2 Alternatives

This chapter describes the Central Valley Wye alternatives that the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) are considering in this *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report (EIR)/Environmental Impact Statement (EIS)* (Draft Supplemental EIR/EIS).[1] This Draft Supplemental EIR/EIS also identifies the State Route (SR) 152 (North) to Road 11 Wye Alternative as the Authority's and FRA's Preferred Alternative (refer to Chapter 8, Preferred Alternative). The Preferred Alternative is also the Authority's proposed project for purposes of the California Environmental Quality Act (CEQA). This chapter presents the following discussions:

- The background of the development of the wye connection in the Central Valley, including previous studies and alternatives screening
- The No Project Alternative and Central Valley Wye alternatives (including the CEQA proposed project/Preferred Alternative)
- Updated travel demand and ridership forecasts
- Updated operations and service plan
- Updated construction plan
- Permits and approvals required

The Central Valley Wye alternatives included in this Draft Supplemental EIR/EIS have been designed to a level sufficient to identify and analyze potential impacts and are presented at a comparable level of detail. Volume III, Alignments and Other Plans, includes the design drawings that support the descriptions of the Central Valley Wye alternatives. For more information on the background and development of the overall California High-Speed Rail (HSR) System, refer to Chapter 2, Alternatives, of the *Merced to Fresno Section California High-Speed Train Final Project Environmental Impact Report/Environmental Impact Statement* (Merced to Fresno Final EIR/EIS) (Authority and FRA 2012a: pages 2-1 through 2-107).

2.1 Background

The background of the wye connection in the Central Valley is complex and spans several years. This section includes the history of the HSR system specifically as it relates to the wye connection (a *wye* is explained in Section 1.1.2, What is a Wye?), and presents studies and related decisions in the following manner:

- California HSR System—Tier 1 Programmatic Studies
- The Wye Connection
  - Early Development of the Wye Connection and the Merced to Fresno Final EIR/EIS
  - Consultation after the Merced to Fresno Final EIR/EIS

Sequence of California HSR Tiered Environmental Documents

1st Tier/Program Documents

- *Final Program EIR/EIS for the Proposed California High-Speed Train System* ***(2005)***
- *Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* ***(2008)***
- *Bay Area to Central Valley High-Speed Train Revised Final Program EIR* ***(2010)***
- *Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* ***(2012)***

2nd Tier/Project Documents

- *Merced to Fresno Section Final EIR/EIS* ***(2012)***
- *Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS* (this document)

[1] The statewide system only needs one heavy maintenance facility (HMF). Nine sites were evaluated and cleared in the 2012 Merced to Fresno Final EIR/EIS and in the 2014 Fresno to Bakersfield Final EIR/EIS. The Authority did not approve an HMF site at that time. In addition, there are no project modifications to these HMF sites proposed in this Draft Supplemental EIR/EIS. Accordingly, this Draft Supplemental EIR/EIS does not contain any new information about HMF sites or impacts.

The Merced to Fresno Final EIR/EIS provides additional background for the HSR system and the Merced to Fresno Section (Authority and FRA 2012a: pages 2-1 through 2-2).

2.1.1 California HSR System—Tier 1 Programmatic Studies

The Authority and FRA are evaluating the California HSR system in a series of tiered environmental documents. *Tiering* of environmental documents means addressing a broad, large-scale general program in an initial *programmatic*, or first-tier, environmental document, then analyzing the details of smaller related projects in subsequent *project*, or second-tier, documents. Tiering environmental documents avoids repetitive evaluation of issues that a first-tier analysis addressed sufficiently, and allows the second-tier analysis to focus on more detailed issues.

The Tier 1 *Final Program EIR/EIS for the Proposed California High-Speed Train System* (Statewide Program EIR/EIS) (Authority and FRA 2005) provided a programmatic analysis of implementing the HSR system across the state, from Sacramento in the north to San Diego in the south and the Bay Area in the west. The Authority approved the Statewide Program EIR/EIS on November 2, 2005, and the FRA issued its related Record of Decision (ROD) on November 18, 2005 (FRA 2005).

Following the Statewide Program EIR/EIS and ROD, the Authority and FRA prepared a second program EIR/EIS for the HSR system to identify a preferred alignment and stations for the connection between the San Francisco Bay Area (Bay Area) and the Central Valley. In 2008, after completing the *Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008), the Authority and FRA selected a Pacheco Pass connection, preferred general alignments, and stations for further second-tier evaluation. After litigation, the Authority rescinded its 2008 decision and prepared the *Bay Area to Central Valley High-Speed Train Revised Final Program EIR* (Authority 2010). The 2010 document was also litigated, after which the Authority prepared the *Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (Authority 2012). With certification of the 2012 programmatic document, the Authority again selected the Pacheco Pass Network Alternative for project-level study, with a corridor extending from the Bay Area over Pacheco Pass to the Central Valley, then along Henry Miller Road to meet the Merced to Fresno corridor.

Figure 2-1 illustrates the program-level corridor decisions for the wye connection. For reference, the area under consideration in this Draft Supplemental EIR/EIS has been added to the figure.

2.1.2 The Wye Connection

2.1.2.1 Early Development of the Wye Connection and the Merced to Fresno Final EIR/EIS

An important objective of the HSR system is to align HSR tracks adjacent to existing transportation corridors where possible (see Section 1.2.2, CEQA Project Objectives of the HSR System in California and in the Central Part of the San Joaquin Valley Region, for more information). This objective was particularly important for developing and screening alignments for the Central Valley Wye, where considerations include minimizing impacts on farmland and communities and balancing environmental impacts with travel time and construction costs. The Authority and FRA considered these factors, along with a wide variety of input from the public through extensive outreach and interested resource agencies, during the development of the wye connection.

The Authority and FRA chronicled the alternatives screening process and development of wye design options in a series of documents prepared between 2010 and 2014.[2] Figure 2-2 illustrates the evolution of wye options that these documents evaluated.

[2] The term *design options* was used during the early stages of the alternatives screening process to refer to preliminary alternative alignments. The term is used in this chapter to be consistent with the alternatives analysis documents prepared between 2010 and 2014 and to differentiate these design options from the alternatives that were developed for this supplemental analysis.

Source: Authority and FRA, 2008

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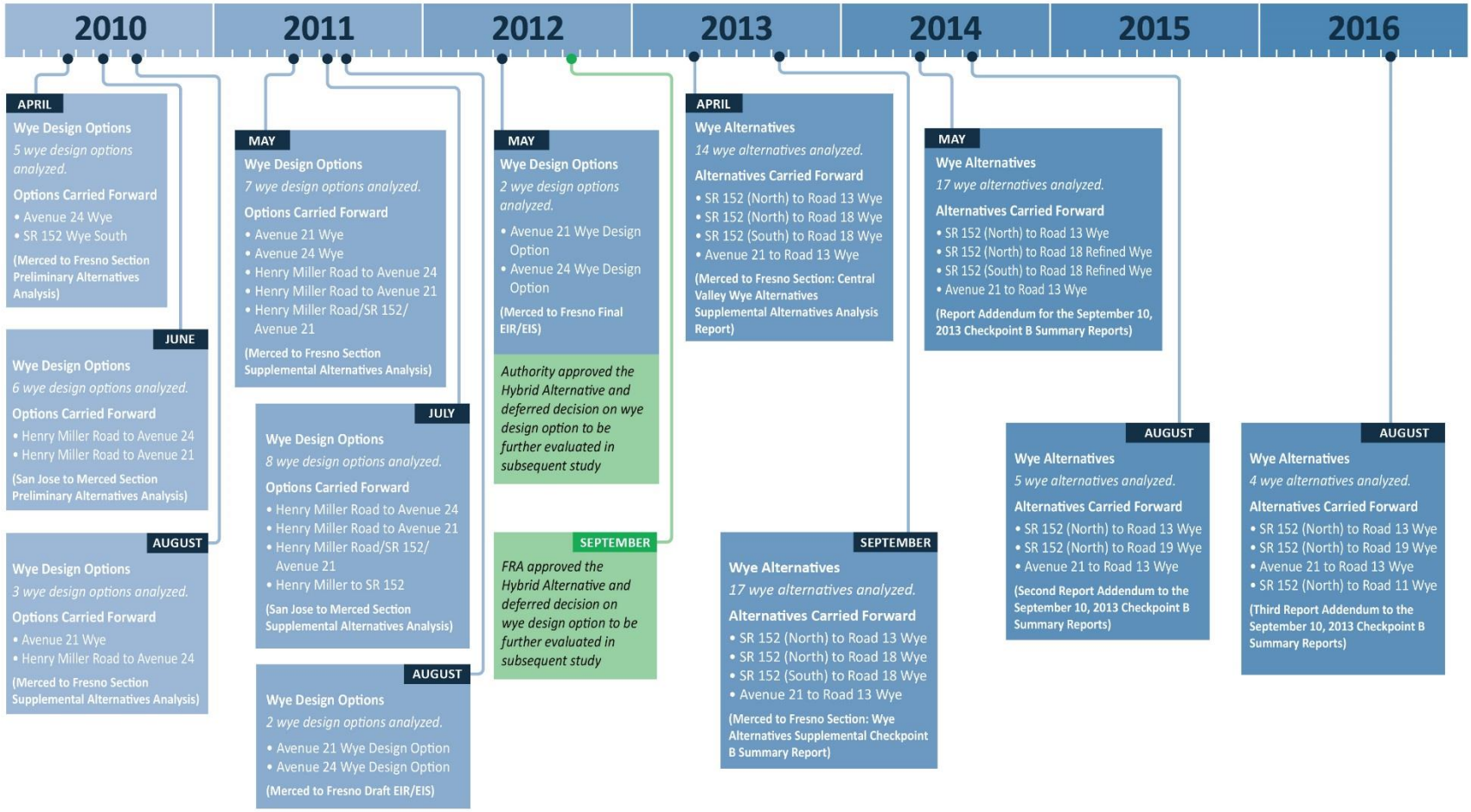
Figure 2-1 Program-Level Wye Connection



Source: Author's compilation, 2017

Figure 2-2 History of Wye-Related Studies

Development of the wye connection began in 2010 when the Authority and FRA initially considered five potential options for the east-west connection with the San Jose to Merced Section to the west in the *Merced to Fresno Section Preliminary Alternatives Analysis Report* (Authority and FRA 2010a). This early alternatives analysis process evaluated the wye connection as "design options" in order to screen and refine each design option to avoid key environmental issues and improve performance. The preliminary evaluation of these design options balanced ecological, agricultural, and community impact issues as well as travel time.

The Authority and FRA prepared three subsequent alternatives analysis reports for the Merced to Fresno Section and the San Jose to Merced Section projects, including the 2010 *San Jose to Merced Section Preliminary Alternatives Analysis Report* (Authority and FRA 2010c), the 2011 *Merced to Fresno Section Supplemental Alternatives Analysis Report* (Authority and FRA 2011a), and the 2011 *San Jose to Merced Section Supplemental Alternatives Analysis Report* (Authority and FRA 2011b). The Authority and FRA selected wye design options along Avenue 21, Avenue 24, and SR 152, among others, to carry forward for further engineering and environmental analysis.

Based on the results of the 2011 *Merced to Fresno Section Supplemental Alternatives Analysis Report*, the Authority and FRA evaluated two wye design options (the Ave 24 Wye and the Ave 21 Wye) in the Merced to Fresno Draft and Final EIR/EISs (Authority and FRA 2012a: page 2-21). The Authority certified the Final EIR/EIS under CEQA on May 3, 2012, and filed a Notice of Determination on May 4, 2012. Although the Authority approved the portions of the Hybrid Alternative for the Merced to Fresno Section[3] outside the wye for the north/south alignment of the high-speed train and the Downtown Merced and Downtown Fresno Mariposa Street station locations, these approvals deferred a decision on the area known as the "wye connection", that is, the east-west high-speed rail connection between the San Jose to Merced Section to the west and the north-south Merced to Fresno Section to the east to allow for additional environmental analysis. The Authority also adopted CEQA findings of fact and a statement of overriding considerations, and adopted a mitigation monitoring and reporting program. FRA issued a ROD under the National Environmental Policy Act (NEPA) on September 18, 2012, and the Surface Transportation Board issued a ROD on June 13, 2013. Through the ROD, FRA approved the portions of the Hybrid Alternative outside the wye and Downtown Merced and Downtown Fresno Mariposa Street station locations, consistent with the Authority's decision in May. This Draft Supplemental EIR/EIS evaluates alternatives for the wye connection in accordance with NEPA and CEQA and identifies a preferred wye alternative.

2.1.2.2 Consultation after the Merced to Fresno Final EIR/EIS

Following the 2012 decisions on the Merced to Fresno Final EIR/EIS, the Authority and FRA further evaluated the wye connection. As part of the evaluation, the Authority and FRA engaged in additional outreach and discussions with stakeholders to identify refinements to the wye design options evaluated in the Merced to Fresno Final EIR/EIS, opportunities to minimize potential impacts, and other potential alternative alignments. These discussions generated multiple conceptual alignments in addition to the wye design options previously considered. The Authority worked closely with the California Department of Transportation (Caltrans), Merced and Madera Counties, the City of Chowchilla, the Merced and Madera County Farm Bureaus, and other local stakeholders to further develop and refine the Central Valley Wye alternatives.

Alternatives Analysis Reports Available for Public Review

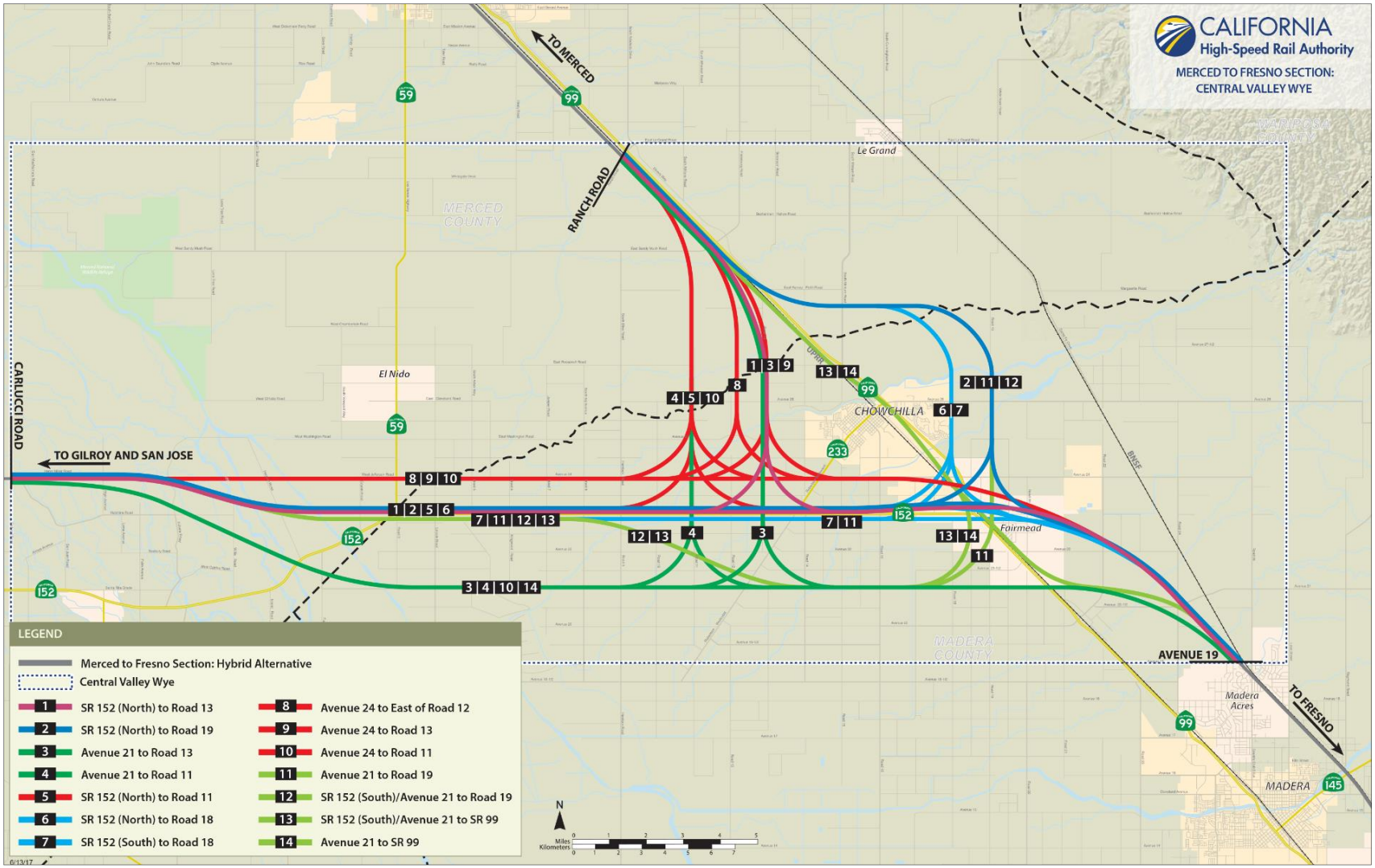
The alternatives analysis reports guiding the refinement of the Central Valley Wye alternatives are available online at: www.hsr.ca.gov

The Authority considered this stakeholder and public input and used it to prepare the *Merced to Fresno Section: Central Valley Wye Alternatives Supplemental Alternatives Analysis Report* (Supplemental Alternatives Analysis Report) (Authority and FRA 2013a). The report summarized ongoing stakeholder engagement, public feedback, and input from regulatory agencies. The report evaluated 14 alternatives, and selected 4 to carry forward for further

[3] As noted in Section 1.3, 2016 Business Plan, a portion of the approved Merced to Fresno Section: Hybrid Alternative was prioritized for construction as part of the design-build contract, Construction Package 1, executed in August 2013.

evaluation (Figure 2-3 and Figure 2-4). These four potential Central Valley Wye alternatives corresponded with four general corridor combinations: north of SR 152, south of SR 152, east of Chowchilla, and west of Chowchilla.

Following completion of the 2013 Supplemental Alternatives Analysis Report, the Authority and FRA continued ongoing coordination with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) pursuant to the *Memorandum of Understanding: National Environmental Policy Act/Clean Water Act Section 404/Rivers and Harbors Act Section 14 Integration Process for the California High-Speed Train Program* dated November 2010 (FRA et al. 2010). This coordination included preparation of a *Supplemental Checkpoint B Summary Report in Support of the Merced to Fresno Section: Wye Alternatives* (Checkpoint B Summary Report) (Authority and FRA 2013b), intended to assist USACE and USEPA in selecting the Central Valley Wye alternatives to be further evaluated pursuant to the Section 404(b)(1) Guidelines of the Clean Water Act as part of Section 404 permitting for the Central Valley Wye.



