at-grade facility. A viaduct structure would increase the traffic noise level by an estimated 1 to 2 dB by increasing the surface area for the sound wave reflection; however, due to a minimal number of affected residential properties or sensitive receptors, this is not expected to make an appreciable difference.

6.2.3 Interface with Interchanges

In reviewing the potential environmental impacts associated with the project's interface with interchanges, the following overcrossings would result in additional impacts due to the large footprint required outside the main project alternative footprints:

- Sheep Creek Road: additional potential impacts to Meadowbrook Dairy
- Oasis Road: additional potential biological resource impacts to waterway/wash
- 240th Street: additional potential farmland impacts
- 170th Street: additional potential farmland and residential impacts

A median railway facility would require the least amount of ROW and ground disturbance at interchanges compared to the side-running railway facility. Of the side-running railway facilities, rail bulb out interchanges would require larger amounts of ROW than would highway bulb out interchanges; however, the various interchange types present no anticipated measurable differences in environmental impacts. No interchanges other than those listed above would generally have any additional environmental impacts. All options would affect the above-mentioned interchanges to the same degree. Therefore, the alignment options present no anticipated measurable differences in the interface with interchanges.

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6.2.4 Station Connections

Two station connections are currently under consideration for the proposed project: the Palmdale Transportation Center and the planned Victorville XpressWest station. The Victorville station has already been environmentally cleared in the XpressWest environmental document.

Traffic impacts at station locations will be greater for high-speed rail than for commuter rail service (Palmdale Metrolink station) and will be addressed in the Traffic Report in early 2014.

Two wye rail connections, Option 1 and Option 7,are proposed for connecting the HDC to the CAHST project at the Palmdale Transportation Center. Both options allow for east- and westbound tracks on the HDC to connect to north- and southbound tracks of the CAHST project by using a combination of aerial and cut-and-cover or tunneling structures.

Option 1 shifts the existing Palmdale Transportation Center south approximately 800 feet and requires a cut-and-cover box and mined tunnels configuration. This option encroaches into the Plant 42 parking lot associated with the Palmdale airport. The alignment also crosses under the commercial development at Rancho Vista Boulevard and 15th Street East. This option diverges outside the HDC median and requires only two rail tracks to cross under the HDC westbound lanes, thus reducing the ROW needed for the HDC.

Option 7 requires a mix of aerial structures and tunneling, and allows the Palmdale Transportation Center to remain at its current location. This option encroaches into a small residential area near 10th Street and requires a four-track section within the HDC median, which requires a larger ROW section for the HDC in this area.

Environmental impacts at the Victorville station have already been analyzed and addressed in the XpressWest EIR/EIS.

6.3 Financial Viability/Capital Costs

The Public-Private Partnership Feasibility Evaluation for this project augments the initial HDC business plan to include the rail facility. This report details the financial viability of both commuter rail and high speed rail, and has determined that the commuter rail option would require an additional subsidy to support the construction of the HDC due to lower revenue potential. Metrolink would also require operational subsidies to extend into the Victor Valley. This would negatively impact the financial viability of the overall project. In contrast, a high speed rail system would contribute significantly to the financial viability of the HDC, due to higher ridership and revenue potential. Providing a high speed connection to the CAHST project and XpressWest systems would increase the financial viability of the HDC, the CAHST project, and the XpressWest system. Forthcoming ridership and traffic reports are expected to confirm these assumptions.

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Capital costs for the railway facility are based on a unit price analysis. Unit prices are based on publically available figures being used in development of the CAHST project. The CAHST capital costs use FRA's standard cost categories, and unit costs from year 2010 have been escalated based on recent construction cost escalation rates. The intent of these conceptual cost estimates is to determine differences in costs between rail options based on standard designs. As the preliminary design moves into later design phases, updated cost estimates will be prepared that reflect construction costs based on more detailed design of the project, and they will reflect the following items not considered in this cost estimate:

- Escalation rates to opening or construction year
- Environmental mitigation costs
- Program implementation/professional service add-ons
- Vehicle procurement
- ROW costs

Railway unit costs are shown in Table 6-4 and are measured in route miles (RM) and lump sum (LS).

Table 6-4: Railway Unit Costs

Item No. / Cost Code	Description	Unit	CAHST 2010, $	CAHST 2012, $
Guideway and Track Elements				
10.01.127	Elevated Structure – 1 Track (70' avg. pier height)	RM	67,356,463	71,114,174
10.01.213	At-Grade Track-bed in Fill – 1 Track (15' avg. fill height)	RM	2,623,735	2,770,109
10.01.227	Elevated Structure – 2 Track (70' avg. pier height)	RM	74,790,367	78,962,803
10.05.221	At-Grade Track Bed in Fill – 2 Track (5' avg. fill height)	RM	1,839,282	1,941,893
10.05.223	At-Grade Track-bed in Fill – 2 Track (15' avg. fill height)	RM	3,486,396	3,680,897
10.07.115	Cut and Cover Box – 1Track/1 Box (50' avg. exc. depth)	RM	109,148,168	115,237,372
10.09.112	Ballasted Track (track laying machine) – 1 Track	RM	1,244,839	1,314,287
10.09.122	Ballasted Track (track laying machine) – 2 Track	RM	2,470,660	2,608,494
	Sitework and Special Conditions	10%		
Communications and Signaling				
50.01.010	Train Controls (ATC)	RM	1,150,066	1,214,226
50.05.010	Communication (w/fiber optic backbone)	RM	195,704	206,622
Electric Traction				
60.02.000	Traction Power Facility (TPF)	LS	16,132,152	17,032,139
60.03.100	Traction Power Distribution	RM	2,159,674	2,280,159

Based on the unit costs and the rail option definition in Section 5, Table 6-5 reflects the anticipated construction cost of the rail facility using the route mile information and lump sum information. This estimate does not include the costs associated with the roadway facility, right of way acquisition or environmental mitigation.

Track costs reflect track at-grade, tunnel or cut-and cover and viaduct costs of the rail facility. Given the complexities of multiple wye connections and the need for consistencies across alignment options for the length of the corridor, Alternative 7 of the Wye connection was used to develop the route mile information to avoid cost difference across options and uncertainties associated with relocation of the Palmdale transportation center. The Wye configurations have undergone a focused cost and engineering analysis and are included in Appendix C. Systems costs include the train control, traction power distribution (catenary lines and poles) as well as the communication costs per route mile. Rail facilities for each option would be the same costs, and reflects an estimated cost for one station, one parking garage, one light maintenance facility and 5 traction power facilities.

Track costs vary due to the connection of the rail facility to and from the highway facility. A median alignment is the least expensive since the median alignment would be elevated above the floodplain as part of the roadway improvements. This allows a lower estimate for the rail bed to be utilized, and reflects gains from shared project development. A rail facility on the side of the roadway would not benefit from the fill and culverts used for the roadway, and thus require additional fill and culverts to raise the rail facility above the flood plain. The rail facility on the south side would require the same cost increase as the north side. Systems costs vary slightly across the options due to the overall route mile differences.

Variation E for both side and center running alignment is the most expensive option, based on increased route miles at an elevation above the floodplain. Overall, the total costs for the rail facility only range by $251 million across the options.

A total of 14 interchanges along the HDC would be redesigned to accommodate the rail facility. As shown in Table 6-6, the median alignment would increase the cost of each overcrossing to approximately $10 million, excluding ROW. Side-running alignments would increase the cost of each overcrossing to roughly $12 million. This represents a $140 million to $160 million increase over the $882.8 million interchange costs already included in the project.

In addition to the increase in the cost of the interchanges, the railway facility would increase the width of the standard section over the roadway facility as designed. The amount of roadway fill would increase based on the cross section. As shown in Table 6-7, assuming a standard roadway height of 12 feet, the median rail facility represents the largest increase in the amount of fill at roughly 13 million additional cubic yards over the roadway facility. (Note: this number does not include the additional fill costs associated with interchanges; those costs are reflected in the interchange cost.) This increase in cost of the roadway facility is due primarily to increased size of the median. This fill increases the costs of the base roadway facility for the median alignment by more than $66 million. When interchange costs are included, the median alignment is the least expensive option at approximately $900 million more than the roadway-only cost estimates. Neither side alignment benefits from shared project development, and both side alignments increase the ROW and the costs of interchanges significantly, resulting in higher costs overall. The side option increases the roadway-only cost estimates by

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approximately $940 million, and the roadway facility with a rail bulbout is the least expensive rail option. It is important to note that the costs do not reflect the increased drainage, soundwalls, or other specialty items that may be required for a large roadway facility.

