As shown in the above table, potential high-contrast visual impacts on the highly scenic mountain passes and open space landscapes have been identified for both the Modal and HST Alternatives in the Bay Area region (Pacheco Pass and Diablo Mountain Range), and in the Bakersfield to Los Angeles region (Pyramid Lake and Soledad Canyon). For the proposed HST Alternative, about 95 mi (153 km) of potential alignments through the scenic natural areas shown on conceptual design maps are proposed to be placed in tunnel through the Pacheco Pass and Diablo Range. For the Los Angeles to Bakersfield region, about 38 mi (62 km) of the potential HST corridor are proposed to be in tunnel in the mountainous area, and about 5 mi (8 km) would be in trench. The plan and profile of the alignments would be decided in the subsequent phase of the project development.

Shadow impacts would result from expanded highway bridges (Modal Alternative), from elevated guideways (HST Alternative), and from noise barriers for both alternatives. For all five regions, the potential visual impacts from the HST Alternative would generally be greater than visual impacts described for the Modal Alternative, primarily because the proposed HST system would introduce a new design feature to the landscapes, and the Modal Alternative would be an expansion of existing facilities. None of these potential impacts are unavoidable at this stage of review. Subsequent analysis and engineering design for the proposed HST Alternative would address feasible alignment options to further reduce visual impacts for areas identified as potential high visual contrasts with existing landscape features.

Following is a summary of the key differences among alternatives and potential HST alignment options for each of the five regions. The bulleted text in the HST discussion briefly summarizes the key differences among HST alignment options for each region.

A. BAY AREA TO MERCED

Modal Alternative

As part of the Modal Alternative, the expansion of SR-152 from four lanes to six lanes from US-101 in the Gilroy area to the junction with SR-156 north of Hollister would be most sensitive to potential visual impacts. This winding two-lane highway traverses agricultural and mountainous landscapes, passing through scenic rural, village, and wetland settings. Widening and straightening the highway through this scenic area would involve removal of vegetation and expanded cut and fill that would add to the dominant line and color of the existing highway and detract from the natural landscape features.

High-Speed Train Alternative

- The UPRR main line north of Hayward would have less potential visual impact than the Burlington Northern Santa Fe (BNSF) Niles Branch that would impact the historic town of Niles near the mouth of the scenic Niles Canyon.
- The I-880 option would have less potential visual impact than the Mulford Line option that crosses the Don Edwards San Francisco Bay National Wildlife Refuge.
- The northern tunnel option would "fly" over a residential neighborhood and result in shadow impacts before entering a highly visible tunnel portal to cross through the Diablo Mountain Range. This option would pass north of Henry Coe State Park and would cross the Diablo Range in a series of tunnels; the tunnel under the park option would cross under Henry Coe State Park. These options would have less potential visual impact than the at-grade option across Henry Coe State Park.
- The Pacheco Pass crossing would potentially impact visual resources less than the more northern Diablo Range options because it would parallel the existing linear feature of SR-152 before going in tunnel to cross the natural area of Pacheco Pass.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

No potential visual impacts were identified for the highway improvements included in the Modal Alternative or airport improvements in this region.

High-Speed Train Alternative

All potential HST alignment options in this region were ranked as having low potential for visual impacts; only stations would have potential visual impacts because of the proximity to historic structures and architecture. The loops around the center of towns would have less visual impact than the alignment options going through town centers; however, they would be visible from long distances as new alignments in the less-developed bypass areas.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

There are two scenic corridors adjacent to two of the segments of the Modal Alternative in this region. The I-5: SR-14 to I-405 segment is adjacent to 2.5 mi (4 km) of a designated scenic route along I-5 between SR-14 and I-405. There would be moderate visual contrasts on this corridor from the double-decking of four lanes over I-5. The I-5: SR-99 to SR-14 segment of highway would be widened by two additional lanes, and this segment would be visible from the Pyramid Lake Visitor Center, and from the Castic Lake Viewing rest area where views of a wider roadway and expanded cut of the hillside would contrast with the natural landscape.

High-Speed Train Alternative

The following HST alignment options would result in the lowest impacts on aesthetics and visual quality in this region.

- The I-5 corridor with the Wheeler Ridge alignment option to Bakersfield would result in the lowest aesthetics/visual quality impacts of the alignments between Bakersfield and Sylmar. Moderate contrast impacts associated with cut and fill would occur along approximately 7.5 mi (12 km) where the alignment would be close to I-5 and/or adjacent to existing roads that parallel I-5. Contrast impacts would be lower in these areas because the landform has previously been graded and altered for these existing roads. Visual impacts would therefore be minimized by locating the alignment in the area of the existing transportation corridor. In comparison, the SR-58/Soledad Canyon corridor would result in approximately 6.2 mi (10 km) of high-contrast cut-and-fill impacts in Soledad Canyon and 11.8 mi (19 km) of high-contrast cut-and-fill impacts in the mountainous area of SR-58. The landform in the mountainous areas on the Antelope Valley corridor would be largely unaltered. Visual contrast related to cut and fill in these areas would therefore be greater than along the I-5 corridor. Both the I-5 corridor and the SR-58/Soledad Canyon corridor would have high-contrast impacts and high potential shadow impacts related to aerial structure.
- Both the Wheeler Ridge and the Union Avenue alignment options of the I-5 alignment would have high-contrast impacts related to aerial structure. The Wheeler Ridge alignment option would have low potential shadow impacts on residential areas, however, while the Union Avenue alignment option would have moderate potential shadow impacts on residential areas.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The highway and airport expansions described for this region would not have potentially high visual contrasts because the changes to these facilities would be in landscapes that have been substantially modified already.

High-Speed Train Alternative

- In the LAUS to March ARB segment, the additional potential high-contrast impacts and shadow impacts of the San Bernardino loop would expose the two alignment options that would include this loop to more high visual impacts than the two alignment options that would not include this loop.
- In the March ARB to Mira Mesa segment, the alignment option that would serve the proposed Escondido Transit Center station site would have slightly more high visual potential impacts than the other alignment option. This difference is due to the relatively greater potential for high-contrast and shadow impacts in the subsegment associated with the transit center station.
- In the Mira Mesa to San Diego segment, the two alignment options that would join the coast and serve downtown San Diego would have more potential high visual impacts than the alignment option that would serve the Qualcomm Stadium station. This outcome is due to the relatively greater potential for high-contrast and shadow impacts expected in this segment. A scenic viewing point included in the two alignment options serving downtown San Diego also would not occur in the other alignment option.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would potentially increase the visual mass of the existing I-5 freeway, interchanges, bridges, and overpasses throughout its length from Los Angeles to San Diego. The existing right-of-way would need to be widened in most areas, resulting in displacement of uses built up to the right-of-way and reduction of undeveloped or landscaped areas along the freeway. In the northern and southern stretches of the freeway corridor (Los Angeles to San Juan Capistrano, and south of Del Mar to downtown San Diego), these changes to the landscape would result in overall low visual impacts. In areas between San Juan Capistrano and Del Mar, visual impacts would generally be higher (medium) due to more alteration of adjacent uses and the need for some extensive cut-and-fill activities in areas of natural hillsides and rock slopes. All elevated portions of the freeway and interchanges would be widened, increasing the shadow impacts on uses underneath the elevated infrastructure and expanding the dominance of the line and form of the existing infrastructure from viewing points along SR-1 (Pacific Coast Highway) and coastal trails. Shadow impacts would be noticeable in the residential and natural open space areas, such as crossing of lagoons in San Diego County.

High-Speed Train Alternative

In some locations along the LOSSAN corridor, the HST Alternative presents opportunities to improve the existing visual environment with alignment and/or construction options that would place existing and new rail infrastructure in a covered trench. The covered trench option in Orange and Santa Ana Counties (LAUS to Irvine segment) would place the existing at-grade rail tracks in a covered trench. This option would have a beneficial impact in the urban/suburban environment, while the option of constructing a second track at grade would have a low impact.

The implementation of some or all of the beneficial options above would improve the scenic quality along the existing LOSSAN corridor in residential areas along the corridor. Neither the No

Project nor the Modal Alternative would provide these opportunities for improving the aesthetic environment.

3.9.5 Photo Simulations of Alternatives in Selected Scenic Areas

Figures 3.9-16 to 3.9-21 are photo simulations that illustrate what the Modal or HST Alternatives (expanded highways or HST) may look like in typical landscapes described for each of the regions, using existing conditions as the baseline. These simulations do not include potential changes to the existing landscapes that could occur between the time of this analysis and the year 2020 from other projects and urban development. These simulations are meant to illustrate how the existing dominant landscape features would be potentially changed with the implementation of the proposed alternatives. Below is a brief description of the photo simulations.

- Figure 3.9-16A and 3.9-16B: Historic Gilroy station with and without HST station. These figures illustrate how the proposed HST station could be integrated with an existing historic structure. The Gilroy station is representative of historic stations, predominantly of those in the Central Valley areas (Bay Area to Merced and Sacramento to Bakersfield).
- Figures 3.9-17A and 3.9-17B: Pixley with and without HST alignment. These figures illustrate how the proposed HST alignment could potentially impact a traditional small urban community. It should be noted, however, that this particular area is already impacted by US-99, which is located adjacent to the proposed HST alignment, the viewpoint from which the picture without HST was taken. Under the Modal Alternative, the visual impact would be a widening of US-99 into the area where the proposed HST alignment is pictured and on the other side of the highway.
- Figures 3.9-18A and 3.9-18B: Soledad Canyon with and without the proposed HST alignment in cut configuration. These figures illustrate how a scenic resource could potentially be impacted by HST alignment in a cut configuration. It should be noted that this impact could potentially be avoided or mitigated by placing the HST alignment in tunnel or by using other construction and landscaping techniques to reduce visual impact.
- Figures 3.9-19A and 3.9-19B: I-15 corridor in San Diego with and without the proposed HST alignment. These figures illustrate how the proposed HST alignment could be integrated alongside an existing highway alignment. It should be noted that along this alignment, the HST alignment in some portions would be in tunnel and would not be visible from the highway or the surrounding area. Under the Modal Alternative, the visual impact would be a widening of I-15 into the area where the HST alignment is pictured and on the other side of the highway (Figure 3.19-C).
- Figures 3.9-20A and 3.9-20B: I-5 corridor in La Jolla with and without the highway widening improvements proposed under the Modal Alternative. These figures illustrate how the addition of one through lane in each direction affects the ramps (moving them into the hillsides) and overcrossing structure (reconstructing the abutments). The improvements would be visible from the highway, and in the case of the ramps visible from the surrounding hillsides as well.
- Figures 3.9-21A and 3.9-21B: Little Italy, downtown San Diego, water view with and without HST alignment. These figures illustrate how the HST system could be integrated into a developed urban region. The potential impact of the HST alignment would be relative to the position of the viewer. For instance, in this case the potential impact would be greatest closest to the alignment, while from the location where the picture was taken, the proposed HST alignment blends into the built area.

3.9.6 Design Practices

It would be speculative to address specific aesthetic treatments at the conceptual level of design of this program level study. However, the Authority is committed to working with local agencies and communities during subsequent project level environmental review to develop context sensitive aesthetic

Figure 3.9-16A
Gilroy Station

Figure 3.9-16B
Photo Simulation of HST Alternative at Gilroy

Figure 3.9-17A
Pixley

Figure 3.9-17B
Photo Simulation of HST Alternative at Pixley

Figure 3.9-18A
Soledad Canyon

Figure 3.9-18B
Photo simulation of HST Alternative at Soledad Canyon (Cut)

Figure 3.9-19A
I-15 Corridor in San Diego

Figure 3.9-19B
Photo Simulation of HST in I-15 Corridor in San Diego

Figure 3.9-19C
Photo Simulation of Highway Improvement (Modal) in I-15 Corridor in San Diego

Figure 3.9-20A
I-5 Corridor in La Jolla

Figure 3.9-20B
Photo simulation of Modal Alternative I-5 Corridor in La Jolla

Figure 3.9-21A
Little Italy, Downtown San Diego Water View

Figure 3.9-21B
Photo simulation of HST Alternative at Little Italy, Downtown San Diego Water View

designs and treatments for HST infrastructure (bridges, tunnel portals, overhead catenary systems, stations, etc.).

3.9.7 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for aesthetics, the HST alternative would have a potentially significant impact on aesthetics when viewed on a system-wide basis. The HST alternative would create construction-related short-term visual changes. The HST alternative would also create long-term visual changes from introduction of a new transportation system. While the significance of the changes is dependent on the sensitivity of the landscape and compatibility with existing landscape features, at least some changes would occur in highly scenic areas of the state and are expected to be significant. Mitigation strategies, as well as the design practices discussed in Section 3.9.5, will be applied to reduce this impact. See also Section 3.7.6, Part B, mitigation for communities and neighborhoods.

General mitigation strategies would include the design of proposed facilities that are attractive in their own right and that would integrate well into landscape contexts, so as to reduce potential view blockage, contrast with existing landscape settings, light and shadow effects, and other potential visual impacts. Further consultation with local and regional agencies and with the public would help the Authority and the FRA refine these general mitigation strategies during the following stage of environmental review. The following measures could be considered during subsequent review and design development to enhance project appearance and minimize project visual impacts.

In the development of the final design for the project, there is a need to generate design solutions that lead to development of project facilities that are attractive in their own right and that integrate into landscape contexts in a way that minimizes view blockage, contrast with settings, light and shadow effects, and other visual impacts. Some of the potential mitigation strategies that could enhance project appearance and minimize project visual impacts include:

- Bridges and elevated guideways could be designed with graceful lines and with minimal apparent bulk and potential shading effects. Features that could be considered include use of contoured, rounded edges for columns and other structural elements.
- Elevated guideway, station, and parking structures could be designed with sensitivity to the context. Exterior materials, colors, textures, and design details could be used that are compatible with patterns in the surrounding natural and built environments and that minimize the contrast of the structures with their surroundings.
- Exterior finishes for catenary support structures could be chosen that have neutral colors, are context-appropriate, and have dulled finishes that minimize reflectivity.
- Aesthetically appropriate fencing could be installed along rights-of-way. In residential and city center areas, decorative fencing may be appropriate. In all contexts, the fencing could be dark and non-reflective to reduce its visual contrast.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape treatments could be installed along the edge of the right-of-way such as trees, shrubs, and groundcover to provide partial screening and to visually integrate the right-of-way into the residential context.
- Night lighting at stations should be the minimum required for operations and safety. All lights should be hooded and directed to the area where the lighting is required. For lights that are not required to be on all the time, sensors and timers should be specified.
- In the project-level review of proposed stations, the potential shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account.

- Areas outside of the operating rail trackbed that are disturbed by cut, fill or grading will be seeded or planted, as feasible, such that these areas will blend with the surrounding vegetated areas. Native vegetation will be placed in appropriate locations and densities to fit adjacent natural settings. Appropriate native or ornamental species will be used adjacent to developed and landscaped areas. Steep areas of cut in rock may not be able to support plants.
- In areas where elevated guideways are close to residential areas, parks, and public open spaces, use of strategic plantings of fast-growing trees to provide partial or full screening of the structures.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape the edge of the right-of-way with trees, shrubs, and groundcovers to provide partial screening and to visually integrate the right-of-way into the residential context.
- Where elevated guideways are located down the median strips or along the edge of freeways or other major roadways, use appropriate landscaping of the area under the guideway. The landscaping should make use of attractive shrubs and groundcovers that provide a high level of visual interest. The emphasis should be on the use of low-growing species to minimize any additional shadow effects or blockage of views.
- In the development of the final site plans for stations, shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account, and all structures should be sited in a way that minimizes shadow effects on sensitive portions of the surrounding areas.
- New outdoor lighting associated with the project can be shielded to minimize both the glare from any new light source and the spillover of light onto developed and undeveloped areas outside of the right-of-way.

The above mitigation strategies are expected to substantially lessen or avoid impacts to aesthetics in many circumstances. Sufficient information is not available at this programmatic level, however, to conclude with certainty that the above mitigation strategies will reduce impacts to aesthetics to a less than significant level in all circumstances. This document therefore concludes that impacts to aesthetics could remain significant, even with the application of mitigation strategies. Additional environmental assessment will allow a more precise evaluation in the second tier project-level environmental analyses.

3.9.8 Subsequent Analysis

Specific analyses that would be appropriate for project-specific environmental evaluation are discussed below.

- Detailed analyses should be performed along each corridor, particularly in areas with elevated structures, to identify potential visual intrusions into residential and park and open space areas. These analyses should focus on identifying the potential for blockage of valued views; the areas where shadows would be cast on residential and open space lands; and the areas where the scale, form, line, and color of project facilities would substantially alter the existing character and quality of the setting. In addition to producing a detailed inventory of area-specific impacts, this analysis would serve as the basis for identifying areas where project siting adjustments and design modifications, landscaping, and other mitigation measures may be incorporated to reduce potentially considerable impacts to a low level.
- Review of local urban design plans and policies should be conducted to take into account local design objectives. The analyses would provide a basis for considering specific design measures that would modify the impacts of the project in ways that would make the project design more consistent with local urban design goals.
- An analysis should focus on the segments of alignment that would be located adjacent to and down the median strip of freeways.

- For each of the proposed station sites, further analyses should be conducted in consultation with local agencies to develop an understanding of the relationship of the proposed station architecture, parking lots, lighting systems, and other features to the surrounding natural and built setting and historic context of the surrounding landscape setting. The analyses should identify the potential for blockage of valued views; the areas where shadows would be cast; and the areas where the scale, form, line, and color of project facilities could be designed to blend with the surrounding landscape. The analyses would be used to provide a basis for considering specific measures that could be integrated into the final station designs to reduce the visual impacts of the stations on their surroundings.

3.10 PUBLIC UTILITIES

This section describes the existing public utilities within the five project regions and identifies the potential for impacts on utility systems for the No Project, Modal, and High-Speed Train (HST) Alternatives. The public utilities evaluated in this section include electrical transmission lines, natural gas facilities, and wastewater treatment facilities. A potential utility impact is any potential conflict between an alignment, station, or airport facility, and a utility, including crossings regardless of depth or height.

3.10.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

California Public Utilities Commission
The California Public Utilities Commission (CPUC) primarily regulates the provision of privately owned utilities in California. These utilities include privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies. The CPUC is responsible for assuring that California utility customers have safe, reliable utility services at reasonable rates; protecting utility customers from fraud; and promoting the health of California's economy. The CPUC does not issue permits for proposed projects that would cross utility lines. The CPUC does, however, regulate at-grade rail crossings.

Office of the State Fire Marshall
The Office of the State Fire Marshall, Pipeline Safety Division, regulates the safety of approximately 5,500 mi (8,851 km) of intrastate hazardous liquid (e.g., oil, gas) transportation pipelines and acts as an agent of the Federal Office of Pipeline Safety concerning the inspection of more than 2,000 mi (3,219 km) of interstate pipelines. Pipeline safety staff inspects, tests, and investigates to ensure compliance with all federal and state pipeline safety laws and regulations. All spills, ruptures, fires, or similar incidents are responded to immediately; all such accidents are investigated for cause.

Research and Special Programs Administration, U.S. Department of Transportation
The Research and Special Programs Administration, U.S. Department of Transportation, is responsible for carrying out the duties regarding pipeline safety set forth in 49 U.S.C. § 60101 et seq. and 49 C.F.R. § 190.1. The regulations apply to the owners and operators of the facilities and cover the design, installation, inspection, emergency plans and procedures, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities transporting oil, gas, and hazardous liquid. The regulations require operators of gas pipelines to participate in a public safety program, such as a one-call system that would notify the operator of any proposed demolition, excavation, tunneling, or construction that would take place near or affect the facility.

Wastewater Regulatory Setting
Many regulatory agencies are involved in wastewater treatment oversight. These agencies include the U.S. Environmental Protection Agency, the California Water Resources Control Board, and nine California Regional Water Quality Control Boards (RWQCBs). Primary wastewater regulation occurs via the issuance of wastewater discharge standards that are implemented through National Pollutant Discharge Elimination System permits and waste discharge requirements issued by the various RWQCBs.

Wastewater conveyance and treatment facilities in the study area are owned and/or operated by different agencies and entities. Any potential conflict with such facilities would be addressed in consultation with the respective agency. If a proposed alternative would potentially include use of wastewater facility properties, during the project-level review the need for easements, agreements, or other arrangements with the agency and/or local jurisdiction would be considered and addressed.

B. METHOD OF EVALUATION OF IMPACTS

Various methods, including the following, were used to gather the appropriate information for each of the regions.

- Review of the project geographic information systems (GIS) to identify cities and counties in the study area.
- Review of the general plans for potentially affected communities within each of the five regions in which proposed alternatives are being studied, as well as maps from the Thomas Bros. California Atlas and from the California State Automobile Association.
- Review of project alignments/proposed improvements against GIS information of electrical transmission lines, and gas and oil pipelines compiled by MapSearch.
- Exploration of Web sites of the GIS-identified cities and counties in the study area to gather appropriate setting information.
- Examination of applicable utility system maps and Web sites to gain a better understanding of facility distribution.
- Contact with public utility providers via mail to obtain or confirm the locations of their current and planned services and facilities in the study area.

Public utilities can generally include a range of services such as water, power, sewage, communications, and other systems. For the purposes of this analysis, three of the most common major facilities that may pose construction challenges were identified to best represent potential utility impacts. These facilities not only provide critical services, they are likely to create a hazard if damaged during construction operations.

- Electrical facilities are defined as major transmission lines and substations that meet or exceed a power rating of 230 kilovolts (kV).
- Natural gas facilities are defined as high-pressure gas pipelines and facilities of various sizes.
- Wastewater treatment facilities are defined as wastewater pipelines with a minimum 36-in (91-centimeter [cm]) diameter, and any treatment facilities located in the project corridor.

The methodology used to assess potential conflicts (any crossing or longitudinal encroachment of an existing utility by the defined improvement) included overlaying the available utility maps with the alternative alignments and identifying facilities within 100 ft (30 m) of the centerline and the proposed alignment alternatives. Because public utilities are so prevalent throughout the study area, it was not practical to assess each potential conflict. Rather, the relative impact between alternatives was determined by quantifying the number and type of potential conflicts for each alternative. In addition, a qualitative ranking of high, medium, or low was assigned to describe the potential severity of the conflict, as described below and summarized in Table 3.10-1.

Electric transmission lines, telecommunications lines, natural gas pipelines, and wastewater pipelines would be less likely to be affected by an alternative because with relatively minimal disruption or construction impacts, they could be avoided, minimized, or mitigated by routing either the public utility or the transportation improvement around, over, or under the facility. Where unavoidable, relocations of the utilities would not pose adverse environmental risks, based on current construction practices. However, they do represent additional project-related costs.

- Fixed facilities, such as electrical substations or power stations and wastewater treatment plants, would be more likely to be affected by an alternative, because they could require more considerable engineering, design, and construction to avoid, minimize, or mitigate potential conflicts. These types of fixed facilities have more significant constraints regarding any potential conflict, such as routing the transportation improvement around, over, or under the facility, or relocating the fixed facility to another location.

Table 3.10-1
Rankings for Potential Public Utilities Impacts/Conflicts

	Electrical Facilities	Natural Gas Lines	Waste Treatment Facilities
Low	No 230-kV or greater facility within study area	1 to 15 gas lines within study area	No wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area.
Medium	N/A*	16 to 30 gas lines within study area	N/A*
High	One or more 230-kV substation, power station, or greater facility within study area	31 or more gas lines within study area	Wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area.

* N/A = not available. There is no medium rating for this category; impacts are either low (no facilities in the segment) or high (one facility or more in the segment).

The analysis indicated that with regard to potential conflicts with utilities, there was little difference among the proposed alternatives. This is because utilities generally do not present significant potential impacts that cannot be avoided, minimized, or mitigated through conventional design and construction processes. For instance, most potential conflicts typically would be identified during the design or construction stage of a project, and standard measures would be taken to minimize costs and disruption of service.

3.10.2 Affected Environment

A. STUDY AREA DEFINED

The study area for public utilities encompasses the area within 100 ft (30 m) of the centerline of each alignment, and 100 ft (30 m) around stations and airports. The study area is generally located within developed and urbanized areas throughout the five study regions. These areas typically include various underground, at-grade, and elevated utilities that provide water, power, communications, and sewage service to residential, business and manufacturing, and agricultural practices. The following section provides additional information on utility resources.

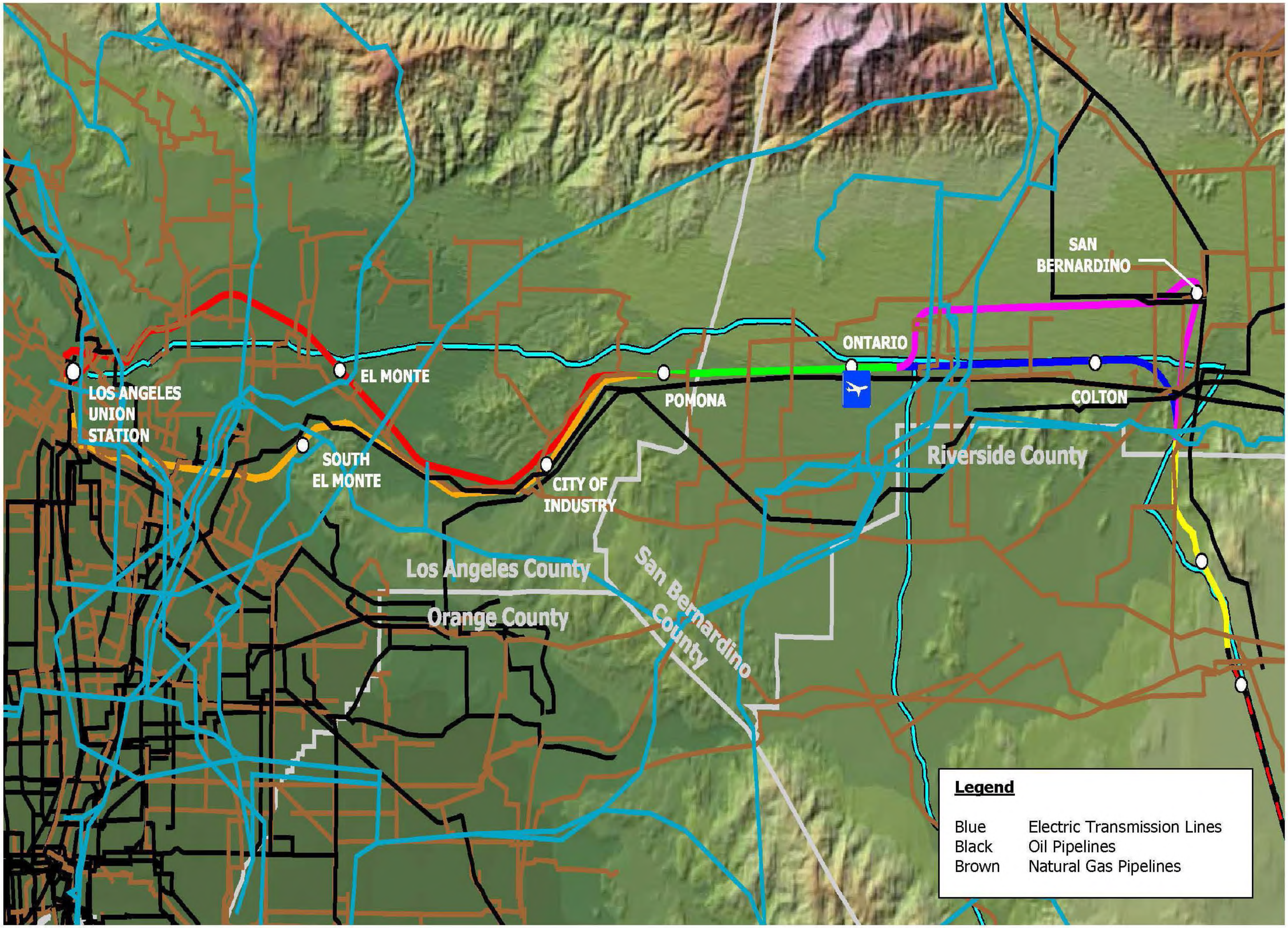
B. GENERAL DISCUSSION OF PUBLIC UTILITIES

As shown in Figure 3.10-1, a representative segment of the proposed HST Alternative in the Los Angeles to San Diego via Inland Empire region illustrates the difficulty in avoiding conflicts with utilities that are present in virtually every segment in the study area. This condition is common across all regions and alignment and design options under consideration.

C. PUBLIC UTILITIES BY REGION

The key service providers and resources in each of the five regions are summarized below. A complete description of these providers and resources is provided in Appendix 3.10-A.

Figure 3.10-1. Major Utility Lines—Los Angeles to San Diego via Inland Empire Region



Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

- Electrical Facilities—Providers include the Pacific Gas and Electric Company (PG&E), Silicon Valley Power, and City of Palo Alto Utilities (CPAU). There are two power-generating facilities within the region (Santa Clara power plant and Gilroy Cogeneration Plant LP).
- Natural Gas Facilities—Provided by PG&E with the exception of the City of Palo Alto. In the City of Palo Alto, CPAU gas is purchased from commodity suppliers and transported via PG&E's system to CPAU's distribution system.
- Wastewater Treatment and Water—Provided by more than 50 cities and other special districts within the region.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

- Electrical Facilities—Provided by PG&E, Sacramento Municipal Utility District (SMUD), and Southern California Edison.
- Natural Gas Facilities—Provided by PG&E.
- Wastewater Treatment—There are three wastewater treatment facilities: Atwater Wastewater Treatment Plant (adjacent to SR-99), Ceres Water Reclamation Facility, and Cross Valley Canal Treatment Plant. Wastewater service is generally provided by each city or other special district within the region.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

- Electrical Facilities—Providers include Los Angeles Department of Water and Power (LADWP), City of Burbank, Southern California Edison (SCE), and PG&E. The MacNeil Substation and a 42-megawatt (MW) natural gas/fuel-to-oil electricity power plant are located in the Burbank area.
- Natural Gas Facilities—Providers include Southern California Gas (SCG) and PG&E. Natural gas facilities are provided by pipeline by PG&E.
- Wastewater Treatment—The region is predominantly served by Los Angeles County Sanitation District, Los Angeles City, Rosemund Community Services District, City of Tehachapi Public Works, Mojave Public Utilities Districts, and City of Bakersfield Wastewater Division. Areas not served by these providers are generally served by septic tanks or wastewater plants well beyond proposed alignments.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

- Electrical Facilities—Providers include LADWP, SCE, and San Diego Gas and Electric Company (SDG&E).
- Natural Gas Facilities—Provided by Sempra Energy Company through its subsidiaries of SCG and SDG&E.

- Wastewater Treatment and Water—Provided by more than 13 cities and special districts.

Los Angeles to San Diego via Orange County
This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County (LOSSAN) rail corridor.

- Electrical Facilities—Providers include LADWP, SCE, and Sempra Energy Company/SDG&E.
- Natural Gas Facilities—Provided by SCG and three wholesale utility customers, including SDG&E, Southwest Gas Corporation, and City of Long Beach Energy Department.
- Wastewater Treatment—Provided primarily by San Diego Metropolitan Wastewater District, Encina Wastewater Authority, San Elijo Joint Powers Authority, U.S. Marine Corps, and South Orange Wastewater Authority.

3.10.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions assume the continued operation of the transportation and public utilities infrastructure described above. The No Project Alternative assumes that, in addition to existing conditions, additional transportation and utility improvements will be developed and operational by 2020. The transportation improvements include projects that are programmed or funded to 2020 (as described in Chapter 2).

It was not possible as part of this study to identify or quantify the utility improvements expected to occur by 2020. Rather, it is assumed that utility development will occur to meet projected demand and growth characteristics near the alignments of the proposed alternatives. For existing transportation facilities, conflicts with electrical transmission lines, natural gas pipelines, oil pipelines, wastewater and water utilities, and other utilities have previously been addressed and few additional or increased impacts are expected from the future transportation improvement included in the No Project Alternative. In addition, it is assumed that measures would be taken to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption of service. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be expected to be analyzed in a project-level environmental document, which would incorporate feasible measures to mitigate potentially significant adverse environmental impacts.

Based on the above assumptions, the existing conditions of the No Project Alternative are used to provide the baseline for analysis of potential conflicts with utilities.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

Existing conditions from the No Project Alternative provide the baseline condition. Improvements associated with the proposed Modal and HST Alternatives would result in potential impacts in addition to those resulting from the No Project Alternative. With respect to public utilities, the analysis did not show significant differences when comparing the No Project Alternative to the Modal and HST Alternatives, or comparing the Modal and HST Alternatives. As described above, the number of potential utility conflicts under the No Project Alternative was not identified, and existing conditions were used as the baseline for analysis. For the purposes of this analysis, the existing conditions are treated as representative of the No Project Alternative, and the analysis summarizes the relative differences between the existing conditions and Modal and HST Alternatives. Because there are several alignment and station options for the HST Alternative, a range of potential utility conflicts was developed that represents the design options with the least to the greatest number of potential conflicts within a region, as summarized below and in Table 3.10-2.

The most significant difference between the alternatives is the lower number of potential high-impact conflicts (conflicts with fixed facilities such as electrical substations, power plants, and wastewater treatment facilities) under the Modal Alternative. For instance, the HST Alternative would result in up to 20 potential fixed-facility conflicts, compared to 10 under the Modal Alternative. This significant difference is because the Modal Alternative generally is an expansion of an existing facility (i.e., highway widening or airport expansion) where high-impact facilities are not likely to be located. In contrast, greater portions of the HST Alternative would be located in undeveloped corridors where high-impact facilities are more likely to be located; however, the undeveloped corridors offer greater potential for avoidance through alignment changes. Another significant finding is the relatively high number of total potential conflicts for both the Modal (up to 384) and HST (as many as 323) Alternatives in the Sacramento to Bakersfield region compared to other regions. This is a result of two major factors.

- The region includes the longest Modal and HST alignments compared to the other regions.
- The Modal and HST alignments pass through developed urban and agricultural areas where there are heavy concentrations of utilities, compared to other more remote regions, such as mountain crossings, where utilities are limited.

Table 3.10-2
Summary of Potential Public Utilities Conflicts for Alternatives[a]

Region	Electrical Transmission Lines	Electrical Sub- or Power Stations	Natural Gas Pipelines	Wastewater Treatment Pipelines[b]	Wastewater Treatment Plants	Regional Totals
Modal Alternative						
Bay Area to Merced	8	3	80	N/A	0	91
Sacramento to Bakersfield	252	3	128	N/A	1	384
Bakersfield to Los Angeles	57	2	128	2	0	189
Los Angeles to San Diego via Inland Empire	33	1	70	21	0	125
Los Angeles to San Diego via Orange County (HST corridor equivalent)	14	0	30	0	0	44
Los Angeles to San Diego via Orange County (conventional rail corridor equivalent)	26	0	45	4	0	75
Modal System-wide Totals[c]	**364**	**9**	**436**	**23**	**1**	**833**
High-Speed Train Alternative[c]						
Bay Area to Merced	3–4	1–2	51–67	N/A	0–0	55–73
Sacramento to Bakersfield	105–227	1–5	45–89	N/A	0–2	151–323

Bakersfield to Los Angeles	22–47	1–1	57–138	0–3	0–1	80–190
Los Angeles to San Diego via Inland Empire	29–29	2–9	61–64	37–51	0–0	129–153
Los Angeles to Orange County	22–25	1–1	73–77	0–0	0–0	96–103
HST System-wide Totals	**181–332**	**6–18**	**287–435**	**37–54**	**0–3**	**511–842**

[a] It is not possible to quantify the utility impacts associated with the No Project Alternative. The existing conditions are assumed to be representative of the future No Project Alternative.

[b] For Bay Area to Merced and Sacramento to Bakersfield regions, the total number of potential wastewater pipeline conflicts was not provided.

[c] The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various design options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a preferred option.

3.10.4 Comparison of Alternatives by Region

The key findings of the utilities analysis by region and alignment options are summarized below. For a complete summary of all utility conflicts by region see Table 3.10-B-1 in Appendix 3.10-B.

A. BAY AREA TO MERCED

Modal Alternative

Within the five segments of the region there would be a total of 11 potential conflicts with electrical utility facilities, of which three are fixed facilities. The Merced to San Jose segment includes two electrical power facilities within the study area: PG&E's Evergreen Substation and Calpine's Gilroy power plant. In addition, the study area for the San Jose to San Francisco segment includes PG&E's San Jose B Substation. There are potential conflicts with natural gas pipelines for a total of 80 potential conflicts in all segments; the San Jose to Oakland segment would have the highest number of potential conflicts (22). No potential conflicts with wastewater treatment plants were identified. There is a potential for conflicts with wastewater pipelines, although no quantifiable data about the total number of potential conflicts were available.

High-Speed Train Alternative

Within the San Jose to Oakland segment, there are two potential high-impact conflicts: the PG&E San Jose B Substation and Santa Clara Power Plant. The San Jose B Substation would potentially conflict with the I-880 alignment option, while the Santa Clara Power Plant would potentially conflict with the Mulford alignment option. The largest number of potential conflicts associated with the HST Alternative would be with natural gas pipelines. There are no potential conflicts with wastewater treatment plants.

High-Speed Train Alignment Option Comparison

The two alignment options for the segment between Oakland and San Jose each would potentially impact an electrical substation and have a similar number of conflicts with natural pipelines, 20 for the Hayward Alignment/I-880 option and 18 for the Hayward/Niles/Mulford option. No other alignment options within the region would result in potential impacts on a fixed facility. From San Jose to Merced, the Pacheco Pass options would each result in more natural gas pipeline conflicts (23) than the three Diablo Range direct tunnel options (9). Each alignment option would potentially conflict with three electrical transmission lines. Along the existing Caltrain corridor between San Francisco and San Jose, the only potential for conflict would be with the 24 natural gas pipelines within the study area.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

Of the 384 total potential conflicts, 255 (66%) are electrical facilities, three of which are high-impact substations. The proposed widening of SR-99 would potentially conflict with two electrical substations in the Sacramento to Stockton segment and one in the Modesto to Merced segment. There are a total of 128 potential conflicts with natural gas pipelines. There is the potential for impacts on the Atwater Wastewater Treatment Plant, which lies adjacent to SR-99 in the Modesto to Merced segment and could be affected by the widening of the highway. There is a potential for conflicts with wastewater pipelines, although data about the total number of potential conflicts have not been gathered.

High-Speed Train Alternative

Within three of the six segments, there is a potential for conflict with either an electrical substation or power station, or a wastewater treatment plant. All the alignment options within the Sacramento to Stockton segment would potentially conflict with electrical substations. Within the Modesto to Merced segment, only one Union Pacific Railroad (UPRR) alignment option would potentially conflict with the Ceres Water Reclamation Facility. All but two alignment options in the Tulare to Bakersfield segment would potentially conflict with either an electrical substation or the Cross Valley Canal Wastewater Treatment Plant.

High-Speed Train Alignment Option Comparison

Within the Sacramento to Stockton segment, the number of potential impacts on fixed facilities is equal for the UPRR and Central California Traction (CCT) alignment options. Depending on the option, the potential fixed-facility conflicts associated with the UPRR and CCT alignment options ranges from one to three. The difference between the alignment options is the addition of another potential electrical substation conflict associated with the UPRR option maintenance facility.

There are no impacts with fixed facilities within the Stockton to Modesto segment. In this segment the UPRR alignment option has more total potential conflicts with electrical transmission lines and natural gas pipelines than the Burlington Northern Santa Fe (BNSF) alignment option.

From Modesto to Merced, one of the connectors to the UPRR alignment option would potentially conflict with a wastewater treatment plant, but the BNSF alignment option would have no major conflicts.

From Merced to Tulare there would be no impacts on fixed facilities for any of the UPRR or BNSF alignment options, and total potential conflicts would be similar for all alignment options.

In the Tulare to Bakersfield segment, each UPRR alignment option would potentially impact an electrical substation, and the majority would also potentially impact a wastewater treatment plant. The BNSF alignment option would not impact an electrical substation, but would potentially impact a wastewater treatment plant.

In general, the alignment option with the greatest number of potential high-impact conflicts and total utility conflicts follows the UPRR alignment. The difference between the alignment options with the greatest potential conflicts and the least potential conflicts is six fixed facilities, and 100 transmission line and natural gas pipeline conflicts. This represents a substantial difference and should be considered a primary discriminator between the alignment options.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

There are 57 potential conflicts with electrical facilities within the study area. This includes potential conflicts in all project segments, with the exception of SR-58/14 from SR-99 to Palmdale (because there is no highway widening in that area). Within the I-5: Burbank to Los Angeles Union Station (LAUS) segment, there is the potential for conflict with the McNeil Substation and a 42-MW electrical power plant in the City of Burbank. Of the total 128 potential conflicts with natural gas pipelines, the I-5 between SR-14 and SR-99 segment has the greatest number (88). There are limited potential conflicts with wastewater facilities, with the exception of I-5: SR-99 to SR-14 segment where there are two potential conflicts with a major sewage pipeline.

High-Speed Train Alternative

In the Bakersfield to Los Angeles region, there is the potential for two high-impact conflicts. The SR-58 corridor alignment option in the Bakersfield to Sylmar segment would traverse a portion of the Lancaster Water Reclamation Plant, while the Burbank Metrolink/Media City in the Sylmar to downtown Burbank segment would potentially conflict with the McNeil Substation. All alignment options would potentially conflict with the McNeil Substation since it is part of the only option through the Sylmar to downtown Burbank segment.

High-Speed Train Alignment Option Comparison

From Bakersfield to Sylmar, only the SR-58 corridor alignment option would potentially impact a fixed facility, the Lancaster Water Reclamation Plant. Among the alignment options in the segment there is a wide range of total potential conflicts with utility infrastructure. The SR-58/Soledad Canyon corridor option would have the fewest overall utility conflicts, while the I-5 Tehachapi corridor option would have the most conflicts.

Within the Sylmar to downtown Burbank segment, the majority of potential conflicts are associated with the station options, including one potential impact on an electrical substation as part of the Burbank Metrolink/Media City. The MTA/Metrolink alignment option has two potential conflicts with natural gas lines, while the Combined I-5/Metrolink option has one potential conflict with natural gas lines.

There are no impacts on fixed facilities in the downtown Burbank to Los Angeles segment. There are no substantial differences in the total number of potential conflicts among the various alignment options.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

Under the Modal Alternative, the segment with greatest number of potential impacts is the LAUS to March Air Reserve Base. This segment traverses the most developed area of the region and contains the most utility infrastructure. There are a total of 25 potential conflicts with electrical facilities within the segment, including one potential conflict with SCE's Vista Substation. There are 70 potential conflicts with natural gas lines, with equal distribution among all segments. There are 21 potential conflicts with wastewater treatment facilities, of which 18 are located in the Los Angeles to March ARB segment. Utility conflicts are not anticipated at either the Orange or San Diego airport.

High-Speed Train Alternative

Within each segment of the Los Angeles to San Diego via Inland Empire region there would be a potential conflict with an electrical substation or power plant. All alignment options in the Los Angeles to March ARB segment and March ARB to Mira Mesa segment would potentially conflict with one or more electrical power stations. In the Mira Mesa to San Diego segment, two of the three alignment options (both I-15 to the coast alignment options) would potentially conflict with a power station. There would be no potential conflicts with any wastewater treatment plants.

High-Speed Train Alignment Option Comparison

Each alignment option in the Los Angeles to San Diego via Inland Empire region, except the I-15 to Qualcomm Stadium option, would potentially impact fixed electrical facilities. The UPRR Riverside Line to San Bernardino option has the greatest potential for impacts, with seven conflicts with electrical substations. Both the UPRR Colton Line to San Bernardino and UPRR Riverside/UPRR Colton Line options would potentially impact four electrical substations.

The fourth alignment option in the Los Angeles to March ARB segment is the UPRR Colton Line, which would potentially impact one electrical substation. Additionally, each of the alignment options in this segment would result in similar numbers of conflicts with electrical transmission lines, natural gas pipelines, and wastewater pipelines.