Source: Environmental Systems Research Institute (ESRI), 2013; California Department of Forestry and Fire Protection (CAL FIRE), 2004; ESRI/National Geographic, 2015; Authority and FRA, 2013a

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Figure 2-3 Fourteen Central Valley Wye Alternatives Initially Identified for Evaluation in Supplemental Alternatives Analysis Report (April 2013)

Source: Authority and FRA, 2013a

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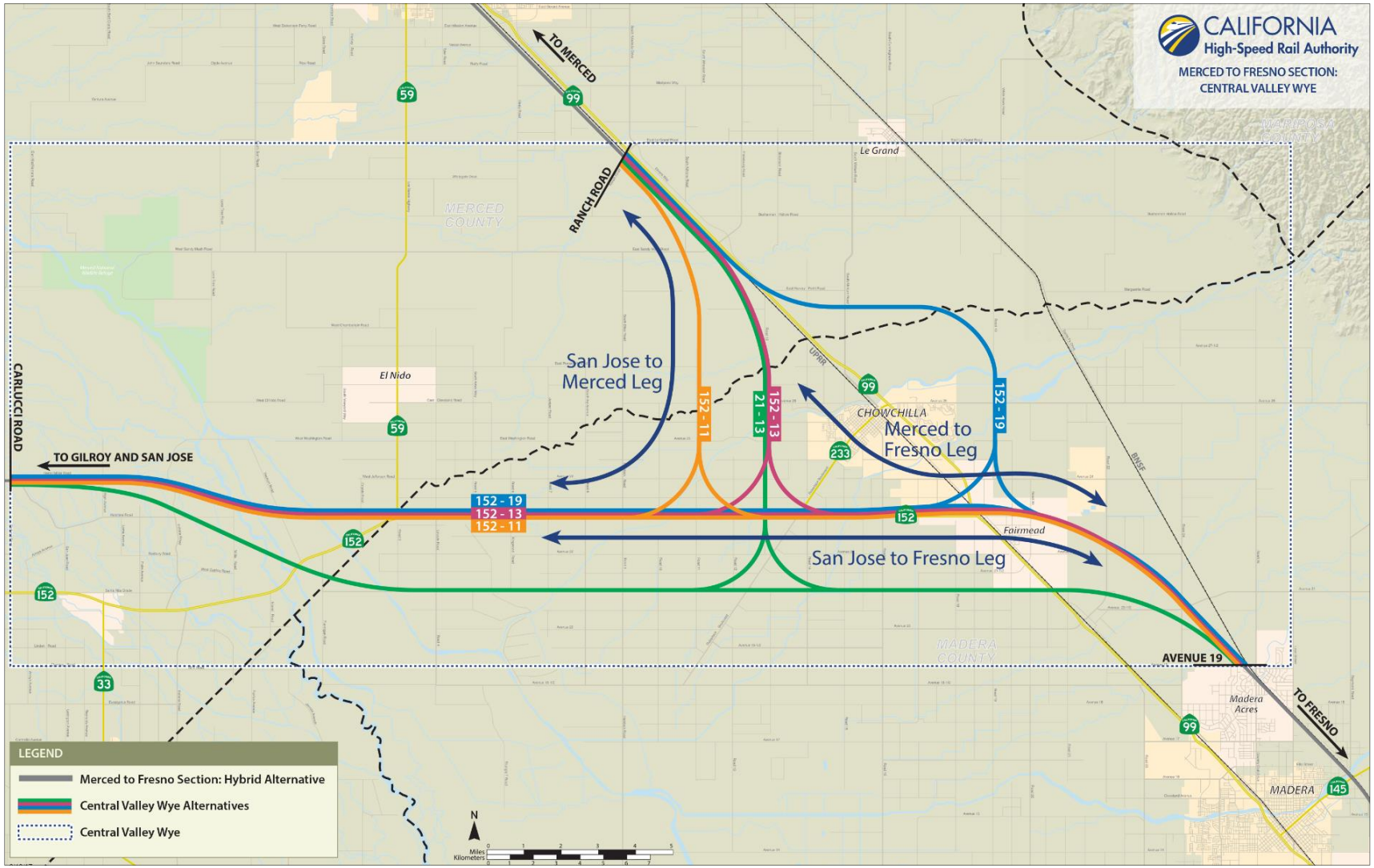
Figure 2-4 Four Central Valley Wye Alternatives Carried Forward in Supplemental Alternatives Analysis Report (April 2013)

At the request of the USACE and USEPA, the Checkpoint B Summary Report included a total of 17 alternatives: the 14 alternatives that were evaluated in the 2013 Supplemental Alternatives Analysis Report, and 3 variations of other alternatives that had been previously considered but withdrawn from further consideration prior to the Merced to Fresno Final EIR/EIS. Based on the analysis in the Checkpoint B Summary Report, the Authority and FRA determined that 13 of the 17 Central Valley Wye alternatives should be eliminated from further environmental review. This decision was supported by the evaluation of the alternatives in the context of the following factors: consistency with the HSR system and Merced to Fresno Section Purpose and Need, impacts on aquatic resources, impacts on the environment, relative construction costs, logistics of implementation/construction, incompatibility with land use, and public/agency input. The four remaining Central Valley Wye alternatives that FRA and the Authority recommended to be carried forward for further evaluation were consistent with the alternatives identified in the 2013 Supplemental Alternatives Analysis Report (Figure 2-4).

Continued coordination between the Authority, FRA, USACE, and USEPA resulted in further refinements to the Central Valley Wye alternatives. In 2014, the Authority and FRA prepared two addenda to the Checkpoint B Summary Report: *Report Addendum for the September 10, 2013 Checkpoint B Summary Report* (May 2014) (Authority and FRA 2014a), and the *Second Report Addendum to the September 10, 2013 Checkpoint B Summary Report* (August 2014) (Authority and FRA 2014b). During preparation of these two reports, the Authority and FRA continued to refine the Central Valley Wye alternatives, ultimately withdrawing two of the four alternatives and adding one alternative to carry forward.

In August and September 2014, respectively, the USEPA and USACE concurred with the Authority and FRA on the alternatives to be evaluated in this supplemental document: SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and Avenue 21 to Road 13 Wye Alternative. Since September 2014, the Authority and FRA have continued to conduct public outreach with local stakeholders. This effort produced additional information about the Central Valley Wye alternatives and informed further refinements to the alternatives proposed to be carried forward. As a result of this additional stakeholder outreach and upon review of improved mapping documentation for the various alignments, a previously considered alternative, SR 152 (North) to Road 11 Wye Alternative, is also being carried forward in this analysis. To support the addition of the SR 152 (North) to Road 11 Wye Alternative, the Authority and FRA prepared a third addendum to the Checkpoint B Summary Report: *Third Report Addendum to the September 10, 2013 Checkpoint B Summary Report* (November 2016) (Authority and FRA 2016a).[4] In December 2016, USEPA and USACE concurred on the decision to carry forward the SR 152 (North) to Road 11 Wye Alternative as well. Figure 2-5 illustrates the alternatives carried forward and evaluated in this Draft Supplemental EIR/EIS. All Checkpoint A, B, and C documents are available online on the Authority's website: http://hsr.ca.gov/Programs/Environmental_Planning/supplemental_merced_fresno.html.

[4] The Authority and FRA prepared Checkpoints A, B, and C as part of ongoing coordination with USACE and USEPA pursuant to the *Memorandum of Understanding: National Environmental Policy Act/Clean Water Act Section 404/Rivers and Harbors Act Section 14 Integration Process for the California High-Speed Train Program* dated November 2010 (FRA et al. 2010). Checkpoint A defines the Purpose and Need that outlines the basic and overall purpose of a particular project. Checkpoint B identifies a range of alternatives for evaluation in the environmental document. Checkpoint C identifies a preferred alternative and makes a preliminary determination of the least environmentally damaging practicable alternative.



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-5 Proposed Central Valley Wye Alternative High-Speed Rail Alignments

2.2 Alternatives Evaluated in this Draft Supplemental EIR/EIS

This section describes the No Project Alternative and the four Central Valley Wye alternatives analyzed in detail. Figure 2-5 illustrates the Central Valley Wye alternatives:

- SR 152 (North) to Road 13 Wye Alternative
- SR 152 (North) to Road 19 Wye Alternative
- Avenue 21 to Road 13 Wye Alternative
- SR 152 (North) to Road 11 Wye Alternative (CEQA proposed project/Preferred Alternative)

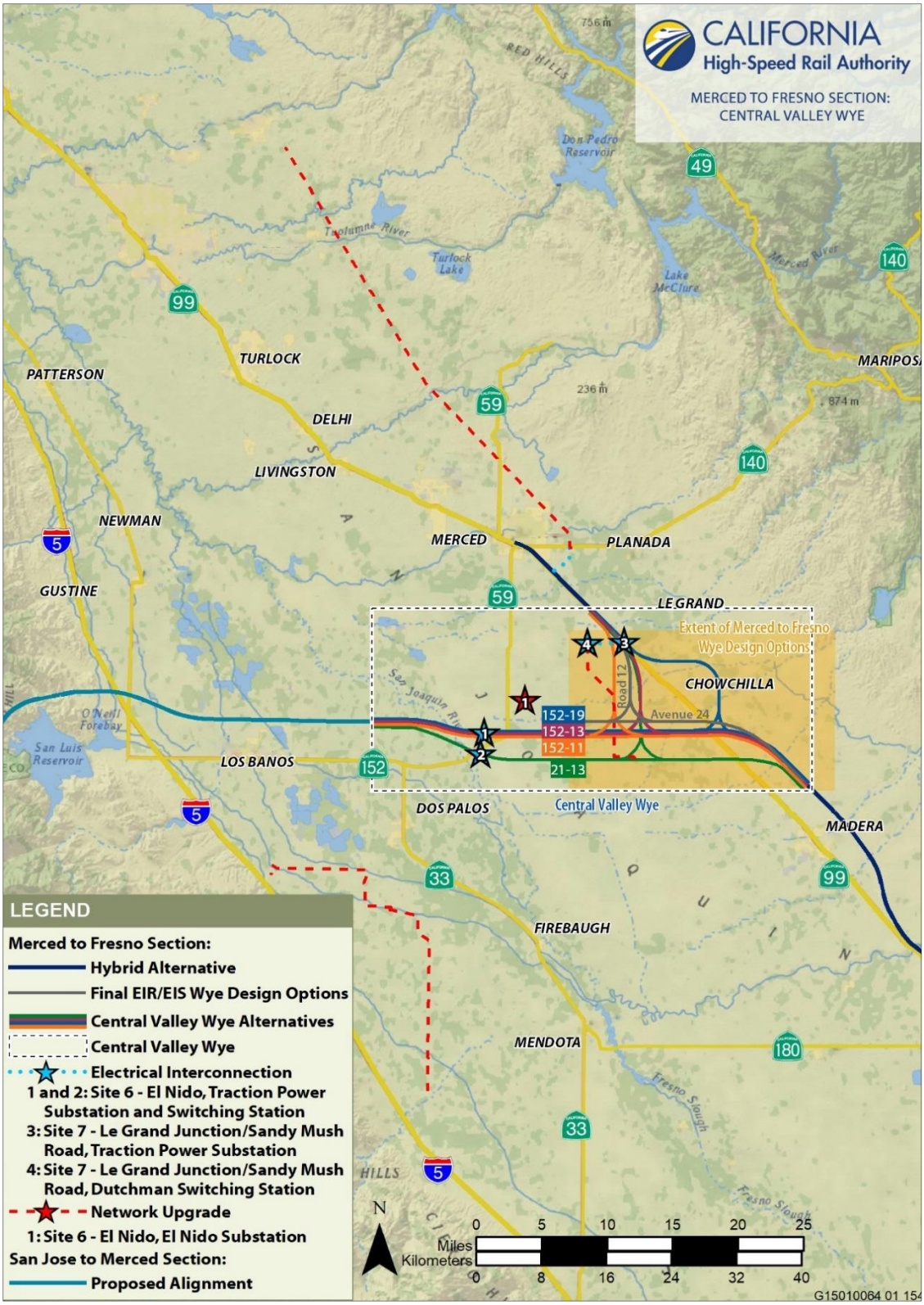
The Central Valley Wye alternatives, including electrical interconnection facilities, cross Merced and Madera Counties in the vicinity of the city of Chowchilla. Network upgrades to existing Pacific Gas and Electric (PG&E) infrastructure that would be required to meet the projected power demands of the HSR system are located in Stanislaus, Merced, Madera, and Fresno Counties. Activities in Fresno and Stanislaus Counties relate only to the network upgrades. Figure 2-6 shows the regional location of these four alternatives and the associated electrical interconnections and network upgrades. Because of the scale and the localized nature of the various resource study areas, not all figures depicting the Central Valley Wye alternatives in this Draft Supplemental EIR/EIS include the electrical interconnections and network upgrades. Where the broader context of the electrical interconnections and network upgrades is needed, such as to show a potentially affected resource, these components are appropriately displayed on relevant figures. Volume III of this Draft Supplemental EIR/EIS provides detailed design drawings of the HSR alignments of all four Central Valley Wye alternatives.

2.2.1 Central Valley Wye Alternatives

Figure 2-5 illustrates the HSR alignments for the four Central Valley Wye alternatives, which have common endpoints (termini) to allow for equal comparison of engineering and environmental considerations across all alternatives. The termini are located at Henry Miller Road/Carlucci Road on the west, Ranch Road/SR 99 on the north, and Avenue 19 near Madera Acres on the south.[5] Figure 2-6 illustrates the four alignments as well as electrical interconnections and network upgrades that would be constructed as part of the Central Valley Wye alternatives and that extend from south of the city of Mendota in Fresno County north to the city of Oakdale in Stanislaus County, west to the city of Los Banos and east to the city of Madera.

As illustrated on Figure 2-6, the termini of the Central Valley Wye alternatives are located approximately 20 miles farther west and 4 miles north of the limits of the wye design options examined in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 2-25). The limits were extended to include the locations where the Central Valley Wye alternatives converge to common points so as not to constrain the consideration of reasonable alternatives.

[5] The San Jose to Merced Section EIR/EIS will include the Central Valley Wye preferred alternative to connect the alignment alternatives in the San Jose to Merced Section through the Pacheco Pass to the Merced Station. The alignments through Pacheco Pass are constrained as a result of the topography in the Pacheco Pass, and these alignments were designed to follow an existing transportation corridor on the east side of the pass (SR 152) to minimize environmental impacts. Henry Miller Road/Carlucci Road was chosen as the western terminus for this Draft Supplemental EIR/EIS because at this location the alternatives come to a common point and use of this endpoint would not constrain the consideration of reasonable alternatives for the Central Valley Wye or for the San Jose to Merced Section. Although both the Merced to Fresno Section and the San Jose to Merced Section require the selection of a wye alternative to achieve a complete alignment to the Merced Station, the two sections have independent utility because they can be constructed and operated independently of each other.



Source: Authority and FRA, 2012a

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Figure 2-6 Relationship of Central Valley Wye to Extent of Merced to Fresno Wye Design Options

The size of the project footprints of each Central Valley Wye alternative evaluated in this Draft Supplemental EIR/EIS are substantially larger in acreage relative to the alternatives evaluated in the Merced to Fresno Final EIR/EIS because of the extension of the termini for the Central Valley Wye alternatives 20 miles west relative to the wye design options examined in the Merced to Fresno Final EIR/EIS. The Central Valley Wye alternative footprints are also larger in acreage because the project footprint for the Central Valley Wye alternatives has an average minimum width of 150 feet, increased from an average minimum width of 100 feet for the alternatives evaluated in the Merced to Fresno Final EIR/EIS, to include a permanent access easement to maintain the HSR right-of-way and for larger temporary construction easements. Finally, the project footprints for the Central Valley Wye alternatives evaluated in this Draft Supplemental EIR/EIS include electrical connections and upgrades that were not included for the alternatives evaluated in the Merced to Fresno Final EIR/EIS.

2.2.2 No Project Alternative

NEPA requires the evaluation of a "no action" alternative in an EIS (Council on Environmental Quality Regulations § 1502.14(d)). Similarly, CEQA requires that an EIR include the evaluation of a "no project" alternative (CEQA Guidelines § 15126.6(e)). The No Project Alternative in this Draft Supplemental EIR/EIS serves as both the "no action" alternative under NEPA and the "no project" alternative under CEQA. The No Project Alternative considers the impacts that would occur if none of the Central Valley Wye alternatives is approved. Under the No Project Alternative, implementation of current land use and transportation plans in all of Merced and Madera Counties, including all planned improvements to the highway, aviation, conventional passenger rail, and freight rail systems, would proceed through the 2040 planning horizon for the environmental analysis.

The network upgrades proposed in Merced, Madera, Fresno, and Stanislaus Counties (Figure 2-6) are ancillary project features, specifically designed to allow PG&E to accommodate the planned electrical load required for the HSR system only. As such, if none of the Central Valley Wye alternatives is approved, these network upgrades would not be required. It is anticipated that the network upgrade areas in Merced, Madera, Fresno, and Stanislaus Counties would remain the same as the existing conditions for the foreseeable future because no other PG&E projects are currently proposed or reasonably foreseeable. Therefore, the balance of the No Project Alternative description is focused on Merced and Madera Counties, where reasonably foreseeable consequences of not implementing the Central Valley Wye alternatives would occur.

As noted in Section 2.1, Background, in 2012 the Authority and FRA approved portions of the Hybrid Alternative outside the wye, including a north-south alignment and stations in Merced and Fresno, but deferred a decision on the wye connection until further study could be completed. FRA also chose to defer a decision on the Central Valley Wye connection pending further study. Construction is proceeding on the approved Merced to Fresno Section alignment south of the Central Valley Wye. Construction is also underway in the adjacent Fresno to Bakersfield Section. The No Project Alternative also assumes that other parts of the Phase 1 HSR System between San Francisco and Los Angeles would be built and operational by 2040, achieving many, but not all, of the benefits of a continuous, 540 mile Phase 1 system. A gap in the Phase 1 HSR System in the wye area, like a gap in the system anywhere else in the state, would reduce the transportation connectivity and environmental benefits of the Phase 1 system as a whole until the gap is eliminated.

2.2.2.1 Changes to the Planning Horizon

The 2012 Merced to Fresno Final EIR/EIS relied on a 2035 planning horizon for characterizing impacts of project construction and rail system operations. The Central Valley Wye alternatives analysis uses 2040 as the horizon forecast year in order to match the updated ridership projections and service assumptions for the HSR with those presented in the *Connecting and*

Transforming California 2016 Business Plan (2016 Business Plan)[6] (Authority 2016a) and with adopted statewide and regional transportation plans that use 2040 as a planning horizon.

2.2.2.2 Planned Land Use

Projections Used in Planning

The two-county region comprising Merced and Madera Counties is projected to grow at a higher rate than the state of California as a whole, as Table 2-1 shows. The populations of Merced and Madera Counties are expected to grow at an average of 1.8 percent per year. Table 2-1 shows the projected population according to the California Department of Finance and employment growth projections through 2040. Despite the economic downturn that temporarily slowed growth, 2040 projections show approximately 221,790 new inhabitants and 28,700 new jobs in this region.

Growth Projections in Merced and Madera Counties

2040 population projections show a need for 67,209 new dwelling units and 10,732 acres of land to accommodate 221,790 new inhabitants in the area.

Table 2-1 Regional Projected and Induced Population and Employment

	2010[1]	2040 Projections[2]	Percent Change
Population			
State of California	37,253,956	47,233,240	27
Merced County	255,793	389,934	52
Madera County	150,865	238,514	58
Regional Total	**406,658**	**628,448**	**55**
	2010[3]	**2040 Projections[4]**	**Percent Change**
Employment			
State of California	16,091,900	20,553,000	28
Merced County	93,200	102,100	10
Madera County	51,400	71,200	39
Regional Total	**144,600**	**173,300**	**20**

Sources: 1 U.S. Census Bureau, 2010
[2] California Department of Finance, 2014
[3] California Employment Development Department, 2017
[4] Caltrans, 2014

Based on the 2010 U.S. Census, which reported that Merced and Madera Counties had an average of 3.3 persons per dwelling unit, and then applying the average residential units per acre, Merced County would require approximately 40,649 new dwelling units and 5,081 acres of land by 2040.[7] Using the same method, Madera County would require 26,560 new dwelling units and almost 5,651 acres of land, for a total of 67,209 new dwelling units across both counties.

[6] The Authority released the Draft 2018 Business Plan for public review and comment on Friday, March 9th for a mandatory 60-day public review and comment period before Board adoption of the plan on May 15th 2018. The 2018 Business Plan continues the vision of the 2016 Business Plan in delivering the initial Silicon Valley to Central Valley Line, which includes the Merced to Fresno Section: Central Valley Wye, and refines and updates the project delivery schedule and ridership projections provided in the 2016 Business Plan.

[7] The average dwelling units per acre were assumed to be 8.6 in Merced County and 4.7 in Madera County, based on projected growth scenarios in local and regional planning documents (Mintier Harnish et al. 2010).

Collectively, this growth would result in converting approximately 10,732 acres of land to accommodate future housing, without taking into account commercial, transportation, and supporting infrastructure such as schools, parks, water treatment, and medical facilities.[8] Those facilities would result in converting additional lands to serve the new residential development.

This projection is the basis for comparing impacts on land from the Central Valley Wye alternatives that would be used to accommodate future growth. It is used as the common growth projection for all the Central Valley Wye alternatives.

Planned Projects

The No Project Alternative includes several planned transportation, housing, commercial, and other development projects by the year 2040. Section 3.19, Cumulative Impacts, provides a detailed list of foreseeable future development projects, which includes shopping centers, large residential developments, and planned transportation projects defined in the various regional transportation plans for both counties and discusses the cumulative impact. Table 2-2 shows some of the notable, larger planned residential projects in the region.[9] For additional details regarding cumulative impacts, see Section 3.19.

Table 2-2 Planned Residential Development Projects within the Vicinity of the Central Valley Wye Alternatives

Project Name	Planned Number of Dwelling Units	Total Number of Units
Merced County		
Fox Hills Community Plan	3,058	19,381
Villages of Laguna San Luis	15,895	
Overland Courts	69	
Planada 15 Subdivision	72	
Yosemite Ranch Estates	287	
Madera County		
Gateway Village Specific Plan	6,568	59,207
Gunner Ranch West Specific Plan	2,840	
Liberty Groves Area Plan and Specific Plan	7,500	
Northshore at Millerton Lake (North Folk Village)	2,996	
San Joaquin Ranch Specific Plan	21,954	
Shaw Specific Plan	997	
Sierra Meadows Subdivision	315	
Southeast Madera Development	1,375	
Tatham Specific Plan	9,040	
Tesoro Viejo Specific Plan	5,190	
Tra Vigne Subdivision	432	

[8] The projected conversion of 10,732 acres is based on data generated following the 2008 economic recession, which has resulted in lower projected growth throughout the region, and a corresponding decrease from the projected conversion presented in the Merced to Fresno Final EIR/EIS.