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Table 6-5: Rail Costs by Alignment Option

	Item No.	Description	Unit	Center	Center with Variation E	Side	Side with Roadway Bulbout	Side with Variation E
10 GUIDEWAY & TRACK ELEMENTS				*$1,308,556,601*	*$1,469,715,273*	*$1,342,835,372*	*$1,347,300,840*	*$1,483,867,994*
	10.01.127	Elevated Structure – 1 Track (70' avg. pier height)	RM	$376,905,120	$376,905,120	$376,905,120	$376,905,120	$376,905,120
	10.01.213	At-Grade Track-bed in Fill – 1 Track (15' avg. fill height)	RM	$23,601,329	$23,601,329	$23,601,329	$23,601,329	$23,601,329
	10.01.227	Elevated Structure – 2 Track (70' avg. pier height)	RM	$446,139,839	$566,163,300	$401,131,041	$401,131,041	$521,154,502
	10.05.221	At-Grade Track Bed in Fill – 2 Track (5' avg. fill height)	RM	$89,074,615	$89,074,615	$—	$—	$—
	10.05.223	At-Grade Track-bed in Fill – 2 Track (15' avg. fill height)	RM	$—	$21,754,098	$169,431,667	$172,045,104	$179,406,897
	10.07.115	Cut and Cover Box – 1Track/1 Box (50' avg. exc. depth)	RM	$217,798,633	$217,798,633	$217,798,633	$217,798,633	$217,798,633
	10.09.112	Ballasted Track (track laying machine) – 1 Track	RM	$20,647,443	$20,647,443	$20,647,443	$ 20,647,443	$20,647,443
	10.09.122	Ballasted Track (track laying machine) – 2 Track	RM	$134,389,622	$153,770,734	$133,320,139	$135,172,170	$144,354,070
20 STATIONS, STOPS, TERMINALS, INTERMODAL				*$—*	*$—*	*$—*	*$—*	*$—*
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS				*$—*	*$—*	*$—*	*$—*	*$—*
40 SITEWORK ROW, LAND, EXISTING IMPROVEMENTS				*$130,855,660*	*$146,971,527*	*$134,283,537*	*$134,730,084*	*$148,386,799*
		Sitework and Special Conditions	10%	$130,855,660	$146,971,527	$134,283,537	$134,730,084	$148,386,799
50 COMMUNICATIONS AND SIGNALING				*$75,418,632*	*$77,947,742*	*$74,836,084*	*$75,844,887*	*$78,686,583*
	50.01.010	Train Controls (ATC)	RM	$64,451,135	$66,612,458	$63,953,303	$64,815,403	$67,243,856
	50.05.010	Communication (w/Fiber Optic Backbone)	RM	$10,967,497	$11,335,284	$10,882,782	$11,029,483	$11,442,727
60 ELECTRIC TRACTION				*$206,191,525*	*$210,250,208*	*$205,256,660*	*$206,875,573*	*$211,435,891*
	60.02	Traction Power Facility (TPF)	LS	$85,160,696	$85,160,696	$85,160,696	$85,160,696	$85,160,696
	60.03.100	Traction Power Distribution	RM	$121,030,829	$125,089,512	$120,095,964	$121,714,877	$126,275,194
70 VEHICLES				*$—*	*$—*	*$—*	*$—*	*$—*
80 PROFESSIONAL SERVICES (applies to Categories. 10–50)				*$—*	*$—*	*$—*	*$—*	*$—*
90 UNALLOCATED CONTINGENCY			25%	*$430,255,604*	*$476,221,187*	*$439,302,913*	*$441,187,845*	*$480,594,316*
100 FINANCE CHARGES				*$—*	*$—*	*$—*	*$—*	*$—*
TOTAL:				*$2,151,278,024*	*$2,381,105,938*	*$2,196,514,568*	*$2,205,939,229*	*$2,402,971,584*

Table 6-6: Interchange Cost Increase

Interchange	ROW Area (Acres)	Clearing Cost, $	Structure Cost, $	Embankment Cost, $	Single Interchange Cost, $	Total Interchange Cost, $
Roadway with Rail on Median	188.41	1,884,068	4,680,000	2,380,000	9,992,472	139,894,607
Roadway with Rail Bulbout on North Side*	198.28	1,982,782	6,175,000	2,625,000	11,308,257	158,315,603
Roadway Bulbout with Rail on South Side*	202.57	2,025,712	6,175,000	2,655,000	11,387,187	159,420,613

Table 6-7: Comparison of HDC Project Costs

	High Speed Rail Cost, $	Standard Cross Section Size (ft)	Amount of Roadway Fill (cy)	Roadway Cost, $	Structure Cost, $	Construction Cost, $
Roadway without Rail	—	184	19,924,608	1,952,600,000	882,800,000	2,835,400,000
Roadway with Rail on Median	2,151,278,024	288	33,133,056	2,018,642,240	931,162,392	5,101,082,656
Roadway with Rail on Median (Variation E)	2,381,105,938	288	33,133,056	2,018,642,240	997,945,780	5,397,693,958
Roadway with Rail Bulbout on Side	2,196,514,568	320	19,924,608	1,952,600,000	949,583,388	5,098,697,956
Roadway Bulbout with Rail on Side	2,205,939,229	320	19,966,379	1,952,808,853	950,688,398	5,109,436,481
Roadway Bulbout with Rail on Side (Variation E)	2,402,971,584	320	19,966,379	1,952,808,853	931,162,392	5,286,942,829

7 Recommended Rail Option

Based on the reasons discussed below, it is recommended that a high speed rail service be included as part of the HDC in the median of the roadway. This section details the recommendation of the preferred rail option.

7.1 Mode Definition Recommendation

Both commuter rail and high speed rail would:

- Capture new riders.
- Support the cities of Palmdale and Victorville.
- Provide additional east-west transportation choices in the area.
- Close the rail gap between the existing Palmdale Transportation Center and the planned Victorville XpressWest station.

In contrast with commuter rail, however, high speed rail has the following advantages:

- It is consistent with regional plans and policies.
- It would support METRO's Public Private Partnership goals.
- It would generate greater ridership by providing faster travel times.
- It demonstrates a financial viable alternative.
- It supports air quality goals by using EMU technology.
- It would allow for transfer free rides for passengers on both CAHST and XpressWest high speed rail networks.

No operators currently have plans to provide service in this corridor. With the introduction of both the CAHST project and XpressWest high speed rail services in the project area, high speed rail would allow for a transfer free ride along both networks. If these projects do not materialize, the rail corridor could act as a preserved ROW for Metrolink service. These ridership projections will be available for the corridor at a later date; however, based on the plans and policies identified in this report, it is anticipated that travel times and market size for a commuter rail service into the Los Angeles basin via Palmdale from Victor Valley would not support construction of a commuter rail extension at this time, given the extensive travel times. This project would not preclude any operator from operating in the corridor, and the basic track design could allow all three operators to use the corridor. The high speed rail design standards based on CHSRA designs are recommended for further design stages.

7.2 Alignment Definition

As shown in Figure 7-1, the rail facility would begin at grade at the planned CAHST project alignment in the city of Palmdale and would continue east in the median until it crosses the Mojave River and heads north near I-15 to the planned XpressWest Station near the city of Victorville. This rail alignment allows for the potential use of Variation B, B-1 and/or D as needed to maintain a single transportation facility. As shown in Figure 7-2, the alignment would use a wye configuration near the Palmdale Transportation

Center in either Alternative 1 or Alternative 7. The wye configuration allows for the possibility of a one-seat ride from Los Angeles to Las Vegas and from San Francisco to Las Vegas.