Each alignment option in the March ARB to Mira Mesa segment would potentially impact one fixed electrical facility and have similar numbers of conflicts with other public utilities infrastructure.

From Mira Mesa to San Diego, each I-15 to the coast alignment option would potentially impact one fixed electrical facility, while the I-15 to Qualcomm Stadium would not impact any fixed facilities and have relatively few potential conflicts with other public utility infrastructure (four natural gas pipelines and one wastewater treatment pipeline).

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

There are 26 locations in which the corridor is crossed by 230-kV transmission lines. No electrical substations or power plants were identified within the 100-ft (30-m) study area of I-5. High-pressure natural gas pipelines cross the I-5 corridor in 45 locations. Water treatment facilities crossing the I-5 corridor include two treated wastewater ocean outfalls in the Camp Pendleton segment and two major sewer trunk lines, one in the I-5/805 to SR-52 segment and another in the SR-52 to Santa Fe Depot segment.

High-Speed Train Alternative

There would be no impacts on fixed facilities in the LAUS to LAX alignment option. The potential conflicts for this option include six electrical transmission lines and 41 natural gas pipelines. Each alignment option from LAUS to Irvine would potentially impact an electrical substation. The LOSSAN option would result in slightly more potential conflicts with other utility infrastructure (49 conflicts) than the UPRR Santa Ana Branch option (44 conflicts). There are no impacts on wastewater facilities within the HSR corridor.

3.10.5 Design Practices

The public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. The Authority plans to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be analyzed at the project-level environmental review along with feasible measures to mitigate potentially significant adverse environmental impacts.

3.10.6 Mitigation Strategies and CEQA Significance Conclusions

Proposed general mitigation strategies for potential utility conflicts should first focus on avoidance of the potential conflicts. If such conflicts are unavoidable, the next strategy should focus on reducing and minimizing the potential impact. The mitigation strategies are similar for all regions and would be refined during subsequent project-specific review.

For large utilities, such as wastewater treatment facilities, electrical substations, and pipelines, the strategy would be first to avoid crossing or using any of the utility right-of-way or facility footprint as the project-specific review proceeds and as engineering designs are refined. Avoidance opportunities should include consideration of modifying both the horizontal and vertical profiles of the proposed transportation improvements.

If avoidance is not feasible, and adjustment of alignments has not removed potential conflict, then in close consultation and coordination with the utility owner, relocation/reconstruction/restoration of the utility should be considered as a second mitigation strategy. This type of mitigation could include combining several utilities into a single utility corridor, or relocation or reconstruction. Where feasible and cost-effective, consolidating several utilities, primarily underground electrical and communications utilities, into one conduit should be considered during utility relocation planning.

Potential strategies to avoid and/or mitigate potential utility conflicts associated with the HST Alternative include but are not limited to the following:

- Make adjustments to the HST alignments and profiles to avoid major utility lines or facilities.
- Relocate transmission lines or substations.
- The co-lead agencies would comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 in the acquisition of all property necessary for the proposed HST system.
- During final design, the Authority would consult with each utility provider/owner to avoid or reduce potential impacts on existing and planned utilities through design refinements. Should impacts be unavoidable, all affected facilities would be relocated or protected in place prior to, during or after construction, as appropriate, and in accordance with the methods and designs approved by the affected utility provider/owner.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for public utilities and service systems, the HST system alternative would not be expected to result in a significant effect on utilities and utility services when viewed on a system-wide basis. The proposed location of the HST system largely within existing transportation corridors reduces the systemwide potential to affect utility operations. In locations where a proposed HST alignment would intersect or be in close proximity to existing utility pipelines or facilities, design modifications and avoidance strategies would be applied to avoid and to limit impacts to utilities. Opportunities for utility relocation and coordination would also help avoid utility impacts. Design practices and mitigation strategies would be applied also to avoid even temporary curtailment of services during construction. Because the proposed HST system, as analyzed in Chapter 5, would not contribute significantly to statewide population growth, it is not expected to result in a significant increase in demand for public utility services, and thus, viewed on a system-wide basis it would have a less-than-significant effect on these services.

The above mitigation strategies are expected to reduce impacts of the HST system alternative to utilities to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier of environmental analyses.

3.10.7 Subsequent Analysis

As previously mentioned, the public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. Project-level environmental documentation and subsequent planning documents should include more detailed information on the following utilities.

- Water supply lines.
- Wastewater conveyance lines.
- Wastewater and water pump stations.
- Storm drains.
- Fiber-optic lines.
- Telecommunication lines.
- Other utilities, and pipelines likely to be crossed or conflict with the various alternative alignments, including liquid petroleum, crude oil, etc.

3.11 HAZARDOUS MATERIALS AND WASTES

This section identifies the potential for impacts on areas that may be contaminated with hazardous materials and/or wastes for the No Project, Modal, and High-Speed Train (HST) Alternatives within the five project regions. According to Title 22 C.C.R. § 66261, waste is considered hazardous if it exhibits at least one of the four characteristics of ignitability, corrosivity, reactivity, or toxicity, or if it is a "listed waste." Waste can be liquid, semi-solid, or gaseous. A potential hazardous waste impact is any potential conflict between an alignment, station, or airport facility and a known contaminated site, including crossings of a known contaminated site regardless of depth or height. The section focuses on contamination at sites on the National Priorities List (NPL)/Superfund, California's high-priority Annual Work Plan (AWP) sites, and solid waste landfill (SWLF) sites.

3.11.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Hazardous materials and waste sites, including their use and remediation, are regulated by a number of federal laws, including the Resource Conservation and Recovery Act and the Comprehensive Environmental Response and Liability Act (CERCLA).

California's hazardous materials regulations for the discovery of hazardous substances in the subsurface during construction, and the disposal of hazardous materials and cleanup of the hazards area incorporate most federal hazardous materials regulations. California's statutes and regulations on hazardous materials are contained in Health and Safety Code Section 25130 et seq. and Title 22 C.C.R., which contains regulations adopted and administered by the California Department of Toxic Substances Control (DTSC). California regulations require that hazardous waste be managed according to applicable regulations that include worker operational safety procedures as identified in Title 8 C.C.R.; handling, storage, and exposure requirements; transportation and disposal requirements under a uniform hazardous waste manifest; and documentation procedures. In California, waste disposal facilities are classified in three categories: Class I, Class II, and Class III. A Class I disposal facility may accept federal and California hazardous waste. Class II and Class III facilities are only permitted to accept non-hazardous waste at facility specific acceptance threshold levels established by the Regional Water Quality Control Board (RWQCB), the permitting agency.

Additional federal and state regulations address worker exposure to safety and health hazards. The federal regulations are identified in Title 29 C.F.R., and the state regulations are in Title 8 C.C.R. The federal and California Occupational Safety and Health Administrations are the primary agencies responsible for enforcing these regulations.

B. METHOD OF EVALUATION OF IMPACTS

Identification of Hazardous Sites

Impacts on hazardous waste and/or material sites are an important consideration in the development of any major transportation improvement project. Remediation of such sites can dramatically increase the overall cost of a project. It is important to know early in the environmental analysis process where potential conflicts with these sites may occur, so that proper planning can be done to avoid these locations where possible. At this program level of analysis, available databases and information regarding the extent and nature of known hazardous materials/hazardous waste sites were reviewed. The following databases were consulted for information on potential hazardous materials risks.

- Federal National Priorities List/Superfund: This U.S. Environmental Protection Agency-developed database lists sites that pose an immediate public health hazard, and where an immediate response to the hazard is necessary. These listings are also found in the CERCLA database, also known as CERCLIS (Title 42 U.S.C. Chapter 103).
- State Priority List: Sites listed in this DTSC and RWQCB database are priority sites that were compiled from AWP and CAL-SITE databases, and sites where Preliminary Endangerment Assessments were conducted by the California Environmental Protection Agency (CEPA). The AWP database lists contaminated sites authorized for cleanup under the Bond Expenditure Plan developed by the California Department of Health Services as a site-specific expenditure plan to support appropriation of Hazardous Substance Cleanup Bond Act funds.
- State of California Solid Waste Landfills: The landfill sites listed in this database generally have been identified by the state as accepting solid wastes. This database includes open, closed, and inactive solid waste disposal facilities and transfer stations pursuant to the Solid Waste Management and Resource Recovery Act of 1972 and is maintained by the California Integrated Waste Management Board. The locations of the disposal facilities are primarily identified through permit applications and local enforcement agencies.

Methods of Analysis

The hazardous materials and wastes analysis for this Program EIR/EIS entailed a qualitative comparison of potential impacts on humans and the natural environment from exposure to hazardous materials or wastes that could result from proximity to or potential disturbance of sites containing these materials due to the No Project Alternative, the Modal Alternative, or the proposed HST Alternative. As described above, the analysis was based on the results of a database search (Environmental Data Resources 2003) for a study area that included the potential HST and Modal alignment corridors as well as proposed station locations and existing airports, as described below in Section 3.11.2. For this program-level broad analysis of potential impacts related to known priority hazards sites, the analysis was limited to hazardous materials sites and hazardous waste sites listed on the NPL, SPL, and SWLF databases. Other types of sites, such as sites with leaking underground storage tanks (LUSTs), would be considered in a subsequent phase of analysis, when site-specific analysis could be tied to more detailed alignment plans and profiles. No site-specific investigations were conducted for this analysis. Because of the large area covered, such analyses would not be cost-effective at this program-level analysis.

Potential impacts of the Modal and HST Alternatives were compared to conditions under the No Project Alternative. This assessment assumed that impacts related to hazardous materials/hazardous waste exposure could occur both during project construction and during project operation. It was based on the anticipated difference between No Project conditions and conditions under the Modal and HST Alternatives, in terms of the estimated area of the proposed improvements described in Chapter 2, Alternatives, which guided the identification of study area boundaries. Particular attention was paid to the extent of improvements that would occur outside existing rights-of-way. This analysis focused on the number of identified NPL, SPL, and SWLF sites within the study area. The program-level comparison of alternatives in this section assesses the relative degree to which known hazardous material and waste sites could constrain the alternatives by requiring costly disposal conditions and site cleanup and remediation. The number of sites gives some indication of an overall level of potential impact; more sites generally imply more potential impact. In this comparative analysis, each type of listing (NPL, SPL, and SWLF) was given equal weight. The program-level analysis does not include a detailed assessment of the nature or extent of any hazardous materials or wastes that may be present at identified sites, or the degree or specific nature of potential impacts under the various alternatives. The analysis and identification of potential hazards within the study area of alternative corridors and alignments is useful in comparing alternatives and in identifying areas where avoidance may be possible in subsequent project-level review.

3.11.2 Affected Environment

A. STUDY AREA DEFINED

The Modal and HST Alternatives would result in substantial improvements to existing highway, aviation, and rail infrastructure within or adjacent to existing rights-of-way, in addition to the No Project transportation improvements. Therefore, the study area for the presence of hazardous materials and wastes includes existing transportation corridors, new HST corridors, and areas where passenger stations, airport expansions, and HST storage and maintenance facilities are being considered. The study area consisted of a 500 ft-wide (152 mm-wide) (250 ft [76 m] on either side of the centerline or the facility) corridor along each rail and highway alignment identified for the Modal and HST Alternatives, and a 250-ft (76-m) radius around each airport and station facility. The study area boundaries were based on the distance within which a hazardous material or waste site could impact the possible location of a transportation improvement under the Modal or HST Alternative.

B. HAZARDOUS MATERIALS AND WASTE SITES BY REGION

Most of the hazardous materials and hazardous waste sites in the study area are relatively minor in extent and could be effectively mitigated through typical design and construction practices. Fewer major sites are known to be located in the vicinity of the proposed HST system alignment options than near existing highway alignments. Figure 3.11-1 shows the general locations of hazardous materials and hazardous waste sites identified through the database search. Additional information on the results of the database search is presented in Appendix 3.11-A and in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003).

3.11.3 Environmental Consequences and Comparison of Alternatives by Region

The potential severity of impacts from hazardous material or waste releases on the construction, operations, and maintenance of the proposed alternatives would depend on two factors: the nature and severity of contamination, and the construction and operations/maintenance activities that are likely to occur near the sites. The sites that pose the greatest concern are those with soil or groundwater contamination within or adjacent to the right-of-way, and those with groundwater contamination near areas where excavation down to groundwater would be necessary. For example, dewatering during excavation, trenching, or tunneling could alter local subsurface hydraulic gradients and draw groundwater contamination into excavated areas, trenches, or tunnels. In addition, fuel or chemical vapors could move through the vadose zone[1] to excavated areas (during construction), or to underground structures associated with the rail line such as vaults and manholes (during project operation).

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The description of existing conditions in the study area was based on the known hazardous materials sites in the vicinity of the transportation infrastructure that exists in 2003. The No Project Alternative would incorporate local, state, and interstate transportation system improvements designated in existing plans and programs. This analysis assumed that no additional hazardous material or waste impacts would occur beyond those already addressed or those that would be addressed in the environmental documents for those improvement projects, and that any such impacts would largely

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[1] The vadose zone comprises the region between the land surface and underlying groundwater aquifers and is the geologic zone through which pollutants and contaminants travel prior to entering groundwater (INEEL National Vadose Zone Project 2002).

FIGURE 3.11-1. Hazardous Material and Waste Locations in the Study Area

be mitigated as part of those projects. For the purpose of this analysis, existing hazardous materials sites and hazardous waste sites identified in the available databases were treated as the baseline for comparison. While the future conditions for the No Project Alternative may result in some additional hazardous materials or waste impacts, they cannot be predicted or estimated for purposes of this program-level analysis. Similarly, it can be presumed that during the next 17 years some of the existing hazardous waste sites would be cleaned up or remediated as part of CEPA and RWQCB efforts.

Projects included under the No Project Alternative would be completed before construction of the Modal or HST Alternative. Construction associated with the No Project Alternative, compared to existing conditions, would vary depending on the region being analyzed. As identified in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003), in the Bay Area to Merced and the Los Angeles to San Diego via Inland Empire regions, the difference between existing conditions and the No Project Alternative would likely be greater than that between the No Project Alternative and the Modal or HST Alternative. The opposite is expected to be the case in the Sacramento to Bakersfield, Bakersfield to Los Angeles, and Los Angeles to San Diego via Orange County (LOSSAN) regions. This assumption and assessment of potential impacts is based on the estimated land area of the anticipated improvements and particularly on the amount of improvements that would likely occur outside of existing right-of-way. This assumption does not take into account the dollar value or complexity of the anticipated improvements.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

As described above, the No Project Alternative was used as a proxy for the baseline 2020 condition; the impact from any improvements associated with the Modal or HST Alternatives would be in addition to the impacts from the 2020 No Project Alternative. Table 3.11.3-1 compares the number of potential hazardous material and waste sites identified under the Modal and HST Alternatives, based on more detailed information presented in Appendix 3.11-A.[2]

As shown in Table 3.11.3-1, the number of sites identified for the HST Alternative varies widely depending on which alignment and station options are selected, ranging from 31 (less than under the Modal Alternative) to 75 (more than twice the number of sites identified under the Modal Alternative). The numbers of sites identified for the HST Alternative in the Bakersfield to Los Angeles; Los Angeles to San Diego via Inland Empire; and LOSSAN, including Los Angeles Union Station to Los Angeles International Airport segments are greater for any alignment option than those identified for the Modal Alternative. The Bay Area to Merced and Sacramento to Bakersfield segments are the only regions in which fewer sites were identified for at least one HST Alternative alignment than for the Modal Alternative, probably because the HST Alternative alignment, depending on alignment option, would follow a route with fewer SWLFs than the Modal Alternative.

Assuming that a larger number of identified hazardous materials and hazardous waste sites increases the potential for hazardous materials and hazardous waste impacts, under the HST Alternative the extent of cleanup or remediation required depends on the alignment and station options selected—and, depending on the route and station locations, the HST Alternative could have either a greater or a lesser potential for such impacts than the Modal Alternative. The extent of cleanup or remediation would translate into additional costs for construction, which could make a major difference in practicality or feasibility of an alternative. As described above, this analysis was limited to searches

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[2] Appendix 3.11-A shows the number of identified NPL, SPL, and SWLF sites associated with the HST and Modal Alternatives. For the Modal Alternative, the number of sites includes those identified along the roadway alignments and around airport improvements. For the HST Alternative, the number of sites includes those identified along the alignment options, stations, and storage and maintenance facilities.

of standard databases listing known sites and did not incorporate information on other smaller sites that could contribute to risk on a local basis and would be studied at the project-specific level, if the proposed HST system is pursued. In addition, because neither site-specific investigations nor onsite fieldwork was performed, little or no information is available about the nature and severity of contamination at the sites identified, or the schedule or program for cleanup, if any, so the comparison above represents a "site-count" approximation and may not fully divulge potential risk levels. Finally, much of both the Modal and HST Alternative alignments would be within existing right-of-way, and these alignments have a land-use history under which additional unknown contamination (e.g., spills or accidental releases) would be a possibility. Consequently, although no unavoidable hazardous materials and hazardous waste impacts are expected under either the Modal Alternative or HST Alternative, hazardous materials and hazardous waste information available at the program level is not sufficient to distinguish the two alternatives.

Table 3.11.3-1
Potential Hazardous Material and Waste Sites Comparison Modal and High-Speed Train Alternatives

Region	Modal Alternative	HST Alternative	
		Fewest Identified Sites	Most Identified Sites
Bay Area to Merced	5	3	11
Sacramento to Bakersfield	16	8	24
Bakersfield to Los Angeles	8	13	23
Los Angeles to San Diego via Inland Empire	4	7	14
Los Angeles to San Diego via Orange County	2	5	5
Total Sites*	33	31	72

* Totals presented do not include the identified LOSSAN sites because this segment is not a part of the HST Alternative defined for the representative demand.

Source: Environmental Data Resources 2003.

3.11.4 Design Practices

At this programmatic level of study it is not possible to identify specific hazardous material impacts, determine the nature and severity of contamination, or the construction and operations/maintenance activities that are likely to occur near specific sites. However, the Authority is committed to avoiding and minimizing potential impacts through design refinement at the project level as well as the use of best practices to avoid potential impacts during construction.

3.11.5 Mitigation Strategies and CEQA Significance Conclusions

Mitigation for impacts related to hazardous materials and/or hazardous wastes depends on detailed site-specific investigations (environmental site assessments) that have not been performed at this programmatic level of analysis. More detailed analysis and specific mitigation measures would be included in subsequent project-level analysis. Mitigation strategies could include realignment of the HST corridor or relocation of associated features such as stations to avoid an identified site, and remediation of identified hazardous material/waste contamination.

In addition, potential mitigation strategies would include, but are not limited to, the following:

- Investigate soils for contamination and prepare environmental site assessments (ESA) when necessary.

- Prior to demolition of buildings for project construction, survey for lead-based paint and asbestos-containing materials.
- Acquire necessary permits if ground dewatering is required
- When indicated by project level ESA's, perform a Phase II ESA (e.g., hydrogeologic investigation) to identify specific mitigation measures. Perform Phase II ESA's in conformance with the ASTM Standards Related to the Phase II Environmental Site Assessment Process (E1903-01)
- Prepare a Site Management Program/Contingency Plan (SMP/CP) prior to construction to address known and potential hazardous material issues SMP/CP including:
  - Measures to address management of contaminated soil and groundwater
  - Site-specific Health and Safety Plan (HASP) including measures to protect construction workers and general public
  - Procedures to protect workers and the general public in the event that unknown contamination or buried hazards are encountered

Based on the analysis above, and considering CEQA Appendix G thresholds of significance and the standards described in paragraph 3.11 for hazardous materials and hazardous wastes, the proposed HST alternative would have a potentially less than significant effect on hazardous materials and hazardous waste when viewed on a systemwide basis. At this programmatic level of review, it is not possible to identify specific hazardous material impacts, or the nature and severity of contamination at specific sites. However, the Co-lead agencies' commitment of using design practices to minimize impacts, and the use of best practices and mitigation strategies for remediation of hazardous sites, are expected to substantially lessen or avoid impacts to hazardous materials and wastes. With the second-tier, project-level review, specific impacts to sites with hazardous materials will be identified, and mitigation measures based on these mitigation strategies will be applied on a site-specific basis. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.11.6 Subsequent Analysis

Specific studies that would be required for project-level environmental documentation include environmental site assessments, which would study the identified hazardous materials and hazardous waste sites in more detail to evaluate the nature and level of contamination and allow thorough analysis of potential impacts in accordance with applicable regulatory requirements. Tasks to be performed as part of the project-level environmental site assessment would be expected to include the following.

- Environmental database search. This would include additional databases (e.g., Cortese list, LUST list, other sites, etc.).
- Review of historical land use for all alignment options or corridor alternatives carried forward for detailed analysis.
- Site reconnaissance.
- Review of agency records and agency consultation.
- Data analysis and report preparation.

3.12 CULTURAL AND PALEONTOLOGICAL RESOURCES

Cultural resources include prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, and historic structures. Paleontological resources are resources in the fossil record, such as prehistoric remains and other evidence of past life. This section discusses the applicable federal and state laws and regulations that protect cultural and paleontological resources, including Section 106 of the National Historic Preservation Act (NHPA) and California Public Resources Code Sections 5024.1 and 21084.1, and assesses the potential for the proposed high-speed train (HST) system and alternatives to have impacts on these resources.

3.12.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Cultural Resources

The NHPA (16 U.S.C. § 470 et seq.) established a national program to preserve the country's historical and cultural resources. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and provide the President's Advisory Council on Historic Preservation an opportunity to comment on a proposed action before it is implemented. Guidelines for implementing the Section 106 process are provided in 36 C.F.R. § 800. Both state and federal guidelines for cultural resources recognize that buildings, structures, objects, districts, and cultural landscapes can be historically significant. The NHPA refers to these significant resources as "historic properties," while under CEQA, such highly sensitive resources are referred to as "historical resources." Adverse changes to historic properties and historical resources caused by an undertaking are described as "adverse effects" under Section 106, and as "adverse changes" or "adverse impacts" under CEQA. Under state law, projects that would cause a substantial adverse change in the historical significance of a historical resource are considered projects that may have a significant impact on the environment for CEQA purposes (see below for NHPA and CEQA discussion. Under NHPA Section 106 (36 C.F.R. § 800.16), an historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (NRHP). Districts include the property types known as cultural landscapes (historic, rural, designed, etc.). To be eligible for the NRHP these property types must meet at least one of the NRHP significance evaluation criteria (36 C.F.R. § 60.4) to be considered an historic property, and the property must also possess integrity. NRHP historic properties meet one or more of the following evaluation criteria:

- The property is associated with events that have made a significant contribution to the broad patterns of our history (Criterion A).
- The property is associated with the lives of persons significant in our past (Criterion B).
- The property embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction (Criterion C).
- The property has yielded, or may be likely to yield, information important to prehistory or history (Criterion D).

Under CEQA, significant cultural resources are called "historical resources" whether they are of historic or prehistoric age. Historical resources are resources that are listed, or eligible for listing, in the California Register of Historical Resources (CRHR), or which are listed in the historical register of a local jurisdiction (county or city). NRHP historic properties located in California are considered to be historical resources for the purposes of CEQA and are also listed in the CRHR (P.R.C. § 5024.1). Generally, a resource should be considered an historical resource for the purposes of CEQA if it has integrity and meets one or more of the criteria for listing in the CRHR (CEQA Guidelines § 15064.5[a][3]). These state criteria are based upon, and are very similar to, federal significance criteria:

- The resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (Criterion 1); or
- The resource is associated with the lives of persons important in California's past (Criterion 2); or
- The resource embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values (Criterion 3); or
- The resource has yielded, or may be likely to yield, information important in prehistory or history (Criterion 4).

The NRHP and CRHR criteria are almost identical. Any resource determined eligible for NRHP is also automatically eligible for CRHR. However, the term "historical resources" under CEQA and CRHR is more inclusive since resources listed in local historical surveys that meet Office of Historic Preservation standards are encompassed.

The definition of <u>effect</u> for the purposes of Section 106 of NHPA is contained within 36 CFR § 800: "Effect means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." An <u>adverse effect</u> occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association… Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative."[1] Examples of adverse effects may include, but are not limited to: destruction, damage, alteration, or relocation of a historic property, as well as the introduction of elements that diminish the property's integrity, cause neglect of a property, or its transfer out of federal ownership.[2]

Impacts on historical resources listed in or eligible for the CRHR constitute a significant effect on the environment (significant impacts that must be disclosed in a CEQA environmental document) if the impact constitutes a substantial adverse change in the significance of a historical resource (P.R.C. § 21084.1). Similar to the federal definition of adverse effect, a "substantial adverse change" to a historical resource under CEQA includes "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines § 15064.5[b][1]). Material impairment includes changes to the physical characteristics that make a historical resource eligible for listing in the CRHR such that the resource would no longer be eligible for the CRHR or a local historical register (CEQA Guidelines § 15064.5[b][2]).

<u>Paleontological Resources</u>

The following United States statutes incorporate provisions for the protection of paleontological resources.

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[1] 36 CFR 800.5(a)(1).

[2] 36 CFR 800.5(a)(2)(i through vii).

- Federal Antiquities Act of 1906 (16 U.S.C. § 431 et seq.): Establishes national monuments and reservation of lands that have historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Section 433 prohibits appropriation, excavation, injury, or destruction of any historic or prehistoric ruin or monument, or any object of antiquity on Federal lands only.
- National Environmental Policy Act of 1969 (P.L. 91–190, 83 Stat. 852, 42 U.S.C. §§ 4321–4327): Mandates policies to "preserve important historic, cultural, and natural aspects of our national heritage" (§ 101.b4).

In California, fossil resources are considered a limited, nonrenewable, highly sensitive scientific resource. The following state statutes incorporate provisions for the protection of paleontological resources.

- CEQA (P.R.C. § 21000 et seq.): Requires public agencies and private interests to identify the potential adverse impacts and/or environmental consequences of their proposed project(s) to any object or site that is historically or archaeologically significant or significant in the cultural or scientific annals of California (P.R.C. § 5020.1). Under CEQA, archaeological resources are presumed nonunique unless they meet the definition of "unique archaeological resources" (P.R.C. § 21083.2[g]). Under CEQA, an impact on a nonunique archaeological resource is not considered a significant environmental impact. An EIR need not discuss nonunique archaeological resources.
- CEQA Guidelines (14 C.C.R. § 15064.5 [a][3]): Provides that a lead agency may find that "any object, building, structure, site, area, place, record, or manuscript" is historically significant or significant in the "cultural annals of California." The section also provides that, generally, a resource may be considered historically significant if it has yielded or may be likely to yield information important in prehistory. Paleontological resources fall within this broad category and are included in the CEQA checklist under Cultural Resources.
- Public Resources Code Section 5097.5: Prohibits excavation or removal of any "vertebrate paleontological site ... or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands." Public lands include lands owned by or under the jurisdiction of the State of California or any city, county, district, authority, or public corporation, or any agency thereof. This section provides that any unauthorized disturbance or removal of paleontologic, archaeologic, and/or historic materials or sites located on public lands, which violates the section, is a misdemeanor.
- Public Resources Code Section 30244: Requires reasonable mitigation of adverse impacts on paleontological resources resulting from development on public land in the Coastal Zone, as defined in Public Resources Code Section 30103.

B. METHOD OF EVALUATION OF IMPACTS

Archaeological Sites and Traditional Cultural Properties

The FRA initiated consultation with the State Historic Preservation Office (SHPO) under Section 106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2). The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 (Appendix 3.12-A). The study area for cultural resources is the Area of Potential Effect (APE), which was defined by the FRA in consultation with the SHPO, who concurred by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method of evaluation for this Program EIR/EIS.

Cultural resources studies began with records searches obtained from the appropriate California Historical Resources Information System (CHRIS) Information Centers. The records searches identified the general locations of previously recorded archaeological sites in the APE. The number of known archaeological sites within the APE for each alternative was tabulated and used as an indicator of potential sensitivity for the comparison of the relative degree of potential impacts or effects for each alternative. For this program-level analysis, individual archaeological sites were not evaluated for eligibility. Instead, the archaeological sites identified as a result of the records searches were considered potentially eligible for listing in the CRHR or the NRHP, and the number of archaeological sites per linear mile identified in the APE for each alternative was used as one indicator of the relative degree of potential impacts on cultural resources from construction or operation of that alternative. Impacts on NRHP-eligible archaeological resources include physical destruction or damage. The total number of archaeological sites in the APE for the corridor was divided by the total length of the corridor being evaluated to arrive at an average number of sites (or proportion of sites) per mile. That average was then translated to a qualitative rating of low, medium, and high impacts as follows.

- Low: 0.00–0.25 site per mile for the corridor.
- Medium: 0.26–0.75 site per mile.
- High: 0.76–more than one site per mile.

The cultural resource specialist's knowledge and background of regional prehistory supplemented the records search results. For example, if the cultural resource specialist has previous experience that several sites have been identified along a particular river drainage in the region, but the records search did not yield formally recorded sites in CHRIS within the APE for a particular alternative route, the cultural resource specialist documented the additional information and, based on it, increased the rating for that corridor.

Certain kinds of prehistoric sites and certain kinds of material sites are often regarded by contemporary Native Americans as especially sensitive. These include habitation sites, shell mounds, and burials. If sites with these characteristics were present along the route for an alternative, that route was automatically ranked high for archaeological resources, indicating that the potential sensitivity to impacts from construction disturbance would be greater in that corridor than in a corridor ranked as low or medium.

Historic-era Properties and Historical Resources

The method used in this Program EIR/EIS for evaluating potential effects and impacts to historic-era properties and historical resources began with the same consultation as used for prehistoric resources. The FRA initiated consultation with SHPO under Section106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2), and requested the SHPO to comment on the proposed Area of Potential Effect (APE) for cultural resources (prehistoric and historic) for this Program EIR/EIS. The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 and the APE by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method used to predict potential effects and impacts for this Program EIR/EIS.

The method used to predict potential effects and impacts of the HST program on historic properties and historical resources is based upon estimating the amount of historic development that occurred along each proposed segment/alignment. These estimates were based upon review of existing documentation, including historical maps, aerial photographs, and local inventories, and the preparers' knowledge of the history of the region. New surveys of historic-period properties/resources were not conducted for this program-level analysis. Instead, the likelihood that a proposed HST route would affect or impact historic properties or historical resources was determined by estimating the linear miles of each alternative that pass through historic development, i.e., buildings, structures, objects, sites, district, and/or landscapes that developed during specific historical time periods (before 1900, 1900 to 1929, and 1930 to 1958). This likelihood, or sensitivity, was calculated by measuring the linear miles of development that occurred during each historic period, so that the various program alternatives could be compared based on the percentage of each route that passed through historic development. The more area along each HST route alternative that developed historically, the more likely it is that there would be historic-era properties/historical resources along the route that could be affected or impacted by the HST program. The percentage of historic development was ultimately expressed as a ranking of low, medium, or high probability of affecting or impacting historic-era properties/resources.

- Low: 0%–25% of the corridor passes through areas of historic development.
- Medium: 26%–75% of the corridor passes through areas of historic development.
- High: 76%–100% of the corridor passes through areas of historic development.

Traditional Cultural Properties and Native American Consultations

The FRA and the Authority initiated consultation with the California Native American Heritage Commission (NAHC) requesting a search of their Sacred Lands file to identify any traditional cultural properties that could be potentially impacted or affected by the project, and requesting lists of Native Americans to contact for the areas that could be affected by the project, as required by 36 C.F.R. § 800.4(1)(4).

Letters were sent to Native Americans on the contact lists provided by the NAHC. The letters provided information about the proposed project alternatives and requested information about any traditional cultural properties that could be affected by the project.

Authority staff met with tribal representatives in a series of three Workshops held during the fall of 2003. The workshops were held on September 9, 2003, at Frazier Park in the Tehachapi Mountains; on September 10, 2003, at the San Luis Recreation Area in Gustine; and on October 9, 2003, at the Temecula Community Center. HST alignment options and potential station locations, potential impacts on cultural resources, the level of detail of the Program EIR/EIS studies, and need for potential subsequent project-specific studies were discussed at each of the workshops.

Native American concerns have also been conveyed to the FRA and the Authority at public hearings or as comments submitted on the EIR/EIS.

Paleontological Resources

Paleontological resources determined to be significant are fossils or assemblages of fossils that are unique, unusual, rare, uncommon, and diagnostically or stratigraphically (layers of the earth's surface) important, and/or those that add to an existing body of knowledge in specific areas—stratigraphically, taxonomically, and/or regionally.

Literature research and institutional records searches or geologic maps and geographic data from the University of California Museum of Paleontology in Berkeley have resulted in the designation of areas within the APE as having high, low, or undetermined paleontologic sensitivity, as follows.

- High: Sedimentary units with a high potential for containing significant nonrenewable paleontological resources. In these cases the sedimentary rock unit contains a high density

3.13 GEOLOGY AND SOILS

This section describes existing geologic conditions in the five study regions and analyzes the potential geological impacts of each alternative and proposed HST alignment option. This analysis focused on potential impacts related to seismic hazards; landslide hazards; locations of oil and gas fields, geothermal fields, and mineral resource sites, and on bedrock and other conditions that could affect excavation.

3.13.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

A number of state regulations apply to geologic hazards and engineering geologic practice. The following paragraphs summarize key regulatory provisions; more detailed discussion is deferred to project-level environmental documentation because these regulations, if applicable, relate to site-specific conditions and thus would be applied as appropriate at the project level rather than the program level.

Principal state guidance relating to geologic hazards is contained in the Alquist-Priolo Act (P.R.C. § 2621 et seq.), and in the Seismic Hazards Mapping Act of 1990 (P.R.C. § 2690–2699.6). The Alquist-Priolo Act prohibits the location of most types of structures for human occupancy across the active traces of faults in earthquake fault zones shown on maps prepared by the state geologist, and regulates construction in the corridors along active faults (earthquake fault zones). The Seismic Hazards Mapping Act of 1990 focuses on hazards related to strong ground shaking, liquefaction, and seismically induced landslides. Under its provisions, the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and the maps are to be used by cities and counties in preparing their general plans and adopting land use policies in order to reduce and mitigate potential hazards to public health and safety.

Site-specific geotechnical investigations may be prepared to provide a geologic basis for the development of appropriate construction design for proposed projects, including mitigation/ remediation of geologic hazards where this is possible. Geotechnical investigations typically assess the bedrock and Quaternary geology, the geologic structure, the soils, and the previous history of excavation and fill placement on and in the vicinity of the site for a proposed project. They may also address the requirements of the Alquist-Priolo Act and the Seismic Hazards Mapping Act.

Pursuant to the Surface Mining and Reclamation Act (P.R.C. § 2710 et seq.), the State Mining and Geology Board identifies in adopted regulations areas of regional significance that are known to contain mineral deposits judged to be important in meeting the future needs of the area. (See P.R.C. § 2726 and 2790; Title 14 C.C.R. 3550, et seq.) The State Mining and Geology Board also adopts state policy for the reclamation of mined lands and certifies local ordinances for the approval of reclamation plans as being consistent with state policies (P.R.C. § 2755–2764, 2774 et seq.).

B. METHOD OF EVALUATION OF IMPACTS

To evaluate potential impacts related to geology and soils, each alternative was ranked for potential seismic hazards (ground shaking and ground failure potential), surface rupture hazard (number of active fault crossings), slope instability, areas of difficult excavation, presence of oil/gas/geothermal fields (presence of the resource and/or production facilities), and presence of economic mineral resources. The analysis was performed generally on the basis of existing data available in geographic information systems (GIS) format as opposed to detailed site investigations. The geologic data provided in this section are intended for planning purposes and are not intended to be definitive for specific sites. Alignments were evaluated by the regional team technical leads as having high, medium, or low potential for geologic impacts based on the number of geologic constraints identified.

Airports, stations, and other facilities were evaluated as having high or low potential for geologic impacts, based on the number of geologic constraints identified. These rankings made it possible to provide a rough comparison of the potential geologic constraints affecting each alternative and each alignment.

The following paragraphs describe the ranking process. Table 3.13-1 summarizes the ranking criteria for potential geologic and soils impacts.

Table 3.13-1
Ranking System for Comparing Impacts Related to Geology/Soils/Seismicity

Impact Ranking	Seismic Hazards (% of Length)	Active Fault Crossings (Number of Crossings)	Slope Instability (% of Length)	Difficult Excavation (% of Length)	Oil and Gas Fields (% of Length)	Mineral Resources (Present or Not Present)
Alignments						
High	>50	2+	>10	>25	>20	>20
Medium	10–50	1	5–10	10–25	10–20	10–20
Low	<10	0	<5	<10	<10	<10
Airports/Stations/Facilities						
High	Present	Present	Present	Present	Present	Present
Low	Not Present	Not Present	Not Present	Not Present	Not Present	Not Present

Seismic Hazards

Seismic hazards that could potentially constrain the design of proposed facilities were evaluated on the basis of potential for strong ground motion and potential for liquefaction. Areas potentially subject to strong ground motion were defined for this program-level study as areas where peak horizontal ground accelerations in an earthquake may exceed 0.50g (i.e., areas where peak horizontal ground acceleration may exceed 50% of the acceleration due to gravity) as mapped by the California Geological Survey (formerly the California Division of Mines and Geology) (State of California 1999). This acceleration is used to calculate the horizontal force a structure may be subjected to during and earthquake. For this analysis, liquefaction was conservatively assumed to be possible in all areas where peak ground accelerations could exceed 0.30g, except for areas mapped as underlain by bedrock. Where groundwater levels were not known from existing literature, they were conservatively assumed to be high, contributing to increased potential for liquefaction.

The ranking system for impacts related to seismic hazards used the percentage of each potential alignment within strong ground motion zones and/or potentially liquefiable zones. Station and airport sites were compared by determining whether any portion of the proposed station site would be within a strong ground motion zone or potentially liquefiable zone.

- Alignments: High, medium, or low, based on percentage of alignment length in strong ground motion zones plus the percentage of length in potentially liquefiable zones.
- Stations/airports: High if any part of the site is within a strong ground motion zone or potentially liquefiable zone; otherwise, low.

Potential for Surface Rupture (Active Fault Crossings)

Surface rupture hazard was evaluated based on whether any portion of a project alignment or facility would be located within 200 ft (62 m) of the mapped trace of any fault with known or inferred movement during Quaternary time (the past 1.6 million years). If any portion of a proposed alignment or potential facilities site was within 200 ft (62 m) of a Quaternary fault, it was identified as crossing an active fault trace. As described below, the State of California defines active faults as those that show evidence for movement in the last 11,000 years. Because of the extreme disruption of transit facilities that can result from surface fault rupture, this analysis deliberately adopted a conservative criterion for the assessment of surface rupture hazard and included potentially active faults, those with known or inferred movement over Quaternary time.

The ranking system for impacts related to surface rupture hazard was based on the number of active fault crossings identified.

- Alignments: High, medium, or low, based on number of active (recent or Quaternary) fault crossings.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of an active (recent or Quaternary) fault; otherwise, low.

Slope Instability

Slope stability was evaluated based on the geologic formations or units present along each alignment and at each facilities site, as shown in statewide mapping compiled by Jennings (1977, 1991). Each of the mapped geologic units was assigned a rating for inferred slope stability, based primarily on lithology (physical characteristics of the rock formation) and age. This approach allowed the identification of areas at risk for slope instability. A conservative 200-ft (60-m) buffer was included around each identified area of instability.

The ranking system for impacts related to slope instability was based on the percentage of each alignment within potentially unstable zones. Station and airport sites were compared by determining whether any portion of the site is within an area of potential slope instability.

- Alignments: High, medium, or low, based on percentage of alignment length in potentially unstable zone.
- Stations/airports: High if any part of the site is within a potentially unstable zone; otherwise, low.

Difficult Excavation

Areas of potentially difficult excavation were identified based on bedrock geologic characteristics in combination with the presence of faults of any age, based on statewide mapping compiled by Jennings (1977, 1991) and information from selected 1:250,000-scale geologic map sheets for the study regions published by the California Geological Survey. Each fault crossing was conservatively assumed to be approximately 600 ft (185 m) wide. Geologic cross-sections were prepared to assess subsurface tunneling conditions along proposed HST tunnel segments.

The ranking system for impacts related to difficulty of excavation was based on the percentage of each alignment where excavation would be required within identified areas of difficult excavation. Stations and airport sites were compared by determining whether any portion of the site is within an identified area of difficult excavation.

- Alignments: High, medium, or low, based on percentage of surface segments in hard rock plus percentage of tunnel segments within fault zones.
- Stations/airports: High if any part of the site is within a hard rock zone or fault zone; otherwise, low.

Oil, Gas, and Geothermal Fields
Areas where the presence of oil, gas, and geothermal resources could constrain project construction or operation were identified on the basis of published resource maps produced by the California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (California Department of Conservation 2001a, 2001b).

The ranking system for impacts related to oil, gas, and geothermal fields was based on the percentage of each proposed alignment within identified oil and gas or geothermal field areas. Station and airport sites were compared by determining whether any portion of the proposed site is within a mapped oil, gas, or geothermal field areas.

- Alignment: High, medium, or low, based on percentage of alignment length within mapped oil and gas plus geothermal fields.
- Stations/airports: High if any part of the site is within a mapped oil, gas, or geothermal field; otherwise, low.

Mineral Resources
Areas where the project could affect mineral resource extraction (primarily sand and gravel deposits) were identified on the basis of reports and published maps by the United States Geologic Survey, and California Geologic Survey.

The ranking system for mineral resources impacts was based on the number of mineral resources sites intersected by each alignment. Station and airport sites were compared by determining whether any portion of the site is within a mineral resource area. The potential value of mineral resources varies with time with demand for the resource. Thus, evaluation of specific sites for relative importance was not considered for this program-level study.

- Alignments: High, medium, or low, based on number of mapped resources within 200 ft (60 m) of a mineral resource area.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of a mineral resource area; otherwise, low.

3.13.2 Affected Environment

A. STUDY AREA DEFINED

The study area for geology and soils is defined as the corridor extending 200 ft (60 m) on each side of the alignment centerlines, and a 200-ft (60-m) radius around each station or airport site. This distance incorporates all cross-sections with the exception of deep cuts and fills. As described in Method of Evaluation of Impacts above, alternatives were compared based on the number of sites with potential geologic or soils impacts per alternative, which depends on the length and location of the alignment; broadening the study area to include the entire width of deep cut-and-fill sections would not change the results of the comparison.

B. GENERAL DISCUSSION OF GEOLOGY AND SOILS

The following sections describe key project constraints related to geology and soils.

Seismic Hazards
Seismic hazards are generally classified in two categories: primary seismic hazards (surface fault rupture and ground shaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Primary: Surface fault rupture, or ground rupture, occurs when an active fault ruptures at depth to produce an earthquake, and the rupture propagates to the ground surface. Surface rupture can also occur as a result of slow, gradual motion referred to as fault creep. An area's potential for ground rupture is assessed based on the displacement history of the area's faults. Two categories of faults have been defined by the State of California in Special Publication 42 (Hart and Bryant 1997). Active faults are those that are known or inferred to have experienced movement in the past 11,000 years and are considered to have a high potential for future ground rupture. Potentially active[1] faults are those that are not known to have experienced movement in the past 11,000 years but have moved during Quaternary time (the past 1.6 million years). These faults may also pose a surface rupture hazard, but the hazard is more difficult to evaluate. For the purpose of this study, both active and potentially active faults were evaluated, and considered active faults in subsequent sections.

Ground shaking occurs in response to the release of energy during an earthquake. The energy released travels through subsurface rock, sediment, and soil materials as seismic waves, which result in motion experienced at the ground surface.

Secondary: Liquefaction and other types of seismically induced ground failure reflect loss of strength and/or cohesion when earth materials are subjected to strong seismic ground shaking. Earthquakes can also trigger landslides where slopes are prone to failure because of geologic conditions or because of modifications during construction.

Surface fault rupture, ground shaking, and seismically induced ground failure all can result in substantial damage to structures. Thorough assessment of the existing hazard combined with appropriate design and construction can reduce the potential for damage substantially.