[9] The information presented in Table 2-2 is different from the information presented in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: Table 2-4) because it has been updated to reflect the most current information available from local and regional planning documents.

Project Name	Planned Number of Dwelling Units	Total Number of Units
City of Chowchilla		
Rancho Calera Specific Plan	2,042	2,042
Community of Fairmead		
Fairmead Colony Area Plan	2,040	2,040
City of Madera		
Ventana Specific Plan	1,000	1,000
Regional Total		**83,670**

Sources: Merced County, 2008; Merced County Planning Department, 2010, 2016; Madera County Planning Department, 2012, 2015; City of Chowchilla, 2012; City of Madera, 2016

Plans for new residential units are currently at various stages of approval in the cities, communities, and counties in the vicinity of the Central Valley Wye alternatives. The cities and communities in the vicinity of the Central Valley Wye alternatives—Chowchilla, Fairmead, and Madera—have approximately 5,082 new residential units planned. Merced and Madera Counties have 19,381 and 59,207 new residential units planned, respectively. Overall, approximately 83,670 residential units are in various stages of approval in Merced and Madera Counties—sufficient to accommodate the 67,209 units projected to be needed by 2040. The economic slowdown reduced the pace of construction for much of the development, but the plans exist to accommodate projected growth as it occurs.

Although the pending development projects illustrate that growth is anticipated, they do not represent the entire scope of potential development in the vicinity of the Central Valley Wye alternatives through the 2040 horizon. One regional measure for growth and travel patterns is vehicle miles traveled[10] in one year. Between 2010 and 2040, vehicle miles traveled is projected to double in the two-county region. Cambridge Systematics, Inc. conducted a statewide transportation study that projects daily vehicle miles traveled in the region could increase from approximately 12 million to 24 million in 2040 (Authority 2016b).

2.2.2.3 Planned Highway Improvements

The No Project Alternative includes planned improvements of the intercity highway network based on financially constrained regional transportation plans developed by regional transportation planning agencies. Table 2-3 shows the transportation improvements in Merced and Madera Counties; this table includes map identification numbers that correspond to the numbered improvement projects illustrated on Figure 2-7. Table 2-3 is a list of the transportation improvement projects included in the Merced to Fresno Final EI/EIS, updated according to the 2014 regional transportation plans for the two counties, in order to eliminate projects no longer listed, include new transportation improvements, or update project timelines.

Table 2-3 Planned Highway Improvements in Merced and Madera Counties

Location/ Map No.	Routes	Planned Improvements	Project Timeline
Merced County			
1	SR 152	Los Banos Bypass[1]	Segment 1—2023 Segment 2—2033

[10] Vehicle miles traveled refers to the distance in miles of on-road motorized travel occurring within a particular region.

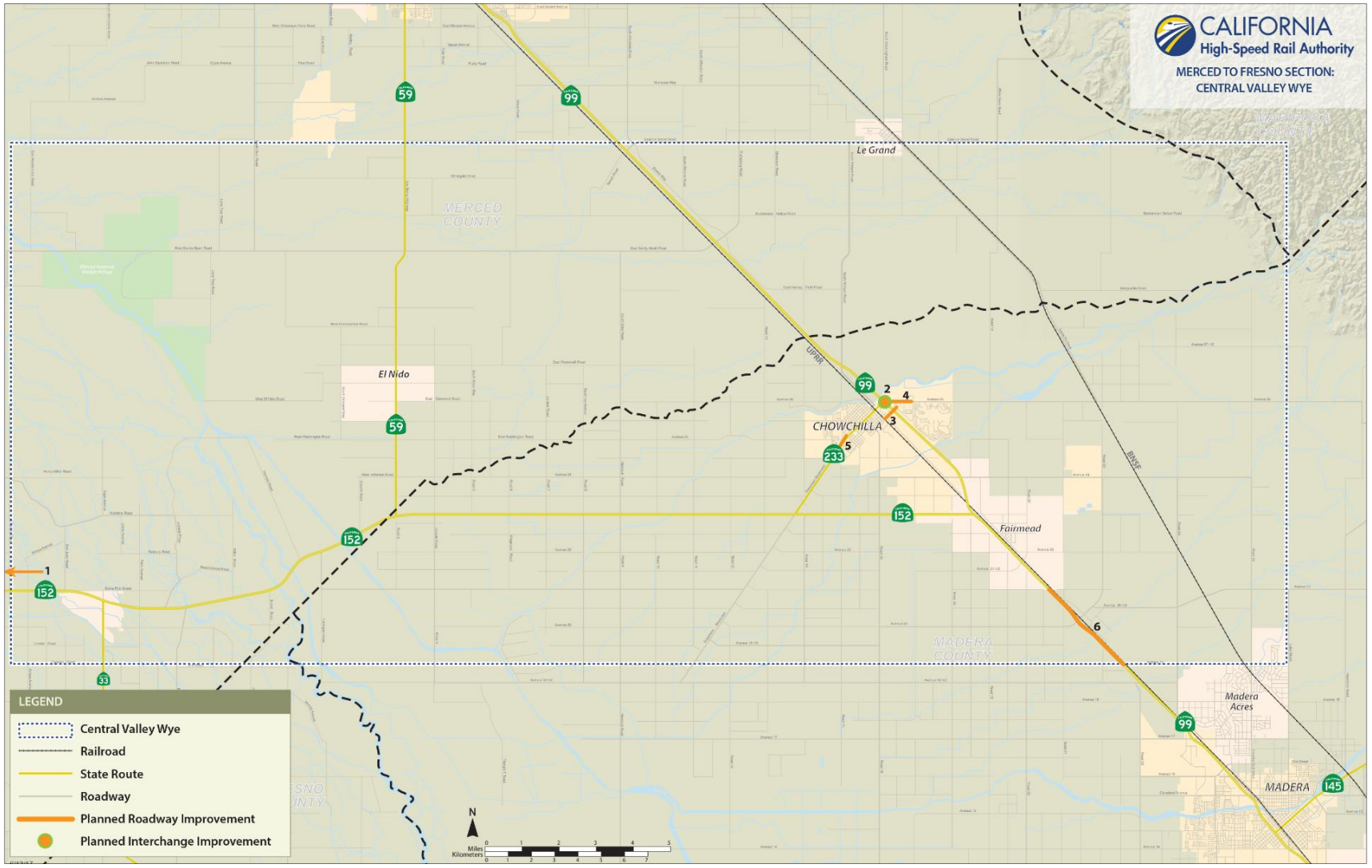
Location/ Map No.	Routes	Planned Improvements	Project Timeline
Madera County			
2	Interchange SR 99 at SR 233	Rebuild interchange	2020
3	Avenue 26 from SR 99 to Coronado	Widen from two lanes to four lanes	2025
4	SR 99 Overcrossing at Fig Tree	Build new two-lane overcrossing to Chowchilla Blvd	2030
5	Robertson Blvd from 15th St to Palm Pkwy	Restripe two to four lanes	2020
6	SR 99	Widen freeway from south of Avenue 21 to Avenue 18 1/2	2040

Sources: Merced County Association of Governments, 2014; Madera County Transportation Commission, 2014
[1]The Los Banos Bypass has initial funding.
Blvd = Boulevard
SR = State Route
Pkwy = Parkway

Several of the roadway improvements are directly related to Caltrans' plans for the improvement of SR 99, the primary north-south highway in the corridor and a major state priority. The updated *Route 99 Corridor Business Plan* (Caltrans 2009) incorporates these efforts and provides the current blueprint for the corridor. That plan defines the improvements necessary to attain the primary objective of a minimum six-lane freeway for the entire corridor. The three priority categories for improvements in the updated *Route 99 Corridor Business Plan* and their relationship to the Central Valley Wye alternatives are:

- **Priority Category 1 (Freeway Conversion)**—New interchange projects at Plainsburg Road and Arboleda Road in Merced County would complete the conversion to a full freeway standard.
- **Priority Category 2 (Capacity-Increasing Projects)**—Several projects would provide a minimum of six lanes in Merced and Madera Counties.
- **Priority Category 3 (Major Operational Improvements)—**Several interchanges are planned for reconstruction and widening, including SR 233 and SR 152.

SR 152 is a major east-west trade corridor linking Highway 99 in the Central Valley to Highway 101 in the Bay Area through the city of Los Banos and Pacheco Pass. Ongoing and planned work by Caltrans includes specific segments of improvements to this corridor such as additional climbing lanes and median protection over Pacheco Pass and construction of the Los Banos Bypass. Larger ongoing regional discussions are also taking place on future major upgrades to the route, including potential conversion to a toll road using a public-private partnership.



Sources: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015; Merced County Association of Governments, 2014; Madera County Transportation Commission, 2014

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Figure 2-7 Planned Highway Improvements in Merced and Madera Counties

2.2.2.4 Planned Aviation Improvements

Merced Municipal/Macready Field is the only commercial airport that serves the communities near the Central Valley Wye alternatives. Two general aviation airports located along the corridor only serve small private aircraft: Chowchilla Municipal and Madera Municipal. Four private airstrips are located in unincorporated agricultural areas: Emmett Field Airstrip and Johnson Ranch Airstrip in Merced County and Chapman Farms Airstrip and Sallaberry Airstrip in Madera County. Table 2-4 shows the use of the Merced Municipal/Macready Field commercial airport in terms of enplanements between 2000 and 2015.[11]

Table 2-4 Passenger Boardings for Merced Airports

Airport	2000	2005	2010	2015	Change 2000–2010	Change 2005–2010	Change 2010-2015
Merced	5,157	8,616	2,051	1,998	-3,106	-6,565	-53

Source: Federal Aviation Administration, 2014 and 2016

The Merced Municipal Airport is located southwest of downtown Merced, south of SR 140. As Table 2-4 shows, passenger use declined notably between 2005 and 2010, when the round-trip flight service to Las Vegas McCarran Airport was terminated and service was changed from Las Vegas to Ontario Airport. In 2011, the airport began providing two daily round-trip flights to Los Angeles, where passengers can connect to other destinations. Despite an initial increase in travel in 2011 and 2012 with service to Los Angeles, enplanements decreased between 2013 and 2015 to approximately 2,000 per year (FAA 2014 and 2016).

Improvement plans for Merced Municipal Airport are documented in the 2007 Merced Municipal Airport Master Plan and are incorporated into the No Project Alternative. The plan forecasts (in 2026) a baseline increase in enplanement of 53,000 annual passengers, with a low growth forecast of 14,800 passengers and a high growth forecast of 104,400 passengers. The primary facility improvement recommended in the plan is a new 11,000-square-foot-passenger terminal. This project is not currently funded.

2.2.2.5 Intercity Transit Improvements

Conventional Passenger Rail

Amtrak provides intercity passenger rail service in California on four principal corridors covering more than 1,300 linear route miles and spanning almost the entire state. The No Project Alternative passenger rail element includes one of these corridors, the San Joaquin route, which shares tracks with the BNSF Railway (BNSF) freight line. One station, just south of the Central Valley Wye alternatives and with limited connectivity to buses and other modes of transit such as airline travel, is located in the community of Madera Acres northeast of the city of Madera.

The San Joaquin route currently provides four trips daily in each direction from Oakland to Bakersfield (with a bus connection to the Los Angeles Basin) and two trips daily in each direction from Sacramento to Bakersfield, for a total of six daily roundtrips serving Merced. This route carried over 1.2 million riders in fiscal year 2013 with an on-time performance of 72.9 percent (Amtrak 2013). The current scheduled running time between Bakersfield and Oakland is 6 hours 8 minutes, at an average speed of 53 miles per hour (mph), but Amtrak plans to reduce travel time to less than 6 hours. Currently, the maximum speed on the route is 79 mph (Amtrak 2013).

The No Project Alternative includes intercity passenger rail system improvements identified in the State Transportation Improvement Program and Caltrans' *2013 California State Rail Plan* for

[11] An enplanement is a passenger getting on an airplane for departure. A visitor flying in and flying out equals one enplanement.

implementation before 2040 (Caltrans 2013a).[12] Table 2-5 shows these improvements, which consist of additional track capacity, curve realignments, and track and signal improvements.

Table 2-5 Programmed Improvements in *2013 California State Rail Plan*

Project Title	Project Description	Project Timeline
San Joaquin Route		
Merced to Le Grand	Build second main track	Segment 1—2016–2018
		Segments 2,3—2019–2040
Madera County		
Planada to Madera	Build second main track and curve realignments	2019–2040
Corridor-Wide Signal Upgrades	Track and signal improvements from Stockton to Bakersfield (90 mph)	2019–2040
Gregg-Madera	Convert Gregg-Madera route to double-track with addition of 11 trains at 90 mph	2019–2040

Source: Caltrans, 2013a
mph = miles per hour

In addition to these programmed improvements, the State Rail Plan also identified additional capital improvements that are needed to support the planned service improvements. These currently unfunded capital improvements were not included in this evaluation because of the funding uncertainty. The plan also identifies the intent to develop options for originating some trains in Fresno and extending rail service from Bakersfield to Los Angeles.

In 2008, Caltrans, in partnership with the counties along the San Joaquin route, completed the *San Joaquin Corridor Strategic Plan*, assuming no HSR system (Caltrans 2008a). In 2013, Caltrans developed the *San Joaquin Corridor Service Development Plan* for improved intercity passenger rail service in the San Joaquin Corridor (Caltrans 2013b). This Service Development Plan is the first of a series of studies that would consider future plans for improving service in the San Joaquin Corridor.

In September 2012, Governor Brown signed Assembly Bill 1779, the Intercity Passenger Rail Act of 2012, creating the San Joaquin Joint Powers Authority consisting of 10 local and regional agencies along the route. The San Joaquin Joint Powers Authority and the State of California signed an Interagency Transfer Agreement in June 2015, transferring administrative and operations oversight to the San Joaquin Joint Powers Authority (San Joaquin Joint Powers Authority 2015).

The *2015 San Joaquin Joint Powers Authority Business Plan Update* sets forth an initial list of preliminary long-term improvements (San Joaquin Joint Powers Authority 2015). However, the list of projects in Table 2-6 would require further review by the San Joaquin Joint Power Authority and is subject to approval from the state, Union Pacific Railroad (UPRR), BNSF, local and regional agencies, and other interested parties. The list of projects includes improvements to increase service from 8 to 11 roundtrip trains and increase maximum speed in certain locations from 79 mph to 90mph within the next 5 to 10 years and 25 years. These improvements are needed to increase service, speed, and safety (San Joaquin Joint Powers Authority 2015).

[12] The *Draft 2018 California State Rail Plan* was released for public comment in October 2017. Following the public comment period, the Rail Plan is scheduled to be revised and finalized in early 2018. For more information on the 2018 State Rail Plan, please see Chapter 1, Section 1.2.4.1, Travel Demand and Capacity Constraints.

Table 2-6 San Joaquin Joint Powers Authority 2015 Business Plan Capital Projects

Project Title	Milepost	Project Timeline
San Joaquin Route		
Gregg Double Track	1008.9–1013.8	5–10 years
Merced–Le Grand Segment 1	1041.7–1050.1	5–10 years
Stockton–Escalon	1106.8–1110.6	5–10 years
Oakley–Port Chicago Segment 2	1152.7–1155.8	5–10 years
Una to Shafter	899.4–902.9	25 years
Angiola to Corcoran Double Track	943.0–953.8	25 years
Figarden Double Track	1004.1–1008.6	25 years
Gregg to Madera Double Track	1013.9–1020.5	25 years
Oakley–Port Chicago Segment	115.9–1163.8	25 years

Source: San Joaquin Joint Powers Authority, 2015

Intercity Passenger Bus Service

Merced County Transit provides intercity and intracity bus service In the Merced area, connecting Merced with the nearby communities of Turlock, Delhi, Livingston, Winston, Atwater, Los Banos, Dos Palos, Dos Palos Y, El Nido, Planada, and Le Grand. The Yosemite Area Regional Transportation System provides additional regional bus service into Yosemite National Park, with connections to intercity transportation providers in Merced such as Amtrak, Greyhound, and Great Lakes Airlines at the Merced Municipal Airport.

The County of Madera operates the Madera County Connection, an intercity bus service in all major communities in Madera County. The Madera County Connection provides service between Chowchilla, Fairmead, and Madera.

While intercity bus service could increase in the future as a result of continued population growth, there are no documented plans for regional service expansion; accordingly, no such increases are considered in the analysis of the No Project Alternative.

2.2.2.6 Freight Rail Improvements

Two Class 1 freight railroads (BNSF and UPRR) operate and own tracks in the vicinity of the Central Valley Wye alternatives. The San Joaquin Valley lines for both the BNSF and UPRR are important segments of their national rail systems. Freight rail traffic nationally has been growing, with a 7.3 percent increase in ton-miles of freight activity between 2001 and 2011 (Bureau of Transportation Statistics 2014).

Freight rail movements in the San Joaquin Valley are primarily interstate rail movements because the railroads generally cover a distance of 700 miles or more. However, while trucking is the dominant mode for moving freight (with rail serving only 8 percent of the total tonnage), stakeholders in San Joaquin Valley are strongly interested in expanding the usage of short-line railroads in freight movement. The San Joaquin Valley Railroad of Genesee & Wyoming Inc. is the nearest short-line railroad to the Central Valley Wye alternatives; it interchanges with the BNSF at Fresno and Bakersfield and with the UPRR at Fresno, Goshen Junction, and Bakersfield. The growth in roadway congestion is expected to increase reliance on rail traffic.

The BNSF alignment is generally located east of the SR 99 corridor. BNSF also owns the railroad right-of-way used by the Amtrak San Joaquin route. The average number of daily one-way train operations within the corridor is 20 to 24 trips, of which 12 are Amtrak trains. BNSF owns a 276-mile section of the San Joaquin corridor from Bakersfield to Port Chicago, 6.5 miles east-

northeast of Martinez in Contra Costa County. Freight has precedence over passenger service on this line. An increase in freight operations may constrain plans to increase Amtrak service, unless more of the corridor becomes double-tracked. UPRR parallels SR 99 for most of the corridor. UPRR along this corridor is primarily single track and averages 20 to 24 daily one-way train trips within the corridor (FRA Office of Safety Analysis 2010).

In Merced and Madera Counties, both BNSF and UPRR currently operate near capacity. According to the 2009 Goods Movement Study (Merced County Association of Governments 2009), without major improvements (such as double tracking more sections), freight activity may exceed capacity by 2027, with minimal additional train movements. UPRR and BNSF have historically added capacity when needed to meet market demands in other regions. Many of the planned track improvements for passenger rail (Table 2-5 and Table 2-6), will benefit both passenger and freight rail services as they currently use the same tracks. These planned and anticipated future improvements are incorporated into the No Project Alternative and are expected to provide sufficient capacity for interstate needs.

2.2.3 Description of the Central Valley Wye Alternatives

The following sections describe the alignments, ancillary features, and necessary modifications to roads, railroads, and land uses associated with each of the Central Valley Wye alternatives. This discussion presents the Central Valley Wye alternatives from west to east and then north to south. Section 2.2.3.6, Features Common to All Central Valley Wye Alternatives, describes the features that all four alternatives share.

To provide adequate capacity for train operations, the proposed electrical power supply system would interconnect into utility networks at 115 kilovolts (kV) or 230 kV, with approximately 30-mile intervals between the traction power substations (TPSS). Other electrical interconnection components, proposed to be designed and constructed by the Authority, would include switching and paralleling stations connected to TPSSs. A 2016 Transmission System Study completed by PG&E and reviewed by the Authority determined what network upgrades would be required to existing PG&E infrastructure to meet the projected power demands of the HSR system. All network upgrades would be implemented pursuant to California Public Utilities Commission General Order (GO) 131-D. For purposes of analysis, each TPSS proposed for the HSR system has been assigned a site number. For the Central Valley Wye alternatives, there would be two TPSSs, designated Site 6 and Site 7, that would require interconnection to PG&E's network.

Volume III of this Draft Supplemental EIR/EIS contains the design drawings showing the track alignments, profiles, structures, typical sections, construction use areas, and other preliminary design information. It is available on the Authority's website: (http://hsr.ca.gov/Programs/Environmental_Planning/supplemental_merced_fresno.html). Volume II, Appendix 2-D, Electrical Interconnections and Network Upgrades, contains background information and a more detailed description of these components.

2.2.3.1 SR 152 (North) to Road 13 Wye Alternative

The SR 152 (North) to Road 13 Wye Alternative (Figure 2-8) follows the existing Henry Miller Road and SR 152 rights-of-way as closely as possible in the east-west direction, and the Road 13, SR 99, UPRR, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation routes or corridors are necessary to accommodate design requirements; specifically, wider curves are necessary to accommodate the speed of the HSR compared to lower-speed roadway alignments. The SR 152 (North) to Road 13 Wye Alternative would not follow existing transportation rights-of-way where it transitions from following one transportation corridor to another.