The recommended alignment should allow for future expansion and phased construction of the full ultimate road and rail facility. The total cost to construct the rail varies by up to $299 million, depending on the various options being considered.

Based on the operational, engineering, cost and environmental concerns, the rail facility in the median of the HDC with a wye configuration has been developed in coordination with stakeholders and is recommended for inclusion in the HDC project as an alternative. The median alignment has the following advantages:

- It is among the least expensive options.
- It allows for use of joint project development.
- It allows interchanges to be phased as demand warrants on local streets.
- It would be the environmentally preferred alignment by buffering the railway from adjacent land uses.
- It is the most feasible option through the Phantom Road West interchange and the SCLA constrained ROW area.
- It avoids environmental concerns and additional ROW acquisition associated with Variation E, and interchange reconfigurations

At approximately $5.1 billion, the median option is also the second lowest cost high speed rail option. The first lowest option, side option with rail bulbout, would significant increase the amount of ROW required near interchanges. This ROW increase was not included in the cost estimate as part of the analysis and would likely increase the cost estimates of side running options above the median option.

The median option also allows for future joint project development. Preservation of the median ROW for the rail facility would benefit from joint development of culverts and fill material in the median. This benefit would not occur on the side options, as a higher embankment and additional culverts would be needed.

Side running options would require significant ROW to be reserved for future interchanges. Bulbouts would be required for side options that would limit any potential phasing of interchanges. Bulbouts would be required at all planned interchanges regardless of any changes in traffic demand over time.

In the Victorville constrained ROW area shown in Figure 7-3, the median option is also preferred due to the interchange design at Phantom Road West. This alignment would not require the acquisition of the industrial property to the north of the interchange, impacts and costs associated with the procurement of ROW south of the federal prison property, both of which would be necessary to accommodate a larger interchange if the railway facility were located either on the south or north side of the roadway. The alignment would maintain design standards through this area except for the area between US 395 and Phantom Road West, where the roadway alignment and interchange would be modified to accommodate the railway.

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At the east end of the SCLA constrained area, the recommended alignment would follow the median through the constrained area near the Mojave River and would leave the HDC roadway alignment just west of the I-15 interchange. From the I-15 and HDC interchange the rail alignment would head north next to the west side of the I-15 until reaching the XpressWest Victorville Station, where the rail would connect into XpressWest tracks.

The environmental screening analysis concluded that the proposed rail options are similar overall: each would place a railway in a planned transportation corridor that would result in similar impacts. The median option would be the environmentally superior alternative of the options presented.

7.3 Options Considered and Withdrawn

Side running alignments were considered at length and withdrawn from consideration due to environmental and ROW concerns. Side alignments require more ROW along the HDC and near interchanges, and would result in modifications to the interchanges that would limit any project phasing opportunities. Side running alignments also place the rail facility closer to adjacent developments, potentially increasing environmental concerns such as noise and vibrations and land use impacts.

The Western CAHST station has been dropped from consideration since it does not provide a connection to Metrolink services, and is not supported by project stakeholders.

Variation A would substantially alter the geometrics of potential Wye Connections requiring a larger radii and is not recommended for inclusion due to increased costs and impacts from a larger rail facility in this area.

Variation E would disrupt the city of Victorville's planned industrial track development, potentially resulting in land use and economic impacts. Variation E would avoid the majority of the impacts within the SCLA constrained ROW area. However, it would run through or adjacent to a residential neighborhood resulting in land use and economic impacts, and therefore is not supported by project stakeholders. Variation E is also the most expensive rail alignment for the rail facility.

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Figure 7-1: Recommended HDC Rail Alignment