Unstable Slopes

Slopes are considered unstable (prone to failure or landslides) when soil or rock strength is insufficient to resist gravitational forces or other loads. Slope instability can occur naturally due to factors such as fracture patterns, soil saturation, or steep slopes. Slope failure can also be triggered by seismic activity or by improperly designed construction.

If slope instability is not adequately characterized and mitigated during design and construction, it can cause severe damage to surface and near-surface improvements as well as risks to public safety. However, slope instability can generally be addressed with planning and design.

Areas of Difficult Excavation

Subsurface geologic conditions will largely determine the ease or difficulty of excavation, which will in turn indicate the appropriate excavation technique for use in various areas. For instance, hard unfractured bedrock may be difficult to excavate using bulldozers and other earthmoving equipment, or too resistant to tunneling using a tunnel boring machine; in these areas, blasting may be required. On the other hand, fractured rock that contains groundwater can also be difficult to excavate using tunneling methods. Faulted material can pose an additional challenge by contributing to instability at the tunnel face.

Geological Resources

Geological resources in California include oil and gas fields, geothermal fields, and a wide range of mineral resources. The principal constraint associated with oil, gas, geothermal, and mineral resources is the need for planning to ensure that construction of new facilities would not conflict with the removal of economically important resources and would avoid known problem areas to

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[1] The term "potentially active" is under review for alternative nomenclature by California Geologic Survey.

the extent feasible. In addition, the presence of even small (noneconomic) quantities of oil or gas in the subsurface can pose toxic or explosive hazards during construction, requiring specific precautions, and may also necessitate special designs and monitoring during the operation of subsurface structures such as subway tunnels. Similarly, certain mineral resources, such as serpentine (the source of natural asbestos) can result in hazardous working conditions if not properly managed.

C. GEOLOGY AND GEOMORPHOLOGY BY REGION

Appendix 3.13-A contains tables summarizing the geologic constraints in each of the five study regions. The following paragraphs provide an overview of key geomorphologic features in each region, based on Norris and Webb's (1990) overview of California's geomorphic provinces and information from topographic maps published by the U.S. Geological Survey.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The Bay Area to Merced region spans two of California's geomorphic provinces: the Coast Ranges province and the Great Valley province.

The Coast Ranges uplift consists of generally northwest-trending ridges that form a rugged barrier between the Pacific Coast and inland California. The valley occupied by San Francisco Bay, bordered by the Diablo Range and East Bay Hills on the east and the Santa Cruz Mountains on the west, is one of several fault-bounded valleys within the Coast Ranges; other important regions of low elevation near the study area include the Salinas, Napa, and Sonoma Valleys.

The Great Valley province comprises a large, elongated north-trending valley situated between the Coast Ranges on the west and the Sierra Nevada on the east. Much of the Great Valley is at elevations near sea level (Norris and Webb 1990). The valley is structurally controlled, with faults occurring at the boundaries between valley and mountain range.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Relatively uniform, gentle terrain that typifies the interior of California's Great Valley geomorphic province characterizes this region. As described above, the Great Valley province consists of an elongate north-trending valley bordered by the Sierra Nevada and the Coast Ranges (Norris and Webb 1990).

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The Bakersfield to Los Angeles region includes portions of three major geomorphic provinces: Great Valley, Mojave, and Transverse Ranges. Consequently, terrain in this region is highly variable. From the southern end of the San Joaquin Valley, the proposed alignments would climb several thousand feet to cross the rugged Tehachapi Mountains. They would descend across the westernmost portion of the Mojave province, and would climb again to cross the San Gabriel Mountains before descending into the Los Angeles basin. The Los Angeles basin is a fault-bounded depression within the Transverse Ranges province, which was named for its westerly structural and geomorphic grain, transverse to the dominant northerly-northwesterly fabric of California landscapes (Norris and Webb 1990).

Los Angeles to San Diego via Inland Empire
This region of southern California includes the eastern portion of the Los Angeles basin (Transverse Ranges) from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. This region is located in the Los Angeles basin and the Peninsular Ranges province. The Los Angeles basin is bounded by several westerly-trending ranges, including the Elysian, Repetto, Puente, and San Joaquin Hills and the Santa Ana Mountains. The Peninsular Ranges province is characterized by a series of northwest- to west-northwest-trending fault-bounded mountain ranges.

Los Angeles to San Diego via Orange County
This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The route follows a coastal corridor that traverses parts of two geomorphic provinces: the Transverse Ranges and Peninsular Ranges. Key features of this southern region include spectacular coastal cliffs.

3.13.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Existing conditions describes transportation conditions as of 2003. The No Project Alternative includes existing transportation infrastructure plus all planned, approved, and funded projects that can reasonably be expected to be in operation by 2020. This analysis assumed that existing major infrastructure (bridges, for example) was designed, has been retrofitted, or is currently scheduled to be retrofitted to meet current design standards for seismic safety and other geologic constraints, and that future projects included in the No Project Alternative would incorporate similar safeguards as part of the development, design, and construction process. However, it is not possible to eliminate or mitigate all geologic hazards through design and construction. Some types of geologic hazards (seismic hazards in particular) are also unpredictable. While it is difficult to evaluate the change in hazards (potential for geologic impacts) between existing conditions and No Project conditions, it can be assumed that some improvements in technology and materials as well as more stringent design codes will be implemented in the next 20 years to address seismic design of new structures. Thus the No Project Alternative would be somewhat improved from the existing conditions, but existing geologic risks were assumed to be representative of geologic risks under the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

This analysis focused on comparing the difference in impacts anticipated with the proposed Modal and HST Alternatives, using 2020 No Project conditions as a baseline.

As shown in Table 3.13-2, geologic constraints would be similar for the proposed Modal and HST Alternatives. They include the following.

- Active fault crossings.
- Potential for strong seismic ground shaking.
- Unstable slopes.
- Difficult excavation of tunnels and deep cuts.
- At-grade construction over problem soils.

Active seismicity represents a key constraint on design and construction for both the Modal and HST Alternatives. Portions of both the Modal and HST Alternatives would require special design, including additional structural ductility and redundancy to withstand severe ground shaking as well as the potential for liquefaction and/or other types of seismically induced ground failure. Conceptual alignments have been laid out so that the proposed HST Alternative would cross major faults at grade; nonetheless, active fault crossings would require special designs to minimize potential damage to the rail lines and other infrastructure as a result of surface fault rupture and surface disruption associated with fault creep. Modal Alternative designs would be subject to similar requirements.

Construction of mountain crossings for both the Modal and HST Alternatives would be constrained by existing unstable slopes and areas of difficult excavation. The tunnels proposed under the HST Alternative would pose additional design and construction issues because of difficult excavation conditions. The Modal Alternative would not require tunnel construction, so impacts related to difficulty of excavation would be less under the Modal Alternative. In the LOSSAN segment, however, tunnel construction under the HST would result in lower impacts on coastal geology because impacts on the stability of coastal bluffs would be reduced.

Potential geologic impacts that are categorized as high should not be regarded as precluding construction of an alternative or an alignment option, or as necessarily indicating that these would be potentially significant impacts. Rather, they identify aspects of project design where additional study would be needed and where engineering and design effort would be required to avoid or mitigate the impacts.

Table 3.13-2
Summary of Geology Potential Impact Rankings by Alternative and Segment

Category	Impact	Bay Area to Merced		Sacramento to Bakersfield		Bakersfield to Los Angeles		Los Angeles to San Diego (via Inland Empire)		Los Angeles to San Diego (via Orange County)	
		Modal	HST	Modal	HST	Modal	HST	Modal	HST	Modal	HST
Seismic hazards	Potential risk to worker and public safety due to collapse or toppling of partially constructed or completed facilities during strong earthquakes. Potential risk to public safety due to automobile accidents/interruption of service due to derailment caused by ground motion during strong earthquakes. Damage to facilities due to secondary hazards over soft or filled ground.	H	M	L	L	H	H	H	H	H	H
Active fault crossings	Potential risk to worker or public safety due to ground rupture along active faults. Potential risk to public safety due to damage to highway or airport/interruption of service due to derailment by ground rupture along active faults.	M–H	H	H	L	H	M–H	H	H	M	M
Slope stability	Potential risk to worker or public safety due to failure of natural and/or construction cut slopes or retention structures.	L–H	L–M	L	L	L	L	L	L	L	M
Difficult excavation	Potential cost and duration of surface or tunnel excavations during construction.	L–M	M	L	L	L	M	H	M–H	L	L–M
Oil and gas fields	Potential migration of potentially explosive and/or toxic gases into subsurface facilities.	L	L	L	L	L	M	L	M	L	L
Mineral resources	Potential project costs and delays due to potential impacts on existing mineral resource areas and facilities, including potential remediation.	L–M	L–M	L	M	L	L	H	M	L	L

H = High impact.
M = Medium impact.
L = Low impact.

3.13.4 Comparison of Alternatives by Region

A. BAY AREA TO MERCED

Modal Alternative

In the Bay Area to Merced region, the majority of the Modal Alternative alignments are located in areas of potentially strong ground shaking and, to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure. Active fault crossings would be a concern along I-80 from I-880 to I-5, along I-580 from I-880 to I-5, and along SR-152 from US-101 to I-5. Overall, the Modal Alternative ranked high with respect to seismic hazards, with the exception of the segment along SR-152 from SR-99 to I-5.

Slope stability would be a major consideration where the alignment would require widening of existing highway cuts along SR-152 through the Diablo Ranges. However, the potential for slope stability impacts is low along the remainder of the Bay Area to Merced modal alignments.

Areas where hard rock may be difficult to excavate occur in mountain crossings along SR-15, I-80, and I-580.

High-Speed Train Alternative

In the Bay Area to Merced region, the majority of the HST alignments are located in areas of potentially strong ground motion, and to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure (Figure 3.13-1). Active fault crossings would also be a concern along I-580 from I-880 to I-5 and along SR-152 from US-101 to I-5. Overall, the HST Alternative ranked medium in this region with respect to seismic hazards.

All of the proposed HST alignment alternatives that cross the Diablo Range traverse steep and potentially unstable slopes where the proposed alignment would be at grade or in cuts into slopes. There would be little to no concern about slope stability where the alignments cross the nearly flat topography of the San Francisco Bay margin, the Santa Clara Valley, and the Central Valley. In addition, considering the lengths of the alignments, the potential for slope stability impacts is low through the Diablo Range.

High-Speed Train Alignment Options Comparison

The most likely areas of difficult underground excavation would be the Diablo Range crossings where rocks of the Franciscan Complex are highly variable and include some rock units that are typically hard and fracture zones are common. The proposed tunnel options are all through Franciscan rock.

B. SACRAMENTO TO BAKERSFIELD

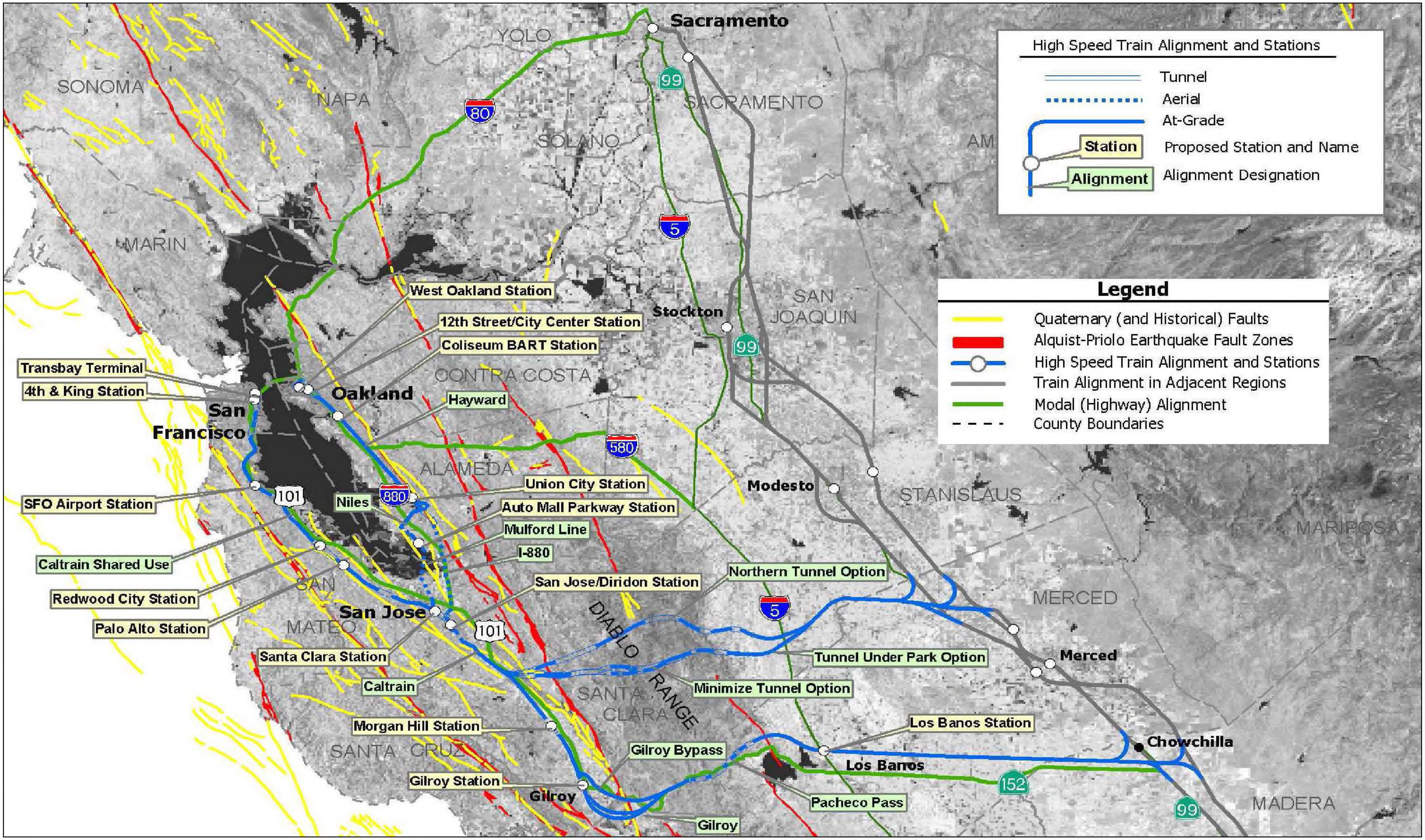
Modal Alternative

In the Sacramento to Bakersfield region, the Modal Alternative alignments are ranked medium and high for seismic hazards. Along the western edge of the Central Valley, portions of the I-5 alignment between I-5/I-580 near Tracy in the north and Kettleman City in the south (Stockton to Modesto, Modesto to Merced, and Merced to Fresno corridors) are subject to strong ground shaking (0.7g), as they are along the west side of the Central Valley, near the coastal ranges and in closer proximity to active faults than the HST alternative.

High-Speed Train Alternative

Seismic hazards, including ground motion, liquefaction, and other seismically induced ground movement, are considered relatively minor for the HST Alternative alignments in the Central Valley. All of the alignments are located in regions ranked low for seismic ground shaking, with

Figure 3.13-1: HST Design Options—Major Fault Crossings—San Francisco Bay Area



the exception of the southern end of the corridor (Bakersfield area), where predicted ground motion is slightly higher but is not expected to exceed 0.5g.

High-Speed Train Alignment Options Comparison

Oil and gas fields would potentially affect all of the following proposed HST alignment segments, as they would the Stockton Downtown Station, Bakersfield Airport Station, and Bakersfield Golden State Station sites. Because the length of the alignment through the oil and gas fields would be relatively short, the overall rankings were all low for impacts due to oil and gas.

Mineral resources provide a potential means to distinguish proposed alignments in parts of the Central Valley. The following alignments and sites ranked high for potential impacts related to mineral resources: Sacramento Downtown Valley station site, Sacramento Power Inn Road station site, and all Sacramento to Stockton alignment options. The presence of mineral resources (typically sand and gravel deposits) is most significant in the Sacramento area but would potentially impact all HST alignment options in the Sacramento to Stockton corridor to some extent.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

In the Bakersfield to Los Angeles region, the Modal Alternative is considered to have high potential for impacts related to seismic hazards and fault crossings. With the exception of I-5 from Burbank to Los Angeles Union Station (LAUS), all Modal Alignment segments cross at least one Quaternary fault. Approximately seven active faults, including the Garlock and San Andreas, cross the segment of I-5 that extends between SR-99 and SR-14. The segment of SR-14 between Palmdale and I-5 has approximately five fault active crossings, including the San Andreas.

High-Speed Train Alternative

The HST Alternative alignment options in the Bakersfield to Los Angeles region are considered to have high potential for impacts related to seismic hazards (Figure 3.13-2). In addition, tunneling proposed with the HST Alternative would result in higher design, construction, and operational costs than at-grade construction. Six faults intersect the I-5 Tehachapi corridor, which extends from Wheeler Ridge to San Fernando, and seven faults cross the Soledad Canyon corridor. In addition, the I-5 Tehachapi alignment option would run parallel to an active fault (San Gabriel Fault) for over 20 miles. With regard to active fault crossings, the HST Alternative is ranked low to medium.

High-Speed Train Alignment Options Comparison

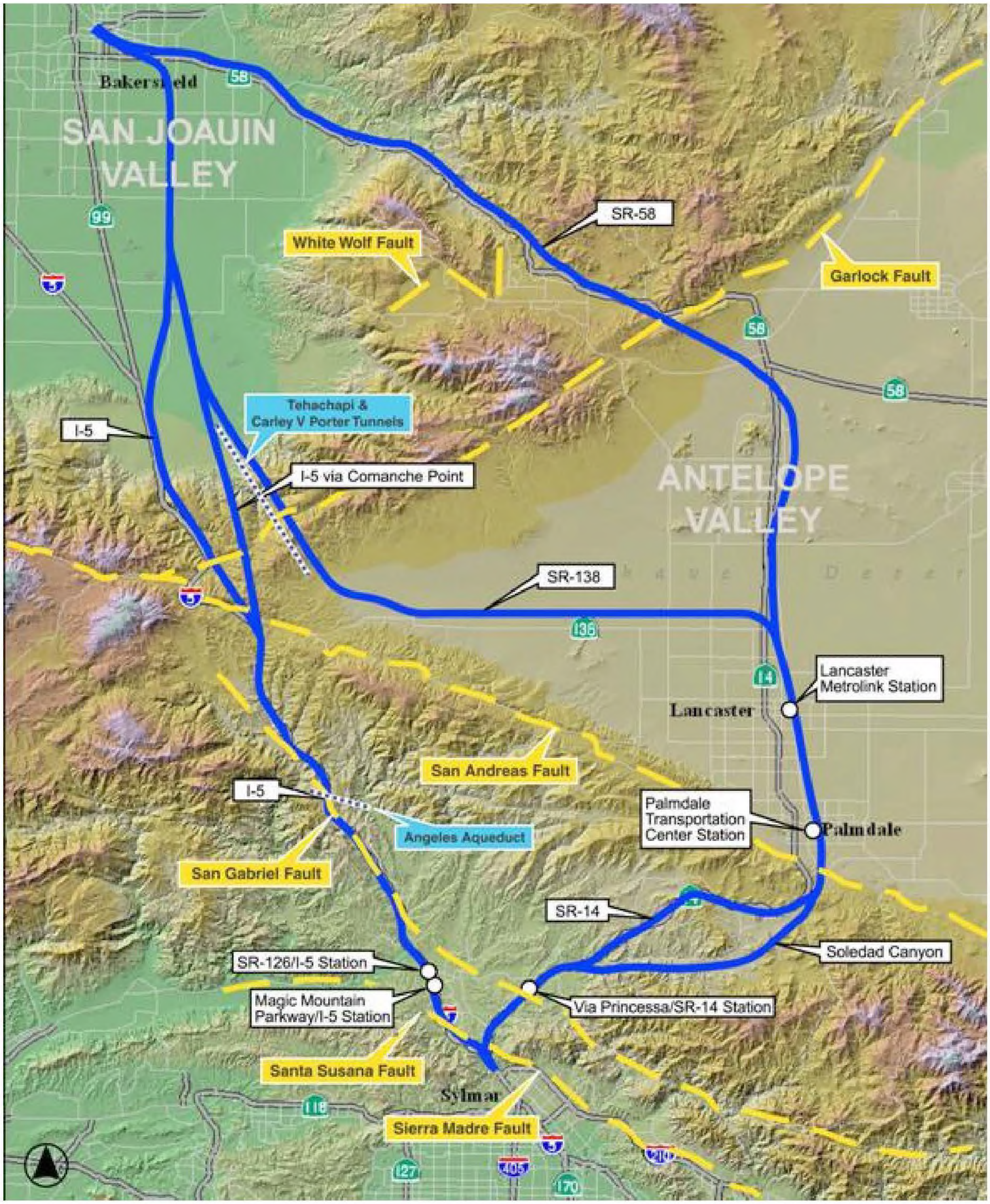
All proposed HST alignments through the Tehachapi Mountains would encounter at least four major fault crossings. The most significant crossings would include the San Andreas and the Garlock faults, which are capable of generating large earthquakes (over magnitude 7). The alignment would be designed to cross these faults at grade. The I-5 alignment options would have considerably higher seismic hazards and constructability issues than the Antelope Valley option since it would run parallel to the San Gabriel fault Los Angeles to San Diego via Inland Empire

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The Modal Alternative is considered to have high potential for impacts related to relatively frequent earthquake activity and the presence of the following faults: the San Jose fault at I-10 in Pomona, the southern San Bernardino fault at I-10 in San Bernardino, and the Temecula fault at I-15 in Temecula. Difficult excavation for cut slopes in hard rock formations would also be a concern in this region.

**Figure 3.13-2. HST Design Options—Major Fault Crossings
Tehachapi Mountains—Bakersfield to Los Angeles**



High-Speed Train Alternative

Several active faults are located in the immediate vicinity of the proposed HST segments and the HST stations; consequently, this alternative ranked high for seismic hazards. The significant faults include the Elysian Park, Rialto-Colton-Claremont, San Jacinto, Murrieta Hot Springs, Whittier-Elsinore, and Newport-Inglewood-Rose Canyon faults. In addition, three active faults cross the proposed HST segments in this region, including the southern San Bernardino, the Temecula, and, in San Diego, the La Jolla. This alternative would also encounter areas of difficult excavation in tunneled sections due to fractured rock.

High-Speed Train Alignment Options Comparison

There is not a significant difference among the proposed HST Alternative alignment options in this region based on geology.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

In the LOSSAN region, the Modal Alternative ranked high for impacts related to seismic hazards between LAUS and Irvine, San Juan Capistrano and Camp Pendleton, and SR-52 and Santa Fe Depot in San Diego.[2] Overall, about half of the Modal Alternative would traverse areas of high seismic hazard. Additionally, the Modal alignment crosses three active faults in the southern portion of the region.

High-Speed Train Alternative

In the LOSSAN region, the HST Alternative ranked high for potential impacts related to seismic hazards along the route between LAX and LAUS. It also crosses two active faults in this area. The HST Alternative also ranked high for potential impacts related to seismic hazards between LAUS and Irvine) and proposed station sites except the Irvine station site.

3.13.5 Design Practices

The Authority has specifically avoided or minimized potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas throughout extensive alignment studies completed prior to and as part of the program EIR/EIS process. The Authority's objective is to avoid fault crossings in tunnel or aerial sections, and this has been carried through the development of the alternatives. Any impacts that remain at the conclusion of project level environmental review would be mitigated through specific design and construction practices described in the following mitigation section.

3.13.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for geology and soils, the HST alternative would have potentially significant impacts when viewed on a system-wide basis. In some alignment segments there would be potential for increased soil disturbance due to slope instability. The HST alternative would involve some seismic hazards along alignment segments being susceptible to ground motion. The proposed HST system would reduce exposure to seismic risk by crossing any known active faults at grade. Mitigation strategies, as well as the design practices discussed in section 3.13.5, will be applied to reduce these impacts.

This document contains a broad program analysis that generally identifies the locations of potential geologic impact areas for the proposed alternatives. These are areas that would need further study in environmental documentation at the project level.

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[2] No Modal Alternative improvement is proposed between LAX and LAUS.

Mitigation for potential impacts related to geologic and soils conditions must be developed on a site-specific basis, based on the results of more detailed (design-level) engineering geologic and geotechnical studies. Consequently, geologic and geotechnical mitigation would be identified in subsequent, project-level analysis rather than at the program level. Following is an overview of general approaches to possible geologic and geotechnical mitigation.

A. GROUND SHAKING

The potential for traffic safety issues related to ground shaking during a large earthquake cannot be mitigated completely; this holds true for most vehicle transportation systems throughout California. However, some strategies are available to reduce hazards, including the following.

- The potential for collapse or toppling of superstructures such as bridges or retaining structures due to strong ground motion can be routinely mitigated by designing structures to withstand the estimated anticipated ground motions. Designs typically include additional redundancy and ductility in the structure. The design needed to withstand a certain magnitude of earthquake would be determined during subsequent stages of design and development of proposed facilities. Temporary facilities, such as shoring, would be designed considering a lower probability of seismic events.
- The potential for structural damage and resulting traffic hazard as a result of liquefaction can be mitigated through site-specific methods such as ground modification methods (soil densification) to prevent liquefaction, or structural design (e.g., deep foundations) to accommodate/resist the liquefiable zones.
- It is unlikely that the potential for HST derailment during a peak event could be mitigated by designing a track-wheel system capable of withstanding the potential ground motions in most of the project area. Existing train systems throughout California face the same challenge. However, a network of strong motion instruments has been installed throughout California and additional monitoring stations are proposed. These stations provide ground motion data that could be used with the HST instrumentation and controls system to temporarily shut down the HST operations during or after an earthquake. The system would then be inspected for damage due to ground motion and/or ground deformation and then returned to service when appropriate. This type of seismic protection is already used for many rapid transit systems in seismically active areas and has been proven effective.

B. FAULT CROSSINGS

The potential for ground rupture along active faults is one of the few geologic hazards that can rarely be fully mitigated. However, known active faults are typically monitored, and in some cases fault creep is mitigated with routine maintenance, which could include repaving or minor track re-alignment. Project design could provide for the installation of early warning systems triggered by strong ground motion associated with ground rupture. Linear monitoring systems such as time domain reflectometers (TDRs) could be installed along major highways and rail lines within the zone of potential ground rupture. These devices emit electronic information that is processed in a centralized location and could be used to temporarily control traffic and trains, thus reducing accidents. In addition, the HST Alternative has been modified in mountain crossing areas where tunnels are proposed to avoid crossing known or mapped active faults within the tunnel.

C. SLOPE STABILITY/LANDSLIDES

The potential for failure of natural and/or temporary construction slopes and retention structures can be mitigated through geotechnical investigation and review of proposed earthwork and foundation excavation plans and profiles. Based on investigation and review, recommendations would be provided for temporary and permanent slope reinforcement and protection, as needed. These recommendations would be incorporated into the construction plans. Additionally, during construction, geotechnical inspections would be performed to verify that no new, unanticipated conditions are encountered, and to verify the proper incorporation of recommendations. Slope monitoring may also be incorporated in final design where warranted.

D. AREAS OF DIFFICULT EXCAVATION

The potential for difficult excavation in areas of hard rock and faults cannot be fully mitigated, but it can be anticipated so that safety is assured, potential environmental impacts are addressed, and project schedule problems are avoided to the extent possible. This includes focusing future geotechnical engineering and geologic investigations in these areas and incorporating the findings into project construction documents, communicating with the contractors during the bid process, and monitoring actual conditions during and after construction.

E. HAZARDS RELATED TO OIL AND GAS FIELDS

Hazards related to potential migration of hazardous gases due to the presence of oil fields, gas fields, or other subsurface sources can be mitigated by following strict federal and state Occupational Safety & Health Administration (OSHA/CalOSHA) regulatory requirements for excavations, and consulting with other agencies as appropriate, such as the Department of Conservation (Division of Oil and Gas) and the Department of Toxic and Substances Control regarding known areas of concern. Mitigation measures would include using safe and explosion-proof equipment during construction and testing for gases regularly. Active monitoring systems and alarms would be required in underground construction areas and facilities where subsurface gases are present. Gas barrier systems have also been used effectively for subways in the Los Angeles area. Installing gas detection systems can monitor the effectiveness of these systems.

F. MINERAL RESOURCES

In some cases, mineral resources sites may represent valuable sources of materials that should either be completely developed prior to use for another purpose or should be avoided by proposed facilities to the extent feasible. This practice could result in realignment of proposed alignments and/or proposed relocation or modification of other proposed facilities. To mitigate the potential for significant project redesign, important mineral sites should be identified as early as possible.

Mitigation strategies to address seismic hazards such as liquefaction, seismically induced settlement and landslides as well as long-term settlement along oil fields may include, but would not be limited to:

- Design and engineer all structures for earthquake activity - Seismic design for the structures would be based on the Caltrans Seismic Design Criteria
- Design and install foundations resistant to soil liquefaction and settlement.
- Identify potential serpentinite bedrock disturbance areas and implement a safety plan
- Apply the requirements of Section 19 (Earthwork) of the most current Caltrans Standard Specifications to ensure geotechnically stable slopes are planned and created.
- Subsurface gases: Install passive or active gas venting systems and gas collection systems in areas where subsurface gases are identified.
- Remove corrosive soil and use corrosion protected materials in infrastructure.
- Address erosive soils through soil removal and replacement, geosynthetics, vegetation, and/or rip rap, where warranted.

- Remove or moisture condition shrink-swell soils, where necessary.
- Utilize stone columns, grouting, and deep dynamic compaction in areas of potential liquefaction
- Utilize buttress berms, flattened slopes, drains, and/or tie-backs in areas of slope instability.
- Avoid settlement through preloading, use of stone columns, deep dynamic compaction, grouting, and/or special foundation designs.

The above mitigation strategies are expected to reduce the geologic and soils impacts of the HST alternative to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier, project-level of environmental analyses.

3.13.7 Subsequent Analysis

As described in Method of Evaluation of Impacts above, this analysis was performed generally on the basis of existing data available in GIS format. The data provided in this section are intended for planning purposes, are not meant to be definitive for specific sites, and have not been independently confirmed. More detailed geological studies would be required at the project level, and would likely include subsurface exploration, laboratory testing, and engineering analyses to support detailed alignment design and mitigation of potential impacts associated with geologic and soils conditions, including seismic hazards.

3.14 HYDROLOGY AND WATER RESOURCES

This section addresses three types of hydrology and water resources—floodplains, surface water, and groundwater—that have the potential to be affected by the proposed alternatives. In addition, water quality issues are briefly addressed in relation to surface and groundwater resources. This section describes the existing hydrologic resources within the five regions and generally identifies the potential for impacts from each alternative and high-speed train (HST) alignments and station options on those resources. The analysis identifies the number and general extent of areas of hydrologic resources that potentially would be affected by the various alternatives for purposes of comparison.

3.14.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Several federal and state laws regulate and are designed to protect hydrologic resources, floodplains, and water quality. Below is a list of these statutes. (See Appendix 3.14-A for brief descriptions of these authorities.)

Federal Laws and Regulations

Clean Water Act (33 U.S.C. § 1251 et seq.): The purpose of the federal Clean Water Act (CWA) is restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters through prevention and elimination of pollution. The CWA applies to discharges of pollutants into waters of the U.S. The following CWA sections are most relevant to this analysis.

Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.): Section 10 of the Rivers and Harbors Act, administered by the U.S. Army Corps of Engineers (USACE), requires permits in navigable waters of the U.S. for all structures such as riprap and activities such as dredging. Navigable waters are defined as those subject to the ebb and flow of the tide and susceptible to use in their natural condition or by reasonable improvements as means of interstate transport or foreign commerce. USACE grants or denies permits based on the effects of navigation. Most activities covered under this act are also covered under Section 404 of the CWA.

Executive Order 11988—Floodplain Management (U.S. DOT Order 5650.2; 23 C.F.R. 650, Subpart A): Executive Order (EO) 11988 directs all federal agencies to seek to avoid to the extent practicable and feasible all short-term and long-term adverse impacts associated with floodplain modification and to avoid direct and indirect support of development within 100-year floodplains whenever there is a reasonable alternative available.

Projects that encroach upon 100-year floodplains must be supported with additional specific information. The U.S. Department of Transportation Order 5650.2, titled "Floodplain Management and Protection," prescribes "policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs and budget requests." The order does not apply to areas with Zone C (areas of minimal flooding as shown on Federal Emergency Management Agency [FEMA] Flood Insurance Rate Maps [FIRM]). Environmental review documents should indicate potential risks and impacts from proposed transportation facilities.

Flood Disaster Protection Act (42 U.S.C. 4001–4128; DOT Order 5650.2, 23 C.F.R. 650 Subpart A; and 23 C.F.R. 771): The purpose of the Flood Disaster Protection Act is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood-hazard areas. The act is applicable to any federally assisted acquisition or construction project in an area identified as having special flood hazards. Projects should avoid construction in, or develop a design to be consistent with, FEMA-identified flood-hazard areas.

State Laws and Regulations

California Department of Fish and Game Code (§ 1601–1603 [Streambed Alteration]): Under Sections 1601-1603 of the Fish and Game Code, agencies are required to notify the California Department of Fish and Game (CDFG) prior to implementing any project that would divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake.

Porter-Cologne Water Quality Act (Water Code § 13000 et seq.): The Porter-Cologne Act is the basic water quality control law for California, and it provides for the State Water Resources Control Board (SWRCB) to implement the CWA for California.

Cobey-Alquist Flood Plain Management Act (Water Code § 8400 et seq.): The California Reclamation Board provides policy direction and coordination for the flood control efforts of state and local agencies along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with USACE. It cooperates with various federal, state, and local government agencies in establishing, planning, constructing, operating, and maintaining flood-control works. The California Reclamation Board also exercises regulatory authority to maintain the integrity of the existing flood-control system and designated floodways by issuing permits for encroachments.

B. METHOD FOR EVALUATION OF IMPACTS

Impact Evaluation

Potential impacts on hydrologic resources, floodplains, and water quality were evaluated using a combination of both qualitative and quantitative assessment methods. The existing conditions as described for the No Project Alternative provide the primary basis of comparison. Appendix 3.14-B provides a discussion of the impact ratings and summarizes the potential impacts.

Qualitative Assessment

A qualitative assessment was used to compare the alternatives when discussing issues such as runoff rates, sedimentation, or other items that would ultimately require a more detailed analytic approach (i.e., at the project level if the decision is made to proceed with the proposed HST system) than appropriate for a program-level analysis. For these items, the differences in impacts between the Modal and HST Alternatives are explained in general, qualitative terms.

Quantitative Assessment

For the quantitative assessment, readily available information on wetland areas, stream locations, existing water quality problem areas, flood zones, and general soil information was used to estimate the magnitude of the potential areas of impacts for the alternatives. The following steps were followed to estimate the potential areas of impact for floodplains and water quality from the No Project, Modal, and HST Alternatives.

- Acreage of floodplains defined as Special Flood Hazard Areas, as defined by FEMA on Flood Insurance Rate Maps, in the study area was identified and estimated to evaluate the area of floodplain potentially impacted by the alternatives.
- Acreage of surface waters (lakes) and the linear feet of surface waters (rivers and streams) in the study area was estimated, using U.S. Geologic Survey (USGS) 1:24,000 scale digital line graphs of blueline streams, including ephemeral streams. The linear feet of surface water was calculated based on the flow-path length of rivers and streams in the study area to evaluate areas potentially affected by the alternatives. Lake surface areas represent the impoundment at maximum capacity.
- Waters with impaired water quality, i.e., waters identified on the Section 303(d) CWA list distributed by SWRCB, in the study area were identified.

- Acreage of areas of potential soil erosion in the study area was estimated to evaluate areas potentially affected by the alternatives. The calculations included those areas with a combination of erosive soils and steep slopes, evaluated as the product of kfact and slopeh (listed in the State Soil Geographic-STATSGO GIS database). Those conditions where kfact x slopeh is greater than 3.0 are potentially susceptible to erosion. Kfact designates the soil erodibility factor (including rock fragments) and slopeh indicates the soil slope.

The quantities of each type of hydrologic resource that could fall in the study area of either the Modal Alternative or the HST Alternative were estimated for each of the regions based on these steps.

3.14.2 Affected Environment

A. STUDY AREA DEFINED

Potentially Affected Area
The potentially affected area for hydrology and water quality is defined as 1) the area within 100 ft (30 m) of the centerline of the proposed HST Alternative alignments and within 100 ft (30 m) of the direct footprint of proposed new station facilities; and 2) the area within 100 ft (30 m) of the Modal Alternative direct corridor footprint and direct footprint of facilities, including corridors and facilities that would undergo upgrades/expansions.

Representative Impacts
The representative impacts were identified according to the actual corridor or facility footprint as follows:

- HST Alternative
  - 0′ in tunnels
  - 50′ total width in aerial and at-grade
- Modal Alternative
  - 20′ on each side of existing highway facility (40′ total width) for 1 new lane/direction
  - 40′ on each side of existing facility (80′ total width) for 2 new lanes/direction

Topography and Climate
The topography of the hydrology study area ranges from flat coastal and valley areas to mountain ranges, as discussed in Section 3.13, Geology and Soils. On average, about 75% of California's annual precipitation falls between November and March; 50% occurs between December and February. Northern California is much wetter than southern California, with more than 70% of California's average annual precipitation and runoff occurring in the northern part of the state (California Department of Water Resources 2003).

B. GENERAL DISCUSSION OF HYDROLOGY AND WATER RESOURCES

Floodplains
Floodplains are land next to a river that becomes covered by water when the river overflows its banks. FEMA designates and maps floodplains. In support of the National Flood Insurance Program (NFIP), FEMA has undertaken flood hazard identification and mapping to produce Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps. The zone of interest for the analysis of hydrologic resources in this program-level evaluation is defined as a special flood hazard area (SFHA) or Zone A, which is the flood insurance rate zone

that corresponds to the 100-year flood hazard area in the hydrologic resource study area. Figures 3.14-1 and 3.14-2 provide maps showing SFHAs in the general vicinity of the hydrologic resources study area.

Floodplains are important because they provide floodwater storage and attenuate the risk of downstream flooding, typically provide important habitat for native species (discussed in Section 3.15, Biological Resources and Wetlands), improve water quality by allowing filtration of sediments and other contaminants, and may provide locations for groundwater recharge.

Floodplains encompass floodways, which are the primary areas that convey flood flows. Floodways are typically channels of a stream, including any adjacent areas. NFIP has introduced the concept of floodways and floodplains to assist local communities in floodplain management. The floodway is the channel of a stream, including any adjacent floodplain areas that must be generally kept free of encroachment so that the 100-year flood can be carried without substantial increases to flood heights. The area between the floodway and the 100-year floodplain boundary is referred to as the floodway fringe. Any approved encroachment may take place within the floodway fringe. According to guidelines established by FEMA, increase in flood height in the floodway due to any encroachment in the floodway fringe areas may not exceed 12 in (30.48 cm), provided that hazardous velocities are not produced in the water body. Constructing levees, rail and road embankments, buildings, etc., that encroach on floodplains may reduce the flood-carrying capacity and increase flood elevations.

Surface Waters

For this analysis, surface waters include improved flood control or drainage channels, intermittent river and stream channels, permanent river and stream channels, ponds, lakes, reservoirs, coastal estuaries and lagoons, and sloughs. In addition, other human-made water features include aqueducts and salt evaporating ponds.

The California State Water Project is a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping facilities. Its main purpose is to store water and distribute it to urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the central coast, and southern California. The State Water Project includes about 660 mi) (1,062 km) of open canals and pipelines.

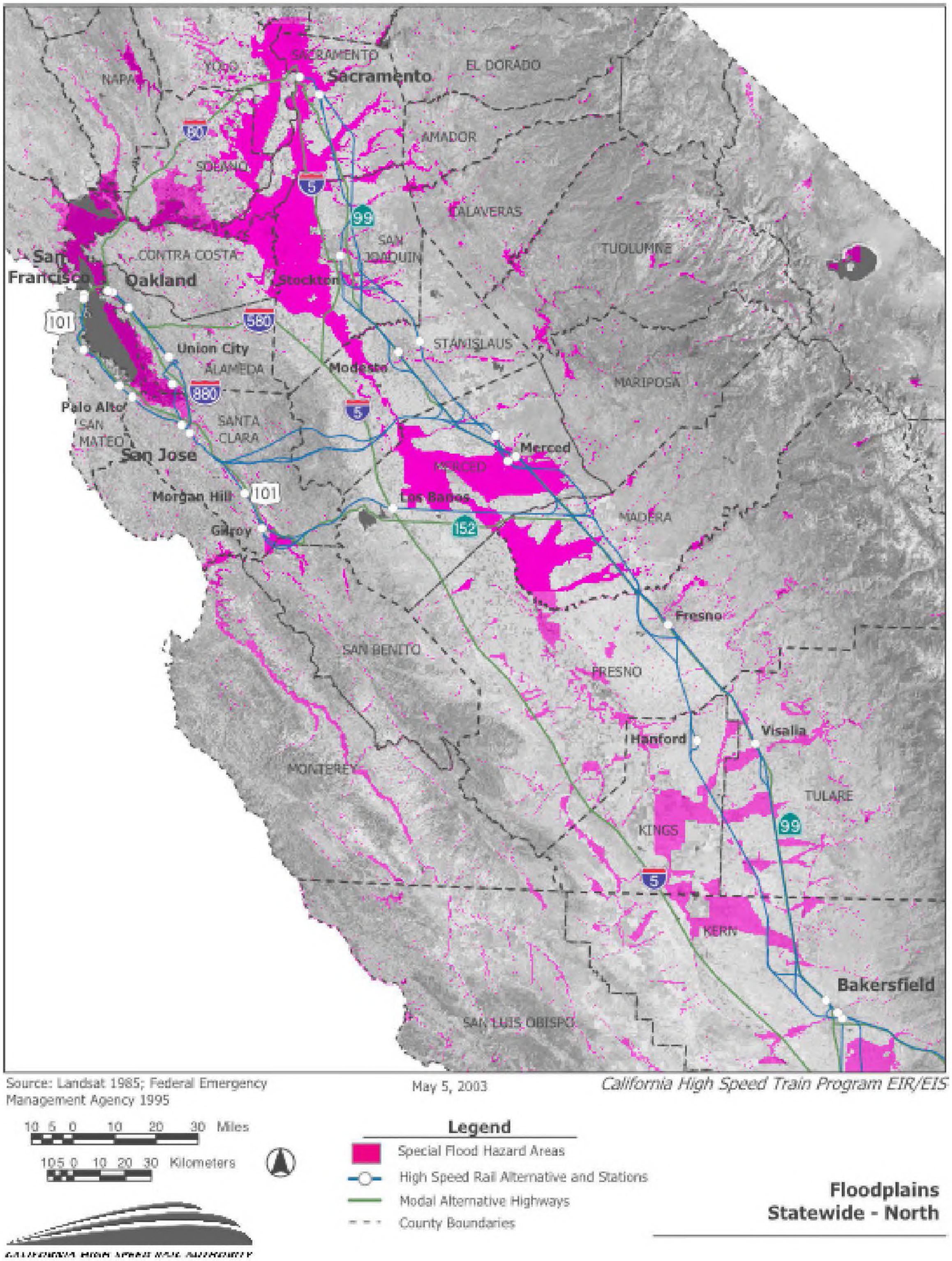
The federal Central Valley Project (CVP) is a long-term project for the storage and delivery of waters of the Sacramento River basin in the north for use in the San Francisco Bay Area, the farmlands of the San Joaquin Valley, and other metropolitan areas in the south.

The CVP's primary purposes include flood control; improvement of navigation on Central Valley rivers; development of hydroelectric power, irrigation, and municipal and industrial water supply; protection of the Sacramento-San Joaquin River Delta from seawater encroachment; and protection and enhancement of fish and wildlife.

Streams and lakes are important for fish and wildlife, for water supply, and because they convey floodwaters and may contribute to or attenuate the risk of downstream flooding. They provide important habitat for native species and may support wetland and riparian habitats (discussed in Section 3.15, Biological Resources and Wetlands), provide direct pathways connecting to downstream ecological or human resources, and provide locations for groundwater recharge.