Alignment and Ancillary Features

The SR 152 (North) to Road 13 Wye Alternative would extend approximately 52 miles, mostly at-grade on raised embankment, although it would also have aerial structures and a segment of retained cut (depressed alignment). Figures in Volume II, Appendix 2-A, High-Speed Rail System Infrastructure, illustrate the different types of profiles. The wye configuration of this alternative

would be located southwest of the city of Chowchilla, with the east-west axis along the north side of SR 152 and the north-south axis on the east side of Road 13.

As shown on the design drawings in Volume III, this alternative would begin in Merced County at the intersection of Henry Miller Road and Carlucci Road, and would continue at-grade on embankment due east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River and Eastside Bypass.[13] Approaching Willis Road, the alignment would cross the San Joaquin River on aerial structure, then would return to embankment. It would then cross the Eastside Bypass on an aerial structure. After crossing the Eastside Bypass, the alignment would continue east and cross SR 59 at-grade just north of the existing SR 152/SR 59 interchange, entering Madera County. The SR 152/SR 59 interchange would be reconstructed a little to the south, and SR 59 would be grade-separated to pass above the HSR on an aerial structure. The alignment would continue east at-grade along the north side of SR 152 toward Chowchilla, splitting into two legs (four tracks) near Road 11 to transition to the Merced to Fresno Section: Hybrid Alternative, and would cross Ash Slough on an aerial structure. All but the northbound track of the San Jose to Merced section of the alignment (leg) would then return to at-grade embankment. The northbound track would rise to cross over the tracks of the San Jose to Fresno leg on aerial structure as it curves north toward Merced. The SR 152 (North) to Road 13 Wye Alternative legs would be routed as described below. Design drawings illustrating these features are provided in Volume III:

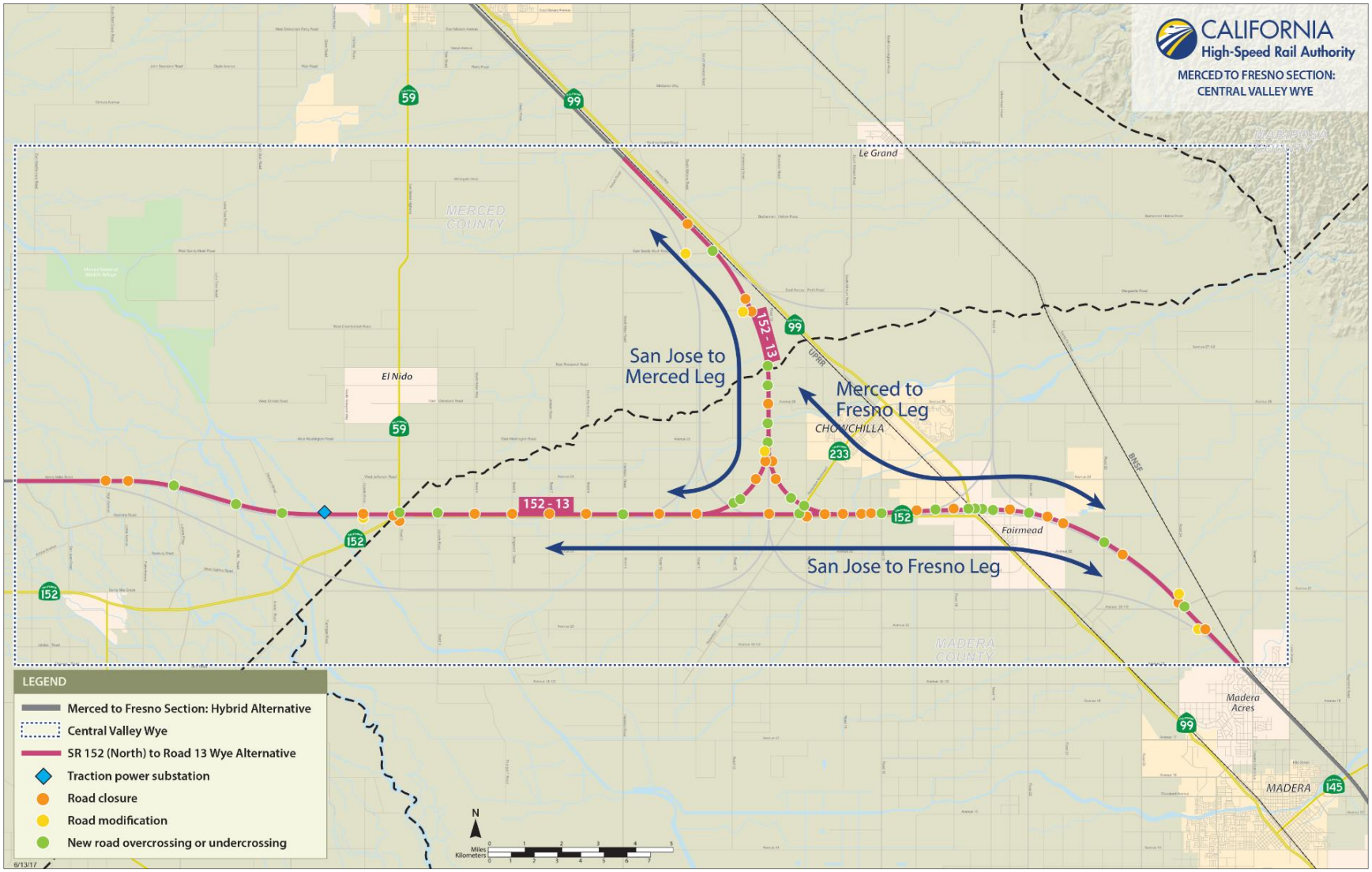
- The southbound track of the San Jose to Merced leg would be at-grade.[14] This split (where tracks separate) would be west of Chowchilla, at approximately Road 11. The two San Jose to Merced tracks would continue north on the eastern side of Road 13, crossing Ash Slough and the Chowchilla River, and then would cross over Road 13 to its west side. As the tracks return to grade, they would curve northwest, crossing Dutchman Creek on an aerial structure, and follow the west side of the UPRR/SR 99 corridor. At Sandy Mush Road, the alignment would descend into a shallow cut (depressed) section for approximately 0.5 mile, with a retained cut-and-cover undercrossing[15] at Caltrans' Sandy Mush Road overhead. The alignment would return to grade and continue along the west side of the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg of this alternative would continue east from the split near Road 11 and along the north side of SR 152 toward Chowchilla. It would be predominantly at-grade, crossing several roads and Berenda Slough on aerial structures. The alignment would pass south of Chowchilla at-grade then would rise to cross over the UPRR/SR 99 corridor and Fairmead Boulevard on an aerial structure. East of the UPRR/SR 99 corridor, the alternative would extend at-grade through Fairmead, north of Avenue 23. At approximately Road 20, the alignment would curve southeast toward the BNSF corridor and cross Dry Creek on a short aerial structure. The San Jose to Fresno leg would align parallel to the west side of the BNSF corridor as it meets the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg of the alternative would split from the San Jose to Fresno leg near Road 14, where the southbound track of the Merced to Fresno leg would ascend on aerial structure, crossing over the tracks of the San Jose to Fresno leg. The northbound track would curve northwest, rise on a high embankment crossing over several roads, and continue on an at-grade embankment until joining the San Jose to Merced leg near Avenue 25.

Wildlife undercrossing structures would be installed in at-grade embankments along this alternative where the alignment intersects wildlife corridors (see Appendix 2-A, Figure 2-12).

[13] The Eastside Bypass is a constructed channel designed to carry flood flow off the San Joaquin River.

[14] A track is a component of a leg (e.g., southbound track of the San Jose to Merced leg).

[15] An undercrossing is a road or track crossing under an existing road or track.



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-8 SR 152 (North) to Road 13 Wye Alternative Alignment and Key Design Features

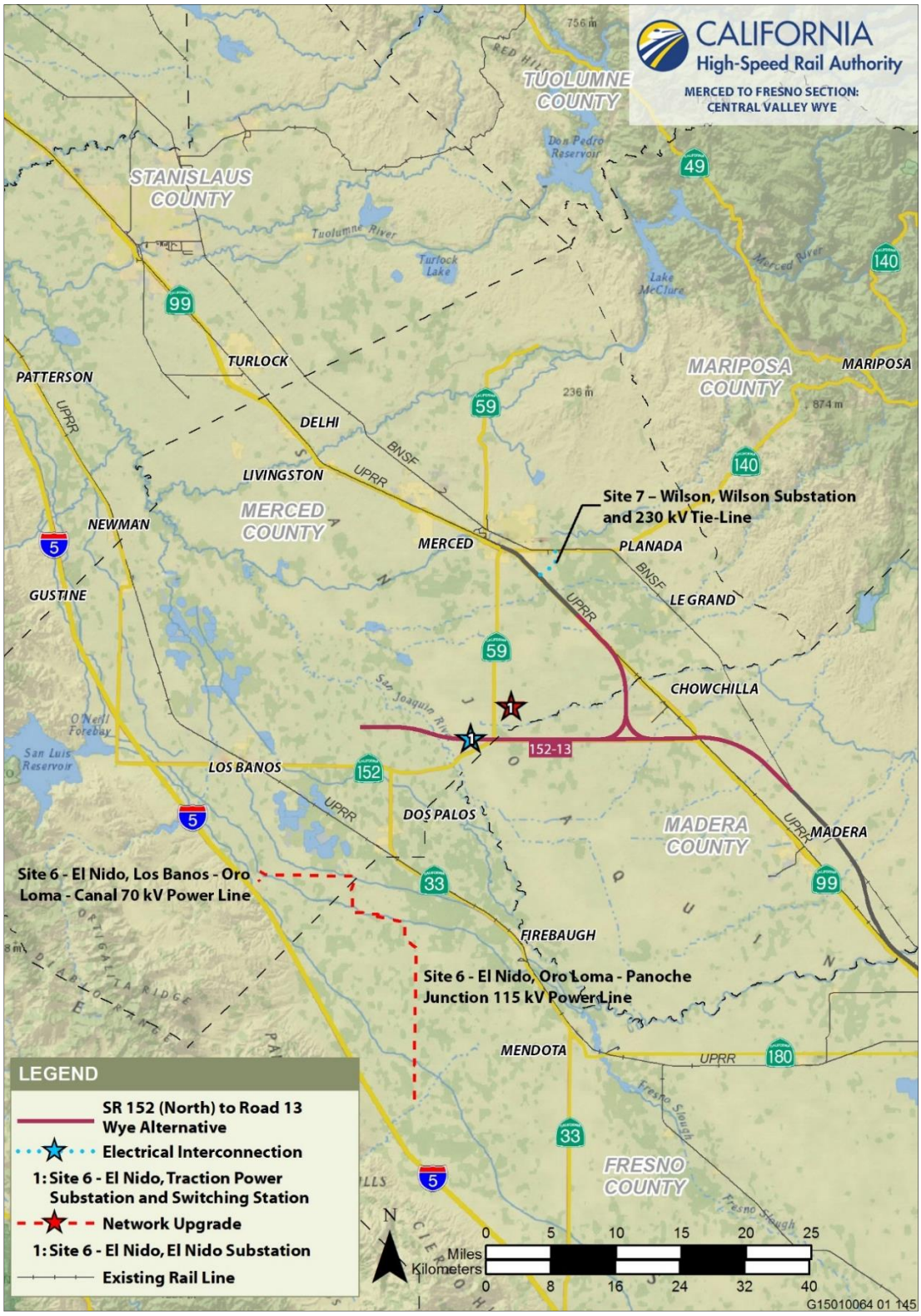
Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located immediately east of where the SR 152 (North) to Road 13 Wye Alternative crosses the Eastside Bypass. This new switching station would connect to the Wilson–Oro Loma 115 kV power line. Network upgrades would include expanding the El Nido Substation and reconductoring (i.e., replacing existing conductor with more efficient conductor and replacing or modify existing poles/towers) 16.9 miles of the single-circuit Panoche–Oro Loma 115 kV Power Line and 13.3 miles of the single-circuit Los Banos–Oro Loma–Canal 70 kV Power Line.[16]

For Site 7—Wilson, interconnection facilities would include a 230 kV TPSS and an approximately 2.3-mile double-circuit 230 kV transmission line (230 kV Tie-Line) to the Wilson Substation. The TPSS and approximately 0.5 mile of the 230 kV Tie-Line were previously analyzed in the Merced to Fresno Final EIR/EIS. To support this interconnection, PG&E would need to rebuild the existing Wilson 230 kV Substation to a 4-Bay Breaker-and-a-Half within the existing fence line. Figure 2-9 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 13 Wye Alternative.

Backup electrical power would be supplied by an emergency standby generator for select electrical loads, including fire protection systems, ventilation systems, emergency lights and signage, communication systems, train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

16 Depending on further engineering, a new switching station could be constructed at this location rather than expanding the existing substation.



Source: ESRI/National Geographic, 2015

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Figure 2-9 SR 152 (North) to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades

State Highway or Local Roadway Modifications

The SR 152 (North) to Road 13 Wye Alternative would require the permanent closure of 38 public roadways at selected locations and the construction of 24 overcrossings or undercrossings in lieu of closure.[17] Table 2-7, Figure 2-8, and Volume II, Appendix 3.2-A, High-Speed Rail Grade Separations and Road Closures for the Central Valley Wye Alternatives, show the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade but need to be closed to convert SR 152 to a fully access-controlled corridor. The 14 proposed closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. Planned new grade separations along SR 152 at the SR 59/SR 152 Interchange, Road 4/Lincoln Road, Road 12, Road 16, and Road 17 1/2 would maintain access to and across SR 152. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders. Each of the new interchanges would require realigning SR 152. Three new interchanges are proposed between SR 59 and SR 99 to provide access to SR 152: at Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where other roads are perpendicular to the proposed HSR. Between these over- or undercrossings, 24 additional roads would be closed, as illustrated on Figure 2-8 and listed in Volume II, Appendix 3.2-A. Local roads paralleling the proposed HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain their function. Access easements would be provided to maintain access to properties severed by HSR.

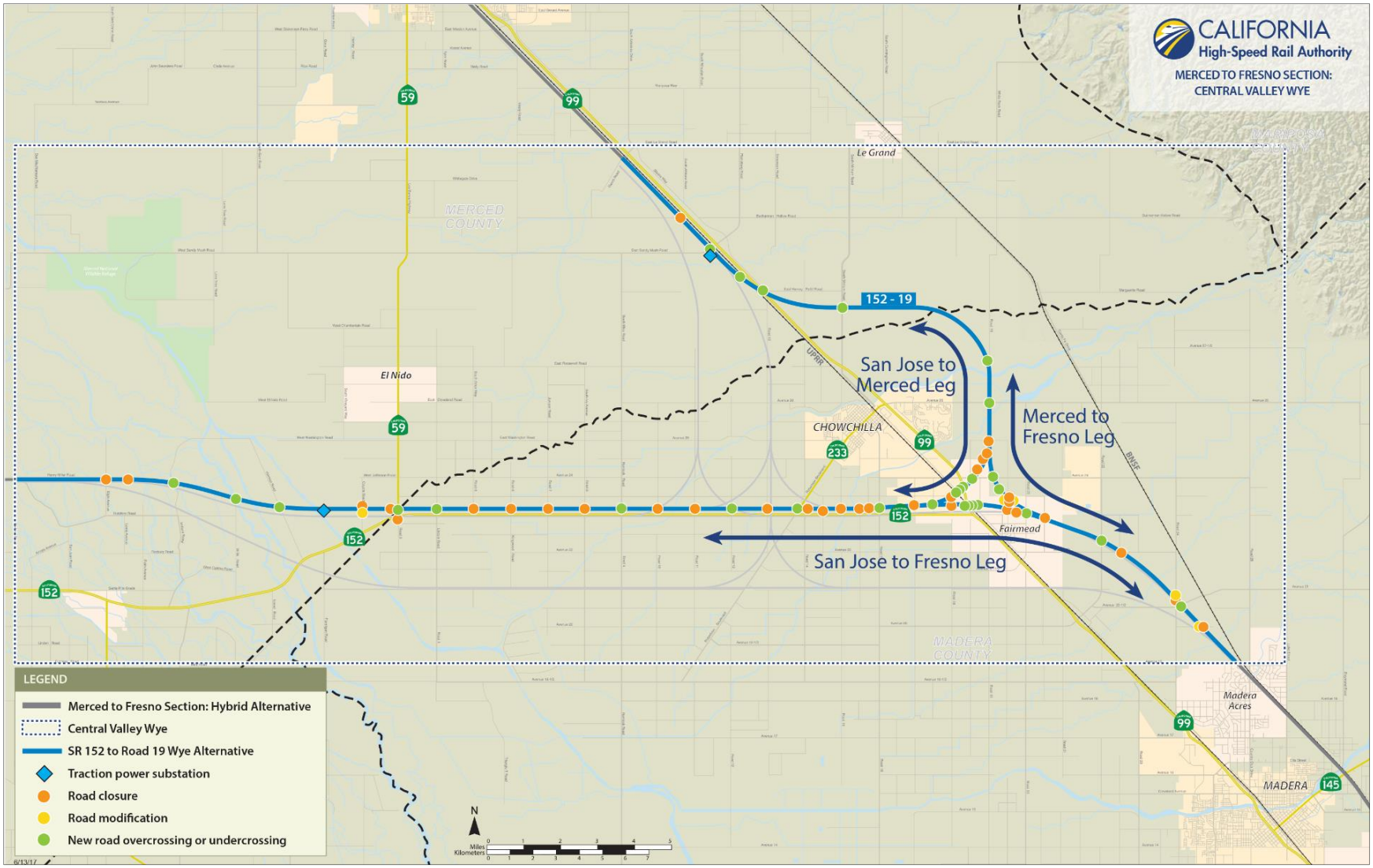
Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 13 Wye Alternative would cross over the UPRR right-of-way south of Chowchilla. This alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize impacts on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). In areas where the SR 152 (North) to Road 13 Wye Alternative parallels the UPRR right-of-way, the alternative maintains a minimum horizontal clearance of 102 feet from the centerline to the UPRR right-of-way (see Appendix 2-A, Figure 2-9).

2.2.3.2 SR 152 (North) to Road 19 Wye Alternative

The SR 152 (North) to Road 19 Wye Alternative (Figure 2-10) is designed to follow the existing Henry Miller Road and SR 152 rights-of-way as closely as practicable in the east-west direction and Road 19, SR 99, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation corridors would be necessary to accommodate design requirements; specifically, larger curves would be necessary to accommodate the high speed of the HSR compared to lower-speed roadway alignments. The SR 152 (North) to Road 19 Wye Alternative would not follow existing transportation rights-of-way as it transitions from following one transportation corridor to another.

[17] An overcrossing is a road or track crossing over an existing road or track.



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-10 SR 152 (North) to Road 19 Wye Alternative Alignment and Key Design Features

Alignment and Ancillary Features

Beginning at the intersection of Henry Miller Road and Carlucci Road (at the same point in Merced County as the SR 152 [North] to Road 13 Wye Alternative), this alternative would continue east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River. It would cross the river on an aerial structure, returning to an at-grade embankment, then onto another aerial structure to cross the Eastside Bypass. After crossing the Eastside Bypass, the alignment would continue east and cross SR 59 at-grade just north of the existing SR 152/SR 59 interchange, where it would enter Madera County. It would continue east at-grade along the north side of SR 152 toward Chowchilla, crossing Ash Slough and Berenda Slough on aerial structures. As it crosses Road 16, the alignment would split into two legs (four tracks) to transition to the Merced to Fresno Section: Hybrid Alternative. East of Road 17, the San Jose to Merced leg would curve northeast, rising to cross the UPRR/SR 99 corridor on an aerial structure, and then would continue north along the east side of Road 19.

As the alignment approaches Avenue 25, the San Jose to Merced and Merced to Fresno legs would converge, requiring the northbound track of the San Jose to Merced leg to rise on an aerial structure and cross over the tracks of the Merced to Fresno leg. The SR 152 (North) to Road 19 Wye Alternative legs would be routed as described below. Design drawings illustrating these features are provided in Volume III:

- The San Jose to Merced leg would continue north to just south of Ash Slough, where it would curve west, cross Ash Slough and the Chowchilla River on aerial structures, and continue west approximately 0.5 mile south of Harvey Pettit Road. West of South Minturn Road, the leg would curve northwest and descend below-grade into a series of three tunnels crossing under the SR 99 and UPRR corridors and the Caltrans Sandy Mush Road overhead. The UPRR tracks would be reconstructed on the roof of the HSR cut-and-cover tunnels, while maintaining the same horizontal and vertical alignment. Construction of this type of below-grade crossing would require temporarily realigning the UPRR tracks. Approximately 0.6 mile north of Sandy Mush Road, the alternative would ascend to grade and continue along the UPRR/SR 99 corridor to connect with the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg would continue east from Road 16 and, east of Road 18, ascend on an aerial structure to cross SR 99 north of the SR 99/SR 152 interchange. East of the UPRR/SR 99 corridor, the leg would continue north of Avenue 23 through Fairmead, descending to grade east of Road 18 3/4. The alternative would then curve southeast toward the BNSF corridor, crossing Dry Creek on a short aerial structure, and continuing along the west side of the BNSF corridor to join the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 20 1/2. The southbound track of the Merced to Fresno leg would ascend on an aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would curve northwest, rise on aerial structures over several road crossings, and then continue at-grade to join the San Jose to Merced leg near Avenue 25.