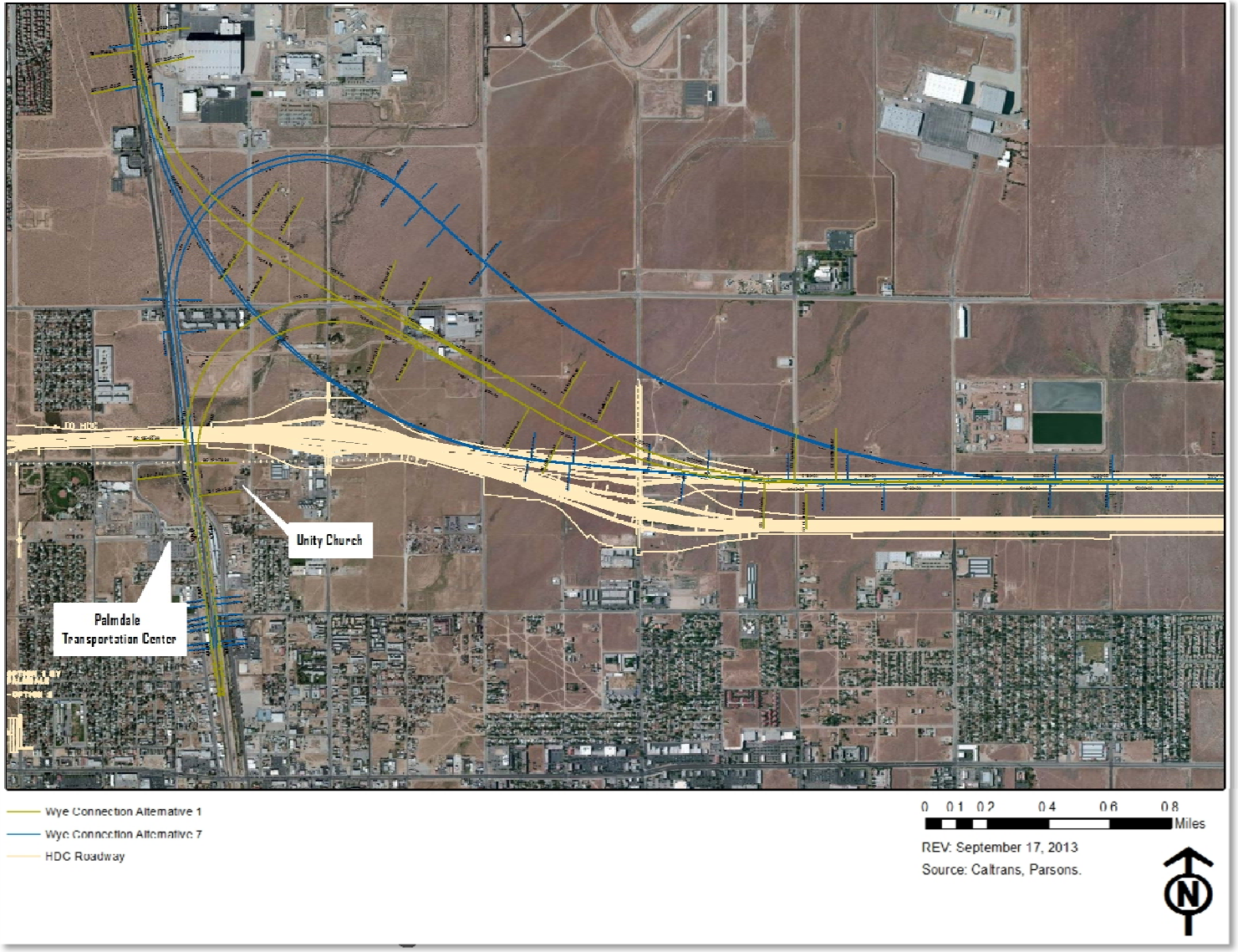

Figure 7-2: Recommended Palmdale Connection Alternatives

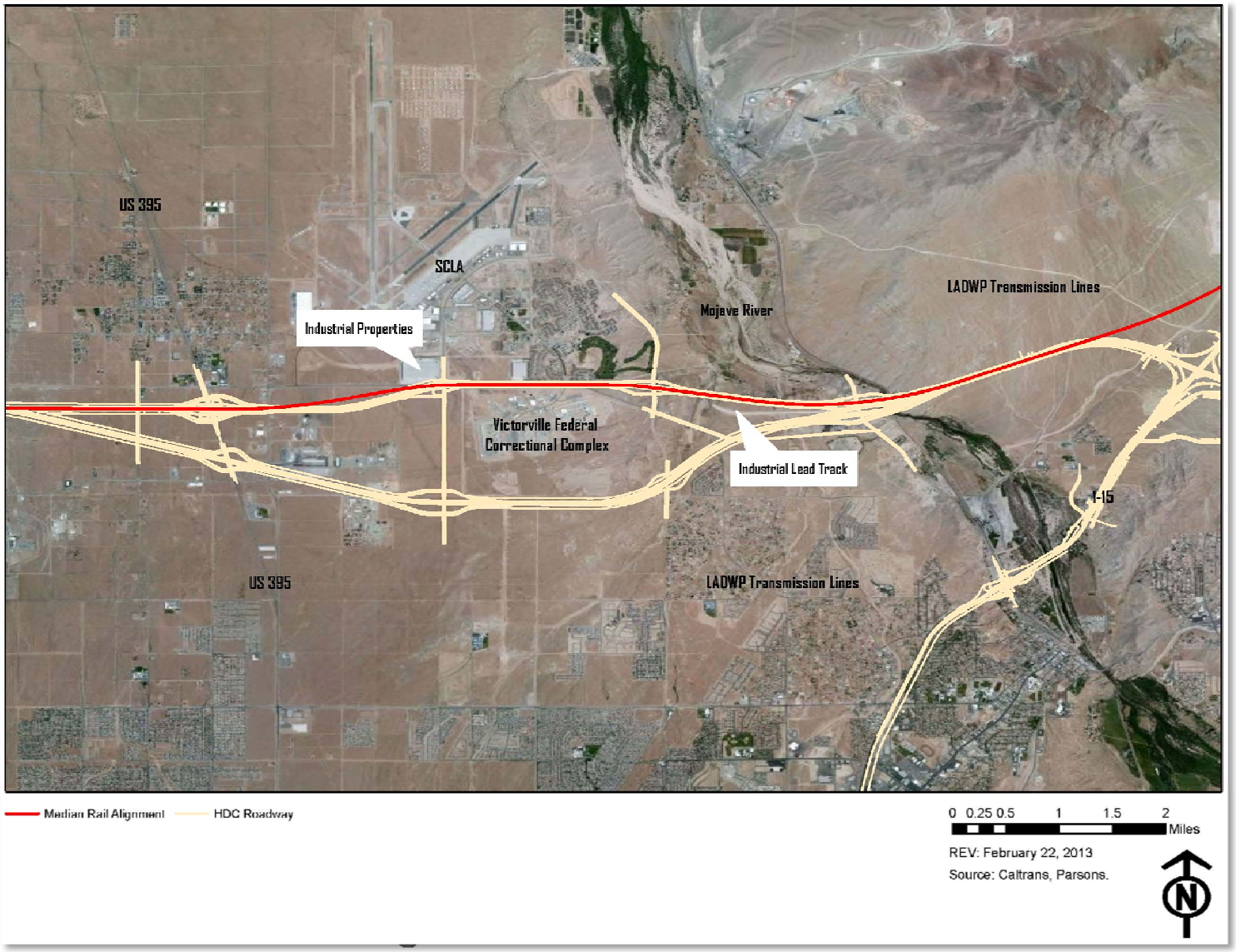

Figure 7-3: Victorville Constrained ROW Area

Appendix A Roadway Cross Section

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Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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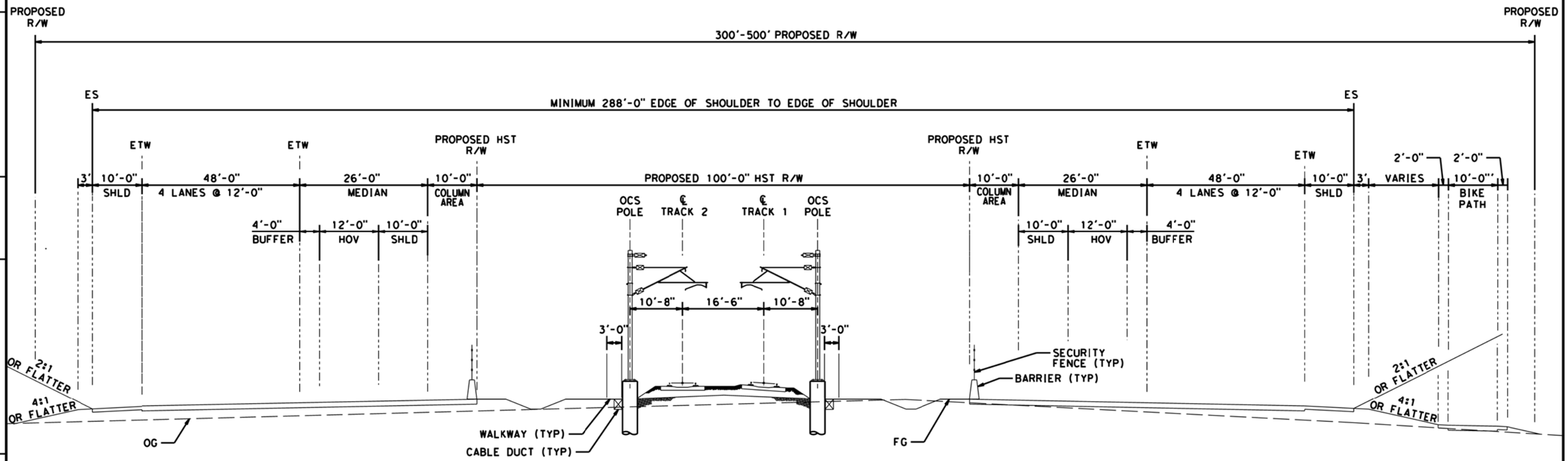
PARSONS
100 WEST WALNUT STREET
PASADENA CALIFORNIA 91124



HST MEDIAN OPTION - 100' HST ROW (PREFERRED)

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TYPICAL CROSS SECTION
(NO SCALE)

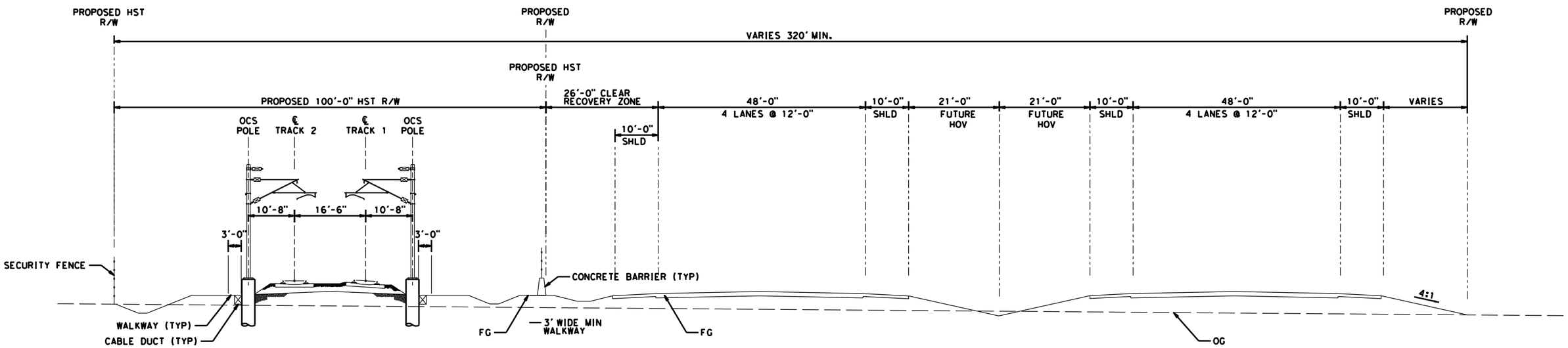
REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