Lagoons and estuaries are sheltered, semi-enclosed, brackish bodies of water along shorelines where fresh and salt waters interface through tidal flows and currents. Pollution from storm water runoff, industrial discharges, and boats can damage these resources, especially if their tidal flow is limited, naturally or otherwise. Of the areas being studied in this document, only the Los

Figure 3.14-1. Floodplains Statewide (North)



Source: Landsat 1985; Federal Emergency Management Agency 1995

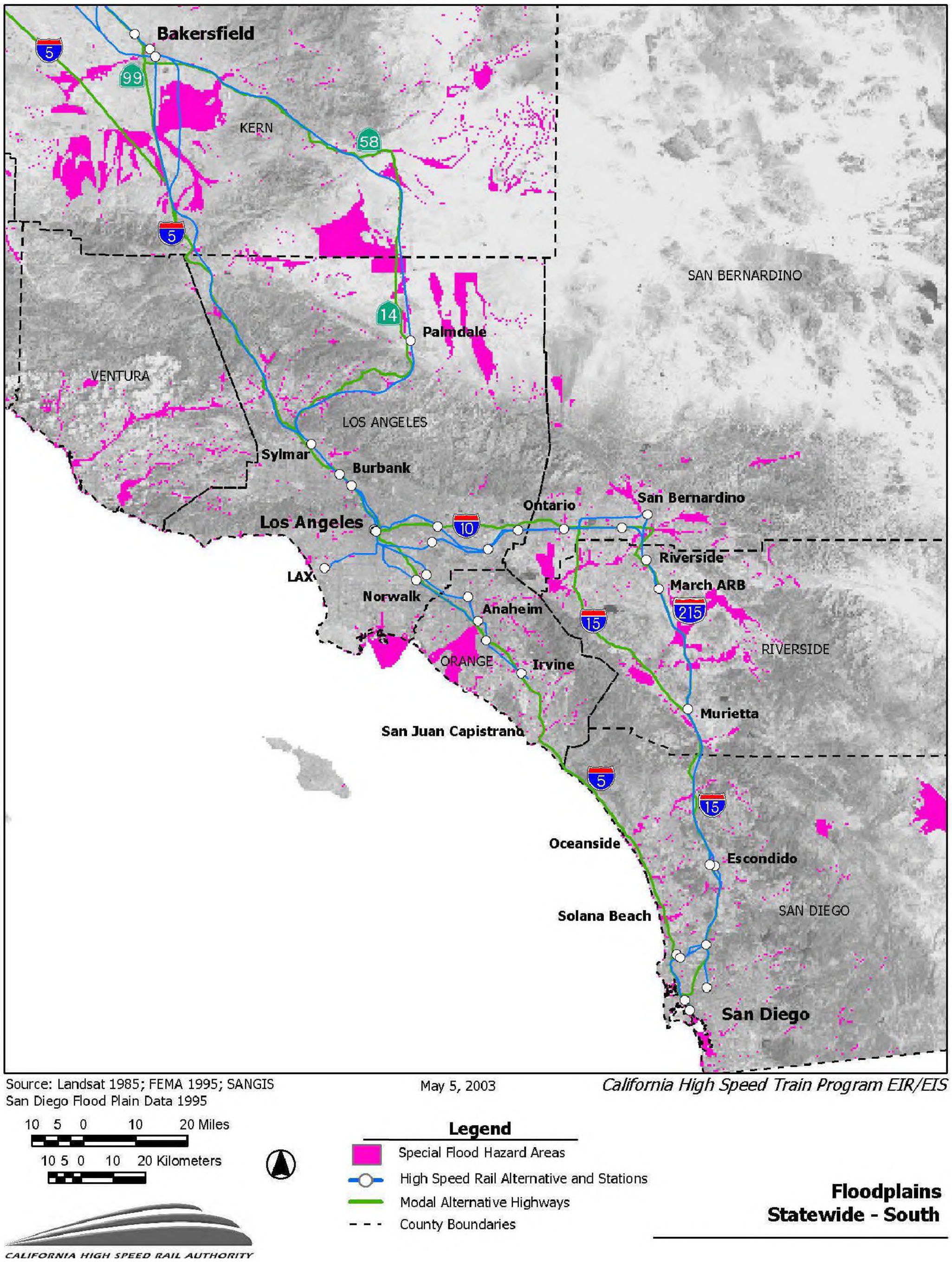
May 5, 2003

California High Speed Train Program EIR/EIS

Floodplains Statewide - North

Figure 3.14-2.

Floodplains Statewide (South)



Source: Landsat 1985; FEMA 1995; SANGIS
San Diego Flood Plain Data 1995

May 5, 2003

California High Speed Train Program EIR/EIS

Floodplains
Statewide - South

Angeles to San Diego via Orange County (LOSSAN) region includes lagoons and estuaries. The amount, frequency, duration, and quality of freshwater flows affect the salinity levels, which in turn dictate the types of biological resources associated with a particular water body. Figures 3.14-3 and 3.14-4 provide maps showing surface waters in the general vicinity of the hydrologic resources study area. (See Section 3.15, Biological Resources and Wetlands, for a discussion of wetlands).

Groundwater

Groundwater is found in subsurface water-bearing formations. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. Groundwater basins, which do not necessarily coincide with surface drainage basins, are defined by surface features and/or geological features such as faults, impermeable layers, and natural or artificial divides in the water table surface. The elevation of groundwater varies with the amount of withdrawal and the amount of recharge to the groundwater basin. Groundwater basins may be recharged naturally as precipitation infiltrates and/or artificially with imported or reclaimed water. Shallow groundwater is subject to potential impacts from dewatering during construction.

Figures 3.14-5 and 3.14-6 provide maps showing groundwater basins within the general vicinity of the hydrologic resources study area.

C. WATER QUALITY

Surrounding land uses affect surface water and groundwater quality. Both point-source[1] and nonpoint-source[2] discharges contribute contaminants to surface waters. Pollutant sources in urban areas include parking lots and streets, rooftops, exposed earth at construction sites, and landscaped areas. Pollutant sources in rural/agricultural areas primarily include agricultural fields and operations.

The impacts of nonpoint-source pollutants on aquatic systems are many and varied. Polluted runoff waters can result in impacts on aquatic ecosystems, public use, and human health from ground and surface water contamination, damage to and destruction of wildlife habitat, decline in fisheries, and loss of recreational opportunities. Small soil particles washed into streams can smother spawning grounds and marsh habitat. Suspended small soil particulates can restrict light penetration into water and limit photosynthesis of aquatic biota. Metals and petroleum hydrocarbons washed off roadways and parking lots, and fertilizers, pesticides, and herbicides from landscaped areas, may cause toxic responses (acute or long-term) in aquatic life, or may harm water supply sources such as reservoirs or aquifers.

Erosion

Potential impacts on water quality may result from construction activity (e.g., grading, which removes vegetation, exposing soil to wind and water erosion). A potential erosive condition occurs in areas with a combination of erosive soil types and steep slopes. Erosion can result in sedimentation that ultimately flows into surface waters. Contaminants in runoff waters may include sediment, hydrocarbons (e.g., fuels, solvents, etc.), metals, pesticides, bacteria, nutrients, and trash. Figures 3.14-7 and 3.14-8 provide maps showing areas with soils susceptible to erosion in the general vicinity of the hydrologic resources study area.

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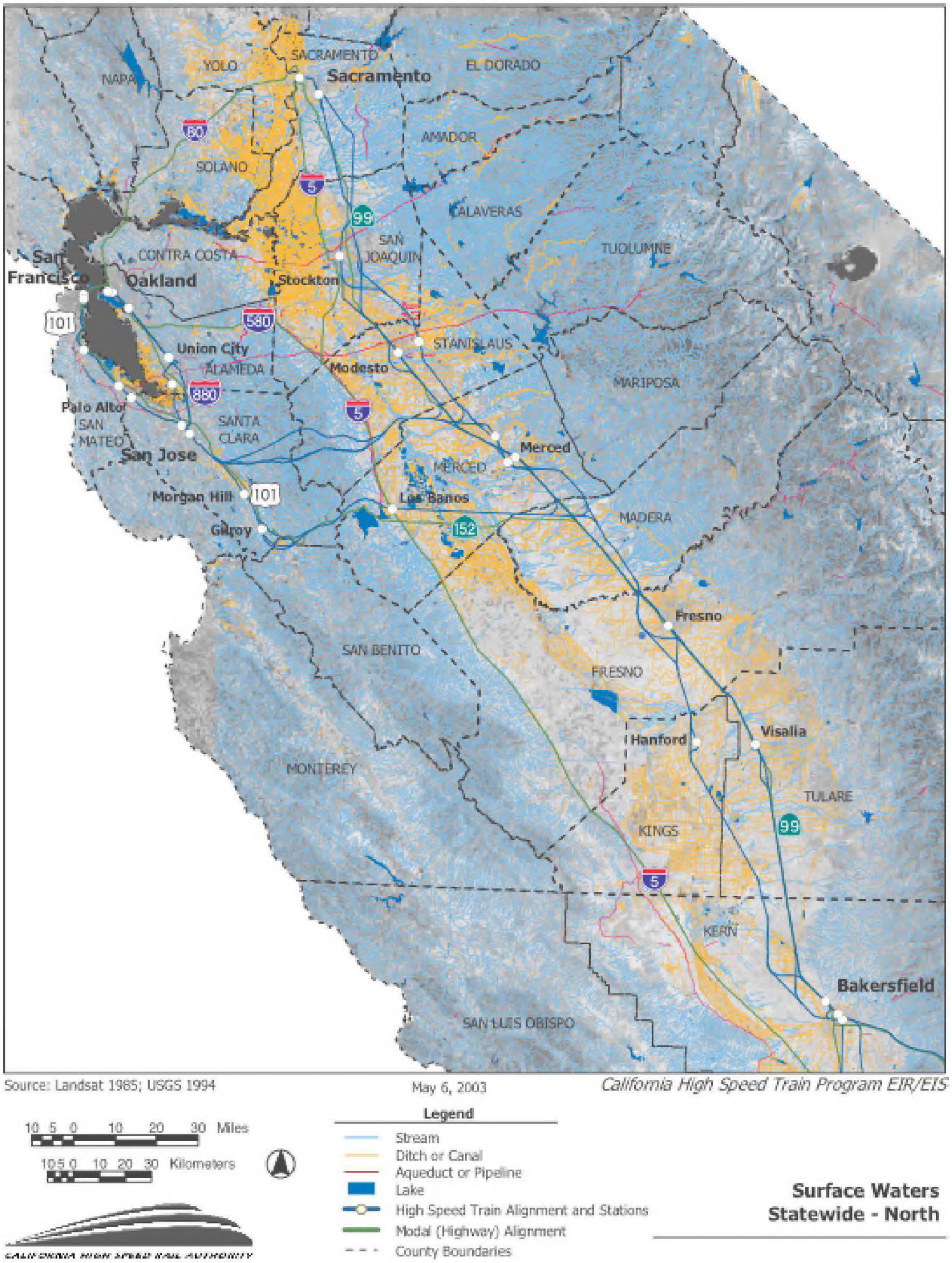
[1] Point source is a stationary location or fixed facility, such as the end of a pipe, from which pollutants are discharged. (U.S. Environmental Protection Agency 2002.)

[2] Nonpoint source pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water (U.S. Environmental Protection Agency 2002).

Figure 3.14-3. Surface Waters Statewide (North)



Source: Landsat 1985; USGS 1994

May 6, 2003

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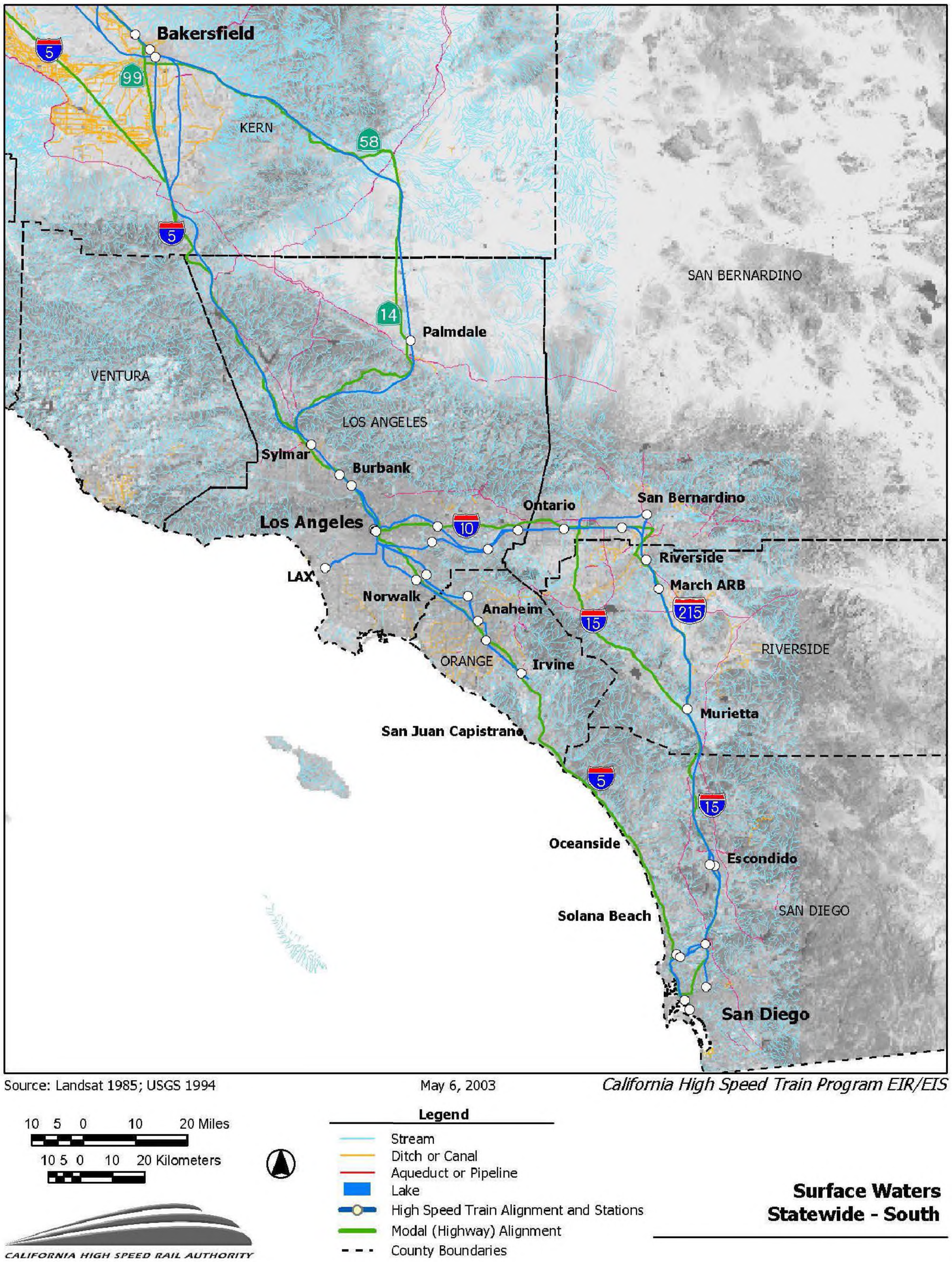
Figure 3.14-4.

Surface Waters Statewide (South)



Source: Landsat 1985; USGS 1994

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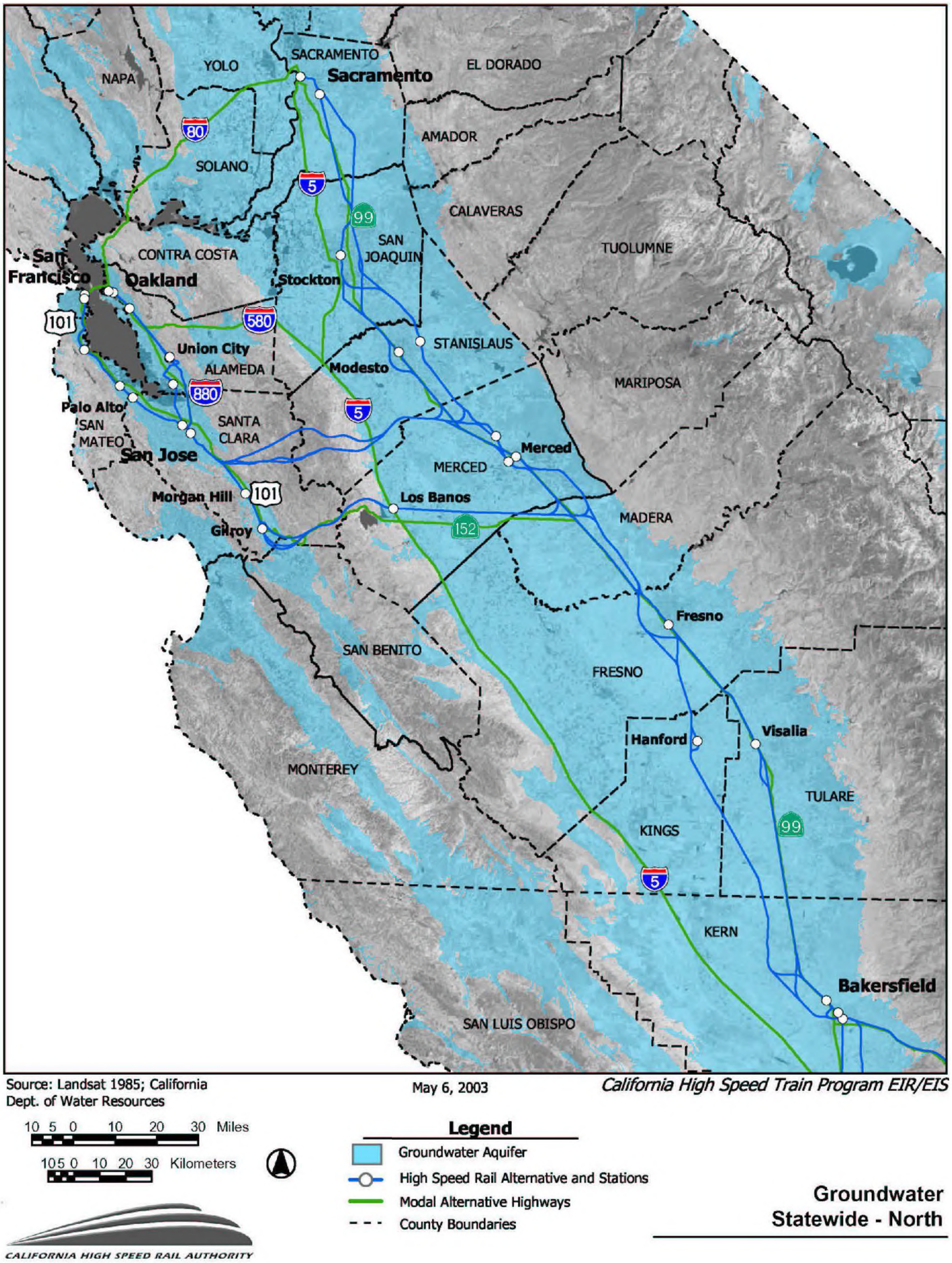
Figure 3.14-5. Groundwater Statewide (North)



Source: Landsat 1985; California Dept. of Water Resources

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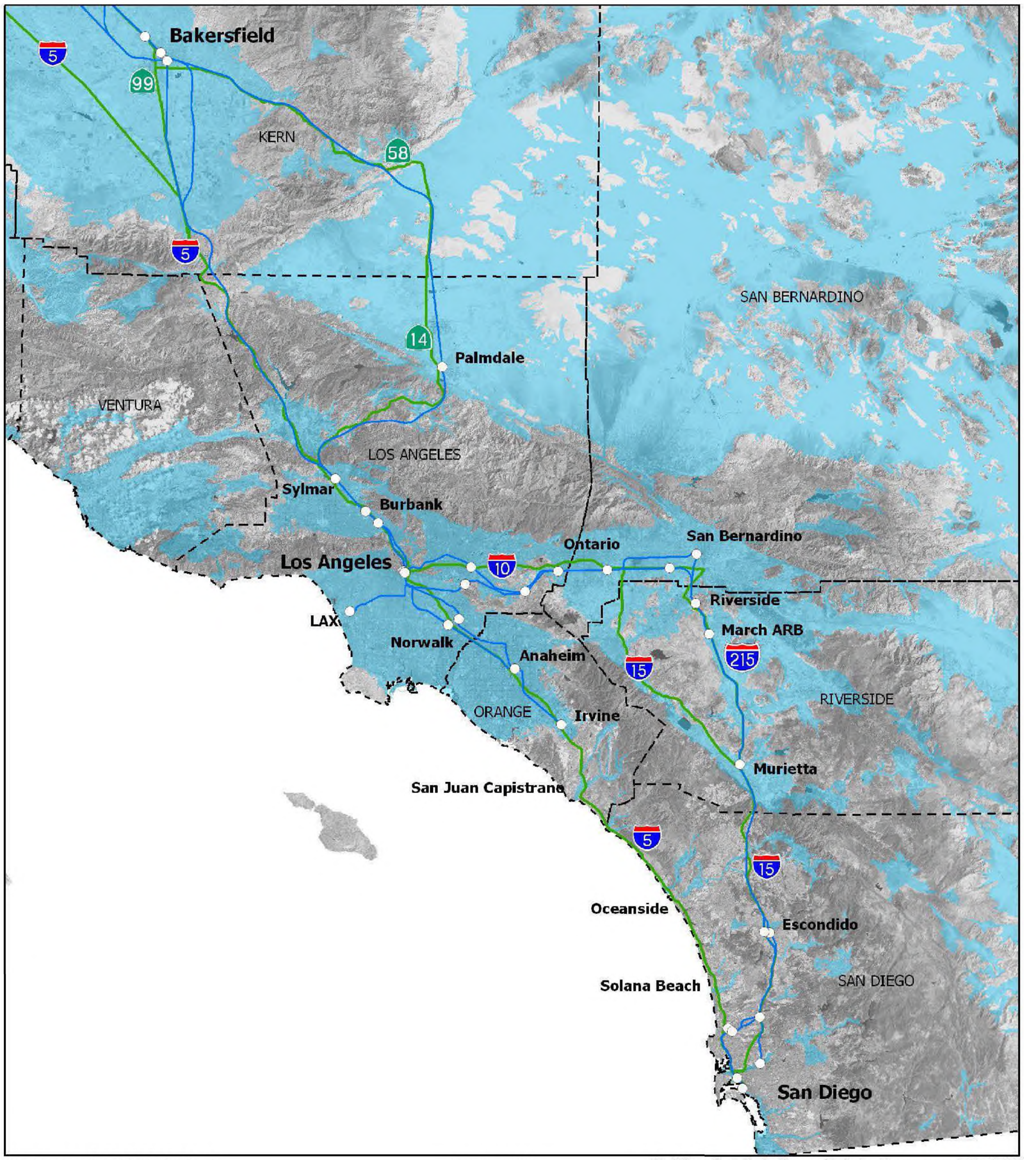
Figure 3.14-6.

Groundwater Statewide (South)



Source: Landsat 1985; California
Dept. of Water Resources

May 6, 2003

California High Speed Train Program EIR/EIS

10 5 0 10 20 Miles

10 5 0 10 20 Kilometers

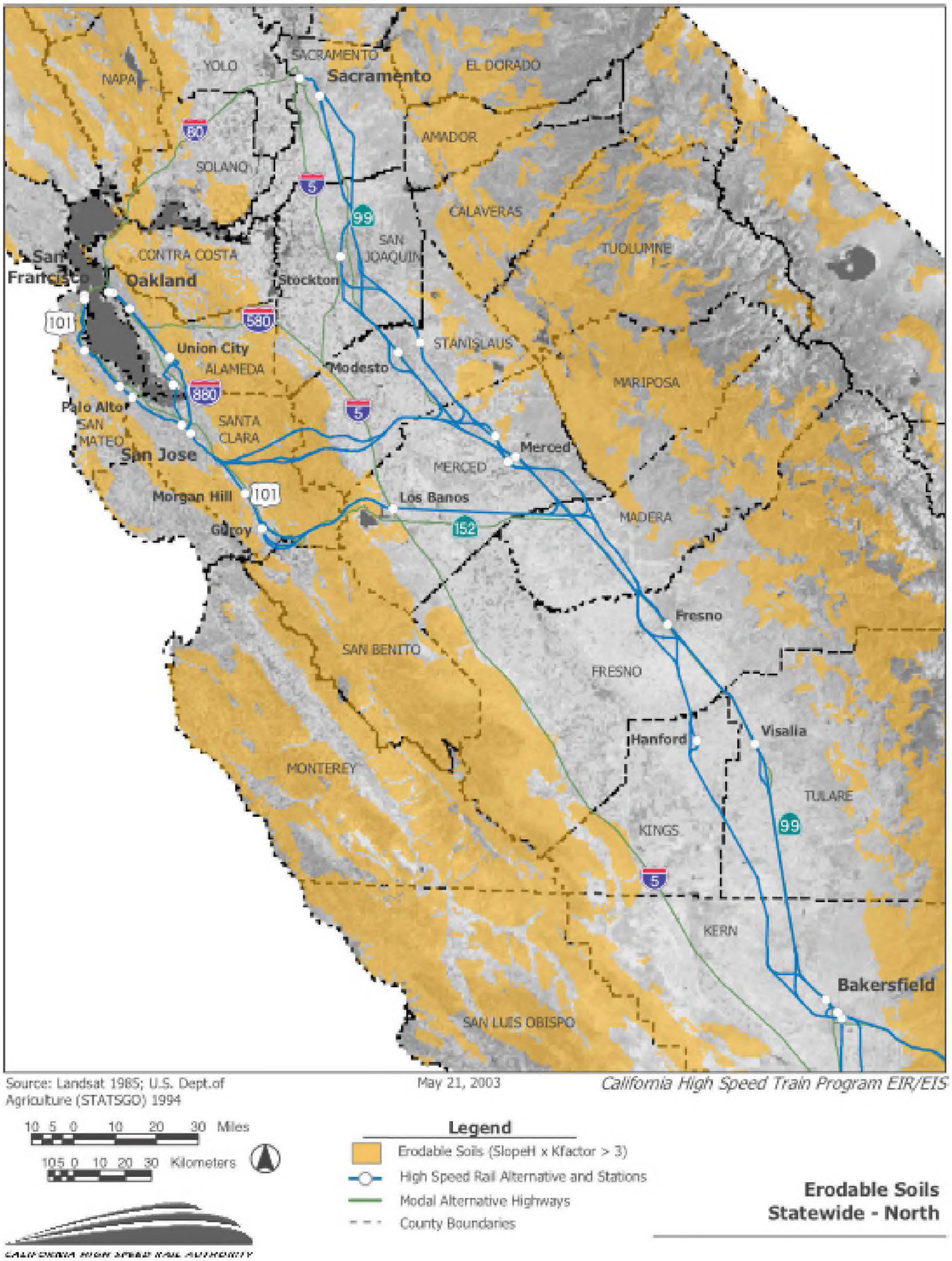
Legend

- 🟦 Groundwater Aquifers
- High Speed Rail Alternative and Stations
- Modal Alternative Highways
- County Boundaries

Groundwater Aquifers
Statewide - South

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Figure 3.14-7. Erodable Soils Statewide (North)



Source: Landsat 1985; U.S. Dept.of Agriculture (STATSGO) 1994

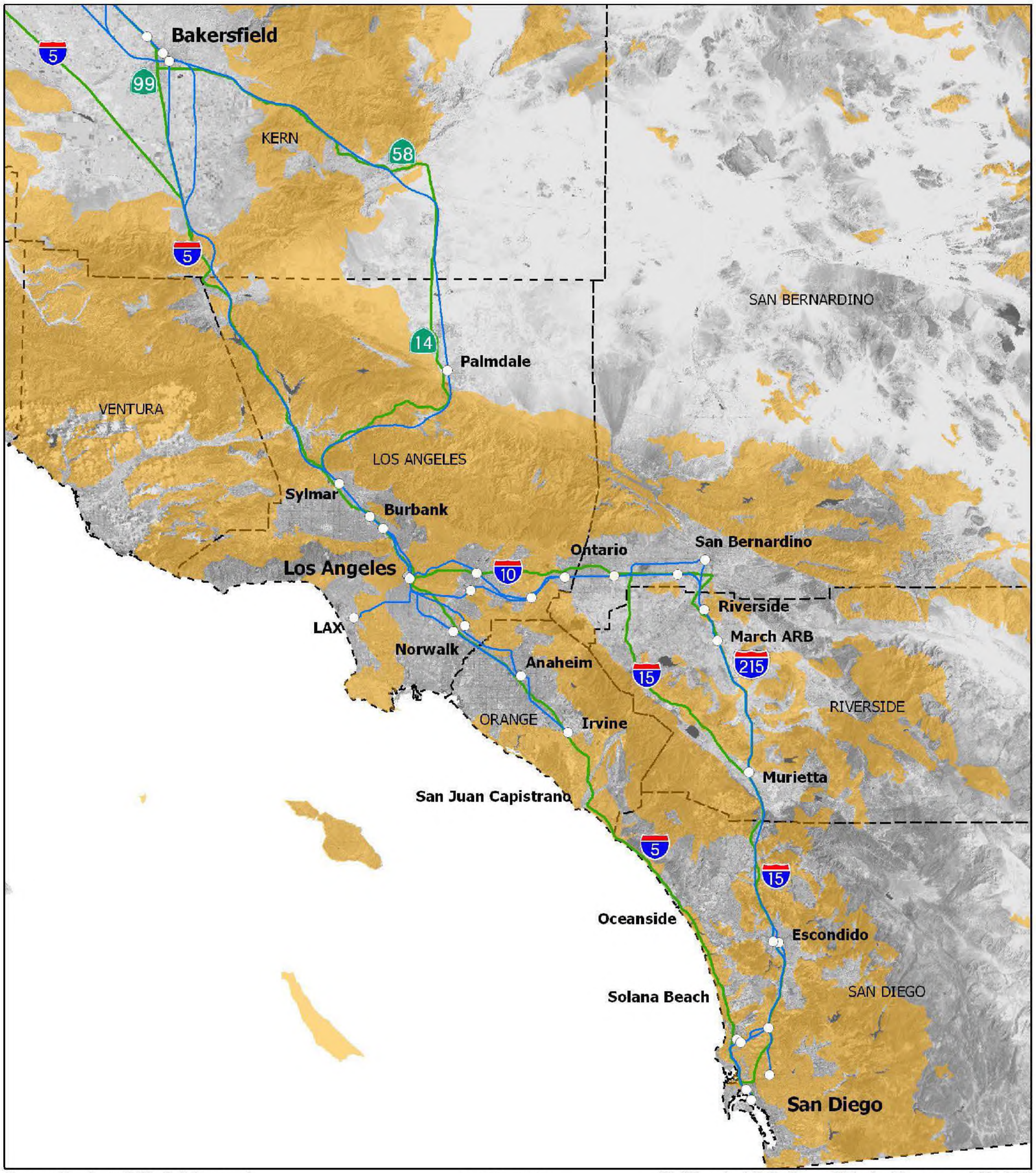
May 21, 2003

California High Speed Train Program EIR/EIS

Erodable Soils Statewide - North

Figure 3.14-8

Erodable Soils Statewide (South)



Source: Landsat 1985; U.S. Dept. of Agriculture (STATSGO) 1994

May 21, 2003

California High Speed Train Program EIR/EIS

10 5 0 10 20 Miles

10 5 0 10 20 Kilometers

Legend

- 🟧 Erodable Soils (SlopeH x KFactor > 3)
- High Speed Rail Alternative and Stations
- Modal Alternative Highways
- County Boundaries

Erodable Soils Statewide - South

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Impaired Waters

Some water bodies have been given special status under the CWA. Section 303(d) of the CWA requires each state to identify waters that will not achieve water quality standards after application of effluent limits, and to develop plans for water quality improvement. For each water body and pollutant for which water quality is considered impaired, the state must develop load-based (as opposed to concentration-based) limits called total maximum daily loads (TMDLs). TMDL is the maximum amount of pollution (both point and non-point sources) that a water body can assimilate without violating state water quality standards. Priorities for development of TMDLs are set by the state, based on the severity of the pollution and the beneficial uses of the waters. The U.S. Environmental Protection Agency's (EPA's) TMDL program provides a process for determining pollution budgets for the nation's most impaired waters. Pollutant loading limits are set and implemented by SWRCB under the Porter-Cologne Act. The program includes development of water quality standards, issuance of permits to control discharges, and enforcement action against violators.

D. HYDROLOGY AND WATER RESOURCES BY REGION

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

Floodplains: As delineated by FEMA, 100-year floodplains have been mapped along the streams bordering San Francisco Bay, along Coyote and Suisun Creeks, and along the Guadalupe, Pajaro, Sacramento, San Joaquin, and Merced Rivers and their tributaries.

Surface Waters: Major streams and surface waters in the study area in this region include San Francisco Bay and the Guadalupe, Pajaro, San Joaquin, and Merced Rivers. The study area also includes Lake Merritt Tidal Channel, Quarry Lakes, extensive tidal flats and salt evaporating ponds in the South Bay, and the estuaries of Coyote Creek and Guadalupe River. The Hetch Hetchy and California Aqueducts, Don Castro and San Luis Reservoirs, San Filipe Lake, and O'Neill Forebay are also located in the study area in this region. Many of the streams and creeks in this region are considered impaired waters. Orestimba Creek and the surrounding watershed has been designated as an aquatic resource of national importance.

Groundwater: Groundwater is present in two distinct areas in the Bay Area to Merced region. Relatively uniform, unconfined aquifers and associated water tables are expected in the two valleys at either end of the proposed alignments, the Central Valley to the east and the San Francisco Bay/Santa Clara Valley to the west. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near the San Joaquin River and its tributaries in the Central Valley, near San Francisco Bay, and in the area of the Sacramento-San Joaquin River Delta. Occurrence of groundwater in the Diablo Range would likely be influenced by fracture patterns and rock type.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

Floodplains: In the study area in the Sacramento to Bakersfield region, 100-year floodplains exist along most of the minor creeks and streams in rural areas. In urban areas and along most of the reaches of the major rivers, the 100-year floodplains are contained within the riverbanks. Levees and floodwalls have been constructed in urban areas, restricting the river flows. Upstream dams also control many of the rivers. Land in certain low-lying rural areas is subject to frequent shallow flooding.

Surface Waters: more than two dozen rivers flow in this region, including the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, Fresno, San Joaquin, Kings, Kaweah, Tule, and Kern Rivers. Additionally, the study area along the west side of the Central Valley includes a portion of the California Aqueduct, the San Luis Canal, and the Sacramento-San Joaquin Delta. Groundwater and surface water are pumped to and from these and many other surface canals and drains that deliver irrigation water to and from agricultural fields throughout the region. The canals are packed earth or concrete-lined and generally lack the meanders, vegetation, biota, and other features of natural streams.

Groundwater: Groundwater levels in the Central Valley fluctuate with seasonal rainfall, withdrawal, and recharge. The large demand for groundwater has caused subsidence in some areas. Depth to groundwater in the study area in this region ranges from a few inches to more that 100 ft (30 m). Most of the groundwater in the region is present in unconfined or semi-confined aquifers as a part of the Sacramento Valley and San Joaquin Valley groundwater basins. Most areas have, at best, moderate recharge capability because infiltration is limited by clay or hardpan layers in the surface soils or subsurface materials.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

Floodplains: In the Bakersfield to Los Angeles region, 100-year floodplains exist along most of the minor creeks and streams in the rural areas south of Bakersfield and north of Palmdale. Land in low-lying rural areas is subject to frequent shallow flooding. While not within the 100-year floodplain, canyon areas through the Tehachapi Mountain range may be subject to flooding from storms.

Surface Waters: The major rivers, streams, and lakes in the region are the California and Los Angeles Aqueducts, Pyramid Lake, and the Santa Clara and Los Angeles Rivers. Smaller creeks and streams exist south of Bakersfield and north of the urban area of Los Angeles County. Seasonal washes and canyons are found within the study area.

Groundwater: Groundwater in this region includes three regional groundwater basins consisting of the Basin and Range, California Coastal Basin, and Central Valley aquifer systems. The depth of these aquifers varies by location. Relatively uniform, unconfined aquifers and associated water tables are expected in the two valleys at either end of the proposed alignments, the San Fernando Valley to the south and the San Joaquin Valley to the north. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuation in water levels due to overdraft and recharge conditions. Groundwater in the mountainous regions between the points represented by the San Gabriel and Tehachapi Mountains is highly variable, affected by fracture permeability in rock units and local alluvial valleys that are relatively restricted in their extent.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

Floodplains: In this region, the FEMA-designated 100-year floodplains are mapped around significant drainage channels in the Ontario area or riparian areas between March Air Reserve Base (ARB) and Temecula.

Surface Waters: The major rivers in the region include the Los Angeles, San Gabriel, Santa Ana, San Jacinto, San Luis Rey, San Dieguito, and San Diego Rivers, and the Rio Hondo Channel. Other major water resources include the California, Riverside Canal, San Diego, and Val Verde Tunnel–Colorado River Aqueducts. Seasonal washes and canyons are common. Lake Hodges and Lee Lake are also in the study area. Of these resources, the Los Angeles, San Gabriel, and Santa Ana Rivers are considered impaired waters.

Groundwater: Groundwater generally occurs in two distinct areas in the region. Relatively uniform, unconfined aquifers and associated water tables are expected in the Los Angeles basin, which includes all of downtown Los Angeles and extends east to just west of Ontario. Groundwater in the mountainous regions (the Peninsular Ranges province), from the Los Angeles basin to the tip of Baja California, is highly variable, controlled by fracture permeability in rock units and local alluvial valleys that are relatively restricted in their extent.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing I-5 highway corridor.

Floodplains: As delineated by FEMA, 100-year floodplains in the region are associated with significant drainage channels or riparian areas just south of Anaheim, or are within coastal areas just south of Camp Pendleton to San Diego.

Surface Waters: The rivers and channels in the region include Los Angeles, San Gabriel, Santa Ana, Santa Margarita, San Luis Rey, San Dieguito, and San Diego Rivers and Rio Hondo Channel. Other water resources include Buena Vista, Agua Hedionda, Batiquitos, San Elijo, and San Dieguito Lagoons, and San Diego and Mission Bays.

Water bodies with impaired water quality in the region include the Los Angeles, San Gabriel, Santa Ana, Santa Margarita, and San Luis Rey Rivers, and the Rio Hondo Channel. The rivers are considered impaired because they exceed standards for algae, ammonia, metals, chloroform count, pesticides, nutrients, toxicity, trash, and/or sedimentation. The lagoons and the San Diego and Mission Bays are also considered impaired because of declining water quality, increased freshwater input, accumulated sediment, diminished biological productivity, and water circulation constraints.

Groundwater: The California Coastal Basin Aquifer is the primary aquifer identified in the region. Groundwater depth within the region varies from a few feet to more than 100 ft (30 m). Perched aquifers with a shallow water surface occur throughout Los Angeles and Orange Counties. Shallow groundwater is also likely adjacent to or in the vicinity of streams, rivers, lagoons, and bays.

Two varieties of groundwater are found along the coastal areas. The first is perched water, which infiltrates and percolates through the sandy terraces, then becomes perched on or within less porous bedrock units. This contributes to the instability of the Del Mar and San Clemente coastal bluffs. Efforts to control the instability have included improvements to the storm drain system, surface drainage, and sub-drains. The second variety of groundwater is subsurface water that saturates surface and formational materials in the vicinity of alluvial or estuarine environments, such as the mouths of the major drainage areas and lagoons.

3.14.3 Environmental Consequences

Potential impacts on hydrology and water resources which may result from the alternatives or the proposed HST system alignment and station options include potential encroachment on or location in a floodplain, potential impacts on water quality, potential increased/decreased runoff and stormwater discharge due to changes in the amount of paved surfaces, potentially increased or decreased contribution of nonpoint-source contamination from automobiles, and potential impacts on groundwater from dewatering or reduction of groundwater recharge.

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions assume that the effects of the current built environment on hydrologic resources and water quality would continue. The No Project Alternative assumes that in addition to existing conditions, planned and programmed transportation improvements would be constructed and operational by 2020. The potential impacts of the No Project Alternative on hydrologic resources and water quality are assumed to be limited because typical design and construction practices would need to meet permit conditions. However, some impacts on hydrologic resources would likely result from the implementation of the projects under the No Project Alternative, such as increased runoff from added lanes of paved surface and new columns for expanded bridges over rivers and streams. However, attempting to estimate these potential changes would be speculative. It is assumed that project-level environmental documents and permits would be prepared by project proponents for future projects that would affect hydrologic resources and water quality. These project-level documents would identify and analyze, and avoid, minimize, or mitigate potential impacts on hydrology and water quality to the extent feasible.

It is assumed that existing conditions would not change substantially, and thus the existing conditions serve as the baseline to which the impacts from the Modal Alternative and HST Alternative would be added.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HST ALTERNATIVES

It is assumed that any improvements associated with the Modal and HST Alternatives would be in addition to those included in the No Project Alternative. Based on available information for the study area, there is a substantial difference in the estimated acreage and linear feet of hydrologic resources that would potentially be crossed by the Modal Alternative compared to the HST Alternative (as shown in Table 3.14-1). These estimated areas of potential impacts on hydrologic resources and water quality would not provide a primary means of differentiating among the potential impacts of alternatives, because neither alternative presents significant potential impacts that cannot be substantially avoided, minimized, or mitigated through conventional design and construction processes, and compliance with permits and best management practices (BMPs) required for project permits. For instance, it is expected that streams and rivers would largely be spanned by bridges (culverts also can be used) to minimize potential impacts on the flow and water quality of these hydrologic resources. Further, potential impacts on water quality from surface runoff or erosion during project construction would be identified during the project-specific analysis and the design phase, and standard BMPs would be used to minimize potential impacts. The primary difference between alternatives would be the cost to bridge over streams and rivers, tunnel under wetland areas, or construct elevated guideways to minimize potential impacts on surface flow.

Areas with identified sensitive habitat, such as the Don Edwards San Francisco Bay National Wildlife Refuge (National Wildlife Refuge), the San Francisco Bay and salt marshes, and the Diablo/Pacheco Pass area near Gilroy, are discussed in Section 3.15, Biological Resources and Wetlands. These areas have streams and wetlands that provide potential habitat to special-status species. Avoiding or minimizing impacts on hydrologic resources and riparian corridors would be an important factor in selecting a corridor as a preferred alternative that is expected to include a least environmentally damaging alternative.

Table 3.14-1 summarizes the potential area of the various hydrologic resources within the potentially affected areas that were examined as part of this evaluation. In most cases, the area and extent of the potential direct impacts would be a function of an alternative's alignment, or alignment option in the case of the HST Alternative.

To represent the potential for direct impact to water and biological resources for the System Alternative (Modal and HST), a GIS analysis has been completed for the approximate footprint of the alternative facilities. For the HST Alternative, this analysis identified and quantified potential direct impacts based on the representative alignments within the broader GIS envelopes used to identify the potentially affected resources. For the Modal Alternative, this analysis identified and quantified potential direct impacts for the highway improvements only. The quantifications are representative of the unmitigated potential for direct impacts that could occur within the corridor. See Table 3.14-1A. This analysis focused on non-wetland waters (streams/rivers and lakes/other bodies of water). Subsequent project level engineering and environmental studies would focus on avoidance and minimization of potential impacts.