Wildlife undercrossing structures would be provided in at-grade embankments where the alignment intersects wildlife corridors (see Appendix 2-A, Figure 2-12).

Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located immediately east of where the SR 152 (North) to Road 19 Wye Alternative crosses the Eastside Bypass. This new switching station would connect to the existing Wilson–Oro Loma 115 kV power line. Network upgrades would include expanding the El Nido Substation and

reconductoring 16.9 miles of the single-circuit Panoche–Oro Loma 115 kV Power Line and 13.3 miles of the single-circuit Los Banos–Oro Loma–Canal 70 kV Power Line.[18]

For Site 7—Le Grand Junction/Sandy Mush Road, interconnection facilities would include a 115 kV TPSS connected to a new switching station located on the east side of the UPRR/SR 99 corridor at the corner of East Sandy Mush Road and South Bliss Road via a new approximately 2.6-mile double-circuit 115 kV power line (115 kV Tie-Line). The new switching station would connect to the Wilson–Oro Loma, Wilson–Le Grand and Wilson–Dairyland (idle) 115 kV lines. Network upgrades would include recondutoring 38.4 miles of the single-circuit Warnerville–Wilson 230 kV No. 1 Transmission Line and 11.3 miles of the existing single-circuit Wilson–Dairyland (idle) 115 kV Power Line. Figure 2-11 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 19 Wye Alternative.

Backup electrical power would be supplied by an emergency standby generator for select electrical loads, including fire protection systems, ventilation systems, emergency lights and signage, communication systems, train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

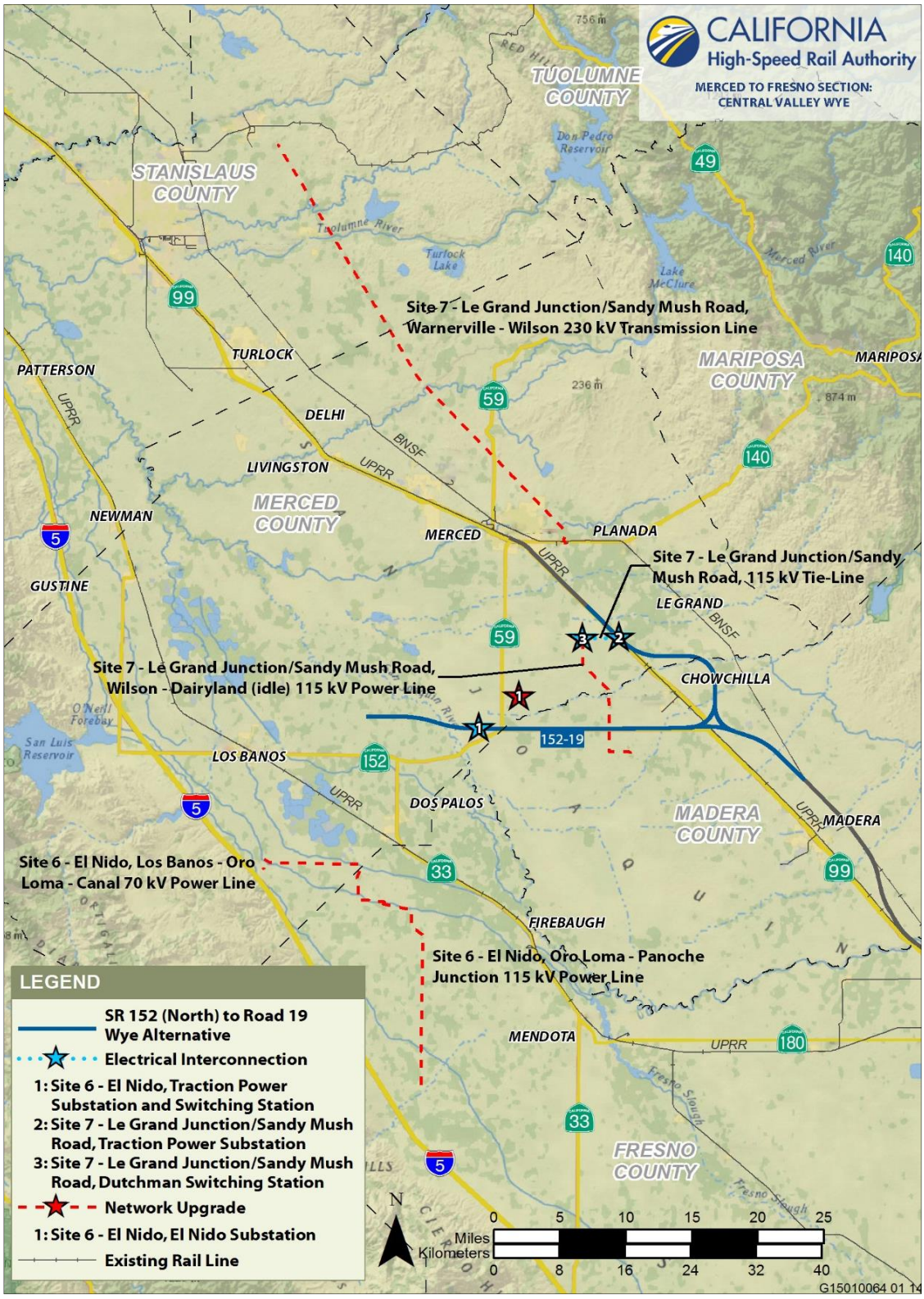
State Highway or Local Roadway Modifications

The SR 152 (North) to Road 19 Wye Alternative would require the permanent closure of 36 public roadways at selected locations and the construction of 29 overcrossings or undercrossings. Table 2-7, Figure 2-10, and Volume II, Appendix 3.2-A show the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade but must be closed to convert SR 152 to a fully access-controlled corridor. The proposed 14 closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. New grade separations are planned along SR 152 at the SR 59/SR 152 interchange, Road 4/Lincoln Road, Road 12, SR and Road 17 1/2. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders, and several of these interchanges would require realigning SR 152. Interchanges between SR 59 and SR 99 that would provide access to SR 152 are Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where roads would be perpendicular to the proposed HSR. Between these over- or undercrossings, 22 additional roads would be closed (Figure 2-10 and Volume II, Appendix 3.2-A). Local roads paralleling the proposed HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain their function. Access easements would be provided to maintain access to properties severed by HSR.

The SR 152 (North) to Road 19 Wye Alternative would cross over SR 99 at three locations. South of Chowchilla, both the San Jose to Merced and the San Jose to Fresno legs would rise on aerial structures to cross SR 99. Another crossing of SR 99 would be at the northern end of the alternative, where it descends below-grade into an undercrossing tunnel segment. SR 99 would be temporarily realigned during construction and would be reconstructed on the roof of the undercrossing tunnel.

[18] Depending on further engineering, a new switching station could be constructed at this location rather than expanding the existing substation.



Source: ESRI/National Geographic, 2015

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Figure 2-11 SR 152 (North) to Road 19 Wye Alternative Electrical Interconnections and Network Upgrades

Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 19 Wye Alternative would cross over the UPRR corridor at three separate locations. South of Chowchilla, both the San Jose to Merced and the San Jose to Fresno legs would rise on aerial structures to cross the UPRR operational right-of-way. In these instances, the alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize impacts on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). The third crossing of the UPRR corridor would be at the northern end of the alternative, where the alignment would descend into an undercrossing tunnel. The UPRR tracks would be reconstructed on the roof of the HSR tunnel, maintaining the same vertical alignment. Construction of this crossing would require the temporary detour (shoofly)[19] of the UPRR tracks. In areas where the SR 152 (North) to Road 19 Wye Alternative parallels the UPRR right-of-way, the alternative maintains a minimum horizontal clearance of 102 feet from the centerline to the UPRR right-of-way (see Appendix 2-A, Figure 9).

2.2.3.3 Avenue 21 to Road 13 Wye Alternative

The Avenue 21 to Road 13 Wye Alternative (Figure 2-12) is designed to follow the existing Henry Miller Road and Avenue 21 rights-of-way as closely as practicable in the east-west direction and the Road 13, SR 99, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation corridors would be necessary to accommodate design requirements; specifically, larger curves would be necessary to accommodate the high speeds of the HSR compared to lower-speed roadway alignments. The Avenue 21 to Road 13 Wye Alternative would not follow existing transportation rights-of-way as it transitions from following one transportation corridor to another.

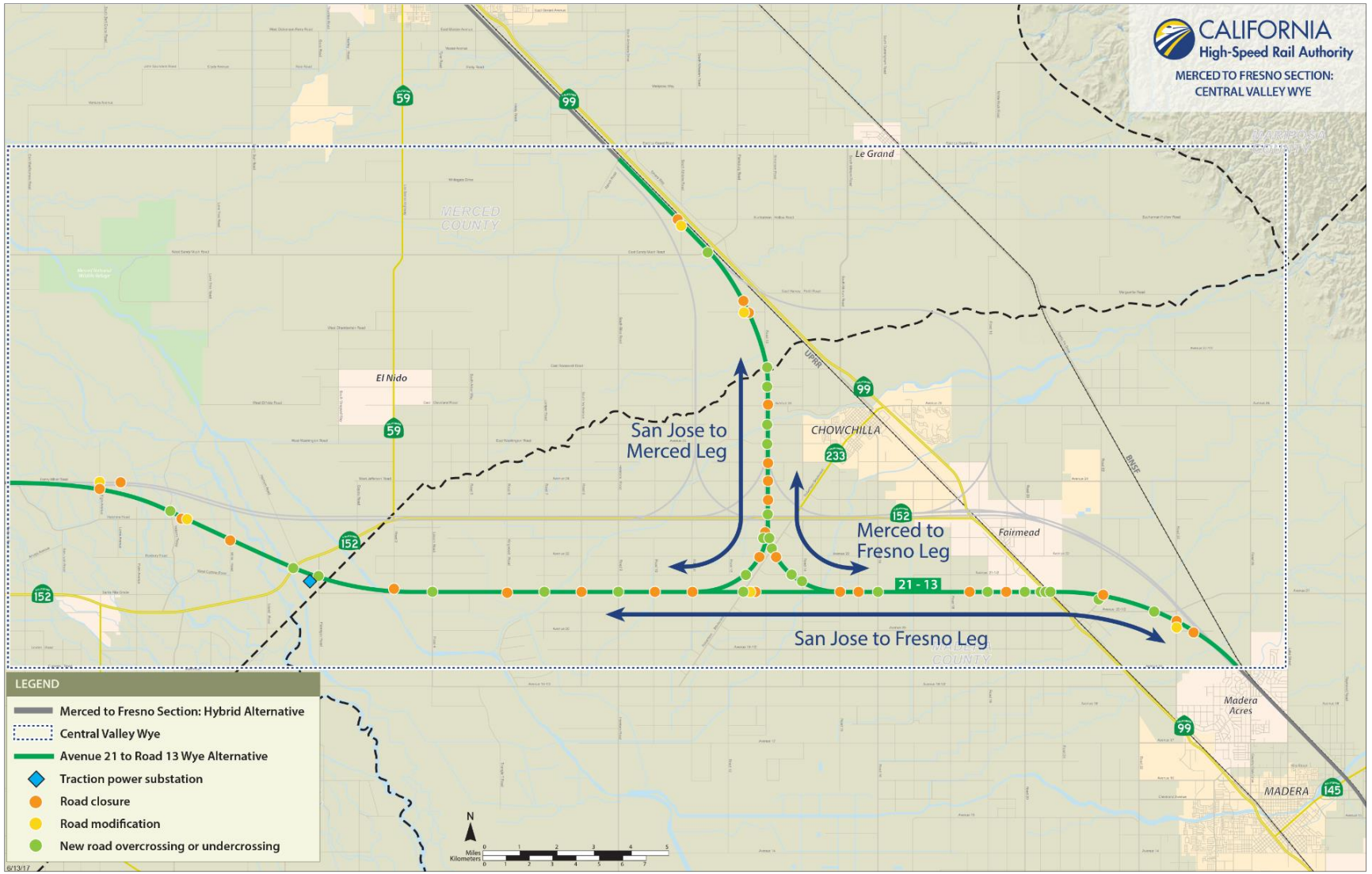
Alignment and Ancillary Features

The Avenue 21 to Road 13 Wye Alternative would extend approximately 53 miles, mostly at-grade on embankment, although it would also have aerial structures and a short segment of retained cut (depressed alignment). The wye configuration of this alternative would be located approximately 4 miles southwest of the city of Chowchilla, with the east-west axis along the north side of Avenue 21 and the north-south axis on the east side of Road 13.

Beginning at the intersection of Henry Miller Road and Carlucci Road (at the same point in Merced County as the SR 152 [North] to Road 13 Wye Alternative), west of Elgin Avenue this alternative would curve southeast toward the San Joaquin River and Eastside Bypass. East of Willis Road, the alignment would rise to an aerial structure to cross the river, SR 152, and the Eastside Bypass. The alignment would continue east along the north side of Avenue 21, crossing Ash Slough on an aerial structure. Southwest of Chowchilla, near Road 11, the alignment would split into two legs (four tracks) for transition to the Merced to Fresno Section: Hybrid Alternative. The San Jose to Merced leg would curve northeast, cross Road 13, and continue north along the east side of Road 13. At the beginning of the San Jose to Merced leg, the northbound track alternative would rise onto an aerial structure to cross over the tracks of the San Jose to Fresno leg. The Avenue 21 to Road 13 Wye Alternative legs would be routed as described below. Design drawings illustrating these features are provided in Volume III:

- As the San Jose to Merced leg approaches SR 152, it would converge with the Merced to Fresno leg, requiring the northbound track of the San Jose to Merced leg to rise on an aerial structure and cross over the tracks of the Merced to Fresno leg. The San Jose to Merced leg would continue north on an elevated alignment crossing Ash Slough, the Chowchilla River, and Road 13 on aerial structures. As the leg returns to grade, it would curve northwest, cross Dutchman Creek on an aerial structure, and follow along the west side of the UPRR/SR 99 corridor. At Sandy Mush Road, the alternative would descend into a shallow cut (depressed) section for approximately 0.5 mile, with a retained cut-and-cover undercrossing tunnel segment at the Caltrans Sandy Mush Road Overhead. The alternative would return to grade and continue along the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road.

[19] A shoofly is a temporary track alignment that detours trains around a construction site.



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-12 Avenue 21 to Road 13 Wye Alternative Alignment and Key Design Features

- The San Jose to Fresno leg would continue east from the split near Road 11 along the north side of Avenue 21 toward Chowchilla. It would be predominantly at-grade on embankment, ascending to cross Berenda Slough on an aerial structure. East of the wye configuration, the alignment would extend south of Chowchilla, ascend on an aerial structure east of Road 19 1/2, and cross the UPRR/SR 99 corridor. The alternative would extend south of Fairmead and curve southeast toward the BNSF corridor, cross Dry Creek on an aerial structure, and run adjacent to the west side of the BNSF corridor to its meeting with the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 15. The southbound track of the Merced to Fresno leg would ascend on an aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would curve northwest, rise on aerial structures over several road crossings, and then continue on an at-grade embankment to join the San Jose to Merced leg near SR 152.

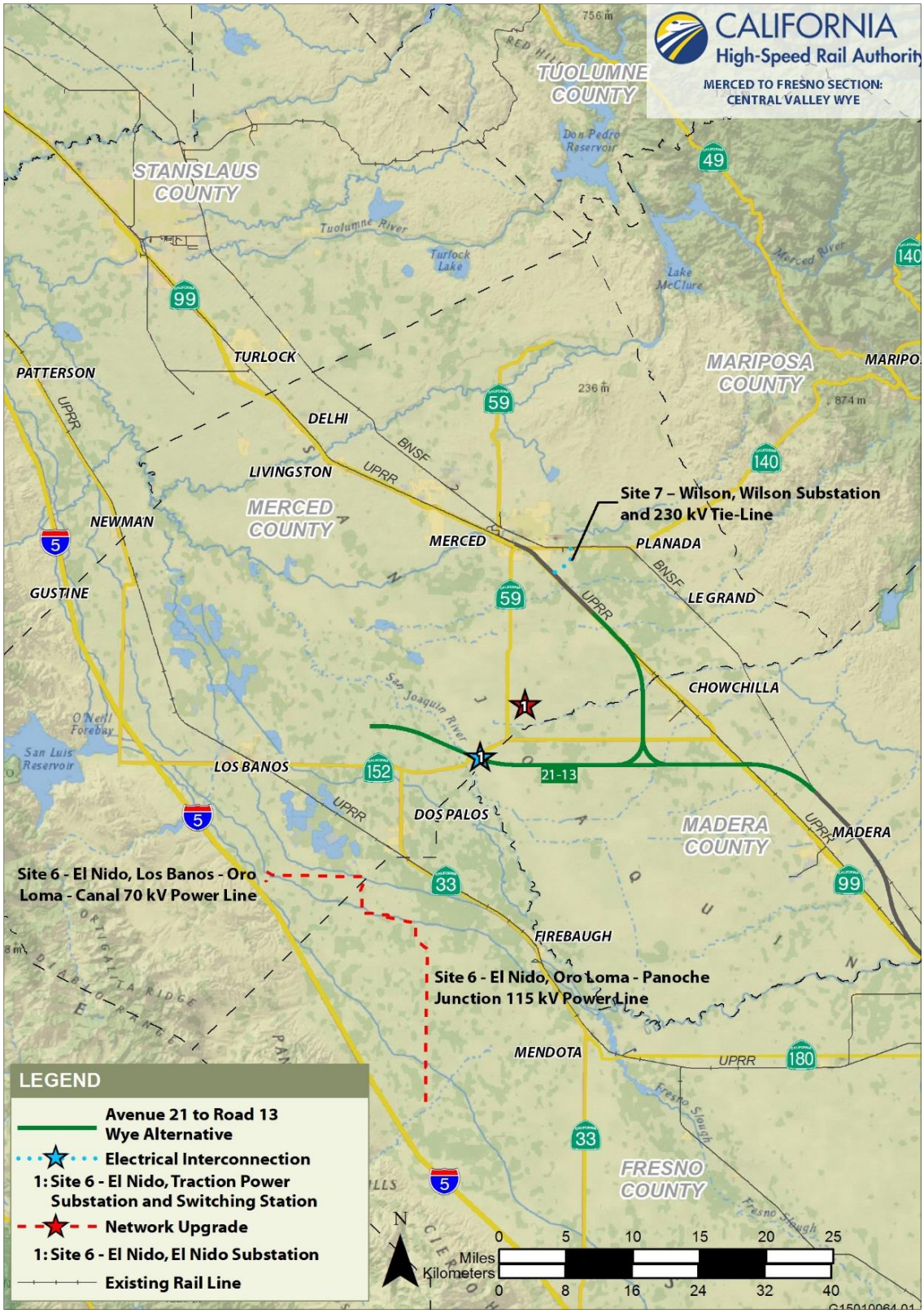
Wildlife undercrossing structures would be provided along this alternative in at-grade embankment portions of the HSR corridor where the alignment intersects wildlife corridors (see Appendix 2-A, Figure 2-12).

Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located on the west side of Flanagan Road. This new switching station would connect to the Wilson–Oro Loma 115 kV power line. Section 2.2.3.1, SR 152 (North) to Road 13 Wye Alternative, further describes the network upgrades associated with Site 6—El Nido as well as the interconnection facilities associated with Site 7—Wilson. Figure 2-13 shows the electrical interconnections and network upgrades associated with the Avenue 21 to Road 13 Wye Alternative.