LAST REVISION 00-00-00 | DATE PLOTTED => $DATE | TIME PLOTTED => $TIME



HST SIDE OPTION - 100' HST ROW (PREFERRED)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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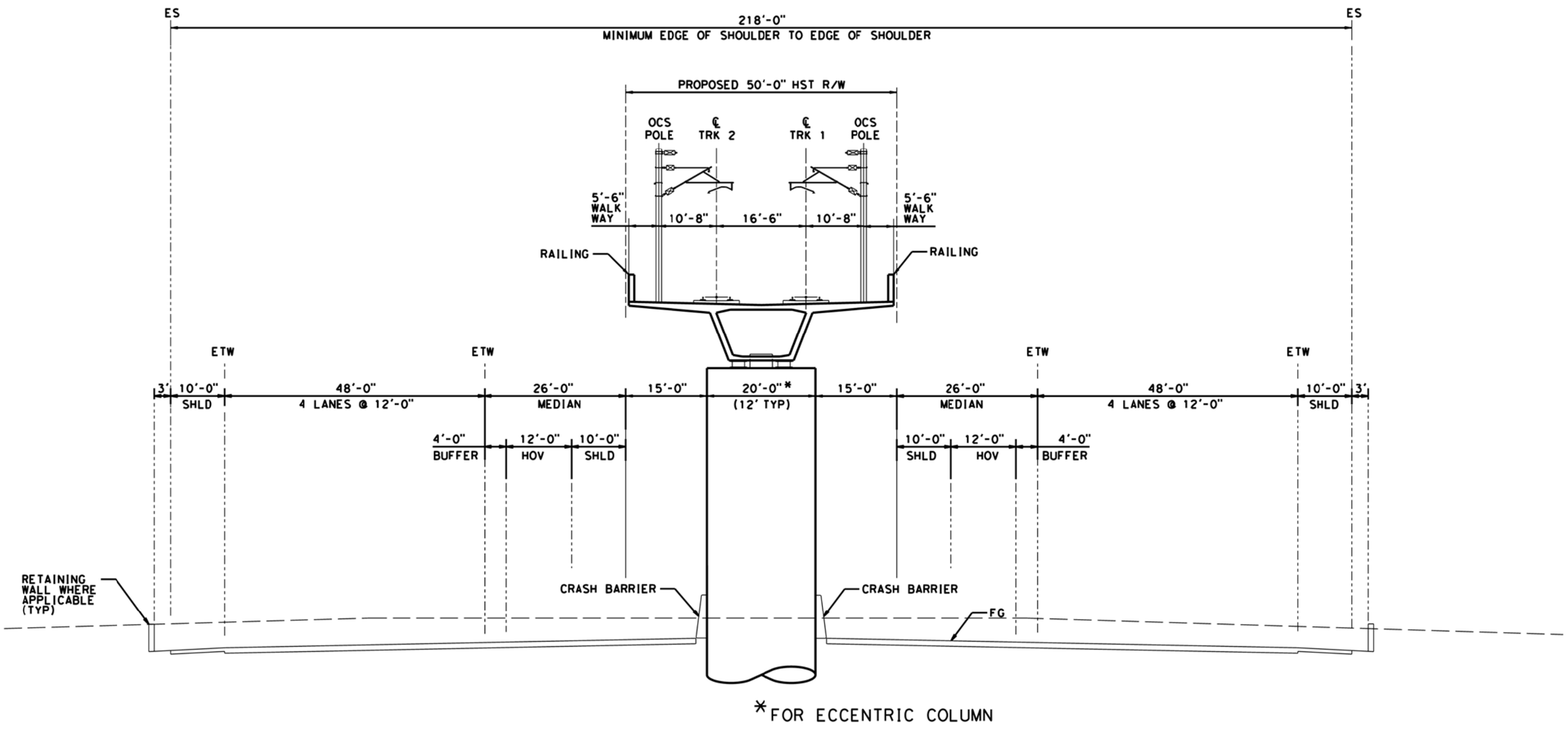

*FOR ECCENTRIC COLUMN

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HST STRUCTURE MEDIAN OPTION

TYPICAL CROSS SECTION
(NO SCALE)

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY	CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR

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Appendix B Interchange Options