Table 3.14-1
Summary of Hydrologic Resource within Potentially Affected Areas

Region	Floodplains in Acres (Hectares)	Streams in Linear Feet (Meters)	Lakes[a] in Acres (Hectares)	Erosion in Acres (Hectares)	Groundwater in Acres (Hectares)
Modal Alternative					
Bay Area to Merced	2,872 (1,162)	2,039,748 (621,715)	663 (268)	2,954 (1,195)	14,128 (5717)
Sacramento to Bakersfield	2,235 (905)	161,599 (49,255)	17 (7)	[b]	16,642 (6,735)
Bakersfield to Los Angeles	125 (51)	46,362 (14,131)	32 (13)	3,016 (1,221)	1,276 (516)
Los Angeles to San Diego via Inland Empire	238 (96)	118,210 (36,030)	14 (6)	615 (249)	[b]
Los Angeles to San Diego via Orange County (HST corridor equivalent)	115 (47)	1,410 (430)	0	95 (38)	0
Los Angeles to San Diego via Orange County (conventional rail corridor equivalent)	95 (38)	6,915 (2,108)	5 (2)	1,335 (540)	Low
Modal System-wide Totals[d]	5,540 (2,242)	2,367,329 (721,562)	726 (594)	6,680 (2,703)	32,046 (12,969)
High-Speed Train Alternative					
Bay Area to Merced	305–781 (123–316)	270,057–453,248 (82,313–138,150)	80–226 (32–91)	1,698–2,797 (687–1,132)	2,621–3,995 (1,061–1,617)

Region	Floodplains in Acres (Hectares)	Streams in Linear Feet (Meters)	Lakes[a] in Acres (Hectares)	Erosion in Acres (Hectares)	Groundwater in Acres (Hectares)
Sacramento to Bakersfield	994–2,150 (402–870)	97,657–147,406 (29,766–44,929)	0–2 (0–1)	b	7,265–11,018 (2,940–4,459)
Bakersfield to Los Angeles	322–424 (130–172)	29,568–70,880 (9,012–21,604)	0–18 (0–7)	2,974–3,661 (1,204–1,482)	1,665–2,100 (674–850)
Los Angeles to San Diego via Inland Empire	224–423 (91–171)	53,030–84,120 (16,164–25,640)	9–10 (4–4)	490–838 (198–339)	b
Los Angeles to San Diego via Orange County (HST corridor)	20–95 (8–38)	1,950–4,565 (594–1,391)	0	210–465 (85–188)	0
Los Angeles to San Diego via Orange County (conventional rail corridor)[d]	295 (119) (Lower-level improvements)	11,210 (3,417)	12 (5)	b	b
	225 (91) (Higher-level Improvements	12,105 (3,690)	11 (4)	b	b
HST System-wide Totals	1,865–3,873 (755–1,567)	452,262–760,219 (137,850–231,715)	89–256 (36–104)	5,372–7,761 (2,174–3,141)	11,551–17,113 (4,675–6,925)

a Includes lagoons in the LOSSAN region.

b Numeric data not available.

c The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various proposed alignment options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a particular option as preferred.

d Analyzed by distinguishing low- and high-level improvement scenarios for this corridor.

For all resource topics except erosion, the maximum extent of resources in the potentially affected area for the HST Alternative alignment options is expected to be less than the potentially affected area for the Modal Alternative. For example, the number of acres of floodplains within the potentially affected area of the Modal Alternative would be 1.4 times the maximum number within the potentially affected area of the HST Alternative, and the number of linear feet of streams that would be within the potentially affected area of the Modal Alternative would be more than three times the maximum number within the potentially affected area of the HST Alternative. The only resource topic in Table 3.14-1 for which that would not apply is erosion; where figures are available, the number of acres of highly erodible soils found in the study area of the Modal Alternative would be within the range of those for the HST Alternative. However, there are proposed HST Alternative alignment options for which the amount of erodible soil areas would be less than what would be expected for the Modal Alternative. In general, the numbers presented in Table 3.14-1 suggest that most of the HST Alternative alignment options would potentially affect fewer sensitive hydrologic resources than the Modal Alternative statewide.

The analysis of representative impacts, as shown in Table 3.14-1A, indicates that overall the Modal Alternative (39,520 linear ft. (12,046 linear m) of streams, and 25 acres (10 ha) of lakes) would have more potential impacts on non-wetland water resources than the HST Alternative (22,600-32,400 linear ft (6,888-9,876 linear m) of streams and 7-27 acres (3-11 ha) of lakes).

Table 3.14-1A
Summary of Representative Hydrologic Resource and Water Quality Impacts for Alternatives

	Representative Impacts[3]	
Region	**Rivers/Streams[4] Linear Feet (Meters)**	**Lakes Acres (Hectares)#**
Modal Alternative		
Bay Area to Merced	9,800 (2,987)	13.9 (5.6)
Sacramento to Bakersfield	16,480 (5,024)	6.3 (2.5)
Bakersfield to Los Angeles	4,280 (1,305)	3.2 (1.3)
LA - Riverside – San Diego	6,240 (1,902)	0.6 (0.2)
LA – Orange Co. - San Diego	2,720 (829)	0.7 (0.3)
Total Modal Alternative	**39,520 (12,047)**	**25 (10.1)**
High Speed Train Alternative		
	Representative Impacts	
Region	**Rivers/Streams[4] Linear Feet (Meters)**	**Lakes Acres (Hectares)#**
Bay Area to Merced	4,550-8,650 (1,387-2,637)	0.6-23.3 (0.2-9.4)
Sacramento to Bakersfield	13,350-14,500 (4,069-4,420)	4.7-12.8 (1.9-5.2)
Bakersfield to Los Angeles	3,400-5,350 (1,036-1,631)	0.3-4.6 (0.1-1.9)
Los Angeles to Irvine	NA	NA
Los Angeles to San Diego	2,150-4,650 (655-1,417)	1.5-3.5 (0.6-1.4)
Total HST Alternative	**22,600-32,400 (6,889-9,876)**	**7-27[5] (2.8-10.9)**

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[3] Based on Representative Facility Footprint

[4] Non-wetland waters excluding lakes

[5] Total based on Business Plan System, "Highest Return on Investment Route."

All waters with impaired water quality, i.e., waters identified on the Section 303(d) CWA list distributed by SWRCB, in the potentially affected area of the Modal and HST Alternatives are identified by name in Appendix 3.14-C.

Implementation of either the Modal or HST Alternative would result in the potential for indirect impacts that are independent of location, but rather based on design characteristics. Because of design characteristics, the Modal and HST Alternatives would add different amounts of impervious surface area. The HST Alternative would consist of permeable track-fill rather than impervious pavement expansion. The quantity of impervious surface attributable to proposed HST Alternative alignments would therefore be substantially less than the estimated 4,640 total ac (1,878 ha) of pavement expansion expected under the Modal Alternative. Thus, the HST Alternative would potentially result in less runoff and would have better infiltration potential. Smaller runoff volumes under the HST Alternative would be less likely to contribute to downstream flow levels and would not increase the extent and frequency of flooding in flood-prone areas that could occur with implementation of the Modal Alternative. The HST Alternative would result in a smaller amount of added impervious surface than the Modal Alternative. As a result, the potential impacts of the HST Alternative on groundwater recharge would likely be less than the potential impacts of the Modal Alternative on groundwater recharge rates in areas where recharge is likely, such as near rivers.

Another design characteristic that differentiates the Modal and HST Alternatives involves the width of structures that would be added or improved. Whereas multiple 12-ft (4-m) lane additions for highways and new runways would be included throughout much of the study area of the Modal Alternative, the alignment width included for HST Alternative improvements would typically be 50 ft (15 m) total, and the total width would not be used completely for structure. The smaller width would accommodate fewer columns to support HST Alternative structures, which would result in less encroachment in floodplains and surface water resources. The HST Alternative would include tunnels and elevated structures designed to avoid or limit impacts that would further reduce potential impacts on hydrologic resources compared to the Modal Alternative. The HST Alternative would also allow for greater flexibility than the Modal Alternative at the design stage in addressing site-specific conditions. For example, greater flexibility in designing bridges over lagoons in the LOSSAN region would allow greater latitude to avoid potential impacts under the HST Alternative than the design of highway expansion under the Modal Alternative. The HST Alternative could be designed to span lagoons with minimal fill materials. Such options would not be available for highway expansion under the Modal Alternative because engineering options would be constrained by existing conditions and engineered fill.

3.14.4 Comparison of Alternatives by Region

The key findings of the analysis are summarized below by region and alignment options. For a complete summary of all potentially affected hydrologic resources by region, see Appendix 3.14-B.

A. BAY AREA TO MERCED

Modal Alternative

In general, the Modal Alternative would present a high potential impact on floodplains and streams in this region because it would include improvements to I-80 and I-580. Essentially, there are more corridor miles for the highway expansion under the Modal Alternative than HST corridor miles, which would result in twice the extent of potential floodplain and surface water encroachments. The Modal Alternative would cross several floodplains and streams in this region, including Suisun Creek and Sacramento River, as a result of the proposed expansion of I-80 through the Sacramento River Delta area. Potential impacts would also result from expansions of US-101 and SR-152 through the Santa Clara Valley near Gilroy, and in the Central Valley south of Merced, where there are extensive floodplains and streams, including Coyote

Creek and the Guadalupe, Pajaro, San Joaquin, and Merced Rivers. Expansion of SR-152 by two lanes would potentially affect San Luis Rey Reservoir and O'Neill Forebay.

The Modal Alternative would cross substantial groundwater resources, mostly as a result of the I-80 expansion from San Francisco to Sacramento. As there is no tunneling proposed for the Modal Alternative, these groundwater resources would be potentially impacted by short-term dewatering during construction in areas where shallow groundwater occurs, and by reduced recharge in areas paved with impervious surface over the long term.

High-Speed Train Alternative

The HST Alternative would potentially affect floodplains associated with Coyote Creek; the Guadalupe, Pajaro, San Joaquin, and Merced Rivers; and the salt ponds and sloughs within and adjacent to the National Wildlife Refuge. Potential effects to these resources might include increases in flood height in the case of the floodplains from earthen berms or linear barriers to surface flow, or encroachment within the physical structure of the salt ponds. Streams potentially affected include those associated with floodplains. Shallow groundwater at potential tunneling sites in the mountain regions (Diablo Range and Pacheco Pass) could be affected by dewatering that in turn could affect groundwater levels.

High-Speed Train Alignment Option Comparison

The San Francisco to San Jose HST alignment option would operate within the Caltrain right-of-way and would cross fewer streams than the Oakland options (Mulford Line and I-880). However, stream crossing would not be a distinguishing factor for two reasons. First, impacts would be reduced and potentially avoided to the extent feasible through the use of elevated structures over surface waters associated with the Coyote Creek river system and the many sloughs through the salt ponds in and adjacent to the National Wildlife Refuge. Second, the rivers encroached upon by the Caltrain right-of-way are channeled and highly developed. The Hayward alignment/I-880 option would have fewer potential impacts on the waters of the refuge than the Hayward/Niles/Mulford alignment. The northern tunnel Diablo Range HST alignment option from San Jose to Merced would avoid substantially more floodplains than the southern Pacheco Pass option through Gilroy, crossing an average of 159 ac (64 ha) compared to 548 ac (222 ha) of floodplains for the southern Pacheco Pass option. The Pacheco Pass route would potentially contribute to flood risk in the Pajaro River watershed, which is presently prone to flooding whereas the Diablo Range options would potentially impact the Orestimba Creek watershed. A potential increase in flood risk would be addressed by engineering design measures (e.g., elevated guideways to minimize obstructions in floodway) that would be a part of the next phase of project development, should the project advance to project-specific evaluation.

The Diablo Range direct alignment options would potentially result in the following.

- Substantially avoid both lakes and rivers, compared to the southern option through Gilroy, crossing 2700 linear ft (823 m) of rivers and 0.6 ac (0.2 ha) of lakes, compared to 6050 linear ft (1,844 m) of streams and 6 ac (2.4ha) of lakes for the Pacheco Option.
- Cross many of the mountain streams that feed Coyote Creek and potentially contribute to the siltation of the Anderson and Coyote Reservoirs.
- Avoid more floodplains than the southern Pacheco Pass option through Gilroy, crossing an average of 159 ac (64 ha) compared to 548 ac (222 ha) for the southern Pacheco Pass option.
- Substantially avoid groundwater resources, crossing an average of 1,505 ac (609 ha) for the three northern options as opposed to an average of 2,716 ac (1,099 ha) for the three southern Pacheco Pass options.

- Avoid some potential groundwater impacts through the use of tunnels with the proposed northern alignment options in the Diablo Range between San Jose and Merced. Most of the groundwater resources in the study area are found in the Santa Clara and the Central Valleys, which would be avoided by routing the alignment through the Diablo Range.

- Cross and potentially impact the Orestimba Creek watershed (an aquatic resource of national importance).

The southern Pacheco alignment options would potentially result in the following.

- Cross mountain streams (including Carnadero, Llagas, Pacheco, and Tequisquita Creeks) tributary to the Pajaro River, which empties into Monterey Bay.
- Contribute to elevated sedimentation levels in the creeks, which could affect Monterey Bay, because of construction across the above-mentioned streams.
- East of the Diablo Mountain Range, the northern route would cross the Crow and Orestimba Creeks and the San Joaquin and Merced Rivers.
- Cross Cottonwood Creek, a tributary of the San Luis Reservoir, and Romero Creek, as well as several low-lying wetlands, ditches, and sloughs that feed the San Joaquin River. The northern route would cross Crow and Orestimba Creeks, and the San Joaquin and Merced Rivers.
- Cross more floodplains than the Diablo Range direct options that run through more of the Santa Clara and Central Valleys, both of which contain more groundwater resources than the mountains.
- Potentially contribute to flood risk in the Pajaro River watershed, which is presently prone to flooding.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

The Modal Alternative in this region would generally involve widening SR-99 and I-5 and expanding the Sacramento Airport with six new gates. I-5 crosses a substantial amount of the Sacramento River Delta between Stockton and Sacramento, and the Sacramento airport is located near the Sacramento River, as well. As a result, the Modal Alternative would potentially encroach on more acres of floodplains region-wide than either of the HST alignment options, thus it would present greater potential for impacts on floodplains.

Direct potential impacts on canals are not expected to be substantial. Potential impacts on lakes would be expected to be similar for the various alignment options, since few Modal or HST Alternative alignments would encroach on lakes. Expansion of the I-5 corridor would result in potential erosion in the Sacramento to Stockton, Merced to Fresno, and Tulare to Bakersfield segments in an area where it would run through the mountains at the edge of the Coastal Range foothills. The Modal Alternative would result in minimal potential impacts on groundwater in this region (the mapped data does not show substantial groundwater in the study areas for modal improvements).

High-Speed Train Alternative

South of Stockton, both HST Alternative alignment options would potentially encroach on more floodplains than the Modal Alternative alignment. There is a network of canal systems in the Sacramento to Stockton corridor in the areas surrounding Modesto, Fresno, and Hanford/Visalia. The HST Alternative would cross many of these canals. Project-specific erosion potential would not pose a problem in this region, since the slope grade through most of the Central Valley would be minimal.

As with the Modal Alternative, potential direct impacts on groundwater resources from the HST alternative would be limited to infrequent shallow groundwater occurrence where dewatering may be necessary during construction of at- and above-grade structures (e.g., support columns) and for tunneling portals. The HST Alternative, which would have permeable-surface construction, would produce smaller runoff volumes and lower potential surface contamination levels than would be expected under the Modal Alternative, which would add lanes of pavement on highways.

High-Speed Train Alignment Option Comparison

At a program level of detail, the technical analysis of these options showed slightly higher potential impacts to water resources for the UPRR alignment as compared to the CCT alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are 49 - 50 miles long. Also, most of the stream crossings under the UPRR alignment are canal crossings, not river crossings, and are generally smaller than the water crossings anticipated for the CCT alignment. The UPRR alignment would have 34 - 88 acres less potential impacts to floodplains than the CCT alignment.

Between Stockton and Modesto, the technical analysis of these options showed slight differences between the BNSF and UPRR alignments in regards to the potential impacts to water resources. These results do not indicate a significant difference between the two HST alignment options. The BNSF option was determined to have fewer potential impacts to lakes (8.5 acres less and streams (0 – 850 linear ft) than the UPRR alignment, but more potential impacts to floodplains (171 – 193 ac) and wetlands (2.7 – 3.0 acres) than the UP alignment.

In general, the maps show that the western HST alignment (Union Pacific Railroad [UPRR] north of Fresno, Burlington Northern Santa Fe [BNSF] south of Fresno) would potentially encroach on fewer acres of floodplains than the eastern HST Alternative alignment (BNSF north of Fresno, UPRR south of Fresno). Each of the Sacramento station options in the Sacramento to Stockton corridor occurs within the 100-year FEMA floodplain. The downtown station option has less than an acre of its footprint within this flood hazard zone and thus has a low potential for flood hazard. In contrast, the two station options at Power Inn Road along UPPR and BNSF would encroach into more floodplain area and are considered to have a medium potential for flood impacts. The inclusion of a high-speed loop around Merced would extend the HST Alternative through a large floodplain, increasing the amount of floodplains potentially affected.

Between Merced and Fresno, the technical analysis of these options showed slightly higher potential impacts to water resources for the BNSF alignment as compared to the UPRR alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are over 67-miles long. The BNSF option was determined to have 1.4 acres more potential impacts to wetlands, 4 more potential sensitive species, 1,050 linear feet more potential impacts to streams, and 1.3 acres more potential impacts to lakes than the UPRR alignment, but would have 10-17 acres less potential impacts to floodplains.

Between Fresno and Bakersfield, the technical analysis resulted in differences between the BNSF and UP alignments in regards to the potential impacts to water resources. However, these results do not indicate a significant difference between the BNSF and UP alignment options that vary between 106 to 111 miles in length. The BNSF option was determined to have fewer potential impacts to floodplains (22,116 – 25,227 linear ft less), streams (500 – 850 linear ft less) and lakes (0.0 – 0.3 ac less) than the UP alignment. The BNSF alignment south of Hanford would cross more linear feet of rivers and canals than the UPRR alignment. The many canals found in this segment would make canal realignment a more costly undertaking than in other segments.

Potential impacts on lakes would be similar for the alignment options because each of the proposed alignments intersect less than 1 ac (.40 ha) of lakes. Potential groundwater impacts are not distinguishable among the alignment options because the groundwater level is deeper, and no tunneling or trenching would be included in the HST options in the region.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

The Modal Alternative alignment would potentially affect approximately 4,280 linear ft (1,305 m) of streams in the region. Potential impacts on lakes, though considerably less of an issue region-wide, would vary by alignment within the Bakersfield to Sylmar corridor. The Modal Alternative (expansion of I-5) would potentially encroach on 3.2 ac (1.3 ha) of lakes, mostly consisting of Pyramid Lake and some of Castaic Lake. Though potential erosion would be of considerable concern within the Tehachapi corridor in the Bakersfield to Los Angeles Region, the difference in the number of acres of highly erodible soil potentially affected by the alternatives and their respective alignment options would be small, providing little distinction between the Modal and HST Alternatives based on potential for erosion.

High-Speed Train Alternative

Similar to the Modal Alternative, the HST Alternative would potentially affect about 3,400 to 5,350 linear ft (1,036 to 1,630 m) of streams. In addition, the HST Alternative would potentially encroach on Castaic Lake and Pyramid Lake.

Groundwater resources would not be an issue in the Sylmar to Burbank and Burbank to Los Angeles Union Station (LAUS) corridors because the alignment structures would be either at or above grade. The HST alignment options would affect floodplains mainly in the valleys between Bakersfield and the base of the Tehachapi Mountains.

High-Speed Train Alignment Option Comparison

The I-5 HST alignment option that includes the Union Avenue and Wheeler Ridge connections with the I-5 Tehachapi corridor would have a higher probability of affecting floodplains in the Bakersfield to Los Angeles region than either the SR-58/Soledad Canyon HST alignment option or the Modal Alternative. This is primarily because the former alignment would potentially encroach upon large areas of floodplain between Bakersfield and the bottom of the ascent over the Tehachapi's at the Grapevine. The I-5 Tehachapi corridor option would potentially affect approximately 3,050 linear ft (930 m) of streams, which is the same as the Modal Alternative, compared to the SR-58/Soledad Canyon HST alignment option, which would potentially affect 5,000 linear ft (1,524 m). The potential impact in the SR-58/Soledad Canyon HST option is due to the relatively small seasonal streams in Soledad Canyon between Palmdale and Sylmar.

The SR-58 HST alignment potentially would encroach on 1.4 ac (0.6 ha) of lakes, whereas both of the I-5 Tehachapi corridor alignment would potentially encroach on 40.6 ac (0.2 ha) of lakes, including Castaic Lake in the Castaic Valley of the Tehachapi, and Upper Van Norman Lake south of the San Fernando Pass.

Absent field verification and more detailed data collection, it is not possible at this program level of analysis to determine specifically which HST Alternative alignment option, with its respective tunneling in the Tehachapi Mountains, would potentially affect more groundwater resources.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

In general, floodplains are not as extensive in the Los Angeles to San Diego region as they are in the Central Valley. The potential impact of Modal Alternative improvements in this region on floodplains would be minimal, because floodplains are highly developed and flood control is part of the existing infrastructure design, which means improvements made with the Modal Alternative would be less likely to contribute to flooding potential. The Modal Alternative would cross minor floodplains in the Temescal and Temecula Valleys.

In the Mira Mesa to San Diego segment, the Modal Alternative would raise the potential for increased runoff and sediments because it would cross more linear feet of streams than the HST Alternative, or 6,240 linear ft (1,902 m) of streams compared to an average of 2,150 to 4,650 linear ft (655 to 1,417 m) for the three HST Alternative alignment options. The Modal Alternative would potentially cross substantially more water-quality-impaired waters than the HST Alternative.

Groundwater resources would not be substantially affected by highway and airport expansion in this region. There are no segments where tunneling or trenching would be required, and shallow groundwater is not prevalent along the Modal Alternative alignment.

High-Speed Train Alternative

Similar to the Modal Alternative, the potential impact of HST Alternative alignment options in this region on floodplains would be minimal, because floodplains in this area are highly developed and flood control is part of the existing infrastructure design which the HST alignments would parallel as much as possible. Potential erosion would be a concern where the alignment options would extend to or along the coast along highly erodable slopes.

The HST Alternative would not substantially affect groundwater resources in this region. None of the segments would include tunneling or trenching, and shallow groundwater is not prevalent along the proposed HST Alternative alignment. With respect to the tunneling that is proposed in the Merriam Mountains between Temecula and Escondido, and in Escondido, little groundwater is present, and these areas would likely not require substantial dewatering during construction.

High-Speed Train Alignment Option Comparison

Though impacts on floodplains are expected to be minimal in this region, the UPRR Riverside/UPRR Colton Line alignment option without connection to San Bernardino would potentially encroach on fewer acres of floodplains than the UPRR Colton Line to San Bernardino option, or the UPRR Colton alignment option with and without San Bernardino in the Los Angeles to March ARB alignment. The South El Monte station would have potential floodplain impacts. The existing floodplain dataset would not provide a basis to distinguish between the two Escondido-traversing alignments. The two alignment options extending to the coast would present a higher potential to affect floodplains than the other HST alignment option or the Modal Alternative. The UPRR Colton Line HST alignment would potentially encroach on considerably fewer linear feet of streams than the UPRR Riverside alignment in the Los Angeles to March ARB segment. Many of these resources are already highly altered and mostly channeled, and would be little affected by the proposed HST system. The UPRR Riverside HST alignment options would potentially encroach on fewer water-quality-impaired waters than the UPRR Colton Line or the San Bernardino option or the Modal Alternative.

Three general station areas are proposed within 100 ft (30 m) of streams, which could increase the potential for contaminated runoff from parking areas entering the streams. The South El Monte station would be within 100 ft (30 m) of the San Gabriel River in South El Monte, the

Colton station would be within 100 ft (30 m) of the Santa Ana River, and the University of California, Riverside station would be within 100 ft (30 m) of Gage Canal. These rivers are mostly channelized. Unstable slopes would result in potential erosion with the two HST alignment options that extend to and run along the coast in San Diego to the downtown station stop.

Potential groundwater impacts would be similar for the proposed HST options.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would not be expected to have a substantial impact on floodplains in the region. The floodplains crossed by I-5 are highly developed, and flood control is part of the existing infrastructure. No impacts on streams or lakes have been identified in this region. Streams in the LAUS to Irvine corridor would be minimally affected because streams in this area are highly developed, and flood controls are part of the existing infrastructure design.

Widening of bridge structures, added columns, and/or increasing the embankment footprints for I-5 improvements through lagoons in San Diego County may potentially impede tidal flushing and potentially adversely affect the hydrologic conditions of the lagoons. Bridge widening would also increase the potential for impacts from stormwater runoff. Construction through these lagoons could potentially induce erosion, and potentially result in a temporary increase in the sediment load in these impaired waters. Construction of Modal Alternative improvements would potentially affect areas of intermittent shallow groundwater from dewatering during construction.

High-Speed Train Alternative

The HST Alternative would not be expected to have a substantial impact on streams or lakes in this region. Streams in the LAUS to Orange County corridor would be minimally affected because streams in this area are highly developed, and flood controls are part of the existing infrastructure.

High-Speed Train Alignment Option Comparison

The UPRR alignment option in the LAUS to Orange County corridor would cross fewer acres of floodplains than the LOSSAN alignment, but the UPRR route would involve more trenching than the LOSSAN option.

3.14.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize potential impacts to biological resources bisecting sensitive areas and creating new crossings or encroachments on water resources. Nearly 70% percent of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). Use of these existing transportation corridors helps minimize potential impacts since they have already imposed a footprint/crossing along which the HST system would pass where not in a new corridor. Moreover, portions of the system would be in tunnel or on aerial structure, which would avoid and/or minimize impacts to surface water resources.

The Authority has strived to avoid water resources throughout the extensive alignment studies leading to and including this program level study. In addition, the Authority is committed to continue avoidance and minimization of potential impacts during subsequent project level analysis; however, it is unavoidable that many streams and water resources would be crossed with the proposed 800+ mile statewide HST system. Therefore, the Authority will work closely with the regulatory agencies to develop acceptable specific design and construction standards for stream crossings, including, but not limited to, maintaining open surface (bridged versus closed culvert) crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other Best Management Practices.

There is also potential for impacts to groundwater in areas of the system where tunneling or substantial excavation would be necessary. For the portions of the HST system in tunnel, geologic exploration including groundwater sampling would be completed prior to constructing the proposed tunnels. The geologic/soils/groundwater conditions would be evaluated prior to and monitored during construction to aid in the development of construction techniques and measures to minimize effects to ground- and surface water resources. Based on available geologic information and previous tunneling projects in proximity to proposed tunnels the Authority plans to fully line tunnels with impermeable material to prevent infiltration of ground- or surface waters. Infiltration of ground and surface waters into tunnels is undesirable for operations and maintenance reasons as well as the potential for adverse impacts to ground and surface waters. All reasonable measures would be taken to avoid water infiltration. In addition, it is assumed that tunnel boring machines would be appropriately equipped with shielding to minimize the infiltration of higher pressure groundwater during the boring process.

3.14.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for hydrology and water quality, and considering the sophisticated design, engineering, and construction practices that would be used (and required in order to obtain permits), the proposed HST system alternative would have a potentially less than significant effect on hydrology and water quality when viewed on a systemwide basis. Placing the conceptual corridors for the HST system alternative within or along existing transportation corridors reduces the potential for adverse effects to these water resources, and engineering and design practices further reduce potential adverse impacts to these water resources (e.g., avoiding encroachments on water resources, use of tunnels lined with impermeable surfaces, infrastructure setbacks from surface waters, using permeable surfaces and structures to reduce flow and drainage obstructions). Additional avoidance and mitigation strategies, as well as the design practices discussed in section 3.14.5, will be applied to reduce these impacts in the second-tier, project-level analyses and in obtaining permits for facilities included in the HST system, should a decision be made to pursue its development.

Proposed general mitigation strategies would be fairly similar for all regions. These strategies are described as general policies that could be adopted and developed in detail at the project-specific level of environmental analysis. First, measures designed to avoid or limit impacts would be considered. If avoidance measures were not feasible, then mitigation measures directed at reconstruction, restoration, or replacement of the resource, in close coordination with state and federal resource agencies, would be considered as part of subsequent project planning, environmental review, and design. Potential mitigation strategies are listed below by resource.

A. FLOODPLAINS

Mitigation for potential impacts on floodplains would include consideration of the following strategies.

- As part of the future project-level analysis, floodplain hydrology/hydraulics would be analyzed to evaluate the impacts of specific designs on water surface elevations and flood conveyance and to evaluate potential flooding risk. Where feasible, avoid or minimize construction of facilities within floodplains. Where feasible, restore the floodplain, if impacted by construction, so it can again operate as before. Where no practicable alternative to avoid construction in the floodplain exists, minimize the footprint of facilities within the floodplain, e.g., by use of aerial structures or tunnels.
- As part of the future project-level analysis, all opportunities for facility redesign or modification to minimize flooding risk and potential harm to or within the floodplain would be assessed.

- Where feasible, avoid construction of facilities within floodplains; where infeasible, minimize the footprint of facilities within the floodplain.

B. SURFACE WATERS, RUNOFF, AND EROSION

Mitigation strategies for potential impacts on surface waters would include consideration of the following.

- As part of the future project-level analysis, conduct studies and evaluate potential alteration in coastal hydrology/hydraulics in tidal lagoons, bays, and marshes from specific construction methods or facility designs. Construction methods or facility designs to minimize potential impacts would be considered and used to the extent feasible.
- Permit requirements as part of project-level review would include Storm Water Pollution Prevention Plans (SWPPPs) and National Pollutant Discharge Elimination System (NPDES) permits. The SWPPP would include BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for all stream and lake crossings. Regional NPDES permit requirements would be followed and BMPs, as required for new developments, would be implemented. These may include measures to provide permeable surfaces where feasible and to retain and treat stormwater onsite using catch basins and treatment (filtering) wet basins. Other measures to manage the overall amount and quality of stormwater runoff to regional systems would be detailed as part of SWPPP.
- Apply for and obtain appropriate permits under Sections 404 and 401 of CWA and comply with mitigation measures required in the permits. Other mitigation measures may include habitat restoration, reconstruction onsite, or habitat replacement offsite to compensate for loss of native habitats and wetlands. The ultimate goal of the mitigation would be to ensure minimal impact on surface water quality.
- Under the requirements of the NPDES Caltrans Statewide Storm Water Permit and the Construction General Permit, a Storm Water Pollution Prevention Plan (SWPPP) would be developed during construction and implemented to reduce pollutants in storm water discharges and the potential for erosion and sedimentation
- Implement best management practices (BMP's) which would include:
    - Practices to minimize the contact of construction materials, equipment, and maintenance supplies with storm water
    - Practices to reduce erosion of exposed soil including soil stabilization, watering for dust control, perimeter silt fences, placement of rice straw bales, and sediment basins, and
    - Practices to maintain water quality including infiltration systems, detention systems, retention systems, constructed wetland systems, filtration systems, biofiltration/bioretention systems, grass buffer strips, ponding areas, organic mulch layers, planting soil beds, sand beds, and vegetated systems (biofilters) such as vegetated swales and grass filter strips that are designed to convey and treat either shallow flow (swales) or sheetflow (filter strips) runoff.
- Work around various surface water bodies would be required to follow Sections 401 and 404 of the Clean Water Act and applicable permit requirements.
- Follow requirements of Section 10 of the Rivers and Harbors Act if work is required around a water body designated as Navigable and applicable permit requirements.

- Work along the banks of various surface water bodies would require an application for a Lake or Streambed Alteration Agreement.

- Implement a spill prevention and emergency response plan to handle potential fuel or other spills.

- Incorporate bio-filtration swales to intercept surface runoff.

- Where feasible, avoid significant development of facilities in areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.

C. GROUNDWATER

Mitigation to reduce potential impacts from construction and operation of project components on groundwater discharge or recharge would include consideration of the following strategies.

- As part of the future project-level analysis, minimize development of facilities in areas that may have substantial groundwater discharge or affect recharge.
- Apply for and obtain waste discharge requirements, where needed (e.g., for de-watering), as part of project-level review.
- As part of the future project-level analysis, develop facility designs that are elevated, or at a minimum are permeable, and would not affect recharge potential where construction is required in areas of potentially substantial groundwater discharge or recharge.
- Apply for and obtain a SWPPP under NPDES permit requirements for grading, and describe BMPs that would control release of contaminants near areas of surface water or groundwater recharge (include constraining fueling and other sensitive activities to alternative locations, providing drip pans under some equipment, and providing daily checks of vehicle condition).
- Include consideration of use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge.

The above mitigation strategies, which include further study leading to refinement of site-specific mitigation measures and Best Management Practices, are expected to substantially lessen or avoid impacts to hydrology and water quality. At the second-tier, project-level review, applications of these mitigation strategies are expected to reduce impacts to hydrology and water quality to a less-than-significant level. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.14.7 Subsequent Analysis

Subsequent analysis to further identify potential impacts on water quality and hydrologic resources would be required as project development, environmental review, and facility design are pursued, if a decision is made to go forward with the proposed HST system. This subsequent analysis may include the following.

- Further analysis and assessment of potential facility impacts on floodplains, specifically on flood elevations, as specific locations and facility designs are developed to determine if the proposed facility is in the base floodplain (that area which has a 1% or greater chance of flooding in any given year). The analysis would identify potential encroachment on study-area floodplains as defined in Executive Order 11998 for Floodplain Management (23 C.F.R. § 650[a]) and DOT Order 5650.2, or location of facilities in a 100-year floodplain without adequate mitigation measures.

- Further analysis (hydrologic modeling of flow rates) of potential construction and facility impacts on surface hydrology in coastal areas and tidal marshes and lagoons, and on other surface waters.
- Analysis of potential construction and facility impacts on surface hydrology in areas that are characterized as wetlands and that were not included in this analysis because field verification and wetland delineation was not part of this program-level evaluation. (See Section 3.15, Biological Resources and Wetlands, for discussion of wetlands.)
- Field surveys of potential surface water impacts to further analyze potential impacts on water quality and to seek required permits from the appropriate agencies.
- Identification of potentially substantial alteration in water-flow and drainage patterns, including increased storm water runoff, or increased groundwater discharge or reduction of groundwater recharge.
- Evaluation of potential impacts of the alternatives on groundwater recharge and infiltration systems.
- Identification and study of areas of shallow groundwater to determine possible dewatering impacts resulting from construction.
- Analysis of how the different alignment options would contribute to total additional impervious surface and the subsequent potential additional impacts on surface runoff. This analysis would also identify potential mitigation measures, including onsite retention facilities.
- Field geotechnical studies to evaluate the potential for erosion and associated risks.
- Field surveys of groundwater discharge or recharge conditions. Additional supplemental analysis of groundwater conditions with information from other geotechnical studies.

3.15 BIOLOGICAL RESOURCES AND WETLANDS

This analysis reviews the biological resources and wetlands that may in the future require a permit and Section 404(b)(1) analysis under the federal Clean Water Act (CWA) for a proposed action, and includes sensitive plant communities and special-status species, marine and anadromous fish habitat, riparian corridors, wildlife habitats, wildlife movement corridors, wetlands, and waters. Appendix 3.15-A provides a general description of the biological resource topics. This section describes the existing biological resources and wetlands within the five project regions, and identifies the areas of potential impacts for each of the alternatives and for the high-speed train (HST) alignment and station options for these resources.

3.15.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

This section briefly identifies the key federal and state laws and regulations relative to biological resources. Descriptions of these laws and regulations are provided in Appendix 3.15-B.

Federal Laws and Regulations

- federal Endangered Species Act (ESA) (16 U.S.C. 1531–1543).
- CWA (33 U.S.C. 1251–1376).
- Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.).
- Fish and Wildlife Coordination Act (16 U.S.C. 661–666).
- Coastal Zone Management Act (16 U.S.C. 1456).
- Executive Order 11990, Protection of Wetlands (May 24, 1977), DOT Order 5660.1A.
- Executive Order 13112, Invasive Species (February 3, 1999).

State Laws and Regulations

- California Endangered Species Act (CESA) (Fish and Game Code 2050 et seq.).
- Native Plant Protection Act (Fish and Game Code § 1900–1913).
- Natural Community Conservation Planning Act (Fish and Game Code Section 2800 et seq.).
- Streambed Alterations (Fish and Game Code § 1601–1603).
- California Coastal Act (Public Resources Code § 30000, et seq.).

B. METHOD OF EVALUATION OF IMPACTS

Data Collection and Geographic Information System Mapping

The proposed Modal and HST Alternatives would cross a variety of biotic communities and could potentially result in impacts on many plant and wildlife species, and many water resources. Plant taxonomy and nomenclature follows Abrams (1923, 1944, 1951), Abrams and Ferris (1960), Buckingham et al. (1995), Hickman (1993), and Hitchcock et al. (1996). Scientific nomenclature and common names for butterflies follows Miller (1992); fish, Robins et al. (1991); herpetofauna (amphibians and reptiles), Committee on Standard English and Scientific Names (2001); birds, American Ornithologists' Union (1983, 1998); and mammals, Wilson and Cole (2000).

Geospatial data based on the California Gap Analysis Program (GAP) (Davis 1998), which uses the Wildlife Habitat Relationship (WHR) classification (Ziener et al. 1988; 1990a; 1990b), was used as the primary source for delineation of vegetation communities along the HST and Modal Alternatives. However, the classification is based on Holland (1986). The most recent vegetation classification for California (Swayer and Keeler-Wolf 1995) was not used, as this data is not available in geospatial contexts. Geospatial data for threatened and endangered species and special-status species was obtained from the California Natural Diversity Data Base (CNDDB) (California Department of Fish and Game 2002). Information on wildlife movement corridors was obtained from the Missing Linkages report prepared by the California Wilderness Coalition (2000).

The type and extent of jurisdictional wetlands within the study areas came from the National Wetland Inventory (NWI) maintained by the U.S. Fish and Wildlife Service (USFWS) to provide information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. NWI digital data files are records of wetlands location and classification as developed by the USFWS. The federal Geographic Data Committee adopted this classification system as a national classification standard in 1996. The location of the wetlands is mapped on U.S. Geologic Survey (USGS) 7.5-minute topographic quadrangle maps with codes that provide information on the water body type and substrate. The NWI maps do not show all wetlands since the maps are derived from aerial photo interpretation with varying limitations due to scale, photo quality, inventory techniques, and other factors. Consequently, the maps tend to show wetlands that are readily photo-interpreted given consideration of photo and map scale. This level of information, though incomplete for some areas, provides a general overview of areas with potential sensitivity for wetland impacts that is used in the comparison of alternatives and the identification of areas where subsequent field work and wetland delineation would be conducted in the next phase of environmental evaluation, should HST be carried forward for further analysis. Wetland information, where previously mapped, is quantified to estimate the approximate acres potentially affected by the alternatives.

In addition, the Authority pursued further research regarding additional sources of information on wetland and water resources as a response to comments. The research included over 12 agency and organizational data sources. Most of the data sources were based on or included the same information as the NWI and USGS databases. One exception was the California Spatial Information Library's Hydrographic database, which included a more comprehensive coverage of water resources than our previous sources. However, the additional information was still only a marginal increment over the USGS database.

In terms of information on wetlands resources, the co-lead agencies acknowledge the areas of the NWI where wetland resources have yet to be mapped; however, extensive attempts to obtain information in these areas has resulted in very little additional data. In these areas of limited or no wetlands information, the co-lead agencies have determined that water resources are the best indicator of the presence of wetlands for this program level analysis. Comprehensive and complete information exists for the water resources and is readily compared in the Program EIR/EIS for each alignment option to determine those that have the least potential for impacting water resources. Subsequent project level studies will provide field surveys in all areas of potential impact along the alignment options carried forward.

Digitized information for vernal pools was obtained from the California Department of Fish and Game (CDFG) and included USFWS Holland vernal pools coverage with density classes and supporting metadata file; Northern San Joaquin Valley vernal pool complexes identified by California State University, Chico; and a vernal pool species layer showing critical habitat for a suite of vernal pool species.

There were no geospatial data available for riparian corridors. The presence of streams and corresponding riparian vegetation was developed using USGS quadrangle maps, and geospatial results of the California GAP and CNDDB for specific riparian vegetation polygons.

Geographic information systems (GIS) data was exported to excel spreadsheets to show acreages of attributes for each alternative and alignment option.

A detailed description of the data collection methods is provided in Appendix 3.15-C. No field or onsite visits were made for this Program EIR/EIS. GIS files of highway, rail, and airport improvements were digitally overlaid on top of the datasets of biological resources and wetlands to identify locations where the study areas around potential alignments for proposed alternatives might include portions of sensitive biological areas. The study area was defined to encompass both direct and indirect construction-related and operational impacts.

The areas of overlap—wherever the study area included a sensitive vegetation community or habitat—were considered to constitute areas of potential impacts from the proposed alternatives. The number of reported occurrences of a particular biological resource within the study area, the linear contact of the study area with the biological resource, and acreage of the resource within the study area were counted and compiled. These results were processed into a series of frequency distributions that allowed an estimate of high, medium, or low for a potential impact.

There are inevitable inaccuracies and gaps in the statewide and federal datasets and vegetation data layers due to differences in collection methods, dates the data was first collected, changes in habitat conditions, and myriad other factors. For the scale of analysis for this Program EIR/EIS, these available data sources are considered appropriate to identify key differences between proposed alternatives and potential alignment options. Given the datasets, the lack of identification of an impact does not necessarily mean that this portion of the proposed alternative would not result in potential impacts on biological resources, only that location-specific data would be required to make a more precise determination. Likewise, the identification of a potential impact on a specific resource is intended to be conservative and in some instances may be an overstatement, because neither habitat that is sensitive nor species of concern may be found in or near the footprint of the proposed corridor or actual alignment. Verification of potential impacts would require future location-specific study and evaluation to determine the level and extent of potential impact. This level of analysis would be part of a subsequent stage of environmental review.

C. SIGNIFICANCE CRITERIA FOR BIOLOGICAL RESOURCES

The significance criteria for identifying potential impacts on biological resources from proposed projects/actions are based on federal and state guidelines and general indicators of significance, including guidelines or criteria in NEPA, CEQA, CWA, CESA, ESA, and California Fish and Game Code. Project-specific criteria would be applied at the project level of environmental analysis when permits are being sought, if a decision is made to proceed with a proposed HST following this program-level analysis.

Based on the presence or absence of sensitive resources, an alternative may have a considerable impact on biological resources if its implementation would result in any of the following.

- Potential modification or destruction of habitat, movement/migration corridors, or breeding areas of endangered, threatened, rare, or other species as described above.
- Potential loss of a substantial number of any species that could affect the abundance or diversity of that species beyond the level of normal variability.
- Potential impacts on or measurable degradation of protected habitats; sensitive natural vegetation communities; wetlands; or other habitat areas' plans, policies, or regulations.

- Potential conflict with the provisions of an adopted habitat conservation plan (HCP), natural community conservation plan[1] (NCCP), or other approved local, regional, or state habitat conservation plan.
- Potential conflict with local ordinances protecting biological resources, such as a tree or creek preservation policy or ordinance.

3.15.2 Affected Environment

A. STUDY AREA DEFINED

The biological resources study area representing the potentially affected environment for the analysis of alternatives, including the various alignments and station options, is defined by the following limits, unless otherwise noted.

- 1,000 ft (305 m) on either side of alignment centerlines and around stations in urbanized areas.
- 0.25 mi (0.40 km) on either side of alignment centerlines and around stations in undeveloped areas.
- 0.50 mi (0.81 km) on either side of alignment centerlines and around stations in sensitive areas.

To provide a larger context to the affected environment and to account for potential indirect impacts on biological resources that could result from project-related noise, light, or shadows, as well as other disruption to or physical separation of habitat areas, the biological resources study area is larger than the footprint of either the Modal or HST Alternative, which would be between 50 ft (15 m) and 100 ft (30 m). The largest study area in sensitive habitat (0.50 mi [0.81 km] either side of the centerline, or a 1-mi-wide [1.6-km-wide] corridor), is used to capture potential indirect impacts on migrating birds and other wildlife that use these areas for nesting or foraging for food. At this program level of analysis, this approach provides opportunities to focus on broad areas of potential impact where field studies would be conducted to help direct where alignment or project profile changes could be made during the subsequent phase of project design to avoid or minimize impacts on sensitive resources (habitat area). The smallest study area (1,000 ft [305 m] on either side of an alignment centerline) applies to alignments/corridors in urbanized areas where biological resources are limited to localized instances (creek crossings, urban parks, and open space). The 0.25-mi [0.40-km] area was used to encompass natural undisturbed resources that could be subject to indirect impacts from noise, erosion, storm water runoff, or other effects of construction or operation of the alternatives.