In addition, the Avenue 21 to Road 13 Wye Alternative would require the Authority to relocate the existing PG&E Dairyland Substation. It is estimated that relocation would take approximately 18 months to complete and specific construction related activities would include the following:

- **Below-Grade Components**—Foundations, a stormwater detention and Spill Prevention Control and Countermeasure basin, raceways, and underground conduit would be constructed. Reinforced concrete subsurface footings and concrete slabs would be installed along with the ground grid. Substation equipment foundations would be approximately 5 to 16 feet deep.
- **Aboveground Structures**—These would include steel structures, circuit breakers, transformers, switchgears, buses, and other electrical equipment. These elements would be installed once the below-grade construction is complete. Equipment would be bolted or welded to slabs and footings and connected to the ground grid. The maximum height of substation equipment would be approximately 35 feet for the dead-end structures supporting the 115-kV power line interconnection. The transformers, switches, and buswork would be approximately 15 feet tall. Substation structures and equipment would be neutral gray.
- **Perimeter Fencing**—A perimeter enclosure with two access gates would be constructed around the substation perimeter for security. An 8- to 10-foot-high chain-link fence with barbed wire would be installed around the substation.
- **Security Lighting**—Security lighting would consist of sodium vapor lamps, and all exterior lighting would use non-glare light bulbs, designed and positioned to minimize casting light or glare to off-site locations. Light poles placed at each corner of the substation would be approximately 10 feet high and constructed of galvanized steel. The lights would be controlled by a photocell that automatically turns the lights off during the day and on at night.
- **Access Roads**—Access roads leading to the substation would be dirt, and roads within the substation would be paved. Generally, access roads would be 20 feet wide.



Source: ESRI/National Geographic, 2015

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Figure 2-13 Avenue 21 to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades

Backup electrical power would be supplied by an emergency standby generator for select electrical loads, including fire protection systems, ventilation systems, emergency lights and signage, communication systems, train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

State Highway or Local Roadway Modifications

The Avenue 21 to Road 13 Wye Alternative would require the permanent closure of 30 public roadways at selected locations and the construction of 28 overcrossings or undercrossings. Table 2-7, Figure 2-12, and Volume II, Appendix 3.2-A show the anticipated state highway and local roadway closures. This alternative would require the fewest roadway and state highway modifications. The Avenue 21 to Road 13 Wye Alternative would rise on aerial structures and cross over state highway facilities in three locations: SR 59 at Harmon Road, SR 152 at Road 13, and SR 99 at Avenue 21. Where other roads would be perpendicular to the proposed HSR, over- or undercrossings are planned at distances from less than 2 miles to 5 miles. Between these over- and undercrossings, some roads may be closed. Local roads paralleling the HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain their function. Access easements would be provided to maintain access to properties severed by HSR.

Freight or Passenger Railroad Modifications

The Avenue 21 to Road 13 Wye Alternative would cross the UPRR operational right-of-way on an aerial structure south of Fairmead and maintain a vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize impacts on other UPRR rights-of-way, spurs, and facilities. In areas where the Avenue 21 to Road 13 Wye Alternative parallels the UPRR right-of-way, the alternative maintains a minimum horizontal clearance of 102 feet from the centerline to the UPRR right-of-way (see Appendix 2-A, Figure 9).

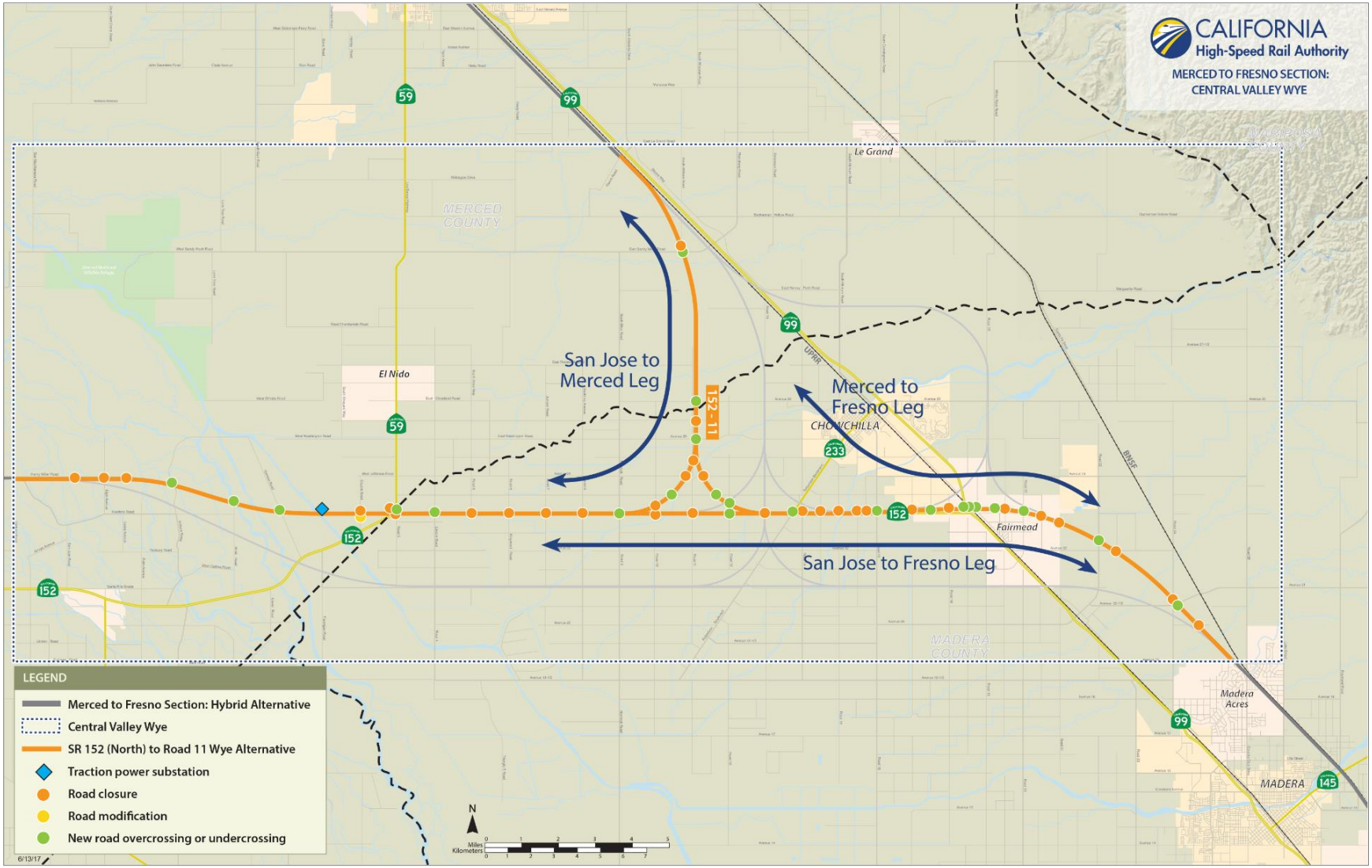
2.2.3.4 SR 152 (North) to Road 11 Wye Alternative (Proposed Project/Preferred Alternative)

The SR 152 (North) to Road 11 Wye Alternative is the proposed project for purposes of CEQA and the Preferred Alternative. The basis for this designation is described further in Chapter 8. The SR 152 (North) to Road 11 Wye Alternative (Figure 2-14) follows the existing Henry Miller Road and SR 152 rights-of-way as closely as practicable in the east-west direction, and the Road 11, SR 99, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation corridors are necessary to accommodate design requirements; specifically, wider curves are necessary to accommodate the speed of the HSR compared to lower-speed roadway alignments. The SR 152 (North) to Road 11 Wye Alternative would not follow existing transportation rights-of-way where it transitions from following one transportation corridor to another.

Alignment and Ancillary Features

The SR 152 (North) to Road 11 Wye Alternative would extend approximately 51 miles, mostly at-grade on raised embankment, although it would also have aerial structures. The wye configuration of this alternative would be located west-southwest of the city of Chowchilla, with the east-west axis along the north side of SR 152 and the north-south axis on the east side of Road 11.

As with the other three alternatives, this alternative would begin in Merced County at the intersection of Henry Miller Road and Carlucci Road, and would continue at-grade on embankment east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River and Eastside Bypass. Approaching Willis Road, the alignment would rise to cross the San Joaquin River on an aerial structure, return to embankment, then cross the Eastside Bypass on an aerial structure. After crossing the Eastside Bypass, this alternative would continue east, crossing SR 59 at-grade just north of the existing SR 152/SR 59 interchange, entering Madera County. To accommodate the SR 152 (North) to Road 11 Wye Alternative, the SR 152/SR 59 interchange would be reconstructed slightly to the south, and SR 59 would be grade-separated to



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-14 SR 152 (North) to Road 11 Wye Alternative Alignment and Key Design Features

pass above the HSR on an aerial structure. The alignment would continue east at-grade along the north side of SR 152 toward Chowchilla, splitting into two legs (four tracks) near Road 10 to transition to the Merced to Fresno Section: Hybrid Alternative, and would cross Ash Slough on an aerial structure. All but the northbound track of the San Jose to Merced leg of the alternative would then return to at-grade embankment; the northbound track would rise to cross over the tracks of the San Jose to Fresno leg on an aerial structure as it curves north toward Merced. The SR 152 (North) to Road 11 Wye Alternative legs would be routed as described below. Design drawings illustrating these features are provided in Volume III:

- The southbound track of the San Jose to Merced leg would turn north at-grade. This split would be west of Chowchilla, at approximately Road 10. The two San Jose to Merced tracks would continue north on the eastern side of Road 11, crossing the Chowchilla River, and then would cross over Road 11 following its west side. As the tracks return to grade, they would curve northwest, crossing Dutchman Creek on an aerial structure, following the west side of the UPRR/SR 99 corridor. The alignment would continue north, crossing over Sandy Mush Road on an aerial structure. The alignment would return to grade and continue along the west side of the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg would continue east from the wye split near Road 10, along the north side of SR 152 toward Chowchilla. It would be predominantly at-grade, ascending on aerial structures at several road crossings and Berenda Slough. The leg would pass south of Chowchilla at-grade, then rise to cross over the UPRR/SR 99 corridor and Fairmead Boulevard on an aerial structure. East of the UPRR/SR 99 corridor, the alignment would extend at-grade through Fairmead, north of Avenue 23. At approximately Road 20, the leg would curve southeast toward the BNSF corridor and cross Dry Creek on a short aerial structure. The SR 152 (North) to Road 11 Wye Alternative would align parallel to the west side of the BNSF corridor as it meets the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 13. The southbound track of the Merced to Fresno leg would ascend on aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would curve northwest, rise on a high embankment crossing over several roads, and continue at-grade on embankment to join the San Jose to Merced leg near Avenue 25.

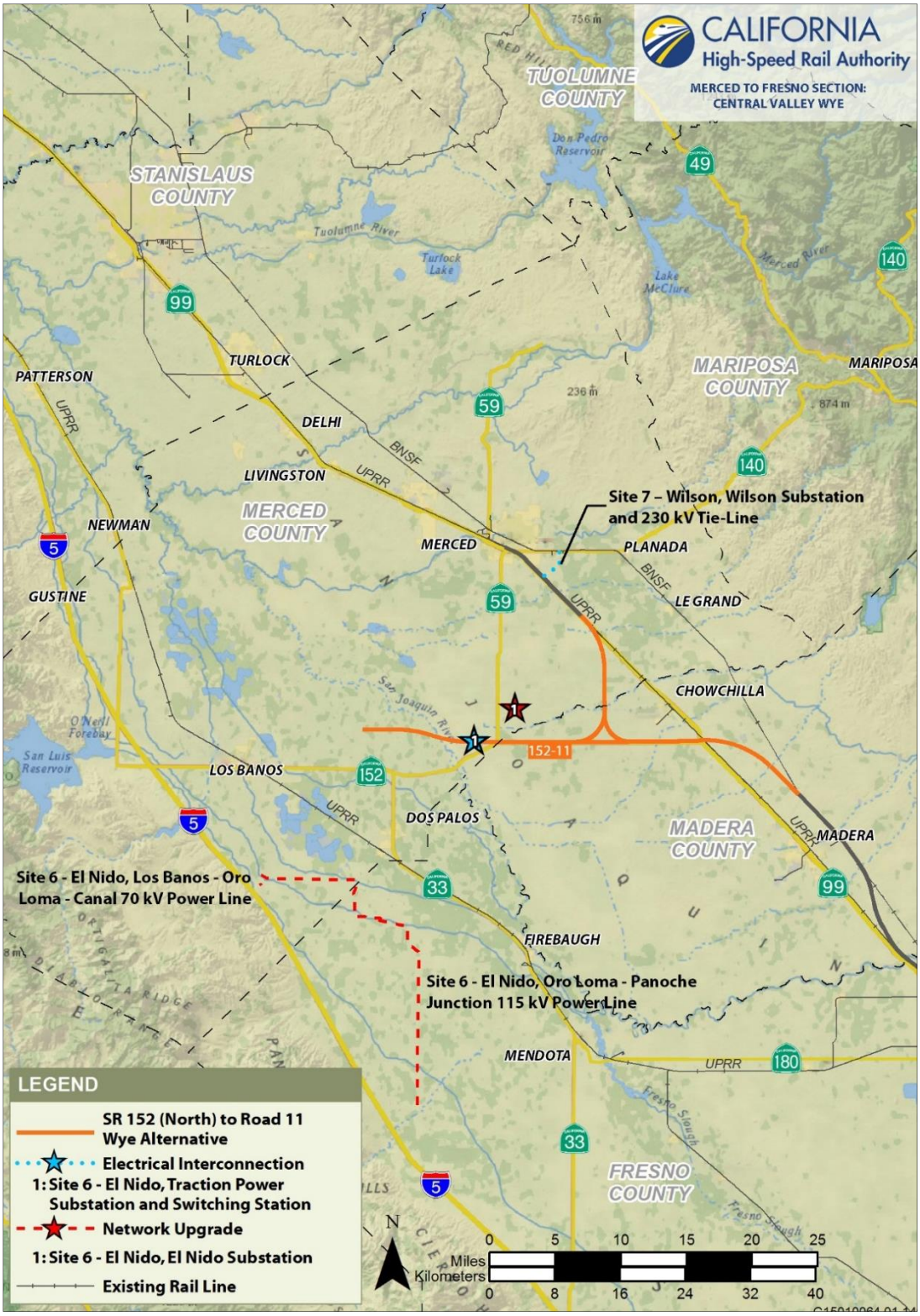
Wildlife undercrossing structures would be installed in at-grade embankments along this alternative where the alignment extends through wildlife corridors (see Appendix 2-A, Figure 2-12).

Electrical Interconnections and Network Upgrades

The electrical interconnections and network upgrades for the SR 152 (North) to Road 11 Wye Alternative would be the same as those described in Section 2.2.3.1. Figure 2-15 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 11 Wye Alternative.

State Highway or Local Roadway Modifications

The SR 152 (North) to Road 11 Wye Alternative would require the permanent closure of 33 public roadways at selected locations and the construction of 24 overcrossings or undercrossings in lieu of closure. Table 2-7, Figure 2-14, and Volume II, Appendix 3.2-A show the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade but need to be closed in order to convert SR 152 to a fully access-controlled corridor. The 14 proposed closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. Planned new grade separations along SR 152 at the SR 59/SR 152 Interchange, Road 4/Lincoln Road, Road 12, and Road 17 1/2 would



Source: ESRI/National Geographic, 2015

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Figure 2-15 SR 152 (North) to Road 11 Wye Alternative Electrical Interconnections and Network Upgrades

Table 2-7 Design Features of the Central Valley Wye Alternatives

Feature	SR 152 (North) to Road 13 Wye Alternative	SR 152 (North) to Road 19 Wye Alternative	Avenue 21 to Road 13 Wye Alternative	SR 152 (North) to Road 11 Wye Alternative
Alignment Features				
Total length (linear miles)[1]	52	55	53	51
At-grade profile (linear miles)[1]	48.5	48.5	48.5	46.5
Elevated profile (linear miles)[1]	3	3.5	4	4.5
Below-grade profile (linear miles)[1]	0.5	3	0.5	0
Number of straddle bents	32	31	32	27
Number of railroad crossings	1	3	1	1
Number of major water crossings	12	13	11	13
Number of road crossings	62	65	58	57
Approximate number of public roadway closures	38	36	30	33
Number of roadway overcrossings and undercrossings	24	29	28	24
Wildlife crossing structures	39	41	44	37
Electrical Features				
Traction power substation sites	1	2	1	1
Switching stations	1	2	1	1
Paralleling stations	8	7	7	7
Signaling and train-control elements	18	21	15	19
Communication towers	9	6	6	9

Source: Authority and FRA, 2016c; BNSF and UPRR, 2016

[1] Lengths shown are based on equivalent dual-track alignments and are one-way mileages. For example, the length of single-track elevated structure is divided by a factor of 2 to convert to dual-track equivalents.

maintain access to SR 152. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders. Several of these new interchanges would require realigning SR 152. Three new interchanges are proposed between SR 59 and SR 99 to provide access to SR 152: at Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where other roads are perpendicular to the proposed HSR. Between these over- or undercrossings, 19 additional roads would be closed. Local roads paralleling the proposed HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain their function. Access easements would be provided to maintain access to properties severed by HSR.

Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 11 Wye Alternative would cross over the UPRR right-of-way as it passes south of Chowchilla. This alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize impacts on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). In areas where the SR 152 (North) to Road 11 Wye Alternative parallels the UPRR right-of-way, the alternative maintains a minimum horizontal clearance of 102 feet from the centerline to the UPRR right-of-way (see Appendix 2-A, Figure 9).

2.2.3.5 Summary of Design Features

Table 2-7 shows the design features of the Central Valley Wye alternatives.

2.2.3.6 Features Common to All Central Valley Wye Alternatives

Many features are common to all four Central Valley Wye alternatives. Project design components, travel times, safety and security procedures, roadway modifications, and railroad modifications are similar among all alternatives. These features are described in the following subsections. Features that are unique to the alternative alignments, such as the electrical interconnections and network upgrades, are discussed for each alternative in Section 2.2.3, Description of the Central Valley Wye Alternatives.

Project Design Components

The design of the track and infrastructure for the Central Valley Wye alternatives is similar to the design described in Chapter 2 of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 2-3). For example, the Central Valley Wye alternatives evaluated in this Draft Supplemental EIR/EIS would include the following components described in the Merced to Fresno Final EIR/EIS:

- Infrastructure components, such as at-grade and elevated track profiles, described in Section 2.2.4, Infrastructure Components, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: pages 2-8 through 2-9).
- Grade separations described in Section 2.2.5, Grade Separations, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: pages 2-9 through 2-11).
- Traction power components described in Section 2.2.7, Traction Power Distribution, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: pages 2-13 through 2-15).
- Track structure types described in Section 2.2.8, Track Structure, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: page 2-15).

In addition to those components of the Central Valley Wye alternatives that are the same as those described in the Merced to Fresno Final EIR/EIS, the preliminary design of the alternatives includes:

- Enhanced access, such as road widening and new interchanges to HSR systems sites as a result of design refinements since publication of the Merced to Fresno Final EIR/EIS.
- Roadway adjustments to provide access to properties that become isolated from access to the public roadway network as a result of the Central Valley Wye alternatives.

- Expanded width of the project footprints in specific locations to accommodate design refinements since publication of the Merced to Fresno Final EIR/EIS.

Travel Time

A key performance measure of each alternatives is how it performs in terms of the travel time between the major destination cities. Proposition 1A specifies that the HSR system shall be designed to achieve a maximum nonstop service travel time between San Francisco and Los Angeles Union Station of 2 hours and 40 minutes and a 2 hour and 20 minute trip between Los Angeles and Sacramento. Unlike travel between San Francisco and Los Angeles, the travel time between these regions is not specified in Proposition 1A. Table 2-8 shows anticipated travel times for the Central Valley Wye alternatives from San Jose to Fresno, San Jose to Merced, and Merced to Fresno. As shown in Table 2-8, travel times deviate slightly for the alternatives in the San Jose to Fresno direction. The SR 152 (North) to Road 19 Wye Alternative has the longest distance and travel time between San Jose and Merced and between Merced and Fresno.

Table 2-8 Anticipated Travel Times for the Central Valley Wye Alternatives

Alternative	Travel Time (minutes:seconds)		
	San Jose to Fresno	San Jose to Merced[1]	Merced to Fresno
SR 152 (North) to Road 13 Wye	23.20	17:52	16:17
SR 152 (North) to Road 19 Wye	23.20	22:05	17:35
Avenue 21 to Road 13 Wye	23:24	18:43	16:47
SR 152 (North) to Road 11 Wye	23.20	17:20	16:31

Source: Authority and FRA, 2016a
SR = State Route
Travel times are calculated for the southbound track based on the alignment geometry, length of track, power consumption, and train behavior.
[1] No direct train services would be provided between San Jose and Merced through the Central Valley Wye under Phase 1 HSR operations.

Safety and Security

The HSR system would provide safety and security by applying risk-based System Safety and System Security programs that identify, assess, and reduce or avoid hazards and vulnerabilities for the HSR. Using domestic regulations, international experience, and industry best practices, the objective of the HSR System Safety and System Security programs is to adequately and consistently apply risk-based hazard avoidance measures. As discussed in Volume II, Appendix 2-A, HSR operations would follow safety and security plans developed by the Authority in cooperation with the FRA.