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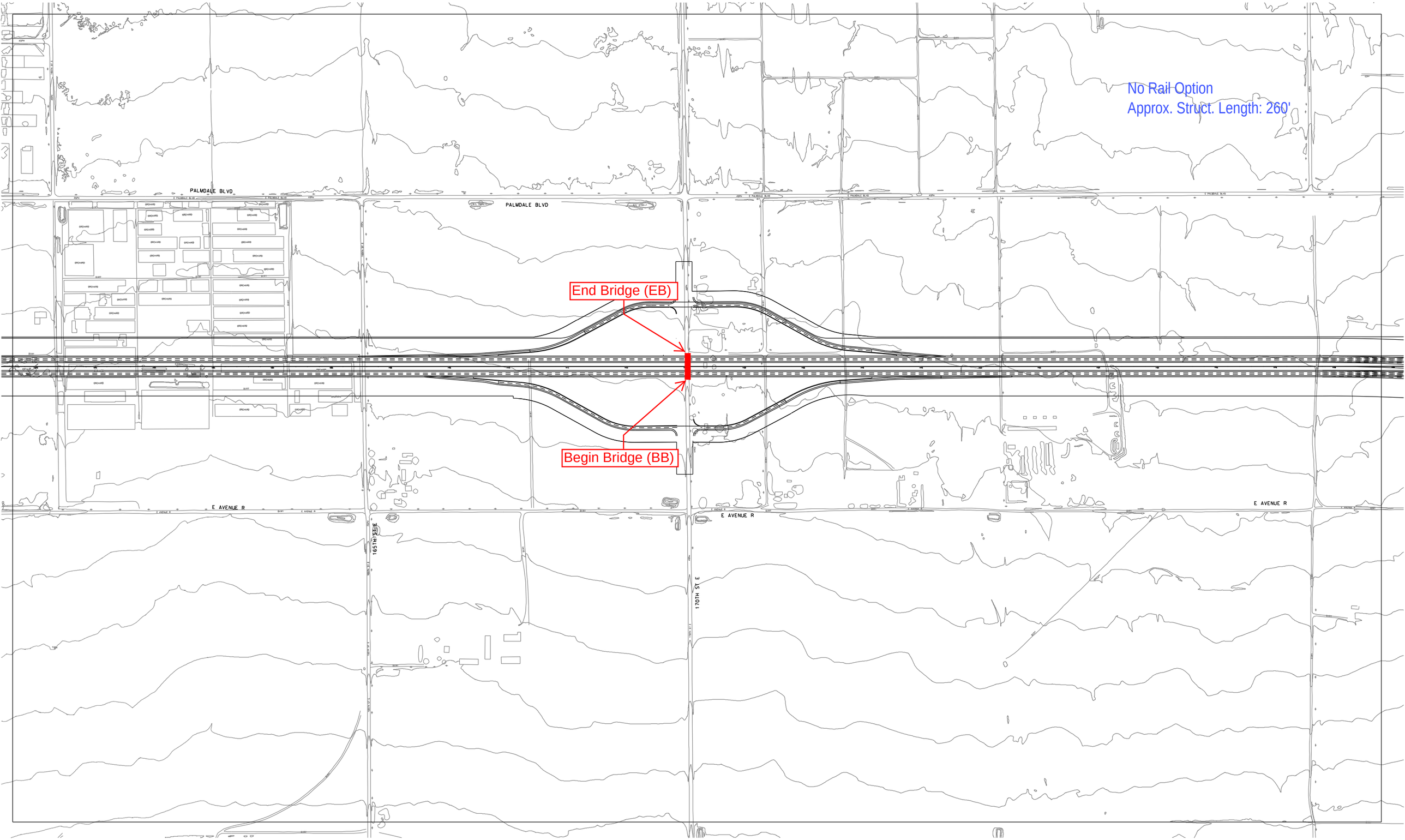
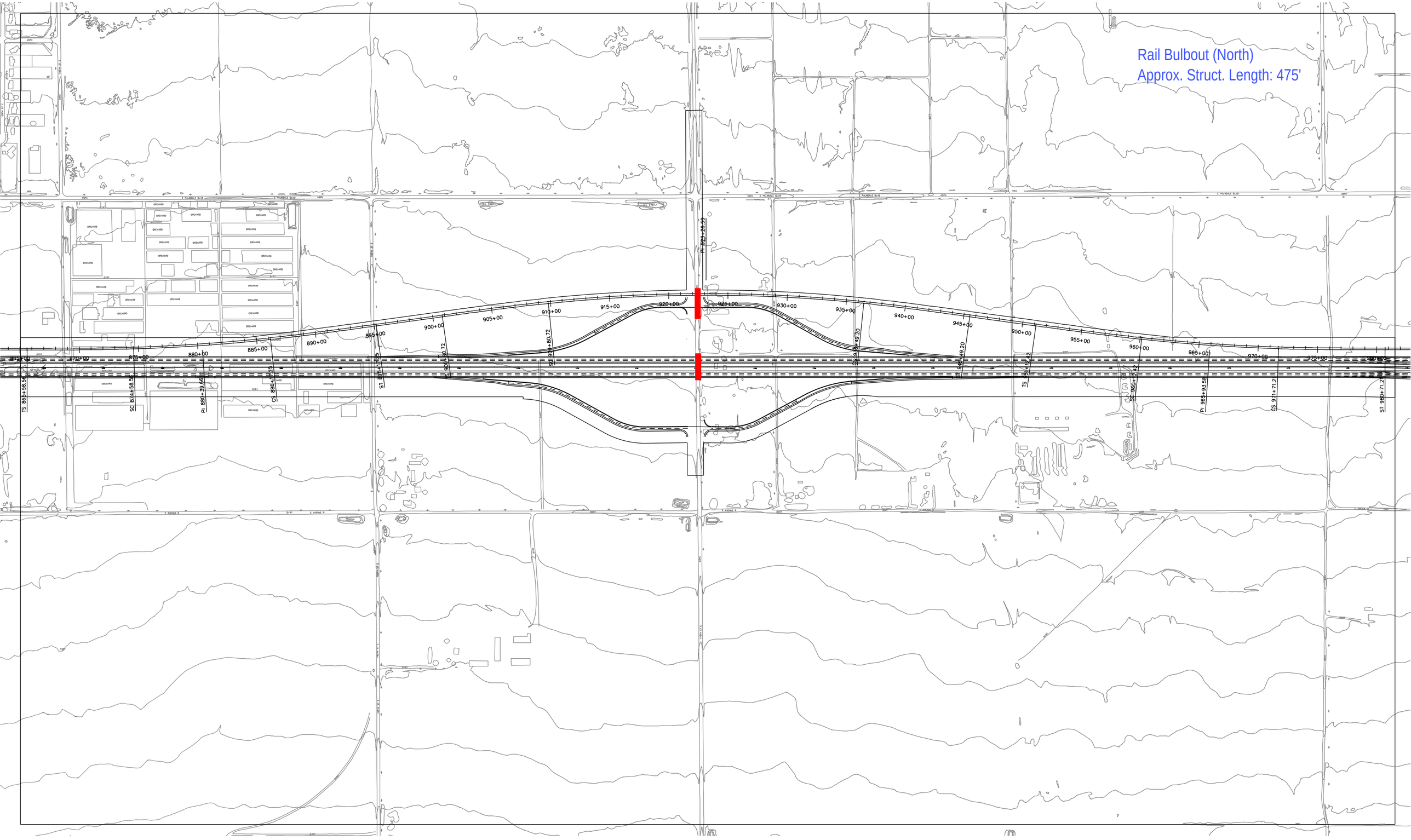
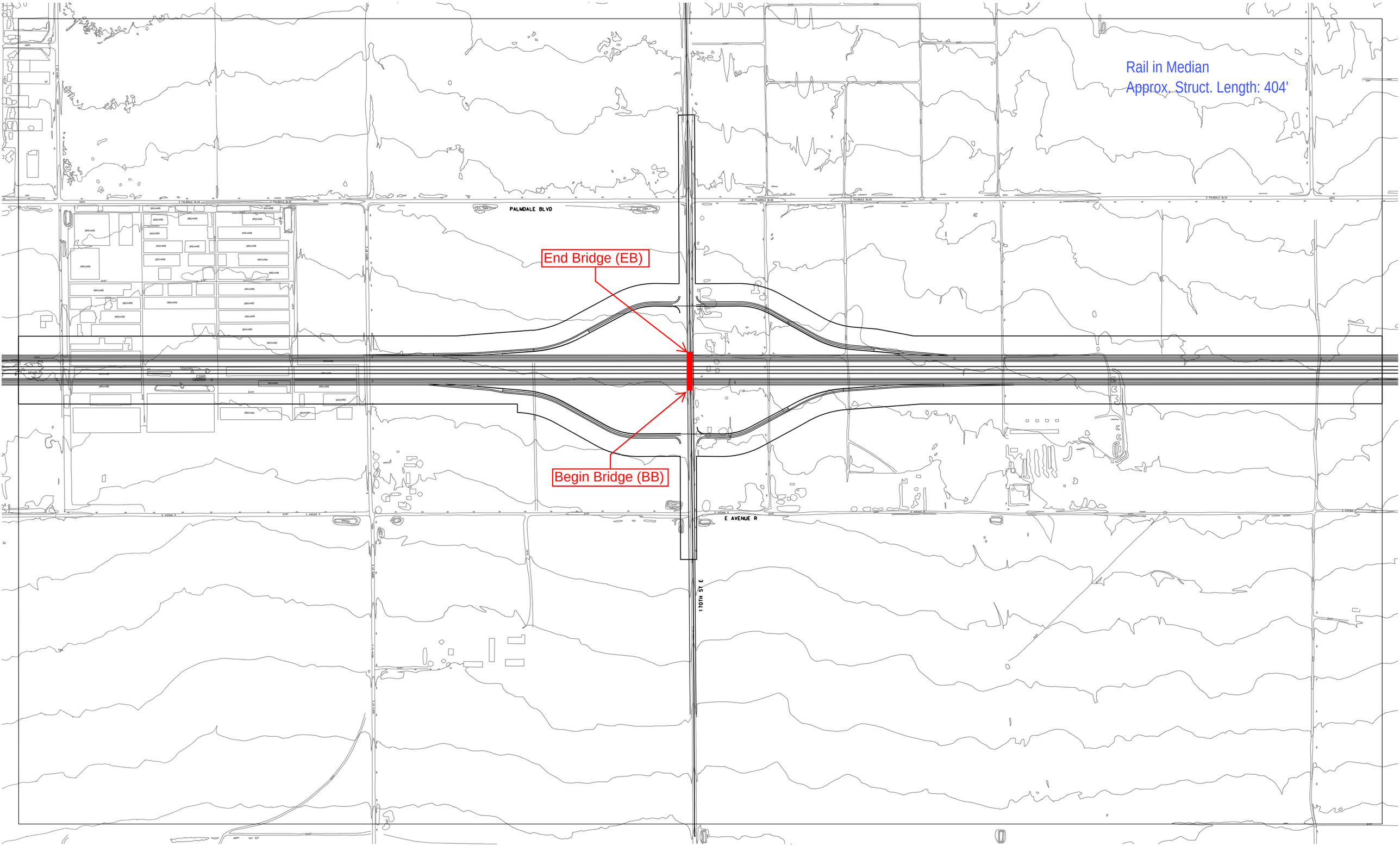
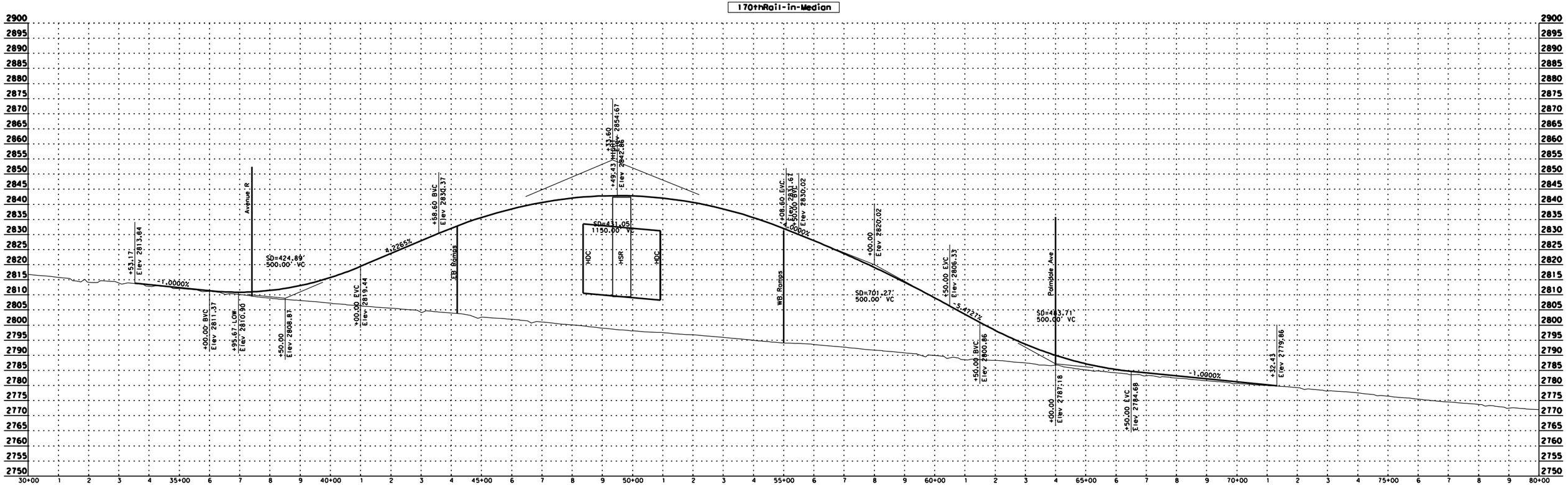