To represent the potential for direct impact to water and biological resources for the System Alternatives (Modal and HST), a GIS analysis was completed for the approximate footprint of the alternative facilities. For the HST Alternative, this analysis identified and quantified potential direct impacts based on the representative Draft Program EIR/EIS alignments within the broader GIS envelopes used to identify the potentially affected resources. For the Modal Alternative, this analysis identified and quantified potential direct impacts for the highway improvements only. The quantifications are representative of the unmitigated potential for direct impacts that could occur within the corridor. Subsequent project level engineering and environmental studies would focus on avoidance and minimization of potential impacts.

This analysis of representative impacts focused on the following biological resources: wetlands (area), special status species (#), and special status species habitat (area).

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[1] The NCCP program of CDFG is an effort by the State of California and many private and public partners that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. CDFG and USFWS provide the necessary support, direction, and guidance to NCCP participants in these functions.

The affected environment study area varied by region based on the technical analysts' judgment of the sensitivity of the biological resources in the region, and in some cases to allow for future flexibility with alignment plans where the proposed alignment is not in an existing rail or highway right-of-way. The study area used for each of the five regions is described below.

Bay Area to Merced
On the Bay side of the alignments along San Francisco Bay, the 1,000-ft (305-m) study area width was reduced to 100 ft (30 m) because local, state, and federal agencies (including the San Francisco Bay Conservation and Development Commission, State Lands Commission, and U.S. Army Corps of Engineers [USACE]) would generally not permit or would severely restrict additional fill in the Bay. Away from the Bay side, the study area was 1,000 ft (305 m) on either side of the centerline of highway and rail corridors (i.e., a corridor totaling 2,000 ft, or 710 m).

Sacramento to Bakersfield
The study area in this region was 1,000 ft (305 m) on either side of alignment/corridor centerlines, around stations, and in developed areas, and 0.25 mi (0.40 km) on either side of the centerline in undeveloped areas. The smaller study area was used where alignments were within or parallel to existing rail or highway transportation right-of-way.

Bakersfield to Los Angeles
The study area in this region was 0.5 mi (0.8 km) on either side of highway and rail corridors and around stations. The broader study area was used in this region primarily because of the Tehachapi mountain crossings in undeveloped areas.

Los Angeles to San Diego via Inland Empire
In this region, the study area was 1,000 ft (305 m) on both sides of Modal and HST alignments/corridors in developed areas, and 0.25 mi (0.40 km) around stations and on both sides of corridors in undeveloped areas.

Los Angeles to San Diego via Orange County
Other than the undeveloped area of Camp Pendleton and several other small open areas, most of the study area in this region is designated by Census data as urbanized. Thus, most of the analysis used 1,000 ft (305 m) on either side of the centerline, or a corridor totaling 2,000 ft (710 m). Because of the sensitive nature of the six lagoons, the surrounding study areas were 1.0-mi (1.6-km) wide. In addition, all undeveloped areas within this region are considered sensitive; therefore, the study area was either 0.50 mi (0.8 km) or 1.0 mi (1.6 km) on either side of the centerline.

The analysis area for the representative impact area was consistently applied throughout the system as follows:

- HST
    - 0′ in tunnels
    - 50′ total width in aerial and at-grade
- Modal
    - 20′ on each side of existing highway facility (40′ total width) for 1 new lane/direction
    - 40′ on each side of existing facility (80′ total width) for 2 new lanes/direction

B. GENERAL DISCUSSION OF BIOLOGICAL RESOURCES AND WETLANDS

Following is a brief description of the resource topics reviewed in this section. A more detailed description of these resources and the sources of information used to obtain the descriptions are provided in Appendix 3.15-A. In addition, this section discusses HCPs, critical habitat[2] areas, and other conservation plans or areas that could potentially be affected by one or more of the alternatives discussed in this document.

Sensitive Vegetation Communities

Sensitive vegetation communities are natural communities (assemblages of species, both plant and wildlife, forming communities) and wildlife habitats that are unique, of relatively limited distribution in the region, or of particularly high wildlife value. These resources have been defined by federal, state, and local government conservation programs.

Sensitive Plant Species

Sensitive plant species include plant species that have been afforded special status and/or recognition by federal and state resource agencies, as well as private conservation organizations, because of documented or perceived decline or limitation of population size or geographical extent.

Sensitive Wildlife Species

Sensitive wildlife species include wildlife species that have been afforded special status and/or recognition by federal and state resource agencies, as well as private conservation organizations, because of documented or perceived decline or limitation of population size or geographical extent. Special-status species include wildlife, fish, or animals that are legally protected, or that are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status species include species listed as state and/or federal threatened or endangered species under ESA or CESA, those considered as candidates for listing, and species identified by USFWS and/or CDFG as California species of special concern.

Wildlife Movement/Migration Corridors

Wildlife movement/migration corridors link together areas of wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization tends to create isolated islands of wildlife habitat.

Water Resources

Lakes, rivers, streams, and other water bodies are protected by federal and/or state law. Special aquatic sites, which include wetlands, are considered an important subset of these waters. Wetlands and certain other waters would be delineated as part of a subsequent environmental review process.

C. BIOLOGICAL RESOURCES AND WETLANDS BY REGION

Following is a brief discussion of resources within each of the five regions for the topics described above.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The area traversed by the alternatives is dominated by three principle geophysical features: the

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[2] Critical habitat refers to areas shown on maps developed by USFWS that provide habitat for threatened and endangered species.

San Francisco Bay and coastal valleys, including the Santa Clara Valley and the Bolsa; the Diablo Range; and the Central Valley. The three major watersheds that correspond to the three principle geophysical features are the San Francisco Bay watershed, Pajaro River watershed, and San Joaquin River watershed. Elevation along the proposed HST alignment options in this region ranges from sea level to nearly 5,000 ft (1,524 m).

Vegetation communities generally found along the proposed HST alignment options from the Bay Area to Merced are varied. Major biological communities include blue oaks (Quercus Douglasii) and/or foothill pine (Pinus sabiniana) woodlands; chaparrals (Adenostoma fasciculatum) and montane hardwoods (Cercocarpus betuloides); chenopod scrubs, including alkali desert scrub; coastal oak woodlands-scrub oak (Quercus berberidifolia); interior live oak (Quercus wislizenii); coast live oak (Quercus agrifolia); valley oak (Quercus lobata); coastal salt marsh (northern coastal type); coastal scrubs (Diablan coastal scrub); freshwater marsh, including emergent wetland and cismontane alkali marsh; nonnative grasslands, including annual grassland and valley and foothill grassland; riparian woodlands; and valley oak woodland.

The 28,000-acre (ac) (11,331-hectare [ha]) Don Edwards San Francisco Bay National Wildlife Refuge, which is located in the region on the southeast side of the San Francisco Bay, is the largest urban wildlife refuge in the nation. It is home to millions of shorebirds and waterfowl, with a total of 250 bird species, including the endangered California clapper rail (Rallus longirostris obsoletus). Another special-status species in the refuge is the salt marsh harvest mouse (Reithrodontomys raviventris). The Mount Hamilton Project of The Nature Conservancy encompasses a 1,560-sq-mi (2,511-sq-km) area in this region that extends from south of the Pacheco Pass to north of the Altamont Pass, with large parts of the area protected by conservation easements. The South Bay Salt Pond Restoration Project, a 25-sq-mi (65-sq-km) project to restore the wetlands from the San Mateo Bridge to the southern edge of the Bay, was initiated by the California Coastal Conservancy, USFWS, and CDFG in 2003. The Henry Coe State Park located northeast of Gilroy is a 79,149-ac (32,031-ha) park and a 23,300-ac (9,429-ha) wilderness area (Orestimba Wilderness Area) that is home to a variety of special-status species and wildlife, including an estimated 675 vascular plants.

The Grassland Ecological Area (GEA), which is located north, east, and south of the city of Los Banos in Merced County, encompasses approximately 180,000 acres and is the largest wetland complex in California and contains the largest block of contiguous wetlands remaining in the Central Valley.[3] This region is considered a critical component of the Central Valley wintering habitat for waterfowl and has been recognized as a resource of international significance.

Sensitive Vegetation Communities: The natural communities of special concern in this region are central coast cottonwood-sycamore riparian forest, cismontane alkali marsh, northern coastal salt marsh, northern hardpan vernal pool, serpentine bunchgrass, sycamore alluvial woodland, valley oak woodland, and valley sink scrub. The Mount Hamilton Project area contains valley oak savanna and blue oak woodlands, and supports diverse animal life.

When cross-referenced with the Wildlife Habitat Relationships System,[4] sensitive vegetation communities were identified along the project alignment options from the California GAP GIS database, including alkali desert scrub (also known as chenopod scrubs), freshwater emergent wetland, lacustrine habitat, valley oak woodland, and valley-foothill riparian woodland.

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[3] Grasslands Water Distric, Land Use and Economics Study: Grasslands Ecological Area (July 2001), P. 2 (hereafter "Grassland Water District").

[4] The Wildlife Habitat Relationship (WHR) was developed by CDFG and is used as a classification system (Zeiner et al. 1988, 1990a, 1990b).

Sensitive Plant Species: Nearly 70 special-status plant species have the potential to occur in this region, including those indigenous to vernal pools, chenopod scrubs, cismontane woodlands, coastal salt marsh, and serpentine substrates. Examples include large-flowered fiddleneck (Amsinckia grandiflora), succulent owl's clover (Castilleja campestris ssp. Succulenta), palmate-bracted bird's beak (Cordylanthus palmatus), and Boggs Lake hedge-hyssop (Gratiola heterosepala). A complete listing of sensitive plant species in this region is included as part of the biological resources technical evaluation for the Bay Area to Merced region.

Sensitive Wildlife Species: More than 98 special-status wildlife species have the potential to occur in this region, including more than 20 special-status invertebrate species, six special-status fish species, 12 special-status reptiles and amphibians, more than 40 special-status bird species, and more than 20 special-status mammal species. These species include several fairy shrimp; vernal pool fairy shrimp (Branchinecta lynchi); three species of steelhead: Central Valley, Central California coast, and South Central California (Oncorhynchus mykiss); Sacramento splittail (Pogonichthys macrolepidotus); California tiger salamander (Ambystoma californiense); California red-legged frog (Rana aurora daytonii); blunt-nosed leopard lizard (Gambelia silus); Alameda whipsnake (Masticophis lateralis euryxanthus); giant garter snake (Thamnophis gigas); San Francisco garter snake (Thamnophis sirtalis tetrataenia); California brown pelican (Pelecanus occidentalis californicus); American peregrine falcon (Falso peregrinus anatum); California black rail (Laterallus jamaicensis coturniculus); California clapper rail (Rallus longirostris obsoletus); least Bell's vireo (Vireo bellii pursillus); salt marsh harvest mouse (Reithrodontomys raviventris); and San Joaquin kit fox (Vulpes macrotis mutica). In addition, southwestern pond turtle (Clemmys marmorata pallidus) and western burrowing owl (Athene cunicularia hypugaea) have the potential to occur in the Mount Hamilton Project area.

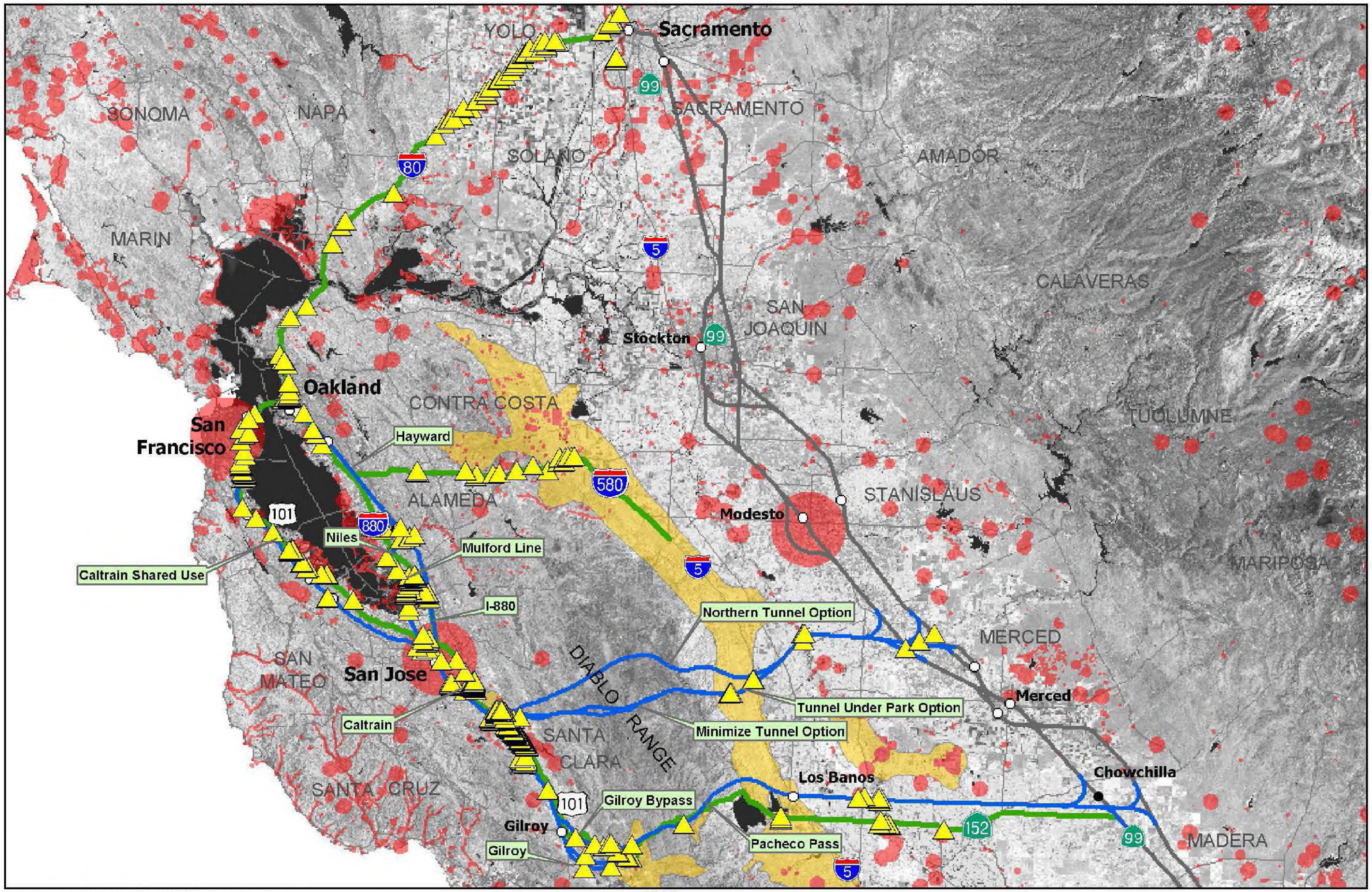
Wildlife Movement/Migration Corridors: While there are limited data available on wildlife movement/migration corridors in this region, all of the major riparian and stream corridors of the canyons of the Diablo Range provide corridors for wildlife movement. In addition, many streams and major rivers of the region are fish migration corridors used by anadromous and freshwater species. Further, on the west side of the Central Valley, the relatively extensive strip about 10-mi (16-km) wide of annual (nonnative) grassland that lies between the irrigated fields and orchards of the valley floor and the oak and pine woodlands of the Diablo Range provides a movement corridor for the San Joaquin kit fox (Vulpes macrotis muticsa).

Water Resources: In the Bay Area to Merced region, wetlands and water resources include most of the major ecological types found in California (i.e., bays, rivers, streams, lakes, ponds, springs, seeps, and marshes). Following the ecologically based Cowardin system of wetland classification, the main types of wetlands along the alignments of the proposed alternatives in this region include estuarine, lacustrine, palustrine, and riverine systems. Vernal pools may be present, specifically on Clear Lake soils fringing San Francisco Bay, or on Central Valley terrace deposits (see Figure 3.15-1).

CDFG's habitat-based California Wildlife Habitat Relationships system catalogues both freshwater emergent wetland and lacustrine wetland types. Following the floristically based Holland system of classification, the major wetland types in the study area for this region are cismontane alkali marsh, freshwater emergent marsh, northern coastal salt marsh, and northern hardpan vernal pool.

Conservation Plans: A restoration plan is being developed by the California Coastal Conservancy, USFWS, and CDFG for the Cargill salt properties (South Bay Salt Pond Restoration Project) to restore salt marshes, as well as to provide public access and public recreation. Critical habitat may be proposed for the tiger salamander, which USFWS has recently proposed for listing and whose habitat areas include the western foothills of the Central Valley, through the Diablo Range

Figure 3.15-1. Bay Area to Merced Habitat



Source: Landsat 1985; California Department of Fish & Game, Natural Diversity Database 2002

July 14, 2003

California High Speed Train Program EIR/EIS

5 0 5 10 15 20 Miles

5 0 5 10 15 20 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Legend

▲	State and Federal Threatened and Endangered Species Found Within 1/2 Mile of Alignment Centerline	—○—	High Speed Train Alignment and Stations
🟥	State and Federal Threatened and Endangered Species	Gilroy	Alignment Designation
🟧	San Joaquin Kit Fox Habitat	—	Rail Alignment in Adjacent Regions
		—	Modal (Highway) Alignment

Special Status Species
Bay Area to Merced Region

crossing to Gilroy. The Nature Conservancy is pursuing conservation measures to protect more than 780 square mi (2,020 square km) of land in the Diablo Range to safeguard native species and natural habitats. This project was started in 1998 with the largest single private conservation project in northern California history—involving two ranches east of Mount Hamilton totaling 61,000 ac (24,686 ha). The Nature Conservancy's goal is to protect some 200,000 ac (80,937 ha) by 2007. This area would protect the San Joaquin kit fox, the California red-legged frog, valley oak savannas, blue oak woodlands, and native fish and amphibians.

Sacramento to Bakersfield

Regional Summary: This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. The study area for the Sacramento to Bakersfield region crosses many different ecosystems: native and introduced plant communities; permanent and seasonal streams and rivers with associated riparian communities; and seasonal wetlands, vernal pools, and other waters. In addition, biological communities are found in lands in agricultural use, including row crops, nut orchards, vineyards, and other cultivated lands.

Between Sacramento and Bakersfield, the Central Valley crosses a relatively flat plain that historically supported lush stands of riparian vegetation, extensive wetlands, and a plethora of wildlife. Since colonization by European settlers, river channeling and flood control efforts, and the introduction of agriculture have changed this plain dramatically. Today this portion of the Central Valley supports a multitude of agricultural activities and is home to many people. This has resulted in the removal of native vegetation communities, the draining of wetlands, and a reduction in wildlife distribution and abundance. While urbanization and agriculture have reduced the abundance of native habitats, habitat areas still exist, often supporting sensitive plants and animals. Vegetation data for the study area in the region indicate that 13 vegetation communities can be found in the Central Valley between Sacramento and Bakersfield. (Lake and river categories are not included in this total.) The largest area, more than 185,000 ac (74,867 ha), is covered by agricultural lands; the smallest area, approximately 10 ac (4 ha), is covered by blue oak woodland.

More than two dozen major rivers flow within the study area in this region, generally heading from east to west, including the Consumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, Fresno, San Joaquin, Kings, Kawaeah, Tule, and Kern Rivers.

Sensitive Vegetation Communities: There are five types of sensitive vegetation communities found in this region: Central Valley cottonwood riparian forest, Central Valley oak riparian forest, northern hardpan vernal pool, northern claypan vernal pool, and valley sink scrub.

Sensitive Plant Species: There is potential for 29 sensitive plant species to occur in the region based on a review of the CNDDB prepared by CDFG. Twenty-eight are federally and state-listed species, and one is a California Native Plant Society (CNPS) List 1B species.[5] Among the sensitive plant species in this region are Ferris's milkvetch (Astragalus tener var. ferrisiae), alkali milkvetch (Astragalus tener var. tener), Heartscale (Atriplex cordulata), brittlescale (Atriplex depressa), San Juaquin saltbush (Atriplex joaquiniana), Bakersfield smallscale (Atriplex tularenses), subtle orache (Atriplex subtilis), lost hills crownscale (Atriplex vallicola), big tarplant (Blepharizonia plumose ssp. Plumose), California jewelflower (Caulanthus californicus), slough thistle (Cirsium crassicaule), Mt Hamilton thistle (Cirsium frontinale var. campylon), hispid bird's beak (Cordylanthus mollis ssp. Hispidus), recurved larkspur (Delphinium recurvatum), Bogg's Lake hedge-hyssop (Gratiola heterosepala), Coulter's goldfields (Lasthenia glabrata ssp. Coulter),

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[5] CNPS listing considered rare or endangered in California and elsewhere in their range, or extinct in California, 2001.

Comanche Point Layia (Layia leucopappa), Munz's tidy tips (Layia munzii), legenere (Legenere limosa), Madera Linanthus (Linanthus serrulatus), Merced Monardella (Monardella leucocephala), San Jouquin Wollythreads (Monolopia congdonii), Bakersfield cactus (Optunia basilaris var. treleasei), San Joaquin Valley Orcutt grass (Orcuttia inaequalis), hairy orcutt grass (Orcuttia pilosa), Merced Phacelia (Phacelia ciliata var. opaca), San Joaquin Adobe Sunburst (Pseudobahia peirsonii), Sanford's Arowhead (Sagittaria sanfordii), Creene's tuctoria (Tuctoria greenei).

Sensitive Wildlife Species: More than 14 special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present. These include vernal pool fairy shrimp (Branchinecta lynchi); valley elderberry longhorn beetle (Desmocerus californicus dimorphus); vernal pool tadpole shrimp (Lepidurus packardi); Sacramento splittail (Pogonichthys macrolepidotus); four runs of chinook salmon (Oncorhynchus tshawytscha), divided into three different Evolutionarily Significant Units, or ESUs; steelhead (Oncorhynchus mykiss); California tiger salamander (Ambystoma californiense); blunt-nosed leopard lizard (Gambelia sila); giant garter snake (Thamnophis gigas); Swainson's hawk (Buteo swainsoni); bank swallows (Riparia riparia); Fresno kangaroo rat (Dipodomys nitratoides exilis); Tipton kangaroo rat (Dipodomys nitratoides nitratoides); and San Joaquin kit fox (Vulpes macrotis mutica).

Wildlife Movement/Migration Corridors: There is little available data on wildlife movement corridors within the study area in this region. Intensive agricultural activities have reduced the available native habitats. Existing infrastructure, such as roads, rail lines, and aqueducts, has fragmented habitat and reduced migration corridors. The San Joaquin kit fox has been known to inhabit areas on the San Joaquin Valley floor in Kern, Tulare, Kings, Fresno, Madera, San Benito, Merced, Stanislaus, and San Joaquin Counties, and in the surrounding foothills of the Coastal Ranges.

Water Resources: The Sacramento to Bakersfield region contains wetlands and other water bodies, including lakes and open water systems, aquatic beds, emergent wetlands, scrub wetlands, unvegetated wetlands, tidal waters, rivers, perennial streams, intermittent streams, and vernal pools.

Conservation Plans: The alternatives and HST alignment options between Sacramento and Bakersfield would cross through several HCP and NCCP planning areas, including the eastern Merced County NCCP/HCP and the Kern Valley Floor multi-species HCP. The Kern County Valley Floor HCP, which is in draft form, will cover 3,110 sq mi (5,005 sq km), located 20 mi (32 km) west of Bakersfield. It will include all of Kern County below 200 ft (61 m) elevation and on the valley floor. The plan is proposed to address eight species, including Bakersfield cactus, blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat. 36 NCCP/HCPs are reported within the San Joaquin Bioregion.

Bakersfield to Los Angeles

Regional Summary: This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The widely varying topography of this region comprises mountainous regions with steep ridges, valleys, and flat plains. The northwestern portion of the study area in this region is located in the San Joaquin Valley, a valley characterized by a flat plain that extends east to the Tejon Mountains, which run approximately north to south. The plain extends south and the elevation abruptly rises into the San Gabriel Mountains, which run west to east, in the central portion of the study area. The San Gabriel Mountains gradually decline into the flat Los Angeles basin in the southern portion of the study area. Between the Tehachapi Mountains and the San Gabriel Mountains in the eastern portion of the study area is the Antelope Valley, a valley characterized by a flat plain dotted with isolated peaks. The City of Tehachapi is located in a flat valley between the Tejon Mountains and the Tehachapi Mountains, which also run north to south. The study area in this region ranges in elevation from 250 ft (76 m) to 5,600 ft (1,707 m).

Major watercourses are located throughout the study area in this region. Pyramid Lake and Castic Lake are located in the west along I-5. Lake Palmdale and Una Lake are located in the east near Sierra Highway. The Santa Clara River traverses the south-central portion of the study area through Soledad Canyon. The Los Angeles River winds through the City of Los Angeles in the southernmost part of the study area.

There are 14 major vegetation communities in the study area in this region: urban/developed, agriculture, chaparral, coastal sage scrub, oak woodland and forest, valley grassland, creosote scrub brush, desert saltbush scrub, foothill pine-oak woodland, montane coniferous forest, piñon-juniper woodland, riparian woodland, freshwater marsh, and Mojave mixed woody scrub.

Sensitive Vegetation Communities: Sensitive vegetation communities found in this region include California walnut woodland, mainland cherry forest, riversidean alluvial fan sage scrub, southern coast live oak riparian forest, southern cottonwood-willow riparian forest, southern riparian scrub, southern sycamore-alder riparian woodland, southern willow scrub, stabilized interior dunes, valley needlegrass grassland, valley oak woodland, valley saltbush scrub, and wildflower fields.

Sensitive Plant Species: A total of 29 CNPS List 1B plants and 14 federally and state-listed species have the potential to occur in the study area in this region. Specific species include Mt. Pinos onion ((Allium howellii var. clokeyi), San Gabriel manzanita (Arctostaphylos gabrielensis), Kusche's sandwort (Arenaria macradenia var. kuschei), Greata's aster (Aster greatae), Braunton's milk-vetch (Astragalus brauntonii), Lancaster milk-vetch (Astragalus preussii var. laxiflorus), Parish's brittlescale (Atriplex parishii), Davidson's saltscale (Atriplex serenana var. davidsonii), Bakersfield smallscale (Atriplex tularensis), Nevin's barberry (Berberis nevinii), Palmer's mariposa lily (Calochortus palmeri var. palmeri), Plummer's mariposa lily (Calochortus plummerae), Alkali mariposa lily (Calochortus striatus), Mt. Gleason Indian paintbrush (Castilleja gleasonii), Southern tarplant (Centromadia parryi ssp. Australis), San Fernando Valley spineflower (Chorizanthe parryi var. Fernandina), Parry's spineflower (Chorizanthe parryi var. parryi), Santa Susana tarplant (Deinandra minthornii), recurved larkspur (Delphinum recurvatum), slender-horned spineflower (Dodecahema leptoceras), many-stemmed dudleya (Dudleya multicaulis), Ft. Tejon wooly sunflower, (Eriophyllum lanatum var. hallii), Tejon poppy (Eschscholzia lemmonii ssp. Kernensis), Mesa horkelia (Horkelia cuneata ssp. puberual), Comanche point layia (layia leucopappa), sagebrush loeflingia (Loeflingia squarrosa var. artemisiarum), Davidson's bush mallow (Malacothamnus davidsonii), Calico monkeyflower (Mimulus pictus), Flax-like monardella (Monardella linoides ssp. Oblonga), San Joaquin woollythreads (Monolopia congdonii), Plute Mountains navarretia (Navarretia setiloba), short-joint beavertail (Opuntia basilaris var. brachyclada), Bakersfield cactus (Opuntia basilaris var. treleasei), California Orcutt grass (Orcuttia californica), Plute mountains jewel-flower (Streptanthus cordatus var. piutensis), Mason's neststraw (Stylocline masonii).

Sensitive Wildlife Species: Forty-six special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present. These include four special-status fish species, 14 special-status reptiles and amphibians, 20 special-status bird species, and eight special-status mammal species. Specific species include arroyo chub (Gila orcutti), Santa Ana sucker (Catostomus santaanae), steelhead—Southern California ESU—(Oncorhynchus mykiss irideus), unarmored threespine stickleback (Casterosteus aculeatus williamsoni), San Diego horned lizard (Phrynosoma coronatum blainvillii), arroyo toad (Bufo californicus), Tehachapi slender salamander (Batrachoseps stebbinsi), western spadefoot (*Spea* *hammondii)*, two-striped garter snake (Thamnophis hammondii), blunt-nosed leopard lizard (Gambelia sila), San Bernardino mountain kingsnake (Lampropeltis zonata parvarubra), California horned lizard (*Phrynosoma coronatum frontale*), California red-legged frog (Rana aurora draytonii), coast patch-nosed snake (Salvadora hexalepis virgultea), coast range newt (Taricha torosa torosa), silvery (California) legless lizard (Anniella pulchra pulchra), western pond turtle (Clemmys marmorata), the desert tortoise (Gopherus agassizii), Le Conte's thrasher (Toxostoma lecontei), least Bell's vireo (Vireo bellii pusillus), California condor (Gymnogyps californianus), Cooper's hawk (Accipiter cooperii), Swainson's hawk (Buteo swainsoni), western yellow-billed cuckoo (Coccyzus americanus occidentalis), coastal California gnatcatcher (Polioptia californica californica), loggerhead shrike (Lanius ludovicianus), northern harrier (Circus cyaneus), prairie falcon (Falco mexicanus), Southern California rufous-crowned sparrow (Aimophila ruficeps canescens), southwestern willow flycatcher (Empidonax traillii extimus), summer tanager species (Piranga rubra), merlin (Falco columbarius), Bell's sage sparrow (Amphispiza Bellii bellii), coastal cactus wren (Campylorhynchus brunneicapillus couesi), ferruginous hawk (Buteo regalis), golden eagle (*Aquila chrysaetos*), tricolored blackbird (Agelaius tricolor), burrowing owl (Athene cunicularia), San Joaquin kit fox (Vulpes macrotis mutica), Tehachapi pocket mouse (*Perognathus alticola inexpectatus)*, Mohave ground squirrel (Spermophilus mohavensis), San Joaquin antelope squirrel (ammospermophilus nelsoni), San Joaquin pocket mouse (Perognathus inornatus inornatus), Tipton kangaroo rat (Dipodomys nitratoides), San Diego desert woodrat (Neotoma lepida intermedia), and Los Angeles pocket mouse (Perognathus longimembris brevinasus).

Wildlife Movement/Migration Corridors: The South End San Joaquin Valley corridor allows movement of wildlife from the Los Padres National Forest to the Tehachapi Mountains and El Tejon Mountains and into the Sequoia National Forest. San Joaquin kit fox, short-nosed kangaroo rat, blunt-nosed leopard lizard, and Le Conte's thrasher are species used to characterize this corridor and are indicative of its habitat connectivity. SR-58, I-5, and gaps in vegetation cover along I-5, as well as the steep and hilly terrain of the area, pose significant barriers to animal movement in the corridor. Bridges, underpasses, and some continuous habitat located along and within this corridor facilitate animal movement.

The Southern Sierra corridor connects the Los Padres National Forest and the Angeles National Forest just south of the I-5 and SR-99 interchange. This corridor allows movement throughout the Tehachapi mountain range and crosses SR-58. Deer, bear, mountain lion, and bobcat are key species used to characterize this corridor and are indicative of its habitat connectivity. SR-58 and other roadways are significant barriers to animal movement in the corridor.

The San Gabriel-Tehachapi corridor connects the Angeles National Forest and the Tehachapi Mountains. Animal movement in the corridor is significantly impeded by private lands, agriculture, and existing development in the area. Existing California Department of Parks and Recreation and CDFG lands facilitate animal movement in the corridor.

The Castaic I-5 undercrossing corridor connects Los Padres National Forest with Angeles National Forest near Castaic Lake. Significant barriers to animal movement associated with the corridor area are SR-126 and I-5. Existing riparian habitat, underpasses, and bridges facilitate animal movement in the corridor.

The Soledad Canyon–Mint Canyon corridor allows movement throughout the Angeles National Forest. Mammals, three-spine stickleback, southwestern willow flycatcher, and western spadefoot are key species used to identify the corridor. SR-14 is the only significant impediment to animal movement in the corridor. The Santa Clara River and the Angeles and Los Padres National Forests facilitate animal movement through the corridor.

The Santa Clara River corridor allows movement along the Santa Clara River from the Pacific Ocean to the Angeles National Forest. Fish and birds are the key species used to characterize the corridor and are indicative of its habitat connectivity. Gaps in vegetation cover are significant barriers to animal movement in the corridor. Existing features facilitating animal movement through the corridor include riparian habitat and an absence of dams.

The I-5 Newhall Pass corridor allows movement from hills west of I-5 south of the I-5/SR-14 interchange to the Angeles National Forest. All San Gabriel Mountain mammals, mountain lions, bobcat, gray fox, deer, coyote, and black bear are key species used to characterize the corridor and are indicative of its habitat connectivity. Significant barriers to animal movement in the corridor are SR-14 and I-5. Existing features that facilitate animal movement through the corridor include the Los Pinetos SR-14 undercrossing (disturbed coast live oak woodland), the Gavin Canyon I-5 crossing (disturbed coast live oak woodland), and the I-5 Weldon Canyon overpass (road cut with buckwheat).

Water Resources: This is a diverse region that includes several types of waters and wetlands. These waters range from concrete-lined urban streams, reservoirs, and agricultural ditches to natural rivers, desert washes, and mountain lakes. The water and/or wetland system present in each area depends on a variety of factors, including substrate, groundwater levels, precipitation, topography, and human-made improvements. Lacustrine systems in the region include Castaic Lake and Palmdale Lake. Palustrine features include ponds and non-tidal wetlands dominated by trees, shrubs, mosses, or lichens, as well as vegetated wetlands traditionally referred to as marshes, swamps, bogs, fens, and prairie potholes. Riverine systems in the study area in the region include the Los Angeles River, the Santa Clara River, and several tributaries.

Conservation Plans: The Kern County Metropolitan-Bakersfield HCP, which covers 405 sq mi (652 sq km), is one of California's largest and most successful multi-species habitat conservation plans (MSHCPs). The plan was approved in 1994 to aid 13 federally and state-listed plant and wildlife species, including the San Joaquin kit fox, San Joaquin antelope squirrel, blunt-nosed leopard lizard, Tipton kangaroo rat, Bakersfield cactus, and California jewel-flower.

The Kern County Valley Floor HCP, which is in draft form, will cover 3,110 sq mi (5,005 sq km), located 20 mi (32 km) west of Bakersfield. It will include all of Kern County below 200 ft (61 m) elevation and on the valley floor. The plan will address eight species, including Bakersfield cactus, blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat.

The Coles Levee Ecosystem Reserve and the Kern Water Bank Authority, two existing conservation banks in Kern County, have established mitigation credits for valley saltbush scrub, valley sink scrub, Great Valley cottonwood riparian, and vernal playas, and support habitat for San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and Swainson's hawk. Two other conservation banks under development in Kern County—the Chevron Lokern Conservation Bank and the Lost Hills District Mitigation Bank—will establish mitigation credits for San Joaquin Valley saltbush scrub, valley sink scrub, Great Valley cottonwood riparian, and vernal playas, and support habitat for Bakersfield saltbush (smallscale), Bakersfield cactus, San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, Swainson's hawk, and San Joaquin wooly-threads.

The proposed West Mohave Plan (WMP) is being prepared in collaboration with federal, state, and local governments in Inyo, Kern, Los Angeles and San Bernardino Counties. The Notice of Availability for the proposed West Mojave Plan and Final Environmental Impact Statement was published in the Federal Register on April 1, 2005 and is a result of over fourteen years of planning by the Bureau of Land Management (BLM) and 27 other federal and state agencies, cities and counties. The Plan consists of two components: (1) amend the existing 1980

California Desert Conservation Area Plan encompassing approximately 3.3 million acres of public land administered by the BLM, and (2) a Habitat Conservation Plan for development on 3.0 million acres of public land administered by the BLM, and (2) a Habitat Conservation Plan for development on 3.0 million acres of private land. The purpose of the WMP is to develop conservation strategies for over 100 Federal and state-listed plant and animal species located within the western Mojave Desert and to simplify procedures for complying with the Federal and State Endangered Species Acts. The Desert Tortoise Preserve Committee and Desert Tortoise Council issued a formal protest of the West Mohave Plan on May 1, 2005. The Biological Opinion from the United States Fish and Wildlife Service has not yet been obtained and the California Department of Fish and Game has raised some concerns on the ability of the proposed HCP conservation measures to "fully mitigate" as required by the California Endangered Species Act.

Los Angeles to San Diego via Inland Empire
Regional Summary: This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas, and south to San Diego generally along the I-215 and I-15 corridors. The dominant land use pattern from Los Angeles Union Station (LAUS) to Ontario Airport consists of heavily developed and urbanized settings. Except for small patches of annual grasslands and coastal sage communities, there are no contiguous natural communities along this segment. In the north-south orientation, the land cover is generally dominated by a patchwork of agricultural land use (orchards and vineyards) and urban areas along the I-215 corridor. Orchards and vineyards dominate south of the San Luis Rey River until north of Escondido. South of Lake Hodges, the land use is predominantly urban. South of Carroll Canyon toward the City of San Diego, Mission Bay, and San Diego Bay, the land use is heavily urban.

The topography along the entire corridor in the east-west orientation, from LAUS to March Air Reserve Base (ARB) segment, is generally flat. The terrain remains relatively flat through Riverside and heading into Perris Valley and Sun City, and becomes relatively steep south of Murrieta and Temecula Valley and further south towards Rainbow Valley. The terrain continues to be relatively steep until Escondido, along the north-south orientation, adjacent to the I-215 corridor. The terrain is also steep near the proposed Mira Mesa station and further south of Carroll Canyon.

Vegetation communities in the study area in this region include annual (nonnative) grasslands, coastal sage scrub, chamise redshank chaparral/mixed chaparral, southern cottonwood willow riparian, southern sycamore-alder riparian woodland, riparian scrub oak, orchards and vineyards, lacustrine wetlands, vernal pools, San Jacinto Valley vernal pools, and San Diego Mesa hardpan vernal pools.

Sensitive Vegetation Communities: The sensitive vegetation communities in this study area include annual grasslands, coastal sage scrub, chamise redshank chaparral/mixed chaparral, southern riparian forest that includes southern cottonwood willow riparian and southern sycamore-alder riparian woodland, and riparian scrub.

Sensitive Plant Species: A total of 22 CNPS List 1B plants, 13 federally and state-listed species, and one federally proposed species occur in the study area in this region. Sensitive plant species include Briand's phacelia (Phacelia stellaris), southern skullcap (Scutellaria bolanderi ssp. Austreomontana), marsh sandwort (Arenaria paludicola), Robinson's pepper-grass (Lepidium virginicum var. robinsonii) intermediate mariposa lily (Calochortus weekii var. intermedius), Culter's goldfields (Lasthenia glabrata ssp. Coulteri), Jaeger's milk-vetch (Astragalus pachypus var. jaegeri), Orcutt's brodiaea (Brodiaea orcuttii), Ramona horkelia (Horkelia truncata), San Jacinto Valley crownscale (Atriplex coronata var. notatior), smooth tarplant (Centromadia pungens ssp. Laevis), summer holly (Comorostaphylis diversifolia ssp. Diversifolia), San Diego ambrosia (ambrosia pumila), Encinitas baccharis (Baccharis vanessae), Nuttall's scrub oak (Quecus dumosa), southern tarplant (Centromadia parryi ssp. Australis), long-spined spineflower (Chorizanthe polygonoides var. longspina), oil nestraw (Stylocline citrileum), San Diego button celery, (Eryngium aristulatum var. parishii), San Diego goldstar (Muilla clevelandii), San Diego mesa mint (Pogogyne abramsii), San Diego thorn-mint (Acanthomintha ilicifolia), willowy monardella (Monardalla linoides ssp. Viminea), lakeside ceanothus (Ceanothus cyaneus), and Otay mesa mint (pogogyne nudiuscula).

<u>Sensitive Wildlife Species</u>: Fifteen special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present as identified in the CNDDB database. These include two special-status fish species, four special-status reptiles and amphibians, six special-status bird species, and three special-status mammal species. Species with potential to occur include Santa Ana sucker (Catostomus santaanae), arroyo chub (Gila orcutti), San Diego horned lizard (Phrynosoma coronatum blainvillei), orange-throated whiptail (Cnemidophorus hyperythus), southwestern arroyo toad (Cila orcutti), western spadefoot (Scaphiopus hammondii), least Bell's vireo (Vireo bellii pusillus), California gnatcatcher (Polioptia californica), western yellow-billed cuckoo (Coccyzus americanus occidentalis), western snowy plover (Charadrius alexandrinus nivosus), light-footed clapper rail (Rallus longirostris levipes), burrowing owl (Athene cunicularia), Stephen's kangaroo rat (Dipodomys stephensi), Los Angeles pocket mouse (Perognathus longemembris brevinasus), and northwestern San Diego pocket mouse (Perognathus fallax fallax).

<u>Wildlife Movement/Migration Corridors</u>: Sensitive natural areas that provide wildlife movement/migration corridors predominantly occur in association with aquatic systems (streams/rivers) in this region. Potential wildlife migratory corridors include Rio Hondo, San Gabriel River, Santa Ana River, Temecula Creek, Murrieta Creek, Box Springs Reserve, San Jacinto River, San Luis Rey River, Lake Hodges/San Dieguito Marsh, Carroll Canyon, Rose Canyon, San Marcos Creek, Escondido Creek, San Clemente Canyon, Rainbow Creek, and San Diego River. These aquatic systems support riparian vegetation that provides food and cover, enhancing the migratory qualities of the habitat.

Important regional wildlife corridors also may be found adjacent to I-215 near Perris, in the vicinity of March ARB, off I-15 near Clinton Keith Road south of the City of Riverside, and in the Los Peñasquitos Canyon Preserve intersected by I-15 near Marine Corps Air Station (MCAS) Miramar. There also are corridors at MCAS Miramar associated with San Clemente Canyon and Rose Canyon and at the Mission Trails Regional Park intersecting I-15 and SR-163.

<u>Water Resources</u>: Many waters of the U.S., including unnamed drainages, traverse the region. A majority of the water bodies, or portions thereof, traversing the LAUS to March ARB proposed segment are channelized. These streams include the Los Angeles River, San Gabriel River, Rio Hondo, San Jose Creek (City of Industry), Etiwanda Channel, and Cucamonga Creek (City of Ontario).

Along the north-south segment (March ARB to Mira Mesa), Perris Valley storm drain (San Jacinto River Channel), San Clemente Canyon, Carroll Canyon, San Diego Aqueduct, San Diego River, Escondido Creek, and Cypress Canyon are channelized and occur in predominantly urbanized areas. Non-channelized water bodies along this alignment include Murrieta Creek, Rainbow Creek, San Luis Rey River, Keys Creek, San Marcos Creek, Lake Hodges/San Dieguito River, Los Peñasquitos Canyon, Rose Canyon, and portions of Carroll Canyon.

Scattered freshwater wetlands associated with the drainage are found along the March ARB to Mira Mesa and Mira Mesa to San Diego segments. These include palustrine wetlands along Murrieta Creek, palustrine emergent marsh, artificially created emergent wetlands associated with San Luis Rey River, and lacustrine and palustrine emergent marshes in association with Lake Hodges and San DeGette Lagoon. Patches of San Diego mesa hardpan vernal pools occur near the proposed Mira Mesa station just north of MCAS Miramar, south of Soledad Freeway, north of San Clemente Canyon, just south of Escondido Freeway, and north of Carroll Canyon.