State Highway Modifications

All of the alternatives would require permanent road closures and new grade-separated crossings. The descriptions of the alternative in Section 2.2.3 specifies the number and location of closures and grade-separated crossings for each alternative. Depending on the HSR guideway type (i.e., whether the tracks are at grade or elevated) at these crossings, the HSR guideway would require construction easements, easements for columns within a state route, or modification of overcrossings or interchanges. Table 2-9 shows the locations of proposed state highway modifications resulting from the alternatives. Figure 2-16 illustrates the locations of the affected state facilities for each alternative.

Locating an HSR guideway adjacent to a state route would require modifying state highway and local roadway systems to maintain their function. Although much of the HSR interaction with state routes along the alternatives would be limited to encroachment into the Caltrans right-of-way, reconfiguration would occur in specific instances. The following sections first discuss proposed highway reconfigurations; descriptions of general modifications to state routes resulting from proximity of the alternatives follow.

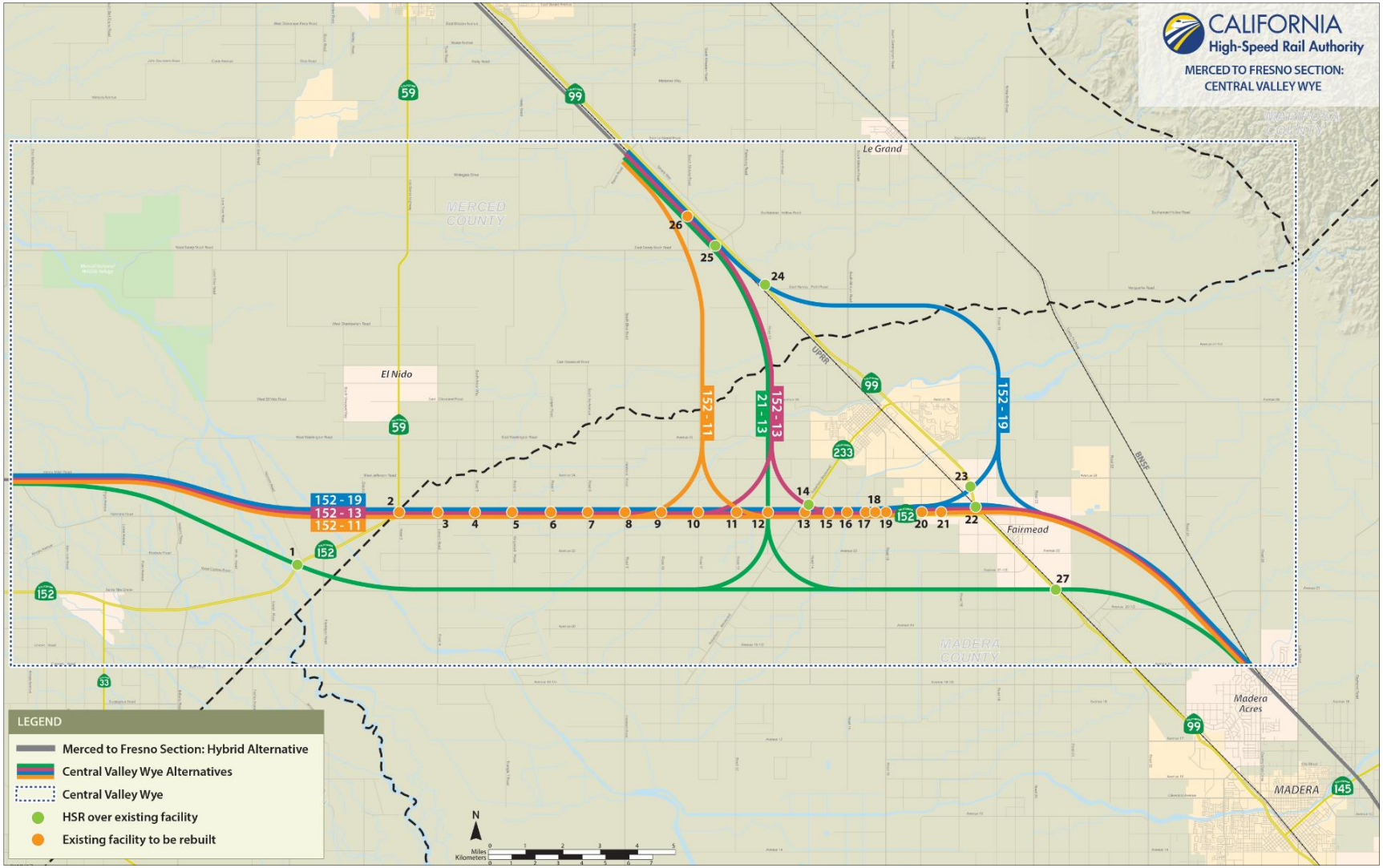
Table 2-9 Proposed Changes to California Department of Transportation State Facilities

No.	District-County-Highway	Location	Required Changes		Alternative				Notes
			Modification	Easement	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye	
1	10-Mer-152	SR 152 at Harmon Road		X			X		At-grade; HSR bridge
2	06-Mad-152	SR 59/SR 152 Interchange	X	X	X	X		X	Overhead grade separation and interchange
3	06-Mad-59	SR 59/SR 152 Interchange	X	X	X	X		X	Overhead grade separation and interchange
3	06-Mad-152	Road 4/Lincoln Road at SR 152	X	X	X	X		X	Overhead grade separation
4	06-Mad-152	Road 5 at SR 152	X		X	X		X	Closure
5	06-Mad-152	Road 6/Kingwood Road at SR 152	X		X	X		X	Closure
6	06-Mad-152	Road 7/Juniper Road at SR 152	X		X	X		X	Closure
7	06-Mad-152	Road 8 at SR 152	X		X	X		X	Closure
8	06-Mad-152	Road 9/Hemlock Road at SR 152	X	X	X	X		X	Overhead grade separation and interchange
9	06-Mad-152	Road 10 at SR 152	X		X	X		X	Closure
10	06-Mad-152	Road 11 at SR 152	X		X	X		X	Closure
11	06-Mad-152	Road 12 at SR 152	X	X	X	X		X	Underpass/overhead grade separation
12	06-Mad-152	Road 13 at SR 152	X		X	X	X	X	Closure

No.	District-County-Highway	Location	Required Changes		Alternative				Notes
			Modification	Easement	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye	
12	06-Mad-152	Road 13 at SR 152	X	X			X		At-grade; HSR bridge
13	06-Mad-152	SR 233/Robertson Boulevard at SR 152	X	X	X	X		X	Overhead grade separation and interchange
14	06-Mad-233	SR 233/Robertson Boulevard	X	X	X	X			At-grade; HSR bridge
15	06-Mad-152	Road 14 at SR 152	X		X	X		X	Closure
15	06-Mad-152	Road 14 1/2 at SR 152	X		X	X		X	Closure
16	06-Mad-152	Road 15 at SR 152	X		X	X		X	Closure
17	06-Mad-152	Road 15 1/2 at SR 152	X		X	X		X	Closure
18	06-Mad-152	Road 15 3/4 at SR 152	X		X	X		X	Closure
19	06-Mad-152	Road 16 at SR 152	X	X	X	X		X	Underpass grade separation and interchange
20	06-Mad-152	Road 17 at SR 152	X		X	X		X	Closure
21	06-Mad-152	SR 152 at Road 17 1/2	X	X	X	X		X	Overhead grade separation—SR 152 (North) to Road 13 Wye Underpass—SR 152 (North) to Road 19 Wye
22	06-Mad-99	SR 99 at SR 152		X	X	X		X	At-grade; HSR bridge
23	06-Mad-99	SR 99 near Chowchilla Boulevard		X		X			At-grade; HSR bridge

No.	District-County-Highway	Location	Required Changes		Alternative				Notes
			Modification	Easement	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye	
24	06-Mad-99	SR 99 at Harvey Petit Road	X	X		X			At-grade; HSR tunnel
25	06-Mad-99	Sandy Mush Road at SR 99	X	X	X	X	X	X	HSR retained cut
26	10-Mer-99	Athlone Road at SR 99	X	X	X	X	X	X	Closure
27	06-Mad-99	SR 99 at Avenue 21		X			X		At-grade; HSR bridge

Source: Authority and FRA, 2016b
District = California Department of Transportation District
HSR = High-Speed Rail
SR = State Route



Sources: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

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Figure 2-16 Location of Proposed Changes to State Transportation Facilities from Central Valley Wye Alternatives

State Route Reconfigurations

State Route 59/Los Banos Highway

Figure 2-16 illustrates that as the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative cross the Merced–Madera County boundary along SR 152, the alignment would be at-grade and would intersect with SR 59/Los Banos Highway. In order to separate the HSR right-of-way and SR 59/Los Banos Highway, the highway would be reconfigured vertically to cross over the HSR and SR 152. The proposed reconstruction of SR 59/Los Banos Highway would include rebuilding all ramps to current Caltrans standards. As part of the interchange reconfiguration, SR 152 would be realigned a maximum of 450 feet to the south with an 85-foot-wide unpaved median for a total of 1.75 miles.

State Route 233/Robertson Boulevard

Southwest of Chowchilla, the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative cross SR 233/Robertson Boulevard at-grade and would require separation. SR 233/Robertson Boulevard would remain on its current horizontal alignment, but the vertical profile would be raised to cross over the HSR right-of-way and SR 152. The proposed reconstruction of SR 233/Robertson Boulevard would include two 12-foot lanes, left-turn lanes, and access ramps bordered by 8-foot shoulders. SR 152 would be realigned a maximum of 350 feet to the south with an 85-foot-wide unpaved median for approximately 1.25 miles.

State Route 152

The SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative would be parallel to the north side of SR 152 and would require new interchanges at Road 9 and Road 16 to connect the local road network to the 15 miles of access-controlled highway. Road 9 and Road 16 would remain on their current horizontal alignments, but the vertical profile would be raised to cross over the HSR right-of-way and SR 152. The proposed reconstruction would include two 12-foot lanes, left-turn lanes, and access ramps bordered by 8-foot shoulders. SR 152 would be realigned a maximum of 350 feet to the south with an 85-foot-wide unpaved median for approximately 1.25 miles.

State Route 99

All alternatives would cross SR 99 on an aerial structure. There would be no permanent changes to the existing SR 99 alignment or associated ramps. Vertical clearance (minimum 16.5 feet over roadways) would be provided, and any obstructions (e.g., columns) within the 30-foot clear zone would be shielded with barrier or guardrail. Column placement would also accommodate future SR 99 interchange and widening (future concept provided by and coordinated with Caltrans).

The SR 152 (North) to Road 19 Wye Alternative would also cross SR 99 in a cut-and-cover tunnel. Under this alternative, SR 99 would be reconstructed on the roof of the HSR cut-and-cover tunnel while maintaining the same horizontal and vertical alignment. It is proposed that SR 99 would be reconstructed with 12-foot lanes and 10-foot shoulders, duplicating the existing conditions.

State Highway Underpasses

At locations where the HSR alignment is proposed to cross over state highways on aerial structures, the possibility of encroaching into the Caltrans right-of-way would depend on where the HSR aerial structure columns would be placed. Placing precast aerial structure sections may require temporarily closing the Caltrans right-of-way. Traffic would be detoured onto local streets during temporary closures.

Roadway Grade Separations

The Authority and FRA propose grade separations (overheads or underpasses) to maintain function of the state highway and local road systems where the HSR alignment would be at-grade

and run parallel to state routes.[20] Intersecting roads with projected traffic volumes that justify grade separation would be realigned horizontally and adjusted vertically to cross over or under the state highway and the HSR alignment. The possibility of encroaching into the Caltrans right-of-way would depend on the placement of the overcrossing columns.

Undercrossings would require structures at the location of the existing state route. The design intent of these crossings is to maintain the existing intersection and traffic patterns during construction. Some temporary road closures may be required during construction, and local traffic would use one of the other overcrossings, undercrossings, or intersections in the vicinity. Building the state route structure for undercrossings would require a temporary detour of the state route.

Leg of Intersection Eliminations

One leg of an existing at-grade intersection with a state highway would be eliminated where the road would be located close to other accessible, proposed grade separations, or where its existing annual average daily traffic is not high enough to warrant its own grade separation. Caltrans also requested that SR 152 be converted to a controlled-access facility wherever the HSR right-of-way is adjacent to it. This would be accomplished by eliminating all access to SR 152 except at interchanges. There are no changes to the Caltrans right-of-way because no structures would be required. Local traffic would use one of the other grade separations in the vicinity.

Ramp Modifications

Ramp modifications would be required where the HSR track is on an aerial structure and the proposed work would directly modify the existing alignments of roadways or off-ramps. These ramps would be modified to avoid the proposed work and to accommodate any other roadway realignments that result from building the HSR. Although the modifications would be slight, additional right-of-way may be required for the realigned ramps. Roadway traffic would likely use existing facilities while the realigned ramps are being built.

Freight or Passenger Railroad Modifications

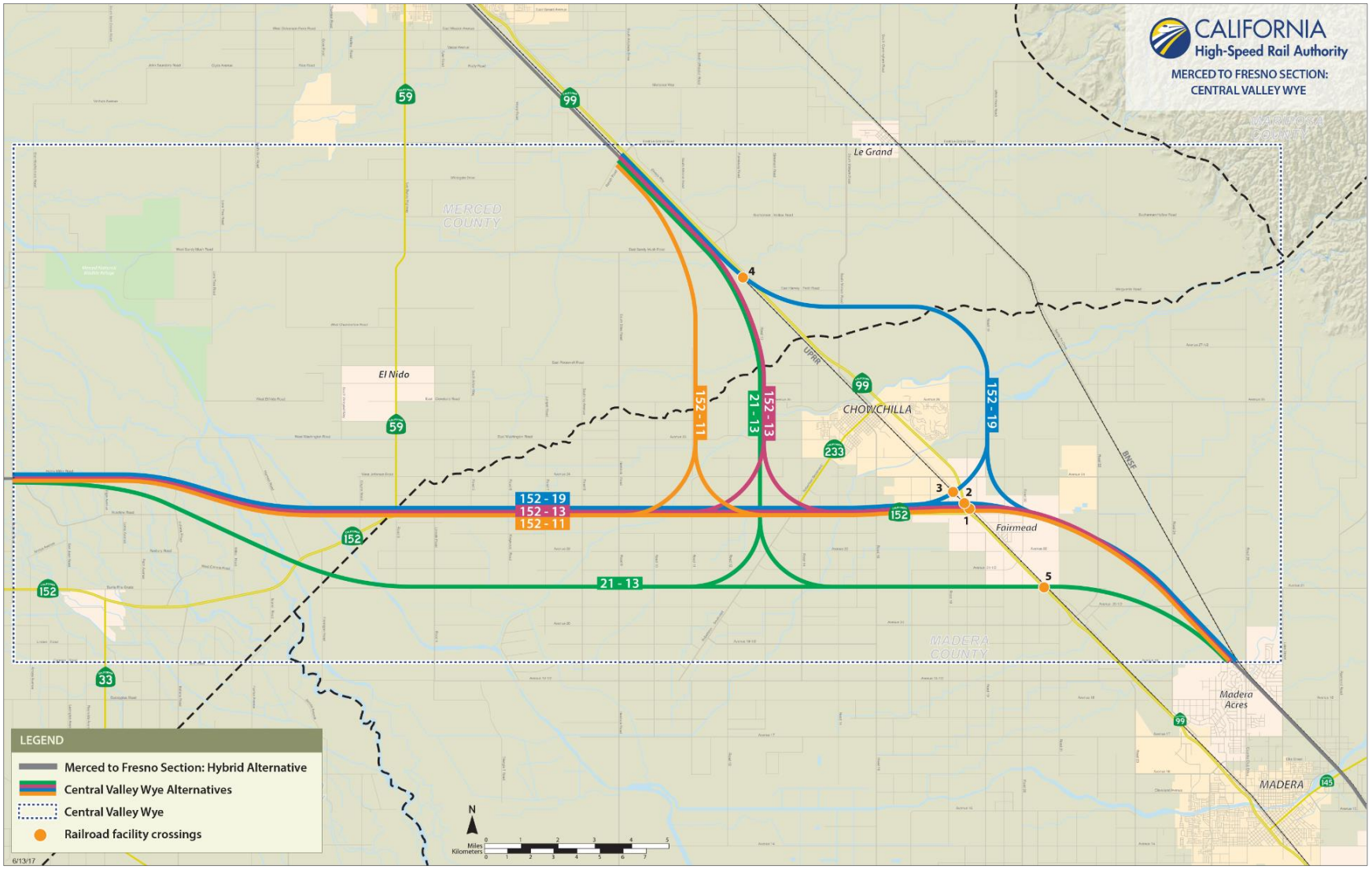
Each of the alternatives would cross the UPRR corridor at new grade-separated crossings. The modifications to this railroad that the alternatives might require depend on the HSR guideway type at each crossing. Table 2-10 shows the proposed freight or passenger railroad modifications required for the Central Valley Wye alternatives, and Figure 2-17 illustrates the locations of the facilities.

Table 2-10 Proposed Freight or Passenger Railroad Modifications Required for Central Valley Wye Alternatives

No.	Railroad Route	Description	Alternative
1	UPRR	Aerial structure above the RR	SR 152 (North) to Road 13 Wye SR 152 (North) to Road 11 Wye
2	UPRR	Aerial structure above the RR	SR 152 (North) to Road 19 Wye
3	UPRR	Aerial structure above the RR	SR 152 (North) to Road 19 Wye
4	UPRR	Cut-and-cover tunnel below RR	SR 152 (North) to Road 19 Wye
5	UPRR	Aerial structure above the RR	Avenue 21 to Road 13 Wye

Source: Authority and FRA, 2016c
UPRR = Union Pacific Railroad
RR = Railroad
SR = State Route

[20] An overhead is a road or highway passing over a railroad and an underpass is a road or highway passing under a railroad.



Source: ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015; Authority and FRA, 2016c

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Figure 2-17 Location of Railroad Facilities Crossed by Central Valley Wye Alternatives

In most locations, the HSR alignment would be elevated to cross over the UPRR operational right-of-way on an aerial structure. In these instances, each of the alternatives would maintain a 23.3-foot vertical clearance over UPRR tracks to avoid or minimize impacts on other UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016).

2.2.3.7 Impact Avoidance and Minimization Features

The Authority has developed impact avoidance and minimization features (IAMF) that are applicable to the Central Valley Wye alternatives. IAMFs are standard practices, actions, and design features that the Authority and FRA have incorporated into the Central Valley Wye alternatives.

Volume II, Appendix 2-B, California High-Speed Rail: Impact Avoidance and Minimization Features, presents complete descriptions of all IAMFs. This Draft Supplemental EIR/EIS describes IAMFs applicable to each resource section in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures. The Mitigation Monitoring and Enforcement Program would track each IAMF.

2.2.3.8 Right-of-Way Acquisition for Construction, Operations, and Maintenance of High-Speed Rail

Right-of-way would be acquired for any of the four Central Valley Wye alternatives and would include areas for permanent acquisition to operate and maintain the HSR system, as well as areas temporarily needed to construct the selected alternative. These acquisitions would include residential, agricultural, commercial, and industrial property, as well as property being currently used for transportation infrastructure (rail and road). Table 2-11 shows the acquisitions that would be required to construct, operate, and maintain each of the four Central Valley Wye alternatives.

Table 2-11 Right-of-Way Acquisition

Resource Category	SR 152 (North) to Road 13 Wye	SR 152 (North) to Road 19 Wye	Avenue 21 to Road 13 Wye	SR 152 (North) to Road 11 Wye
Property Acquisitions (acres – all property types)				
Permanent Right-of-Way Acquisition for HSR Operations and Maintenance	2,615	2,804	2,414	2,565
Additional Temporary Right-of-Way Acquisition for HSR Construction	657	1,227	486	536
Property Acquisitions (residential, commercial, industrial, and agricultural facilities)				
Residential Acquisitions	Approximately 96 residential units	Approximately 119 residential units	Approximately 65 residential units	Approximately 62 residential units
Commercial and Industrial Acquisitions	Approximately 4 commercial and 4 industrial properties	Approximately 4 commercial and 4 industrial properties	Approximately 1 industrial property	Approximately 4 commercial and 3 industrial properties
Agricultural Facility Acquisitions	Approximately 21 displaced agricultural facilities, and 5 relocated or reconfigured dairies	Approximately 17 displaced agricultural facilities, and 2 relocated or reconfigured dairies	Approximately 29 displaced agricultural facilities, and 4 relocated or reconfigured dairies	Approximately 16 displaced agricultural facilities, and 2 relocated or reconfigured dairies

Source: Author's compilation, 2017

2.3 Updated Travel Demand and Ridership Forecasts

The level of annual HSR ridership plays a role in the analysis of environmental impacts and benefits for traffic, air quality, noise, and energy. The Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: pages 1-28 through 1-30) was based on ridership forecasts that ranged from 69.3 to 98.2 million riders annually in 2035, assuming full build out of the entire 800-mile HSR system (Phase 1 and Phase 2), and based on two ticket price scenarios (high and low price). The Final EIR/EIS assessed adverse impacts conservatively using the high end of the range and assessed benefits conservatively using the low end of the range.