No Rail Option
Approx. Struct. Length: 260'
PALMDALE BLVD
PALMDALE BLVD
End Bridge (EB)
Begin Bridge (BB)
E AVENUE R
E AVENUE R
E AVENUE R
165TH ST E
170TH ST E

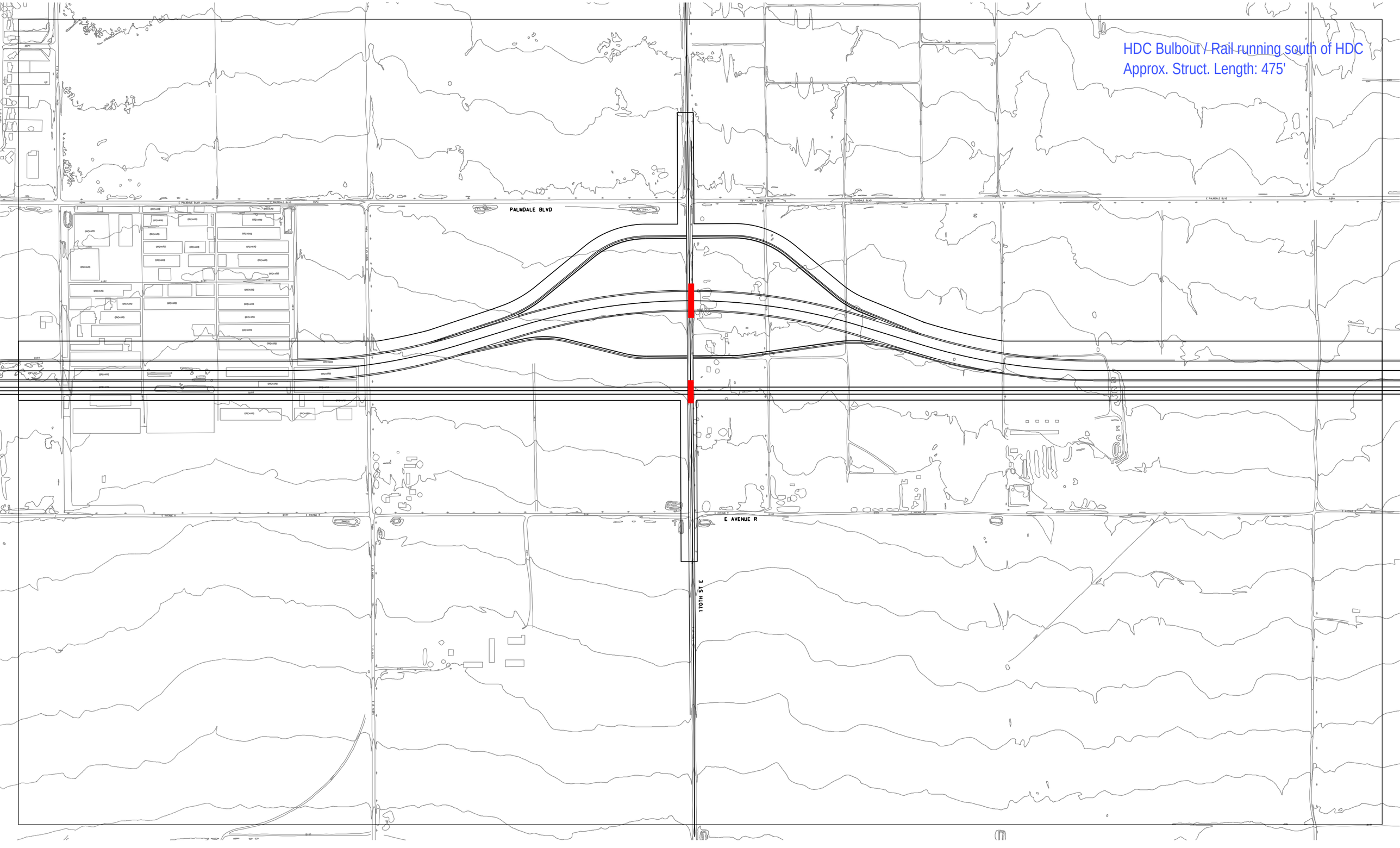

Rail Bulbout (North)
Approx. Struct. Length: 475'
E PALMDALE BLVD
E AVENUE R
PI 923+26.59
TS 865+58.56
SC 874+58.56
PI 884+39.66
CS 886+77.23
ST 897+11.95
SC 909+80.72
SC 919+80.72
SC 936+49.20
SC 946+49.20
TS 954+71.42
SC 960+71.42
PI 969+93.58
CS 971+71.2
ST 980+71.2
875+00
880+00
885+00
890+00
895+00
900+00
905+00
910+00
915+00
920+00
925+00
930+00
935+00
940+00
945+00
950+00
955+00
960+00
965+00
970+00
975+00

170thRailBulbout

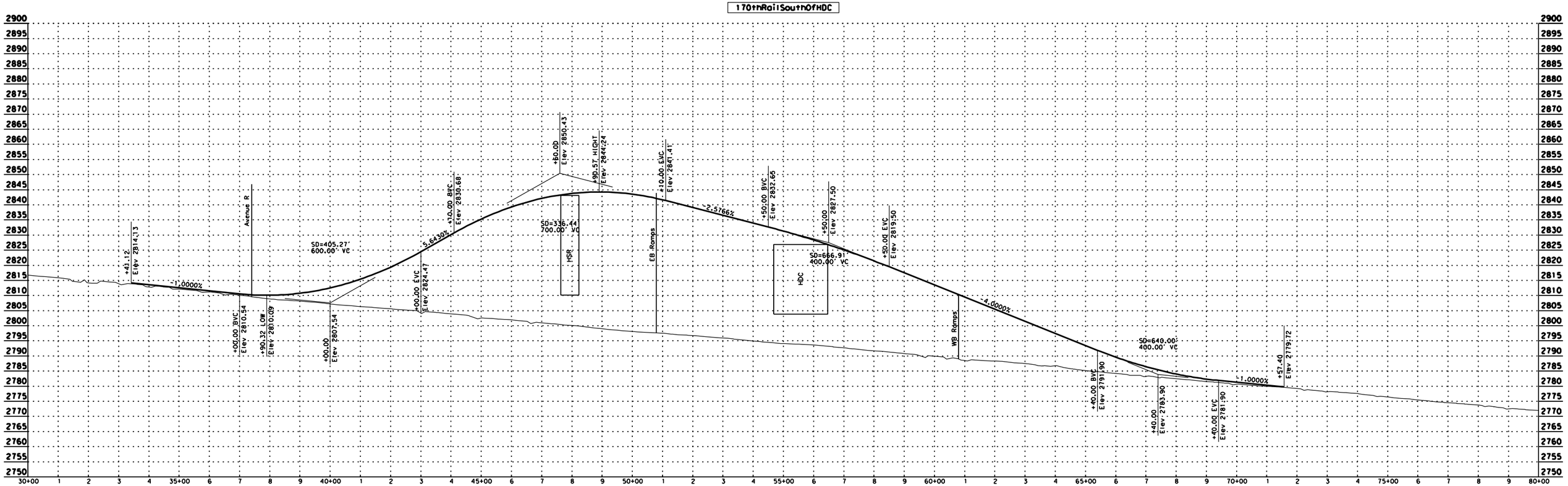

Rail in Median
Approx. Struct. Length: 404'
End Bridge (EB)
Begin Bridge (BB)
PALMDALE BLVD
E AVENUE R
170TH ST E