A number of small lacustrine wetlands, predominately human-made detention ponds that have been naturalized, are scattered along I-10. The most sensitive and biologically productive wetland along the entire study area in this region is the lacustrine/palustrine marsh wetlands associated with the Lake Hodges/San Dieguito River off I-215. There are an estimated 46 ac (19 ha) of estuarine wetlands within the San Diego Airport study area.

A number of vernal pool complexes exist in the areas between Mira Mesa and San Diego, primarily in the I-15 corridor and on and around MCAS Miramar. The vernal pools are documented by the U.S. Fish and Wildlife Service in the "Vernal Pools of Southern California Recovery Plan," 1997.

Conservation Plans: The San Diego County MSCP is a comprehensive habitat conservation program that addresses multiple species' habitat needs and the preservation of native vegetation communities for a planning area encompassing 900 sq mi (1,448 sq km) in southwestern San Diego County (www.dfg.ca.gov/nccp/mscp). The MSCP is a subregion of the NCCP's coastal sage scrub region. It is one of three subregional habitat conservation efforts in San Diego County that contribute to preservation of regional biodiversity through coordination with other habitat conservation planning efforts throughout southern California. Completed in 1998, the MSCP targets 171,917 ac (69,573 ha) of open space for conservation within the planning area. This includes 167,667 ac (67,853 ha), or more than half of all remaining natural habitat areas, and 4,250 ac (1,720 ha) of other open spaces (such as disturbed and agricultural lands) that contribute to conservation objectives.

The North San Diego County MSHCP, along the county's northern coast, covers conservation of many natural communities, including vernal pools. In the study area in this region, the following critical habitat units[6] are designated to protect specific species.

- Gnatcatcher: MSHCP units near the campus of the University of California at Riverside in Murrieta and Temecula. The East Los Angeles County Matrix NCCP is located near the City of Industry. In addition, a unit near Escondido, as part of the North County subarea of the MSHCP for unincorporated San Diego County, and an area near Lake Hodges (North San Diego County MSHCP), have been designated.
- Least Bell's vireo: at San Luis Rey River (Unit No. F).
- San Bernardino kangaroo rat: at Etiwanda Alluvial Fan Unit near Fontana, and at Lytle and Cajon Creeks Unit in San Bernardino County.
- Southwestern willow flycatcher: at San Luis Rey River (Unit No. 17), and at San Dieguito River (San Dieguito River Unit).
- Southwestern arroyo toad: at San Luis Rey River (Unit No. 14).

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[6] USFWS designates critical habitat maps that show areas or units of habitat considered essential to the protection of threatened and endangered species.

The following are proposed critical habitats in the study area in this region.

- Vernal pools critical habitat (San Jacinto-Hemet Unit No. 33 A) near Perris in Riverside County associated with San Jacinto River and consisting of 5,730 ac (2,319 ha) (50 C.F.R. part 17, vol. 67, No. 185, Tuesday, September 24, 2002).
- Critical habitat (Southwest Riverside Unit) for Quinoa checkerspot butterfly near the I-15 and I 215 junction near Murrieta (50 C.F.R. part 17, vol. 66, No. 26; Tuesday, February 7, 2001).

Los Angeles to San Diego via Orange County

Regional Summary: This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The entire study area in this region lies within the South Coast Bioregion, an area of contrasting landscapes ranging from coastal mountains, canyons, streams and river valleys, rolling hills, and beaches to densely populated cities. The region more specifically lies within the Peninsular Range Physiographic Province. This area is characterized by a Mediterranean climate with winter rainfalls and summer droughts. Average annual rainfall ranges from 9 in (23 cm) in the San Diego region to 15 in (38 cm) in the Los Angeles basin.

In San Diego County, the study area is further characterized by the presence of large coastal wetlands, including six lagoons located in the northern region of the county. These lagoons and the associated open space around them provide vital habitat for resident and migratory birds and other wildlife. Sensitive plant and animal species are found here in substantial numbers despite increasing urbanization, hydrological changes in the watershed, and limited tidal action.

The vegetation communities found in the study area include urban-agricultural and Diegan coastal sage scrub communities. Urban-agricultural vegetation is highly disturbed and widespread within existing residential/commercial, farming, and landscaped areas and may include flower farms, strawberry and vegetable farms, vineyards, and other irrigated uses. Diegan coastal sage scrub is the most commonly found sage scrub community in coastal southern California, ranging from Los Angeles to Baja. This coastal sage scrub community is dominated by low soft-leaved, drought-deciduous shrubs and is typically found on dry sites and steep slopes.

Sensitive Vegetation Communities: Although urban-agricultural vegetation is likely to provide foraging habitat for some wildlife species (e.g., red-tailed hawks, coyotes), it is not considered a sensitive vegetation community. Diegan coastal sage scrub, however, is considered sensitive and provides habitat for many endangered and threatened species. This vegetation community has suffered severe reductions compared to historic levels from spreading urbanization. For the purposes of this program-level analysis, Diegan coastal sage scrub is considered the dominant sensitive vegetation in the study area in this region.

Lagoons and other wetlands are also considered to encompass sensitive vegetation. Sensitive vegetation communities include southern maritime chaparral, succulent sage scrub, southern riparian scrub, southern riparian forest, southern cottonwood willow riparian, Torrey pine forest, southern dune scrub, southern foredunes, southern coastal salt marsh, coastal brackish marsh, and San Diego mesa hardpan vernal pool.

Sensitive Plant Species: The mosaic of vegetation communities that make up Diegan coastal sage scrub and the lagoon/wetlands supports a variety of sensitive plant species. A total of 28 CNPS List 1B plants and nine federally and state-listed species have the potential to occur in the study area. The nine federally and state-listed species include Del Mar manzanita (Arctostaphylos glandulosa ssp. crassifolia), coastal dunes milk-vetch (astragalus tener var. titi), Orcutt's spineflower (Chorizanthe orcuttiana), San Fernando Valley spineflower (Chorizanthe parryi var. Fernandina), salt marsh bird's beak, (Cordylanthus maritimus ssp. maritimus), many-stemmed dudleya (Dudleya multicaulis), San Diego button-celery (Eryngium aristulatum var. parishii), spreading navarretia (Navarretia fossalis), California Orcutt grass (Orcuttia Californica).

Sensitive Wildlife Species: Twenty-six special-status species have the potential to occur in the study area in this region, based on the general habitat types present. These include two sensitive invertebrate species, three special-status fish species, six special-status reptiles and amphibians, 11 special-status bird species, and four special-status mammals: San Diego fairy shrimp (Branchinecta sandiegonensis), Riverside fairy shrimp (Streptocephalus woottoni), tidewater goby (Eucyclogobius newberryi), arroyo chub (Cila orcutti), southern steelhead trout (oncorhynchus mykiss irideus), arroyo toad (Bufo Californicus), orange-throated whiptail (Cnemidophorus hyperythrus), coastal western whiptail (Chemidophorus tigris multiscutatus), northern red-diamond rattlesnake (Crotalus Exsul), San Diego horned lizard (Prynosoma coronatum blainvellei), western spadefoot (Scaphiopus hammondii), southern California rufous-crowned sparrow (Simophila ruficeps canescens), coastal cactus wren (Campylorhynchus brunneicapillus couesi), western snowy plover (Charadrius alexandrinus nivosus), northern harrier (Circus cyaneus), California black rail (Laterallus jamicensis coturniculus), Belding's savannah sparrow (Passerculus sandwichensis beldingi), coastal California gnatcatcher (Polioptila Californica), light-footed clapper rail (Rallus longirostris levipes), bank swallow (riparia riparia), California least tern Sterna antillarum browni), least Bell's vireo (Vireo Bellii pusillus), northwestern San Diego pocket mouse (Chaetodipus fallax fallax), Stephens' kangaroo rat (dipodomys stephensi), San Diego desert woodrat (Neotoma lepida intermedia), and Pacific pocket mouse (Perognathus longimembris pacificus).

The San Diego fairy shrimp, tidewater goby, coastal California gnatcatcher, and least Bell's vireo may potentially be designated critical habitats in the region (and potentially in the corridor/alignment study area) as defined by USFWS.

Wildlife Movement/Migration Corridors: Only large open areas, lagoons and surrounding park or reserve areas, and riparian areas in undeveloped areas are considered potential wildlife movement corridors in this region. These include San Juan Creek; Camp Pendleton Marine Corps Base (including San Mateo Creek, San Onofre Creek, and Santa Margarita River); San Luis Rey River; Buena Vista Lagoon; Aqua Hedionda Lagoon; Batiquitos Lagoon; San Elijo Lagoon; San Dieguito River and Lagoon; Los Peñasquitos Lagoon; Peñasquitos Creek and Canyon; Sorrento Valley, Rose Canyon; and San Clemente Canyon.

Water Resources: The estuarine lagoons of northern San Diego County are within the coastal zone. They are a unique biological resource and are the focus of many resource agencies and other entities interested in the quality of these areas. Six lagoons are located in the in the region: Buena Vista, Agua Hedionda, Batiquitos, San Elijo, San Dieguito, and Los Peñasquitos.

Vernal pool, a potential component of coastal sage scrub or chaparral landscapes, is considered another type of wetland. Vernal pools are likely to exist within the study area in this region, particularly on the Camp Pendleton Marine Corps Base. There are potentially more than 25 major non-wetland waters in the region.

Conservation Plans: Other than the potential USFWS-designated critical habitats described in the sensitive plants discussion above, there are no conservation plans identified in this region. The Batiquitos Lagoon at the southern edge of Carlsbad is 600 ac (243 ha) and was made a CDFG-designated State Ecological Reserve in 1983. The San Elijo Lagoon located between Encinitas and Solana Beach is a CDFG-designated State Ecological Reserve. A portion of the San Dieguito Lagoon at the northern edge of the City of Del Mar is also a CDFG-designated State Ecological Reserve, as is the recently designated Los Peñasquitos Lagoon State Preserve.

3.15.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The biological resources and wetlands described above in the affected environment section (Section 3.15.2) characterize the existing conditions in the five regions potentially affected by the alternatives, drawing primarily from existing available data, with gaps in data in some areas. Because this is a program-level analysis, data are representative rather than complete, and are for comparison purposes.

Though some changes may occur between the existing conditions and the year 2020 due to natural changes in resources as well as urbanization and transportation projects that would be implemented by 2020 under the No Project Alternative, attempting to estimate the extent of these changes would be speculative at this time. Further, it is assumed that each of the projects associated with the No Project Alternative would incorporate and implement the appropriate mitigation and monitoring measures to minimize or avoid considerable impacts on sensitive biological and wetland resources. It is also realistic to project that urbanization in some of the regions resulting from population growth over the next 17 years (to 2020) would change the conditions reported in this document, and that continued efforts by local communities and nonprofit organizations (e.g., The Nature Conservancy) would continue to expand protected areas (habitat conservation planning areas). Because estimating the extent of change prior to 2020 would be speculative, no substantial change to the existing conditions is assumed for purposes of this program-level evaluation and comparison of alternatives.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The existing conditions associated with the No Project Alternative are used as a baseline for comparison with the changes or impacts that would potentially result from either the Modal or HST Alternatives. Though potential impacts would vary from segment to segment along the Modal and HST Alternatives, overall, based on available information for each of the study areas along corridors and alignments, the Modal Alternative would potentially affect a greater area or number of sensitive biological and wetland resources than HST alignment options. Because of the higher potential for impacts under the Modal Alternative, associated mitigation measures are expected to be more extensive and thus more expensive than under the HST Alternative.

This section provides a general comparison of resources potentially impacted by the Modal and HST Alternatives. The following section compares the potential impacts of the alternatives by region.

Modal and HST Alternatives

Because there are several alignment and station options for the HST Alternative, a range of potential impacts was developed that represents the options with the fewest to the greatest potential impacts on biological and wetland resources within a region for purposes of a broad, program-level review.

Affected Environment

Using existing data and information as the basis for the evaluation, approximately 77,018 ac (31,168 ha) of sensitive vegetation are present in the study area for the Modal Alternative, which is substantially more than the approximately 9,773 ac (3,955 ha) to 17,619 ac (7,130 ha) present in the study area for the HST Alternative. Approximately 5.3 million ft (1.6 million m) of non-wetland waters are present in the Modal Alternative study area, which is substantially more than the up to 1.2 million ft (0.4 million m) present in the HST Alternative study area. Approximately

23,172 ac (9,377 ha) of wetlands are potentially present in the Modal Alternative study area compared to approximately 3,996 ac (1,617 ha) to 18,356 ac (7,428 ha) for the HST Alternative. There were 321 special-status species identified as potentially present in the study area for the Modal Alternative, compared to a range of 279 to 350 for the HST Alternative. Table 3.15-1 summarizes the biological resources and wetlands present within the potentially affected environment.

The proposed Modal and HST alternatives would have potential to affect wildlife movement/migration corridors throughout the study area. Figures 3.15-1A and 3.15-1B illustrate the known wildlife movement corridors throughout the overall study area and general areas where the movement corridors cross proposed highway improvements in the Modal Alternative and the alignment options in the HST Alternative.

Construction activities for either the Modal or HST alternative could affect stormwater quality by releasing sediment and/or chemicals onto the ground or directly into water courses. Construction activities could increase sediment load in stormwater during rainfall events. Sediment sources created during construction include soil stockpiles, soil tracked across construction areas, and soil transported by wind. Mismanagement of on-site excavated or imported construction materials could result in release of sediments directly into creeks at above-ground stream crossings or into the storm drainage system and subsequently into creeks.

Excavated soil could be contaminated, and release of contaminated sediments could pollute surface water sources. Retained cuts could expose the soil to run off and potentially cause erosion and entrainment of sediment in the runoff. Soil stockpiles could be exposed to runoff and, if not managed properly, runoff could cause erosion and increased sedimentation directly into receiving water bodies at stream crossings, in storm sewers, or in drainage channels.

In addition to erosion, there is a potential for chemical releases at construction sites. Once released, substances such as fuels, oils, paints, and solvents could be transported to nearby drainage channels.

Earthwork for the Modal and HST alternatives would involve excavations and fill construction, producing potential erosion and sedimentation problems if not properly designed, constructed, and maintained. Stockpiles of excavated solid and imported fill, if properly managed, should not be sources of sedimentation. If, however, construction-related erosion and sedimentation were to occur, it could result in impacts to surface water quality and drainage channel maintenance.

Dewatering operations for excavations could result in discharge of sediments and/or pollutants to surface water bodies, thereby degrading water quality. High sediment content in dewater discharges is common because of the nature of the operation, in which soil and water mix in the turbulent flow of high-volume pump intakes.

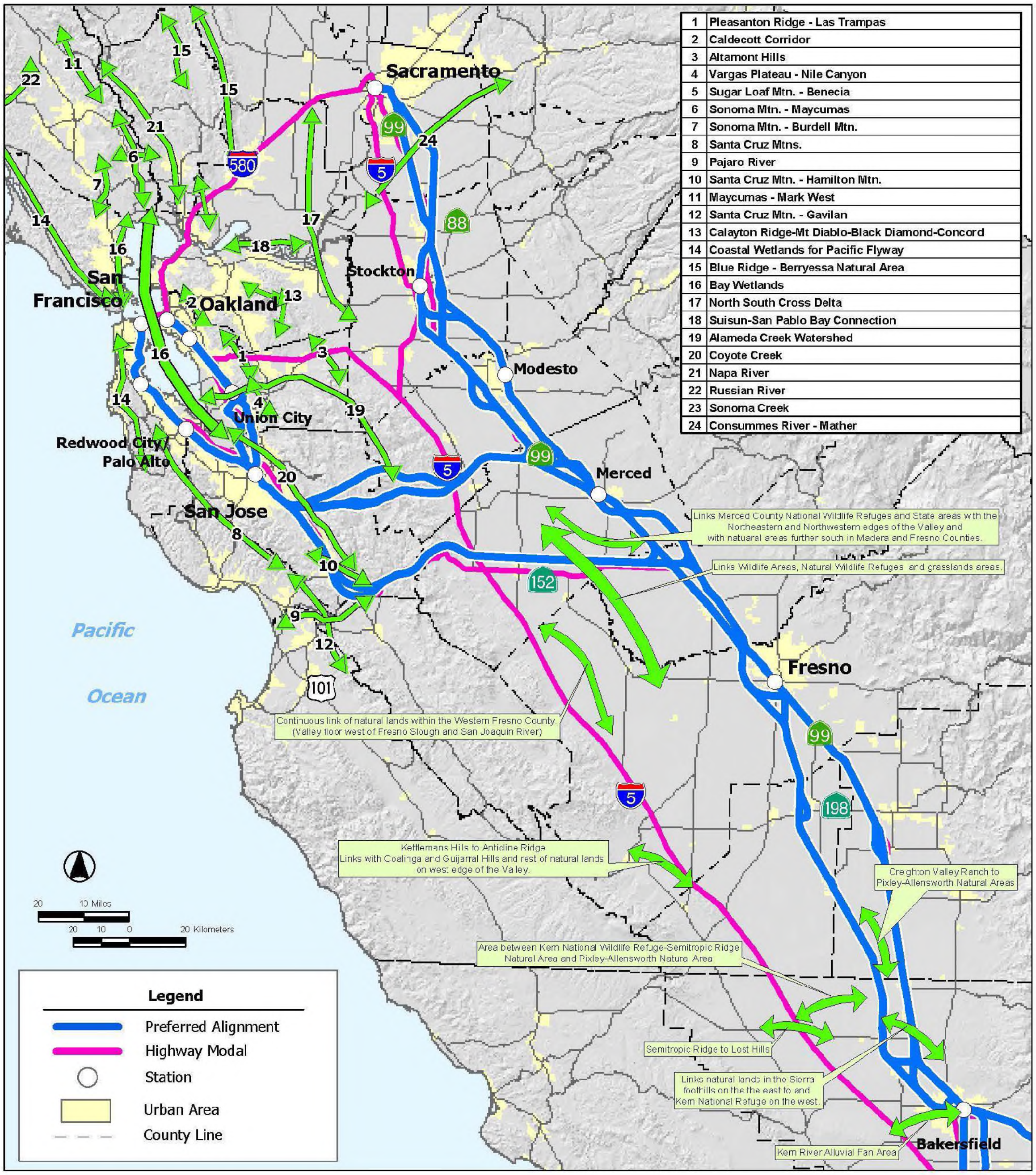
Direct discharge of dewatering effluent to a storm drainage system could result in water quality impacts to downstream drainages.

Representative Impacts

Table 3.15-1A presents the representative impacts on biological resources and wetlands from disturbance to or fragmentation of habitat due to construction and operation of the Modal and HST Alternatives.

Figure 3.15-1A

Wildlife Movement Corridors-North



1	Pleasanton Ridge - Las Trampas
2	Caldecott Corridor
3	Altamont Hills
4	Vargas Plateau - Nile Canyon
5	Sugar Loaf Mtn. - Benecia
6	Sonoma Mtn. - Maycumas
7	Sonoma Mtn. - Burdell Mtn.
8	Santa Cruz Mtns.
9	Pajaro River
10	Santa Cruz Mtn. - Hamilton Mtn.
11	Maycumas - Mark West
12	Santa Cruz Mtn. - Gavilan
13	Calayton Ridge-Mt Diablo-Black Diamond-Concord
14	Coastal Wetlands for Pacific Flyway
15	Blue Ridge - Berryessa Natural Area
16	Bay Wetlands
17	North South Cross Delta
18	Suisun-San Pablo Bay Connection
19	Alameda Creek Watershed
20	Coyote Creek
21	Napa River
22	Russian River
23	Sonoma Creek
24	Consummes River - Mather

Links Merced County National Wildlife Refuges and State areas with the Northeastern and Northwestern edges of the Valley and with natuaral areas further south in Madera and Fresno Counties.

Links Wildlife Areas, Natural Wildlife Refuges and grasslands areas.

Continuous link of natural lands within the Western Fresno County. (Valley floor west of Fresno Slough and San Joaquin River)

Kettlemans Hills to Anticline Ridge
Links with Coalinga and Guijarral Hills and rest of natural lands on west edge of the Valley.

Creighton Valley Ranch to Pixley-Allensworth Natural Areas

Area between Kern National Wildlife Refuge-Semitropic Ridge Natural Area and Pixley-Allensworth Natural Area

Semitropic Ridge to Lost Hills

Links natural lands in the Sierra foothills on the the east to and Kern National Refuge on the west.

Kern River Alluvial Fan Area

Figure 3.15-1B

Wildlife Movement Corridors-South

Table 3.15-1
Summary of Potential Impacts on Biological Resources within the Potentially Affected Area for Modal and HST Alternatives

Region	Sensitive Vegetation in Acres (Hectares)	Wildlife Movement Corridor (Yes/No)	Non-wetland Jurisdictional Waters in Linear Feet (Meters)	Wetlands in Acres (Hectares)	Marine/Anadromous Fish Resources (Yes/No)	Number of Special-Status Species
Modal Alternative						
Bay Area to Merced	1,323 (535)	Y	4,630,791 (1,411,465)	6,384 (2,583)	Y	80 (72,246 ac [29,237 ha])
Sacramento to Bakersfield	52,535 (21,260)	Y	59,329 (18,083)	10,158 (4,111)	Y	50
Bakersfield to Los Angeles	2,773 (1,122)	Y	172,656 (52,625)	547 (221)	Y	23
Los Angeles to San Diego via Inland Empire	14,321 (5,795)	Y	401,531 (122,387)	859 (348)	N	65
Los Angeles to San Diego via Orange County	6,066 (2,455)	N	119,525 (36,431)	5,224 (2,114)	N	103
Total Modal Alternative	**77,018 (31,168)**	**Y**	**5,383,832 (1,640,992)**	**23,172 (9,377)**	**Y**	**321**
High-Speed Train Alternative						
Bay Area to Merced	455–812 (184–329)	Y	322,390–650,073 (98,264–198,142)	576–10,721 (233–4,339)	Y	24–38 (13,705–18,613 ac [5,546–7,532 ha])
Sacramento to Bakersfield	1,227–4,696 (496–1,900)	Y	26,455–70,720 (8,063–21,555)	1,601–5,540 (648–2,242)	Y	22–40
Bakersfield to Los Angeles	482–1,616 (195–654)	Y	101,904–146,784 (31,060–44,740)	231–400 (93–162)	Y	14–23
Los Angeles to San Diego via Inland Empire	7,609–10,301 (3,079–4,169)	Y	273,699–353,837 (83,423–107,849)	701–751 (284–304)	N	53–77
Los Angeles to San Diego via Orange County (HST corridor)	0	N	9,880–23,760 (3,011–7,242)	1–2 (0.4–0.8)	N	14–17
Los Angeles to San Diego via Orange County (conventional rail corridor)	0–194 (0–78)	Y	75,350–92,067 (22,967–28,062)	886–942 (358–381)	Y	152–155
Total HST Alternative	**9,773–17,619 (3,955–7,130)**	**Y**	**783,223–1,266,521 (238,726–386,036)**	**3,996–18,356 (1,617–7,428)**	**Y**	**279–350**

Table 3.15-1A
Summary of Representative Impacts on Biological Resources for Modal and HST Alternatives

	Representative Impacts[7]		
Region	**Wetlands Acres (Hectares)**	**Species[8] #**	**Habitat[9] Acres (Hectares)**
	Modal Alternative		
Bay Area to Merced	35.8 (14.5)	21	278.3 (112.6)
Sacramento to Bakersfield	51.3 (20.8)	19	799.3 (323.5)
Bakersfield to Los Angeles	6.5 (2.6)	10	139.6 (56.5)
LA - Riverside – San Diego	2.1 (0.8)	19	152.5 (61.7)
LA – Orange Co. - San Diego	3.9 (1.6)	21	106.7 (43.2)
Total Modal Alternative	**100** **(40.5)**	**90**	**1,476** **(597.3)**
	High Speed Train Alternative		
	Representative Impacts[10]		
Region	**Wetlands Acres** (Hectares)	**Species #**	**Habitat Acres** (Hectares)
Bay Area to Merced	3-74 (1.2-29.9)	16-25	260-337 (105.2-136.4)
Sacramento to Bakersfield	15-22 (6.1-8.9)	25-28	NA
Bakersfield to Los Angeles	2-14 (0.8-5.7)	12-14	154-238 (62.3-96.3)
Los Angeles to Irvine	NA	NA	NA
Los Angeles to San Diego	1.5-5.3 (0.6-2.1)	20-26	188-266 (76.1-107.6)
Total HST Alternative	**30-89** **(12.1-36)**	**67-84**	**1,201-1,568** **(486-634.5)**

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[7] Based on Representative Facility Footprint

[8] Special Status Species per California Department of Fish and Game, Natural Diversity Database 2004

[9] Special Status Species Habitat per California Department of Fish and Game, Natural Diversity Database 2004

[10] Based on Representative Facility Footprint. Impacts could be greatly reduced through avoidance and minimization methods at the project level.

Modal Alternative

The highway improvements under the Modal Alternative focus entirely on existing corridors and facilities and would comprise more miles of alignment (linear improvement) statewide than the HST Alternative. The potential expansion of lanes on existing highways would require extensive cut-and-fill through mountain passes to accommodate the lanes and associated interchange widening. One example is the potential highway widening of the existing I-5 through the Grapevine where extensive cut and fill would be necessary in steep mountain terrain. Federally and state-listed plant and animal species in the Grapevine area along I-5 between SR-99 and SR-14 that could potentially be affected by lane expansions include slender-horned spineflower, San Fernando Valley spineflower, Santa Ana sucker, Arroyo toad, San Joaquin kit fox, Tehachapi slender salamander, unarmored threespine stickleback, and San Joaquin antelope squirrel. Vegetation communities in the Grapevine segment that would be subject to potential impacts from widening I-5 include California walnut woodland, Riversidean alluvial fan sage, southern cottonwood willow riparian forest, southern willow scrub, valley needlegrass grassland, and valley oak woodland.

Additional right-of-way necessary under the Modal Alternative would potentially include some areas of currently undeveloped natural vegetation. For example, right-of-way needed for potential widening of SR-152 near Gilroy passes through the natural area of Pacheco Pass in the Diablo Range. Also, bridges and overpasses would be widened in urban, suburban, coastal, and open space environments, increasing the footprint of the highway and potential shadow effects[11] beneath the infrastructure. Bridge widening would be of concern in areas where the existing bridge columns and approaches impede tidal flow, such as the lagoon areas of northern San Diego County.

High-Speed Train Alternative

The proposed HST Alternative would generally be located in or adjacent to existing transportation rights-of-way such as highways or railroads, or would be in tunnels or elevated through mountain passes and sensitive habitat areas. The HST Alternative would include several tunnels, which could avoid or substantially reduce surface impacts on sensitive biological resources except at tunnel portal areas. The footprint of bridges across bodies of water such as lagoons in San Diego would not be increased under the proposed HST Alternative because new bridges would replace older bridges, and the new bridges would use materials and designs to minimize the number of piles/columns in the water and would retain the same or smaller footprint of the span. The east-west HST options across the Diablo Range and across the western portion of the San Joaquin Valley would potentially impact wildlife movement/migration corridors for the San Joaquin kit fox.

In general, railroad corridors have been found to have the following environmental advantages over highways: 1) Water drains away from the track-bed, maintaining a dry environment that prevents unwanted vegetation from establishing. 2) The track-bed has a porous, stable base that prevents runoff from concentrating, keeps slope erosion to a minimum, and filters out particulates and chemical pollutants. 3) A service road or other narrow access strip running alongside the track-bed prevent spoils from shifting beyond the toe of the track-bed slope. 4) Drainage ditches parallel to the track-bed prevent uncontrolled erosion, act as sediment traps, filter railway runoff, and insulate adjoining land from uncontrolled channel flow. 5) High Speed Rail (HSR) construction usually has a significantly smaller footprint than road construction, so it has less long-term and short-term impacts. 6) HSR corridors are narrower than roads, so animals are more willing to cross under them. This is a significant advantage. 7) It is more feasible to elevate an HSR system on pile-supported structures than to elevate a road.

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[11] Shadow effect refers to shading of plants that would affect access to sunlight and health of the plants.

> "Elevated corridors on bridges or viaducts undoubtedly have the less disruptive impact on wildlife movement and migration passageways." (DeSanto, R.S. and D.G. Smith; Environmental auditing: an introduction to issues of habitat fragmentation relative to transportation corridors with special reference to high-speed rail (HSR); Environmental Management 17:111-114; 1993)

3.15.4 COMPARISON OF ALTERNATIVES BY REGION

The potential impacts on biological resources and wetland/water resources that could result from the Modal and HST Alternatives through each of the regions are summarized above in Table 3.15-1. To allow a reasonable means of comparing the impacts of the alternatives and to estimate a range of potential areas of impact on biological resources for each region, the various options for the HST Alternative were considered combined for each region. For a summary of the potential impacts on biological resources for all alignment and station options for each region see Appendix 3.15-D.

As discussed earlier, all comparisons are based on information currently available from existing databases. Field surveys, which would be performed during a subsequent environmental review, would provide more detailed information and could indicate an increase or a decrease in the potential impacts on biological resources from a proposed HST system, particularly along routes that have not previously been the focus of field surveys or mapping by any of the regulatory agencies (such as CDFG or USFWS).

A. BAY AREA TO MERCED

Figures 3.15-1 and 3.15-2 show the general locations of sensitive habitat and wetlands in the Bay Area to Merced region. The Modal and HST Alternatives would have the potential to result in potential adverse impacts on the following resources.

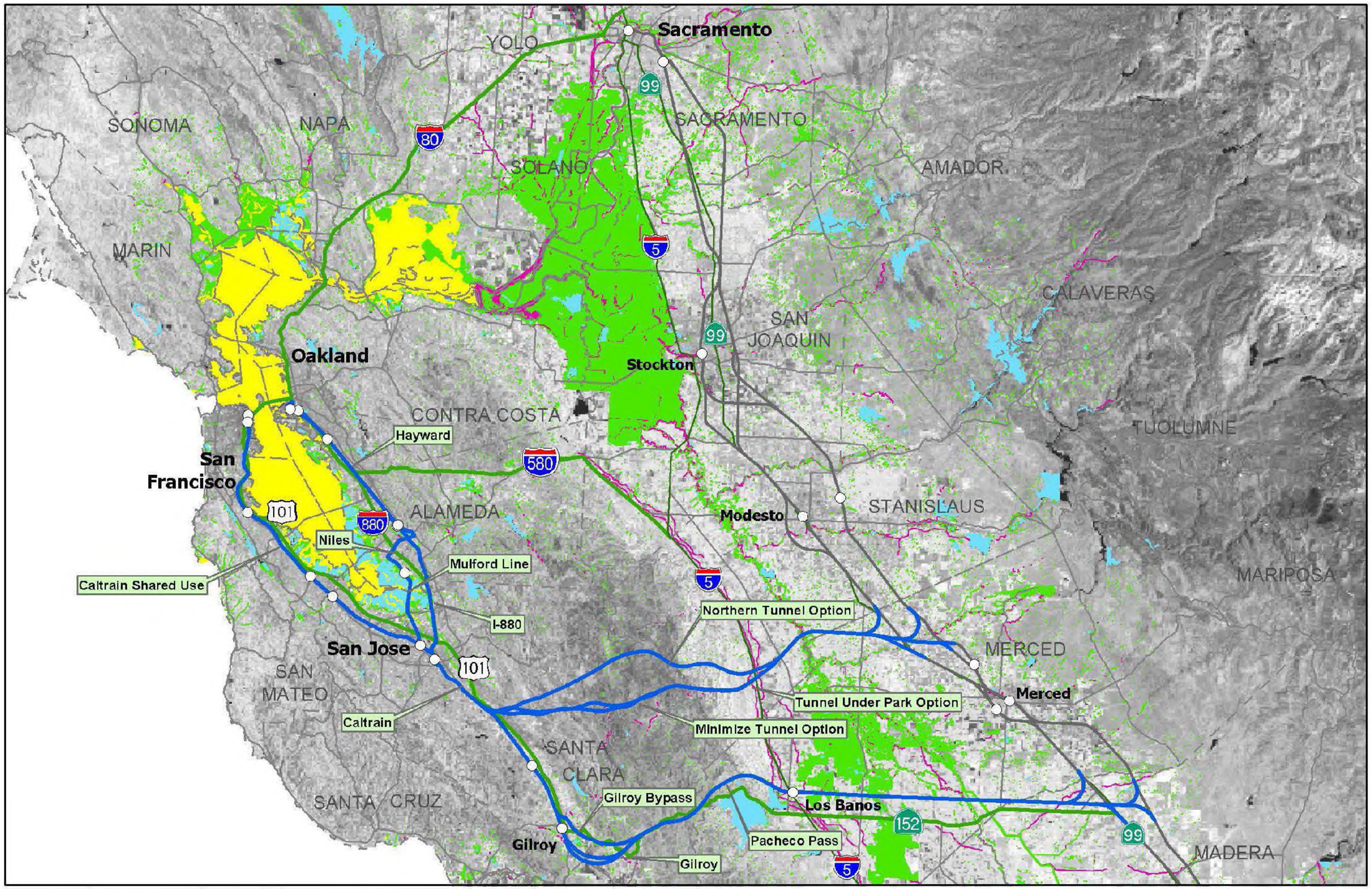
- Several special-status species, including the California red-legged frog and San Joaquin kit fox.
- Sensitive plant communities and sensitive habitat, including marsh, chenopod (alkali) scrub, valley sink scrub, riparian woodlands (e.g., sycamore alluvial woodland), and valley oak woodland plant communities.
- Sensitive habitat of concern, such as freshwater emergent wetland.
- San Joaquin kit fox foraging habitat.
- Oak trees.
- Streams below top-of-bank, including riparian corridors.
- Anadromous fish habitat.
- Wetlands and waters at a level that may require an Individual Permit and Section 404(b)(1) Analysis of Alternatives, which would be addressed in a subsequent environmental review.

Modal Alternative

The Modal Alternative could result in potential impacts on several hundred sensitive plant communities, including possibly more than 278 ac (112.5 ha) of habitat for 21 special-status species in the study area in this region. The Modal Alternative could also impact more than 9,800 linear ft (2,987 linear m) of streams, about 14 ac (5.7 ha) of other water bodies, and more than 6,300 ac (2,550 ha) of NWI wetlands. This would constitute a potentially high impact.

The Modal Alternative potentially would impact hydric soils (indicator of wetlands), serpentine soils (substrate for several special-status species), and oak trees. Expanding SR-152 by two lanes between Gilroy and Hollister would potentially impact sensitive habitat in the study area for the red-legged frog, and the San Joaquin kit fox in the Diablo Range, as well as other special-status species, because it would require extensive cut-and-fill work in some areas to

Figure 3.15-2. Bay Area to Merced Wetlands



Source: Landsat 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 30, 2003

California High Speed Train Program EIR/EIS

10 5 0 10 20 30 Miles

10 5 0 10 20 30 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Legend

Wetlands Categories

🟨	Estuarine
🟪	Riverine
🟦	Lacustrine
🟩	Palustrine

Alignment Profiles

—○—	High Speed Train Alignment and Stations
Gilroy	Alignment Designation
—	Rail Alignment in Adjacent Regions
—	Modal (Highway) Alignment
- - - -	County Boundary

Wetlands
Bay Area to Merced Region

accommodate lane additions. The Modal Alternative would include extending existing infrastructure (bridges, culverts, abutments, and fill) to accommodate additional lanes, and would be expected to include mitigation for potential wildlife and biological impacts. However, providing sufficient mitigation for compliance with CWA requirements for wetlands and waters would likely be difficult and challenging. For example, along the I-880 corridor between Oakland and San Jose, almost all onsite wetland mitigation sites have been taken for previous freeway widening projects. Mitigation along the I-880 corridor would need to be undertaken elsewhere offsite.

High-Speed Train Alternative

The HST Alternative in the Bay Area to Merced region would potentially result in impacts similar to those associated with the Modal Alternative along the west-east segments across the Diablo Range where potential impacts on threatened and endangered species, including the San Joaquin kit fox, are possible. The kit fox has a wide distribution, using the spine of the Diablo Range as a north-south movement corridor. The California red-legged frog occupies corresponding valley wetlands and riparian corridors. Efforts to conserve the California tiger salamander are increasing, and USFWS has proposed listing it as a threatened and endangered species.

The proposed HST Alternative alignment options would create new transportation corridors in this region that would have the potential to fragment habitat for threatened and endangered species in the Diablo Range.

The proposed HST Alternative alignment options would have the potential to affect wildlife movement/migration corridors in this region, primarily for terrestrial mammals, depending on the selection of a final alignment. Because the proposed routes between both San Francisco and Gilroy and Oakland and Gilroy are along existing rail corridors, little impact on movement/migration routes would be anticipated. The potential for impacts would be expected to occur mainly along the east-west HST options through the Diablo Range (Diablo Range direct) and across the western portion of the San Joaquin Valley. Portions of these alignments are proposed to be in tunnels (between 11 mi [18 km] and 16 mi [26 km], depending on alignment option) and the segments in tunnels would not hinder wildlife movement. Segments that would be placed at grade (cut and fill) would require fencing the HST alignment for the safety of humans, as well as protection from train-wildlife collisions, and would have the potential to interfere with wildlife movement. Placement of overpasses, underpasses, and tunnels along these alignments could provide for movement of wide-ranging and migratory species. The proposed HST Alternative would potentially impact a relatively small percentage of wetlands compared to the Modal Alternative (from approximately 2.8% for the Bay Area to Merced segment with the Oakland to San Jose East plus tunnel under Henry Coe State Park, to about 6.7% for the Hayward/Niles/Mulford alignment plus the south line Gilroy station option). The major wetland features in this region include the San Francisco Bay. With the exception of the Mulford Line, the HST alignment options would be able to avoid or limit potential impacts on these features (see Figure 3.15-2). The Modal Alternative would potentially affect 36 ac (14.6 ha) total acres of wetlands in the region, compared to potential impacts on between 3 ac (1.2 ha) and 74 ac (29.9 ha) for the HST Alternative, depending on the alignment options.

High-Speed Train Alignment Option Comparisons

The Hayward/Niles/Mulford alignment option would pass through the Don Edwards San Francisco Bay National Wildlife Refuge adjacent to the existing rail line, potentially impacting substantially more wetlands (25 ac [10.1 ha]) than the Hayward alignment/I-880 (1.3 ac [0.5 ha]). . The Mulford alignment option potentially impacts habitat for special-status shorebirds and waterfowl, including the endangered California clapper rail. The Mulford alignment option would pass through important wetlands and tidal salt marsh that supports endangered species such as the salt marsh harvest mouse, steelhead, western snowy plover, and red-legged frog.

The HST segment using the northern tunnel under Henry Coe option would involve the fewest wetland impacts. Of the three Diablo Range direct options, the northern tunnel alignment would potentially affect fewer special-status species than other alignment options. The Diablo range direct options would also have potential impacts on aquatic resources of national importance (ARNII) along the Orestimba Creek.

B. SACRAMENTO TO BAKERSFIELD

The No Project, Modal, and HST Alternatives would all cross sensitive areas of biological resources, including habitats of endangered species, at the southern end of the San Joaquin Valley. The available GIS data indicate the presence of certain types of habitat, and therefore the possible presence of special-status species based on available information. Location-specific data would be needed to make more precise determinations.

Figures 3.15-3a, 3.15-3b, 3.15-4a, and 3.15-4b show the general locations of habitat and wetlands in the Sacramento to Bakersfield region. As illustrated in these figures, possible improvements to multiple highway facilities (SR-99 and I-5) are included as part of the Modal Alternative, whereas a single general alignment option with some variations is proposed for this region as part of the HST Alternative.

Modal Alternative

The Modal Alternative would result in potential impacts on about 800 ac (323.7 ha) of special status species habitat, with a large number of impacts between Sacramento and Stockton. The Modal Alternative would potentially impact more than 50 ac (20.2 ha) of wetlands in the region. Potential impacts on other waters would vary across the region, ranging from low to high impacts (59,329 ac [24,010 ha]), with the highest number of acres potentially impacted (5,500 ac [2.226 ha]) in the Sacramento to Stockton part of the region.

The Modal Alternative would result in potential impacts on fish resources between Sacramento and Fresno during construction because of the need to cross streams and rivers. From Sacramento to Stockton and Merced to Fresno, the Modal Alternative would potentially result in a high incidence of impacts on threatened and endangered species (including blue oak woodland). Potential impacts may result to San Joaquin kit fox habitat between Tulare and Bakersfield. In this region the Modal Alternative would have the potential to result in a high incidence of impacts on wildlife habitats and of disturbance to wildlife movement corridors.

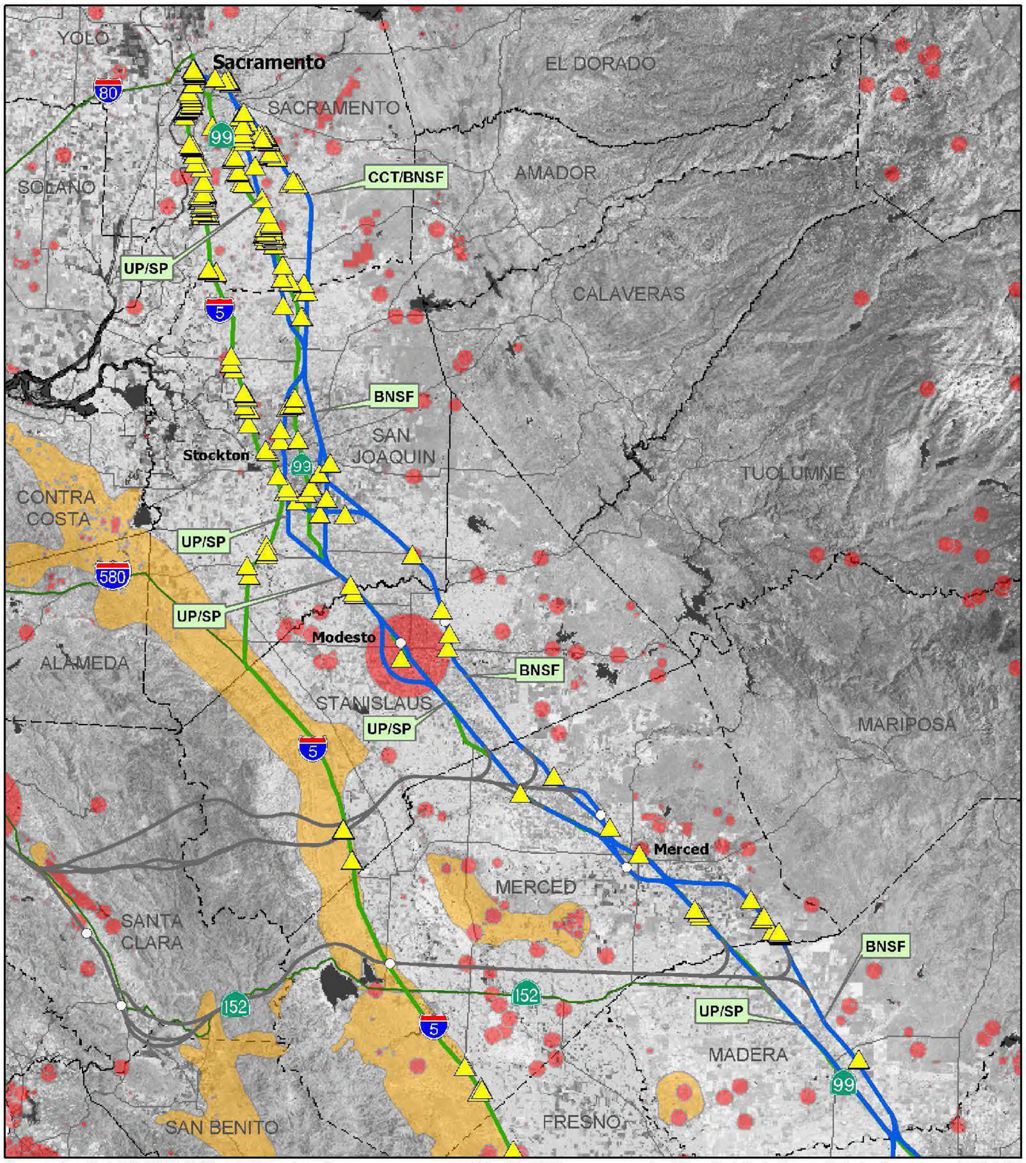
High-Speed Train Alternative

The HST Alternative would pass largely through agricultural lands in this region and would affect few areas of threatened and endangered species, except in the southern portion of the region from Fresno to Bakersfield (San Joaquin kit fox). Similar to the Modal Alternative, the proposed HST Alternative would result in potential impacts on fish resources during construction between Sacramento and Fresno because of the number of streams and rivers the alignment options would cross.