Chapter 1 of the Merced to Fresno Final EIR/EIS discussed the implications of the Authority's Revised 2012 Business Plan on project phasing, ridership forecasts, and the document's evaluation of impacts. The Final EIR/EIS explained that the Revised 2012 Business Plan approach to project phasing would not alter the construction impacts outlined in the Final EIR/EIS, but that significant impacts and benefits of project operations in certain areas were expected to be lower than presented in the Final EIR/EIS because of lower forecasted ridership that would build more slowly over time. Phase 1 ridership was identified in the Revised 2012 Business Plan as 19.6 to 31.8 million riders in 2035, increasing to 20.1 to 32.6 million riders annually in 2040. This is described in more detail in the Addendum to the Final EIR/EIS (Authority and FRA 2012b).

This document utilizes ridership forecasts consistent with Exhibit 7.1 Ridership: San Jose – North of Bakersfield (Silicon Valley to Central Valley Line) through Phase 1 in the Authority's 2016 Business Plan, which refines and updates the ridership projections from the Authority's 2012 Business Plan. The 2016 Business Plan estimates HSR system ridership at full buildout of Phase 1 at 42.8 million riders per year in 2040 under the medium ridership scenario, up to 56.8 million riders per year under the high ridership scenario. Eventual HSR system ridership would depend on many uncertain factors, such as the price of gasoline or eventual cost of an HSR ticket. Accordingly, the HSR system is designed to accommodate the broad range of future ridership over the coming decades. For more information about how HSR system ridership affects system design, see the Merced to Fresno Final EIR/EIS Section 2.5.1, Ridership and HSR System Design (Authority and FRA 2012a: pages 2-93 through 2-94).

Updated ridership forecasts were used in the following technical analysis sections in Chapter 3:

- Section 3.3, Air Quality and Global Climate Change: Two ridership scenarios from the 2016 Business Plan (medium and high) were used in modeling emissions. These ridership scenarios were modeled both with and without the Central Valley Wye alternatives in 2015, representing the CEQA baseline, and in 2040 for full operation of Phase 1.
- Section 3.4, Noise and Vibration: The analysis uses the modeled number of 1 to 2 train passes per hour. Train passes per hour were obtained from the service plan assumptions in the 2016 Business Plan (Table 3.2 in the Ridership Revenue Forecast).
- Section 3.6, Public Utilities and Energy: Two ridership scenarios (medium and high) were used to model energy use for the 2040 full operation of Phase 1, consistent with the 2016 Business Plan.

Other technical analyses in Chapter 3 are not directly reliant on ridership numbers. For example, as there is no station or maintenance facilities proposed under any of the Central Valley Wye alternatives, there would be no change to local vehicle generating activities. Therefore, Section 3.2, Transportation, does not rely on ridership scenarios to determine potential local congestion issues.

2.4 Updated Operations and Service Plan

2.4.1 HSR Service

The 2016 Business Plan anticipates service between the Silicon Valley and the Central Valley (Valley to Valley) by 2025. Phase 1 is anticipated to be complete by 2040 and would provide

service from San Francisco to Los Angeles and Anaheim. Subsequent stages of the HSR system include a southern extension from Los Angeles to San Diego through the Inland Empire and an extension from Merced north to Sacramento.

In 2025, 40 trains would operate daily between the Silicon Valley and Central Valley. When the HSR is fully operational in 2040, 232 trains would operate daily throughout the HSR system to meet ridership demands.

The anticipated travel time for the Central Valley Wye alternatives between San Jose and Fresno is 23 minutes 20 seconds; travel time between San Jose and Merced is between 17 and 22 minutes; travel time between Merced and Fresno is between 16 and 17 minutes (Table 2-8). The maximum operating speed would reach 220 mph in this section. Train service in the corridor is anticipated to run from around 6:00 a.m. to midnight. Non-service activities required to maintain the system are anticipated to occur overnight during non-revenue service hours.

The service plan concept for the horizon year of 2040 estimates that the main HSR line through the Central Valley would have eight trains per hour in each direction during the peaks, and five trains per hour at other times. Because of capacity constraints coming from the shared-use operations between Caltrain regional rail service and the HSR service, the level of HSR service along the Peninsula Corridor would be limited at four trains per hour in each direction throughout the day. During off-peak periods, the base level of service would provide three trains per hour between San Francisco and Los Angeles, one train per hour between San Francisco and Anaheim, and one train per hour between Merced and Anaheim in each direction. During the peak periods, there would be two extra trains per hour operating south of San Jose and one train per hour between Merced and Los Angeles in addition to the five trains per hour in each direction in the off-peak base service with one of those hourly San Francisco-Los Angeles trains extended to Anaheim. For more detail and conceptual train stopping patterns, see Volume II, Appendix 6-A, Operations and Service Plan.

2.4.2 Maintenance Activities

The Authority would regularly perform maintenance along the track and railroad right-of-way, as well as on the power systems, train control, signalizing, communications, and other vital systems required for the safe operation of the HSR system. The Authority expects maintenance methods to be comparable to those of existing European and Asian HSR systems, adapted to the specifics of the California HSR system. However, the FRA would specify standards of maintenance, inspection, and other items in a set of regulations to be issued in the next several years, and the overseas practices may be amended in ways not currently foreseen. Therefore, these brief descriptions of maintenance activities are based on best judgment about future practices in California:

- **Track and Right-of-Way**—The track at any point would be inspected several times a week using measurement and recording equipment aboard special measuring trains. These trains are of similar design to the regular trains but would operate at a lower speed. They would run between midnight and 5:00 a.m. and would usually pass over any given section of track once in the night.

  Most adjustments to the track and routine maintenance would be accomplished in a single night at any specific location; work trains would bring crews and material along the line. When rail grinding is needed, perhaps several times a year, specialized on-track equipment would pass over the track sections at 5 to 10 mph.

  Approximately every 4 to 5 years, at-grade or on embankment ballasted track would require resurfacing through tamping. This more intensive maintenance of the track uses a train with a succession of specialized cars to raise, straighten, and tamp the ballast rock, using vibrating “arms” to move and position the ballast under the ties. The train would typically cover a mile-long section of track in the course of one night’s maintenance. Slab track, which is expected to comprise track on elevated aerial structure sections, would not require this activity. Once built, no major track components are expected to require replacement through 2040.

Other maintenance of the right-of-way, aerial structures, and bridge sections of the alignment would include drain cleaning, vegetation control, litter removal, and other inspections that would typically occur monthly to several times a year.

- **Power**—The overhead contact system along the right-of-way would be inspected nightly, with repairs made when needed, which would typically be accomplished in one night's maintenance window. Other inspections would occur monthly. Many of the functions and status of TPSSs and smaller facilities outside the trackway would be remotely monitored; however, staff would visit to repair or replace minor items, and would also schedule visits several times a month to check the general site. Once installed, no major component replacement of the overhead contact system or the TPSSs is expected through 2040.
- **Structures**—Visual inspections of the structures along the right-of-way and testing of fire- and life-safety systems and equipment in or on structures would occur monthly, while inspections of all structures for structural integrity would occur annually at minimum. Steel structures would also require painting on a routine basis. For tunnels and buildings, repair and replacement of lighting and communication components would be performed on a routine basis. Once built, no major component replacement or reconstruction of any structures are expected through 2040.
- **Signaling, Train Control, and Communications**—Inspection and maintenance of signaling and train control components would be guided by FRA regulations and standards that the Authority would adopt. Typically, physical in-field inspection and testing of the system would occur four times per year using hand-operated tools and equipment. Communication components would be routinely inspected and maintained, usually at night, although daytime work may occur if the work area is clear of the trackway. No major component replacement of these systems is expected through 2040.
- **Perimeter Fencing and Intrusion Protection**—Fencing and intrusion protection systems would be remotely monitored and inspected periodically. Maintenance would be performed as needed, but the fencing or systems are not expected to require replacement through 2040.

2.5 Updated Construction Plan

2.5.1 Design/Build Project Delivery

As discussed in Section 2.8, Construction Plan, of the Merced to Fresno Final EIR/EIS, the Central Valley Wye alternatives would be built using a design-build approach (Authority and FRA 2012a: page 2-101). This method of project delivery involves a single contract between the Authority and the contractor to provide both design and construction services. This differs from the design-bid-build approach, where design and construction services are managed under separate contracts and the design is completed before the project is put out for construction bids. The design-build approach offers opportunity for innovation and for cost-saving alternative construction methods to be considered through the final design process. The Authority's contract with the design-build contractor would require compliance with standard engineering design and environmental practices and regulations, as well as implementation of the design features and mitigation measures included in this Draft Supplemental EIR/EIS. For more information on the design-build delivery process, see Volume II, Appendix 2-A.

2.5.2 General Construction Approach

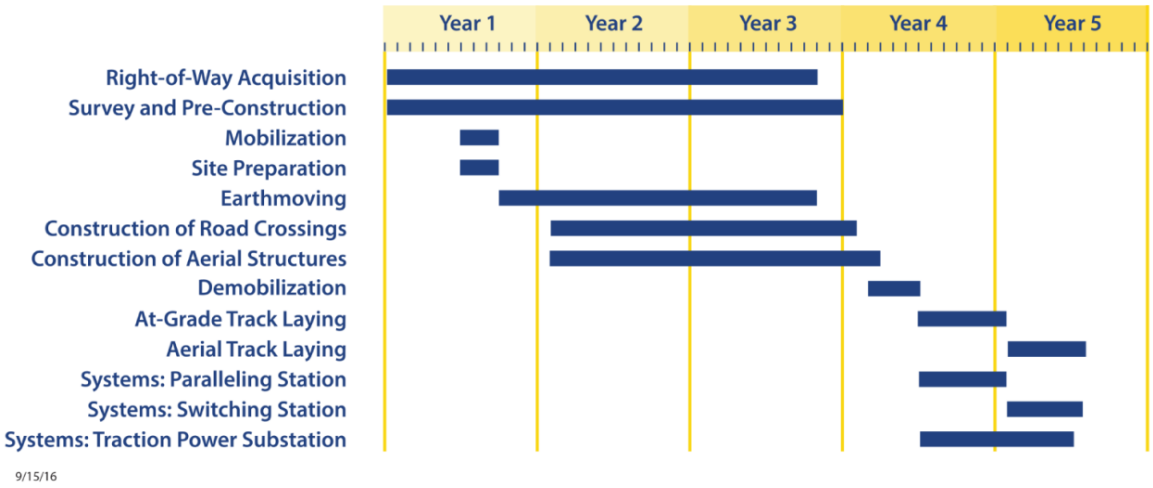
Upon receiving the required environmental approvals and securing needed funding, the Authority would advance the design, acquire right-of-way, perform environmental Phase 1 and Phase 2 investigations[21] and geotechnical borings, and conduct biological or cultural resources investigations still required under permits and agreements. The Authority would then begin

[21] Phase 1 and Phase 2 investigations are typically conducted to assess the likelihood of the presence of hazardous materials or wastes, to determine and characterize the concentration and distribution of contaminants, and to determine future remediation options.

implementing its construction plan. Given the size and complexity of the HSR system, the design and construction work could be divided into a number of procurement packages. In general, the procurement would address the following:

- Civil/structural infrastructure, including design and construction of passenger stations, maintenance facilities, and right-of-way structures.
- Trackwork, including design and construction of direct fixation track and sub-ballast, ballast, ties and rail installation, switches, and special trackwork.
- Core systems, such as traction power, train controls, communications, the operations center, and the procurement of rolling stock.

The Authority would develop one or more design-build packages and then issue construction requests for proposals, start right-of-way acquisition, and procure construction management services to oversee physical construction of the project. During peak construction periods, it is anticipated that work would occur at several locations along the route, with overlapping construction of various project elements. Working hours and workers present at any time would vary depending on the activities being performed. Where construction fencing is required, it would be restricted to areas designated for construction staging and areas where public safety is an issue. Figure 2-18 illustrates the approximate durations of construction activities for building each of the phases of the Central Valley Wye alternatives; the design-build contractor would set the actual schedule.



Source: Authority and FRA, 2016c

Figure 2-18 Typical Construction Durations

Consistent with the *Memorandum of Understanding for Achieving an Environmentally Sustainable High-Speed Train System in California* (Authority et al. 2011), the Authority intends to build the Central Valley Wye alternatives using sustainable methods that:

- Minimize the use of nonrenewable resources.
- Minimize the impacts on the natural environment.
- Protect environmental diversity.
- Emphasize the use of renewable resources in a sustainable manner. An example of this approach would be the use of recycled materials for construction (e.g., asphalt, concrete or Portland cement concrete, excavated soil).

A design-build contractor would excavate fill material from local, permitted borrow sites and travel from 10 to 40 miles by truck to the HSR alignment. There are many local sites in Merced and Fresno that the contractor could use (California Geological Survey 2012). The contractor would also source railroad ballast from existing, permitted quarries located within the Bay Area. These sites would be located outside the project footprints. Multiple scenarios involving a combination of transportation modes (rail only, truck only, and rail and trucks) were evaluated for ballast delivery. All materials would be suitable for construction purposes and free from toxic pollutants in toxic amounts, in accordance with applicable local, state, and federal regulations. Applicable design standards, including compliance laws, regulations, and industry standard practices, are included in Volume II, Appendix 2-C, Applicable Design Standards.

2.5.3 Pre-Construction Activities

During final design, the Authority and its contractor would conduct a number of pre-construction activities to determine how best to stage and manage actual construction. The Merced to Fresno Final EIR/EIS, Table 2-15, Construction Sequence, presents these activities, which also apply to the Central Valley Wye alternatives (Authority and FRA 2012a: page 2-102). The following pre-construction activities are new or have changed:

- Identifying construction laydown and staging areas used for mobilizing personnel, stockpiling materials, and storing equipment for building HSR or related improvements. In some cases, this area is also used to assemble or pre-fabricate components of guideway or wayside facilities before transport to installation locations. Also identify precasting yards, which would be needed for the casting, storage, and preparation of precast concrete segments, temporary spoils storage, workshops, and the temporary storage of delivered construction materials. Field offices or temporary jobsite trailers would also be located at the staging areas. Construction laydown areas are part of the project footprints that are evaluated for potential environmental impacts, yet actual use of the areas are left to the discretion of the design-build contractor.

2.5.4 Major Construction Activities

The major construction activities for the Central Valley Wye alternatives are the same as those activities described in Section 2.8.3, Major Construction Activities, of the Merced to Fresno Final EIR/EIS (Authority and FRA 2012a: pages 2-103 through 2-105), with the exception of station construction; these elements are not repeated here. Volume II, Appendix 2-D describes construction activities associated with these components. Moreover, the Central Valley Wye alternatives include tunnel construction, as briefly described in this section.

2.5.4.1 Tunnels

Any tunnel constructed for the Central Valley Wye alternatives would use a cut-and-cover construction method. Cut-and-cover tunneling is a simple tunnel construction method used to build shallow tunnels (less than 40 feet deep), as described in Volume II, Appendix 2-A, High-Speed Rail System Infrastructure. One of two construction types may be employed to build a cut-and-cover tunnel:

- **Bottom-Up Tunnel Construction**—In the bottom-up or caisson wall method, a drilling rig is used to install caisson walls down to the existing bedrock. Once the caisson walls are in place, soil between the walls is excavated to a depth below the tunnel floor. A concrete slab is poured for the tunnel floor, followed by the tunnel side walls from the bottom up. After the tunnel walls are completed, the roof is built and the roadway or ground over the tunnel restored. Materials used for structure support in building the tunnel may include concrete, precast concrete, precast arches, or corrugated steel arches.
- **Top-Down Tunnel Construction**—In the top-down or diaphragm wall method, the opposite process is used to build the tunnel. A trencher or trench cutter is typically used to dig a trench first before concrete walls are built. This process consists of using a slurry mixture to build a slurry wall. The slurry wall provides temporary support to the trench sides before concrete is poured for a permanent wall structure. Once the concrete tunnel walls are completed, the

tunnel roof is constructed and the surface roadway or ground is restored. Excavated tunnel material is carried out through tunnel openings in the roof top-down to the tunnel floor. The tunnel floor slab is constructed last.

2.6 Permits

The Authority and FRA have entered into agreements with environmental resource agencies to facilitate regulatory compliance required during final design and construction. These agreements identify the Authority's responsibilities in meeting regulatory requirements of the federal, state, and regional environmental resource agencies. An example of this is the Memorandum of Understanding executed in 2010 among the Authority, the FRA, the USACE, and the USEPA (FRA et al. 2010) integrating NEPA, Clean Water Act Section 404, and Rivers and Harbors Act Section 14 processes. The Authority and FRA also coordinated with the U.S. Coast Guard, and the U.S. Coast Guard confirmed that this project is not within its jurisdiction (Sulouff 2011).

Table 2-12 lists the major environmental authorizations required for the Central Valley Wye alternatives and associated electrical interconnections and network upgrades. The table identifies each agency's status as a NEPA cooperating agency or CEQA responsible agency. The agencies identified in Table 2-12 are anticipated to rely on the forthcoming Final Supplemental EIR/EIS to support their regulatory decisions.

Table 2-12 Potential Major Environmental Permits and Approvals

Agency	Permit
Federal	
U.S. Army Corps of Engineers (NEPA Cooperating Agency)	Section 404 Individual Permit for Discharge of Dredge or Fill Materials into Waters of the U.S., including wetlands under the Clean Water Act of 1972 Section 10 Permit for Construction of any Structure in or over any Navigable Water of the United States under the Rivers and Harbors Act of 1899 Section 408 Letter of Permission to modify, alter, or occupy a USACE Civil Works project under the Rivers and Harbors Act of 1899
U.S. Department of Interior/ Federal Railroad Administration	Section 4(f) of the U.S. Transportation Act of 1966
U.S. Advisory Council on Historic Preservation and the California State Historic Preservation Office	Section 106 Consultation (National Historic Preservation Act of 1966) and Memorandum of Agreement
U.S. Environmental Protection Agency	Review of Environmental Justice conclusions General Conformity Determination
U.S. Fish and Wildlife Service	Section 7 Consultation and Biological Opinion pursuant to the Endangered Species Act of 1973
National Oceanic and Atmospheric Administration, National Marine Fisheries Service	Section 7 Consultation and Biological Opinion pursuant to the Endangered Species Act of 1973
Surface Transportation Board (NEPA Cooperating Agency)	Authority to construct and operate new rail line pursuant to the Interstate Commerce Act, as amended by the ICC (Interstate Commerce Commission) Termination Act
U.S. Bureau of Reclamation (NEPA Cooperating Agency)	Temporary Construction Permit to alter or relocate irrigation facilities crossed by HSR system

Agency	Permit
State	
California Department of Fish and Wildlife (CEQA Responsible Agency)	California Department of Fish and Wildlife Section 1602 Lake and Streambed Alteration Agreement Incidental Take Permit under Section 2081 of the California Fish and Game Code
Caltrans (CEQA Responsible Agency)	Caltrans Encroachment Permits
California Public Utilities Commission (CEQA Responsible Agency)	Approval for construction and operation of railroad crossing of public roads and ministerial Notice of Construction or discretionary Permit to Construct for construction associated with network upgrades.
State Water Resources Control Board, Central Valley Regional Water Quality Control Board (CEQA Responsible Agency)	Section 401 Water Quality Certification under the Clean Water Act of 1972 Waste Discharge Requirements under the California Porter-Cologne Water Quality Control Act Section 402 National Pollutant Discharge Elimination System Water Discharge Permit Dewatering Permit (Order No. 98-67) Spill Prevention, Control, and Countermeasure Plan (part of Section 402 process) Stormwater Construction and Operation Permit
Central Valley Flood Protection Board (CEQA Responsible Agency)	California Code of Regulations, title 23, section 2, and 33 C.F.R. Part 208.10 (flood protection facilities) 33 C.F.R. Part 408
Regional	
San Joaquin Valley Air Pollution Control District (CEQA Responsible Agency)	Rule 201 General Permit Requirements, Rule 403 Fugitive Dust, Rule 442 Architectural Coatings, and Rule 902 Asbestos

Source: Author's compilation, 2017
NEPA = National Environmental Policy Act
CEQA = California Environmental Quality Act
Caltrans = California Department of Transportation
C.F.R. = Code of Federal Regulations
USACE = U.S. Army Corps of Engineers