170thRail-in-Median




HDC Bulbout / Rail running south of HDC
Approx. Struct. Length: 475'
PALMDALE BLVD
E AVENUE R
110TH ST E

170thRailSouthOfHDC



Appendix C Wye Connection Options

DRAFT

Updated: 8/22/2013
By: N. Oum

PARSONS OPTIONS

OPTION	NORTH WYE						SOUTH WYE						OVERALL			
	Location	Speed	Over/Under UP/Metrolink	Connection to CHST	Connection to HDC	Double or Single Track	Location	Speed	Over/Under UP/Metrolink	Connection to CHST	Connection to HDC	Double or Single Track	Impacts	Station Location	Status	Reason for Elimination
1	North of Airport	110 MPH	Over	110 MPH TO	110 MPH XO	Single	North of Airport	110 MPH	Under	110 MPH TO	110 MPH XO	Single	LAWA Property, Future Power Plant	Current PTC Location	DROPPED	Single track connection therefore one seat ride not possible, power plant impact, at-grade xing of CHST trks,
1A	North of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Over	110 MPH TO	N/A Through Track	Double	LAWA Property	North of Colton Cutoff	DROPPED	South Wye connects to mainline therefore the configuration pushes Palmdale Transit Center further south, Station located South of Palmdale Blvd
1A 1	North of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Over	Direct to Station Tracks	N/A Through Track	Double	LAWA Property	North of Avenue R	DROPPED	Station located South of Palmdale Blvd
1A 2	North of Airport	80 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Over	Direct to Station Tracks	N/A Through Track	Double	LAWA Property	North of Avenue R	DROPPED	Station located South of Palmdale Blvd
1B	North of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	110 MPH	Under	110 MPH TO	N/A Through Track	Double	LAWA Property, Water Treatment Plant	North of Colton Cutoff	DROPPED	Water treatment plant impact, South Wye connect to CHST mainline therefore the configuration pushes Palmdale Transit Center further south, Station located South of Palmdale Blvd
1B 1	North of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Under	Direct to Station Tracks	N/A Through Track	Double	LAWA Property	North of Palmdale Avenue	DROPPED	Impacts encroach into Lancaster. Largest footprint out of all options and will go into LAWA property
1B 2	North of Airport	80 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Under	Direct to Station Tracks	N/A Through Track	Double	LAWA Property	North of Palmdale Avenue	DROPPED	Impacts encroach into Lancaster. Largest footprint out of all options and will go into LAWA property
2	North of Airport	110 MPH	N/A	110 MPH TO	110 MPH XO	Single	North of Airport	110 MPH	N/A	110 MPH TO	110 MPH XO	Single	LAWA Property, Future Power Plant	East of Current PTC Location	DROPPED	Single trk connection therefore one seat ride not possible, power plant impact, at-grade xing of CHST trks. South Wye connection, mainline station platform is separate from CHST platform and located on east side of existing PTC and UPRR.
3	North of Airport	110 MPH	Over	110 MPH TO	110 MPH TO	Single	North of Airport	125 MPH	South of Station Over	110 MPH TO	N/A Through Track	Double	LAWA Property, Future Power Plant	East of Current PTC Location	DROPPED	Single track connection therefore one seat ride not possible to North Leg, power plant impact, airport impacts. South Wye connection, mainline station platform is separate from CHST platform and located on east side of existing PTC and UPRR.
4	South of Airport	60 MPH	Over	60 MPH TO	60 MPH TO	Single	South of Airport	35 MPH	South of Station Over	60 MPH TO	Loop Track 110 MPH TO	Single	N/A	East of Current PTC Location	DROPPED	Single track connection therefore one seat ride not possible to North Leg, large impact to structures w/ loop, 35 MPH South. South Wye connection, mainline station platform is separate from CHST platform and located on east side of existing PTC and UPRR.
5	South of Airport	60 MPH	Over	60 MPH TO	60 MPH TO	Single	South of Airport	35 MPH	South of Station Over	60 MPH TO	N/A Through Track	Double	N/A	East of Current PTC Location	DROPPED	Single track connection therefore one seat ride not possible to North Leg, 35 MPH curve to South. South Wye connection, mainline station platform is separate from CHST platform and located on east side of existing PTC and UPRR.
6	South of Airport	60 MPH	Over	60 MPH TO	60 MPH TO	Single	South of Airport	70 MPH	South of Station Over	60 MPH TO	N/A Through Track	Double	Plant 42	East of Current PTC Location	DROPPED	Single track connection therefore one seat ride not possible to North Leg, Plant 42 impact, station on East separate from CHST
7	South of Airport	110 MPH	Over	110 MPH TO	110 MPH TO	Double	South of Airport	60 MPH	Under	Direct to Station Tracks	N/A Through Track	Double	LAWA Property, Plant 42	Current PTC Location	DROPPED	Impact to Plant 42 SW corner
7A	South of Airport	110 MPH	Over	110 MPH TO	110 MPH TO	Double	South of Airport	60 MPH	Under	Direct to Station Tracks	N/A Through Track	Double	N/A	North of Avenue R	DROPPED	Station located South of Palmdale Blvd
7A 1	South of Airport	80 MPH	Over	110 MPH TO	110 MPH TO	Double	South of Airport	60 MPH	Under	Direct to Station Tracks	N/A Through Track	Double	N/A	North of Avenue R	DROPPED	Station located South of Palmdale Blvd
7B	South of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	110 MPH	Under	110 MPH TO	N/A Through Track	Double	LAWA Property	North of Colton Cutoff	DROPPED	Station located South of Palmdale Blvd
7B 1*	South of Airport	110 MPH	Over	110 MPH TO	150 MPH TO	Double	South of Airport	60 MPH	Under	60 mp TO to station tracks	N/A Through Track	Double	LAWA Property	Current PTC Location		

*North leg for Option 7B1 can also be configured to go under UP/Metrolink tracks

HATCH MOTT MCDONALD OPTIONS

1	South of Airport	80 MPH	Under	110 MPH TO	N/A Through Track	Single	South of Airport	60 MPH	Under	60 mp TO to station tracks	80 MPH TO	Single	Will go under Plant 42 parking lot	Approx. 800' south of current station location		
2	South of Airport	100 MPH	Under	110 MPH TO	110 MPH TO	Double	South of Airport	80 MPH	Under	60 mp TO to station tracks	N/A Through Track	Single	Residential community	North of Palmdale Avenue	DROPPED	Option 2 is too similar to option 1 but shifts the Palmdale Transit Center 1400' further south
3	South of Airport	150 MPH	Under	110 MPH TO	110 MPH TO	Double	South of Airport	100	Under	110 MPH TO	N/A Through Track	Single	Will go under Plant 42 parking lot	North of Palmdale Avenue	DROPPED	Encroaches too far into Plant 42 property, also station platform is shifted further south
4	South of Airport	100 MPH	Under	110 MPH TO	80 MPH TO	Double	South of Airport	60 MPH	Under	60 mp TO to station tracks	N/A Through Track	Single	N/A	North of Palmdale Avenue	DROPPED	eastbound tracks therefore one seat ride is not possible, also Palmdale Transit Center is shifted further south