High-Speed Train Alignment Option Comparisons

Within the HST alignment segment from Sacramento to Stockton, the data show the possibility of more potential disturbances to biological resources along the Union Pacific Railroad (UPRR) than along the Central California Traction Company (CCT) route. Because of its proximity to the confluence of the Sacramento and American Rivers, the downtown Sacramento Valley station site may have impacts on biological resources. From Stockton to Modesto, the incidence of potential impacts on biological resources would not differ significantly for the two HST options, except that the UPRR/Modesto Downtown station option would potentially impact about twice as much

Figure 3.15-3A Sacramento to Bakersfield Habitat (North)



Source: Landsat TM 1985; California Department of Fish & Game, Natural Diversity Database 2002

July 14, 2003

California High Speed Train Program EIR/EIS

5 0 5 10 15 20 Miles

5 0 5 10 15 20 Kilometers

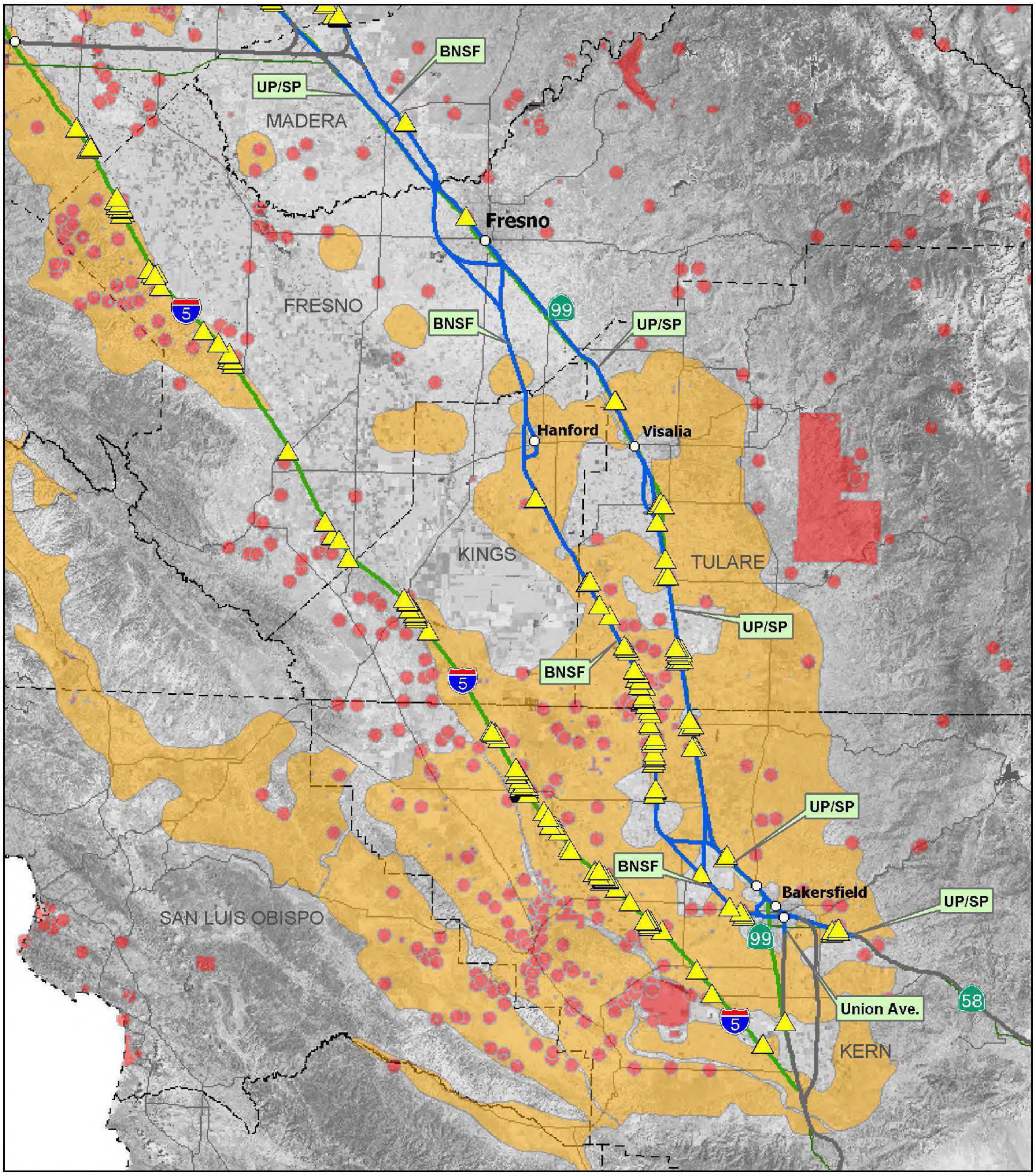
CALIFORNIA HIGH SPEED RAIL AUTHORITY

Legend

- ▲ California Threatened and Endangered Species Found Within 1/2 Mile of Alignment Centerline
- 🟥 State and Federal Threatened and Endangered Species
- 🟨 San Joaquin Kit Fox Habitat
- ─○─ High Speed Train Alignment and Stations
- UP/SP Alignment Description
- ─ Modal (Highway) Alignment

**Special Status Species
Sacramento to Bakersfield
(North) Region**

Figure 3.15-3B Sacramento to Bakersfield Habitat (South)



Source: Landsat 1985; California Department
of Fish & Game, Natural Diversity Database 2002

July 14, 2003

California High Speed Train Program EIR/EIS

Legend

▲ California Threatened and Endangered Species Found Within 1/2 Mile of Alignment Centerline

🟥 State and Federal Threatened and Endangered Species

🟨 San Joaquin Kit Fox Habitat

High Speed Train Alignment and Stations

UP/SP Alignment Description

Modal (Highway) Alignment

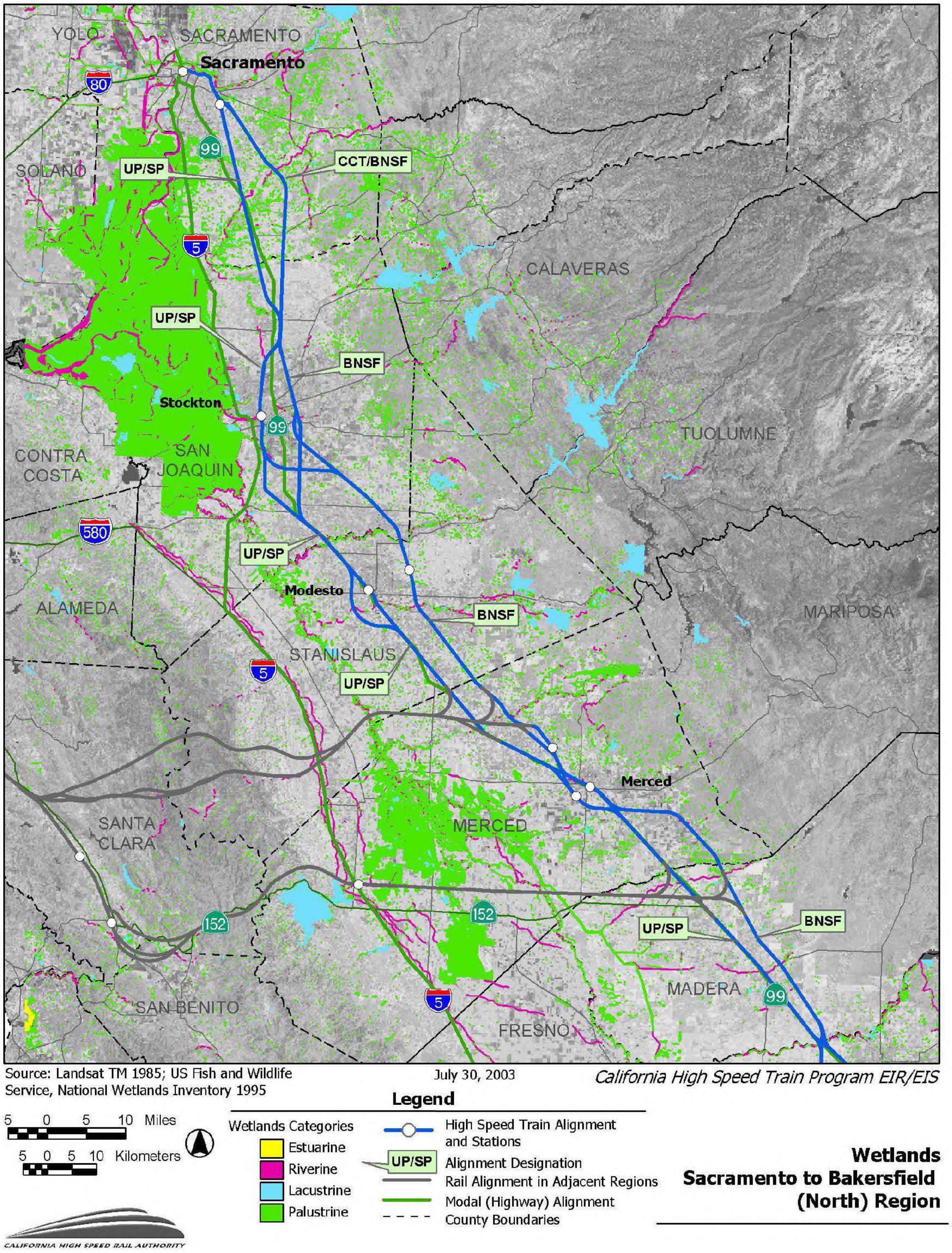
10 5 0 10 20 Miles

10 5 0 10 20 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Special Status Species
Sacramento to Bakersfield
(South) Region

Figure 3.15-4A Sacramento to Bakersfield Wetlands (North)



Source: Landsat TM 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 30, 2003

California High Speed Train Program EIR/EIS

Legend

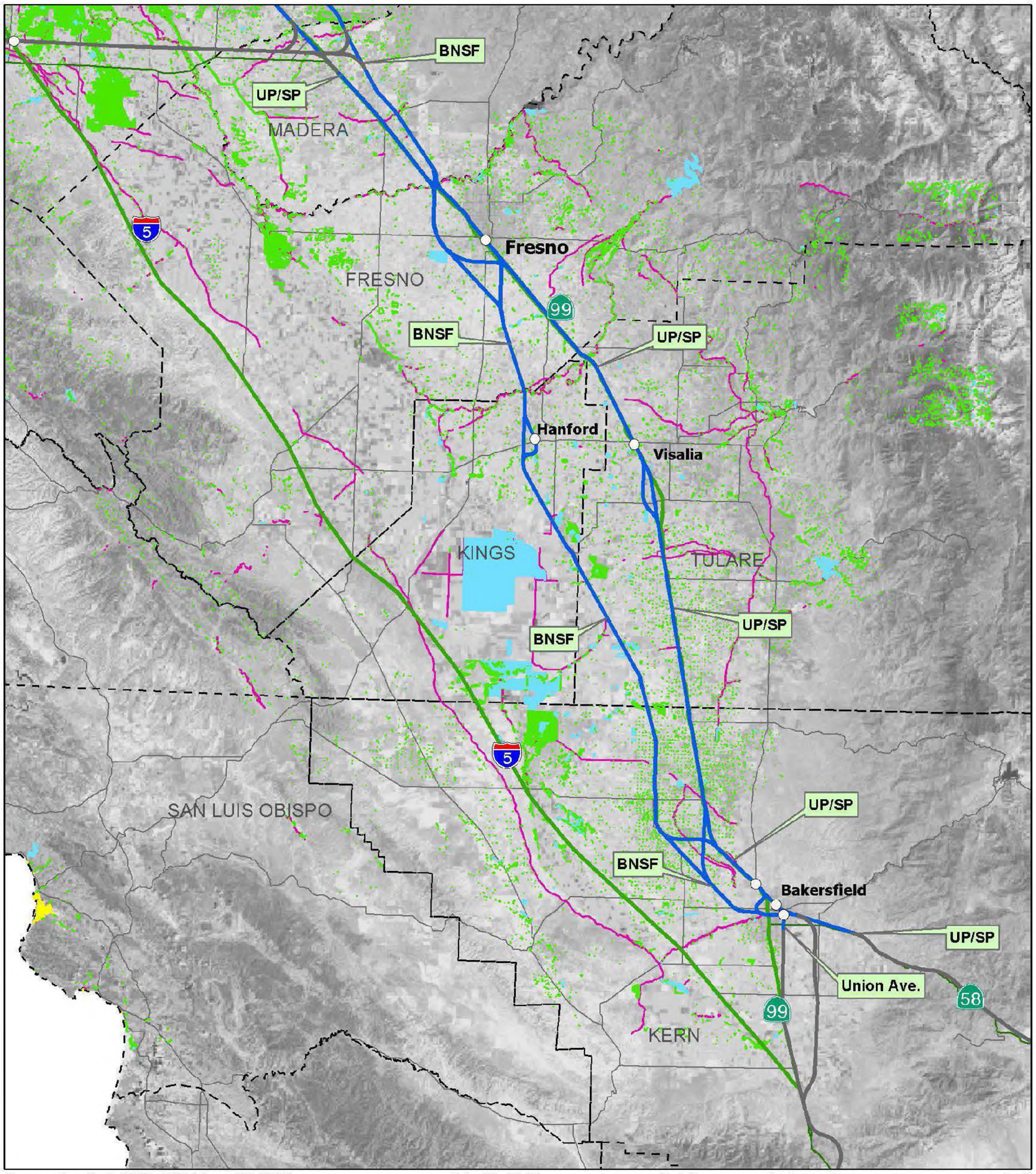
Wetlands Categories

- 🟨 Estuarine
- 🟪 Riverine
- 🟦 Lacustrine
- 🟩 Palustrine

- High Speed Train Alignment and Stations
- UP/SP Alignment Designation
- Rail Alignment in Adjacent Regions
- Modal (Highway) Alignment
- County Boundaries

Wetlands
Sacramento to Bakersfield
(North) Region

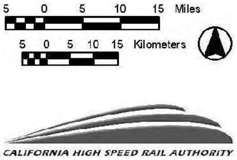
Figure 3.15-4B Sacramento to Bakersfield Wetlands (South)



Source: Landsat 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 30, 2003

California High Speed Train Program EIR/EIS



Legend

Wetlands Categories
🟨 Estuarine
🟥 Riverine
🟦 Lacustrine
🟩 Palustrine

High Speed Train Alignment and Stations
UP/SP Alignment Designation
Rail Alignment in Adjacent Regions
Modal (Highway) Alignment
County Boundaries

Wetlands
Sacramento to Bakersfield (South) Region

wetland acreage as the BNSF/Modesto Briggsmore option. However, fewer potential impacts on wetlands would be expected under the proposed HST Alternative than the Modal Alternative.

At a program level of detail, the technical analysis of these options showed slightly higher potential impacts to biological and water resources for the UPRR alignment as compared to the CCT alignment. However most of the stream crossings under the UPRR alignment are canal crossings, not river crossings, and are generally smaller than the water crossings anticipated for the CCT alignment. The UPRR alignment would have 34 - 88 acres less potential impacts to floodplains than the CCT alignment.

Although the program-level analysis utilizing the sightings reported in the California Natural Diversity Database (NDDB) indicates that the UPRR alignment has the potential to affect 25 acres more of wildlife habitat and 20 more sensitive species, this information was not confirmed by biological surveys. Recent field observations indicate more vegetation and higher habitat values along the out of service CCT alignment for habitat associated with both the aquatic ecosystem and upland resources than those observed along the UPRR alignment [Derek Jansen, Wildlife Biologist, Jones & Stokes; field observations June 21, 2005]. It was observed that the out of service CCT alignment currently has greater breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species associated with the aquatic ecosystem, as well as upland habitats. It is expected that introduction of the HST service on the CCT right-of-way would result in greater adverse environmental consequences related to interference of wildlife movement and would have more severe impacts to riparian vegetation and habitat values, in comparison with the UPRR alignment, which is a heavily used freight corridor.

The potential for impacts on sensitive plant and animal species for the various HST alignment options between Modesto and Merced would be low. Each of the alignments would potentially result in similar impacts on wetlands, except the BNSF/Merced Municipal Airport station option would cross substantially more acres of wetlands than the other option. The Merced Downtown station option would have a low potential for impacts on wetlands, while the potential for impacts at the airport site would be high.

From Merced to Fresno, the UPRR option would encounter fewer wetlands and sensitive habitats than the BNSF option. From Fresno to Tulare, the BNSF option with a high-speed loop around Fresno would have the potential to result in impacts on the highest number of threatened and endangered species; the HST loop west of Fresno would generally increase the number of potential impacts on biological resources over the route through Fresno. The BNSF/Hanford station option would potentially have fewer impacts on biological resources than the UPRR/Visalia Airport station option due to the greater presence of wildlife habitats, wetlands, and waters along the UPRR.

The technical analysis of these options showed slightly higher potential impacts to biological resources for the BNSF alignment as compared to the UPRR alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are over 67-miles long. The BNSF option was determined to have 1.4 acres more potential impacts to wetlands and 9 acres more potential impacts to habitat, and 4 more potential sensitive species than the UPRR alignment. In addition, the UPRR has greater potential impacts to the San Joaquin kit fox, with 25 records identified for the UPRR as compared with only 2 – 5 occurrence records for the BNSF.

The technical analysis resulted in differences between the BNSF and UP alignments in regards to the potential impacts to biological and water resources. However, these results do not indicate a significant difference between the BNSF and UP alignment options that vary between 106 to 111 miles in length. The program-level analysis, utilizing the sightings reported in the CNDDB, indicates that the BNSF alignment is considered San Joaquin kit fox habitat, while the UPRR alignment is not described as habitat. However, this information was not confirmed by biological surveys and appears to be a mapping anomaly of the CNDDB. The habitat indicators for kit fox in the Bakersfield area include annual grassland and salt scrub vegetation within ruderal open space areas [Steve Avery, senior wildlife biologist and San Joaquin kit fox expert, Jones & Stokes]. There is no indication that these habitat indicators differ within the two alignments [Steve Avery]. In addition, the entire area encompassing both alignments is considered habitat for the San Joaquin kit fox according to USFWS [Kit Fox Habitat coverage information provided to FRA on January, 2005; Cheryl Hickman, USFWS]. Therefore, the amount of endangered species habitat affected by the alignments is considered equivalent, with no difference between the two alignments on effects to endangered species.

C. BAKERSFIELD TO LOS ANGELES

Figures 3.15-5 and 3.15-6 show the general locations of sensitive habitat and wetlands in the Bakersfield to Los Angeles region in relationship to Modal Alternative corridors and alignments for the HST Alternative.

The Modal and HST Alternatives would potentially impact a similar number of wildlife movement/migration corridors in this area. Based on a general assessment of the potential magnitude of the possible impacts, while taking into consideration the relative sensitivity of the resources potentially affected and expected mitigation requirements, the Modal Alternative would have the potential to impact a greater number of sensitive biological resources than the HST Alternative. However, because the HST Alternative would traverse more undeveloped (and possibly more unsurveyed) areas than the Modal Alternative, once the project-level analysis is completed and field surveys of resources are performed, it is possible that the HST Alternative could impact a larger number of special-status species and habitat than has been estimated in this document. The potential to use tunneling and elevated structures and special construction techniques to reduce or avoid impacts of the HST Alternative would be included in the design for the project, should a decision be made to proceed to the next phase of analysis.

Modal Alternative

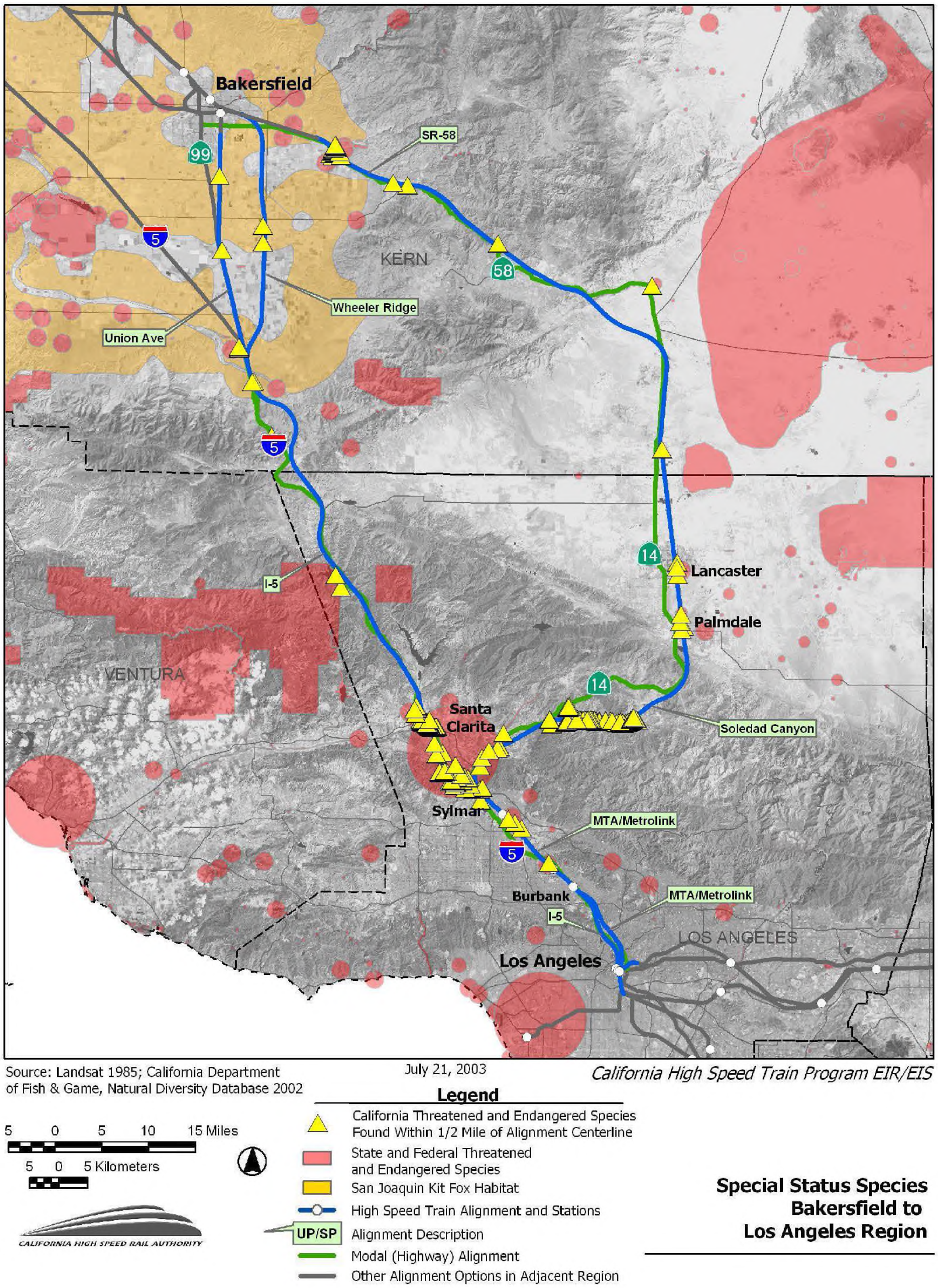
Implementation of the Modal Alternative would potentially result in impacts on about 140 ac (56.7 ha) of special status species habitat, 10 sensitive species, five wildlife movement/migration corridors, 6.5 ac (2.6 ha) of jurisdictional wetlands, and marine/anadromous fish resources at the Santa Clara River. Most of these impacts would result from the widening of I-5 from SR-99 to SR-14, and of SR-14 from Palmdale to I-5. Extensive cut and fill would be required for the Modal Alternative along I-5 in the Grapevine mountain crossing where biological and wetland resources are shown in existing data sources.

It is expected that the Modal Alternative would result in potential impacts on sensitive biological resources primarily as direct and indirect impacts during construction. Operational impacts are expected to be minor in comparison to construction impacts and would likely consist of indirect impacts such as dust; the introduction and spread of nonnative, invasive plants; stormwater runoff; siltation; and erosion.

High-Speed Train Alternative

Implementation of the proposed HST Alternative would potentially result in impacts on special status species habitat (between 154 ac [62.3 ha] and 238 ac [96.3 ha]), 12 to 14 sensitive species, five wildlife movement/migration corridors, between 2 ac (0.8 ha) and 14 ac (5.7 ha) of wetlands, and marine/anadromous fish resources at the Santa Clara River. Most of these impacts

Figure 3.15.-5. Bakersfield to Los Angeles Habitat



Source: Landsat 1985; California Department of Fish & Game, Natural Diversity Database 2002

July 21, 2003

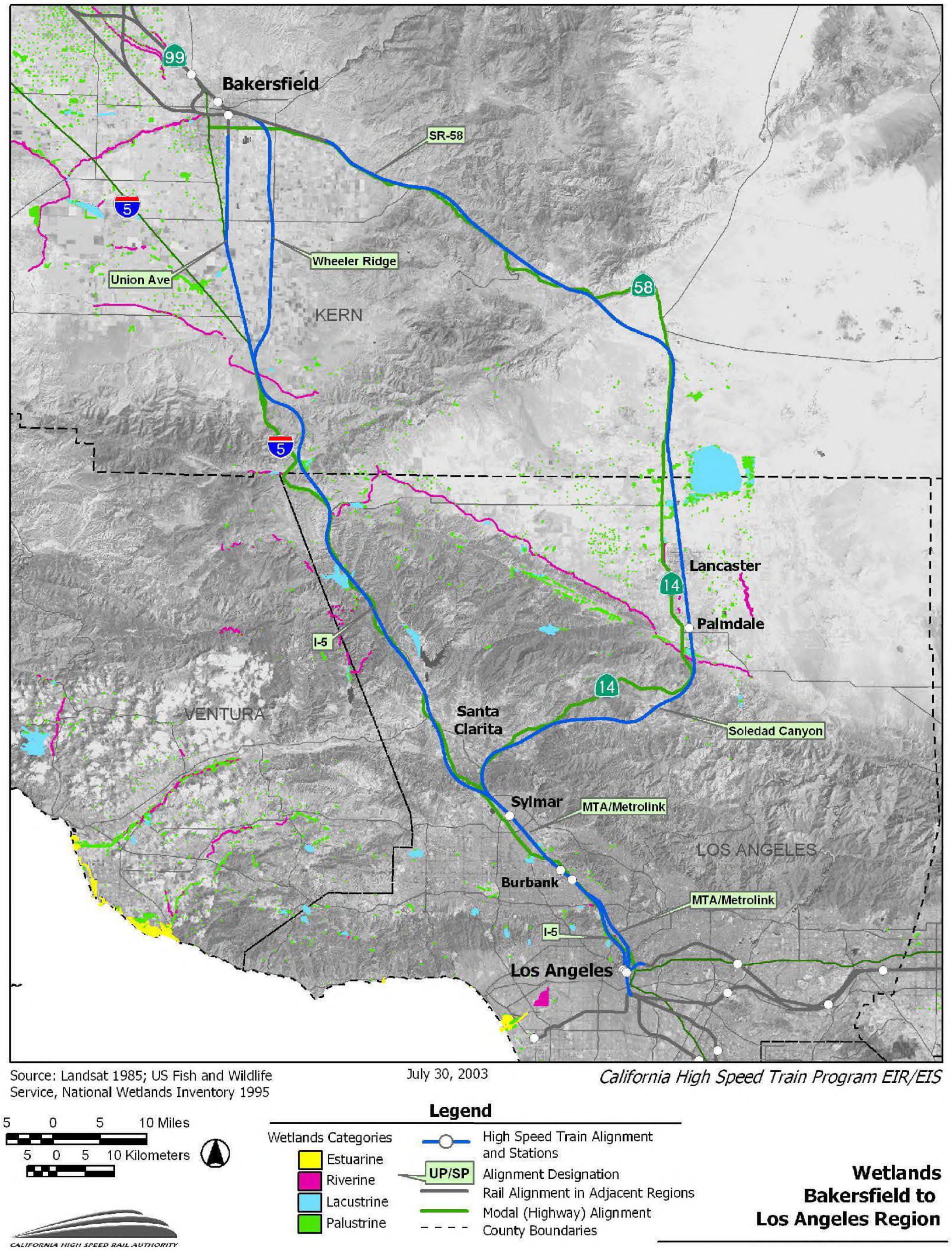
California High Speed Train Program EIR/EIS

Legend

- ▲ California Threatened and Endangered Species Found Within 1/2 Mile of Alignment Centerline
- 🟥 State and Federal Threatened and Endangered Species
- 🟧 San Joaquin Kit Fox Habitat
- High Speed Train Alignment and Stations
- UP/SP Alignment Description
- Modal (Highway) Alignment
- Other Alignment Options in Adjacent Region

Special Status Species
Bakersfield to
Los Angeles Region

Figure 3.15-6. Bakersfield to Los Angeles Wetlands



Source: Landsat 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 30, 2003

California High Speed Train Program EIR/EIS

Wetlands Bakersfield to Los Angeles Region

would occur in the I-5 and SR-58/Soledad Canyon corridors. The MTA/Metrolink and combined I-5/Metrolink options would not impact any sensitive biological resources.

High-Speed Train Alignment Option Comparisons

The Bakersfield to Sylmar segment of the HST includes two routing options: 1) the I-5/Grapevine route (either the Union Avenue or Wheeler Ridge corridor and the I-5 Tehachapi corridor); and 2) the SR-58/Soledad Canyon route (the SR-58 corridor, Antelope Valley corridor, Palmdale station site, and Soledad Canyon corridor). The I-5 route would have the potential to impact slightly more sensitive plant communities, wetlands, and non-wetland waters than the SR-58/Soledad Canyon route. The SR-58/Soledad Canyon route would potentially impact more sensitive plant and wildlife species and more wildlife movement/migration corridors than the I-5 route. Overall, however, there would be a slightly greater potential for impacts on biological resources for the SR-58/Soledad Canyon route than for the I-5 route.

The sensitive plant and wildlife species that would potentially be impacted by the SR-58/Soledad Canyon route are expected to be greater than those for the species that would potentially be impacted by the I-5 route, including potential impacts to desert tortoise habitat. In addition, a greater proportion of the I-5 route would be in tunnels or on an elevated structure, which would reduce potential impacts on sensitive biological resources. Tunneling and elevated structure construction types could avoid potential impacts on wildlife movement/migration corridors along the I-5 route. In contrast, there would be very limited sections of tunnel and elevated structure along the SR-58/Soledad Canyon route, particularly where this route parallels the Santa Clara River. Potential impacts on sensitive plants and wildlife, as well as on major wildlife movement/migration corridors, would therefore be expected to be greater due to the use of cut-and-fill construction techniques. Additional tunneling in Soledad Canyon would reduce potential impacts on sensitive biological resources.

The Sylmar to Los Angeles segment of the HST includes two routing options: 1) the combined I-5/UPRR route; and 2) the MTA/Metrolink route. There are also a number of options on the approach to LAUS.

The I-5 route would have the potential to impact slightly more biological resources than the MTA/Metrolink route. The I-5 route could potentially impact one sensitive plant community, whereas the MTA/Metrolink route would not impact any. The I-5 route would also potentially encounter more water resources than the MTA/Metrolink route.

The LAUS approach options would potentially impact non-wetland waters. The LAUS east bank north/LAUS east bank siding option could potentially impact more waters than the LAUS south siding or the LAUS existing siding option. The LAUS existing south/south connection could potentially impact more waters than the LAUS existing east/east connection.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Both the Modal and HST Alternatives potentially would impact biological resources in the study area in this region. However, when considering biological resources across the region, there are not significant differences among the alternatives and alignment options. Potential advantages in one resource area may be accompanied by potentially higher impacts in other resource areas.

In this region, the Modal Alternative would potentially impact approximately 152 ac (61.5 ha) of special status species habitat compared to between 188 ac (76.1 ha) and 266 ac (107.6 ha) for the HST alternative, and an estimated 2.1 ac (0.8 ha) of wetlands compared to between 1.5 ac (0.6 ha) and 5.3 ac (2.1 ha) for the HST. For special-status species, the Modal Alternative would potentially affect 19 species, and the HST Alternative would potentially affect between 20 and 26 species.

Figures 3.15-7 and 3.15-8 show the general locations of habitat and wetlands in the Los Angeles to San Diego region.

Potential wetland impacts for the HST Alternative include impacts on vernal pools along the alignment from Mira Mesa to San Diego, and impacts on the San Dieguito wetlands. The HST Alternative would also result in potential impacts on a number of federally listed wildlife species. The Los Peñasquitos Canyon Preserve near MCAS Miramar provides a significant regional wildlife corridor that could be impacted by the HST Alternative.

In the Los Angeles to March ARB segment, the Modal and HST Alternatives would potentially result in similar levels of potential impacts on biological resources. Both alternatives would result in potential impacts on wildlife habitat and wildlife movement corridors, and both alternatives would be expected to encounter threatened and endangered species as well as sensitive vegetation and non-wetland waters. Because of the more urbanized character of the I-10 corridor compared to the UPRR/Colton or UPRR/Riverside rail corridors, the Modal Alternative would result in slightly fewer potential impacts than the HST Alternative alignments in this segment. However, the potential Modal Alternative impacts along the I-15 freeway corridor would be avoided by the HST Alternative because it would follow the San Jacinto Line (near the I-215 freeway corridor).

In the March ARB to Mira Mesa segment, the Modal and HST Alternatives would result in a similar level of potential impacts on biological resources. Both alternatives would result in potential impacts on wildlife habitat and movement corridors and encounter threatened and endangered species. Both alternatives would encounter similar amounts of sensitive vegetation and potentially would result in impacts on non-wetland waters along the I-215 corridor between March ARB and the I-15/I-215 split at Temecula. Both alternatives would have the same potential impacts along the I-15 corridor between the I-15/I-215 split and Mira Mesa. However, the HST Alternative would avoid the potential Modal Alternative impacts along the I-15 corridor north of the I-15/I-215 split at Temecula because the HST alignment would follow the I-215 corridor north of the split rather than the I-15 corridor in this segment.

In the Mira Mesa to San Diego segment, the Modal and HST Alternatives would result in a similar level of potential impacts on biological resources. Both alternatives would potentially result in impacts on wildlife habitat and movement corridors and would potentially encounter threatened and endangered species. The Modal Alternative and the three HST alignment options that follow the I-15 to Qualcomm Stadium would be expected to encounter similar amounts of sensitive vegetation and would potentially result in impacts on non-wetland waters along the I-15 corridor between Mira Mesa and I-8. Although the other two HST alignment options would depart from the I-15 corridor, they still potentially would encounter sensitive biological resources, passing through undeveloped areas to the coast and then south along the existing rail corridor to downtown San Diego. The HST Alternative would avoid the potential Modal Alternative impacts along the SR-163 freeway corridor.

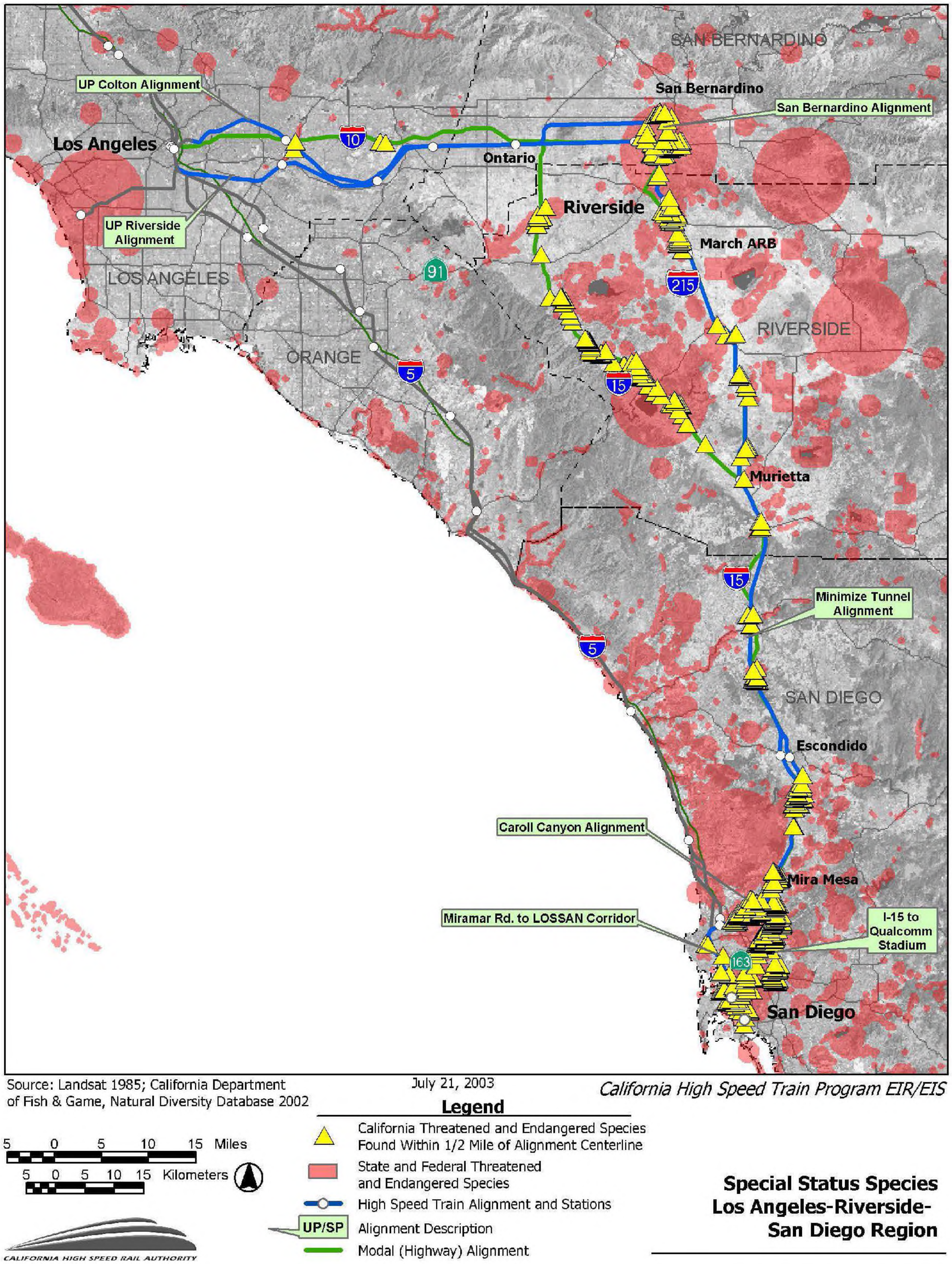
Modal Alternative

The Modal Alternative would have the potential to result in impacts on more than 152 ac (61.5 ha) of special status species habitat; 19 sensitive species; and 2.1 ac (0.8 ha) of wetlands. The I-15 improvements included in the Modal Alternatives could result in substantial impacts on sensitive vegetation communities and wetlands, including of vernal pools, just north of MCAS Miramar. These wetlands are known to support the California least tern and western snowy plover, both of which are federally listed as endangered.

High-Speed Train Alternative

The HST Alternative would have the potential to impact the following ranges of biological resources, depending on the alignment option.

Figure 3.15-7. Los Angeles to San Diego (Inland) Habitat



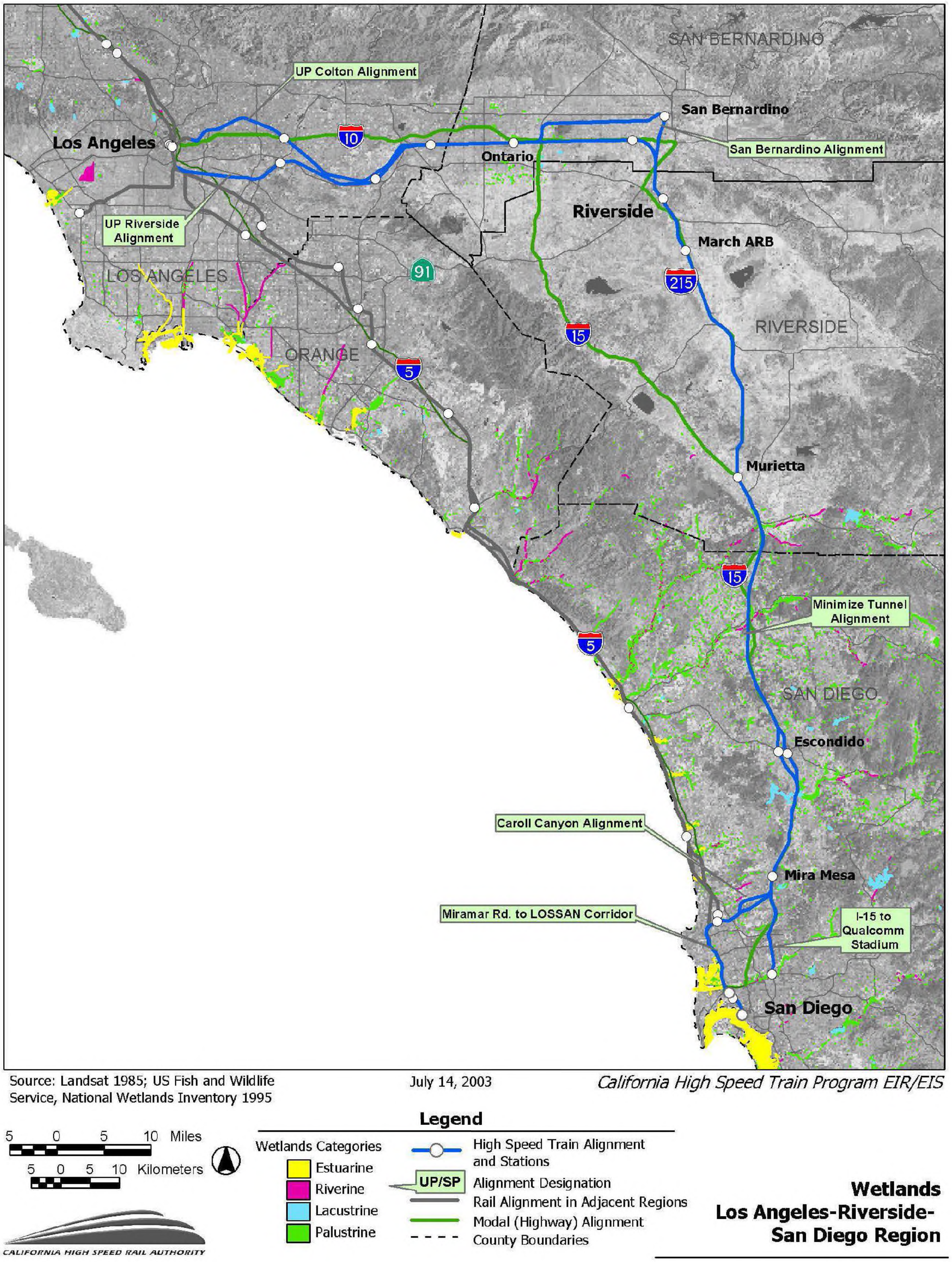
Source: Landsat 1985; California Department of Fish & Game, Natural Diversity Database 2002

July 21, 2003

California High Speed Train Program EIR/EIS

Special Status Species
Los Angeles-Riverside-
San Diego Region

Figure 3.15-8. Los Angeles to San Diego (Inland) Wetlands



Source: Landsat 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 14, 2003

California High Speed Train Program EIR/EIS

Wetlands
Los Angeles-Riverside-San Diego Region

- Special status species habitat: between 188 ac (76.1 ha) and 266 ac (107.6 ha).
- Wetlands: between 1.5 ac (0.6 ha) and 5.3 ac (2.1 ha).
- Sensitive species (based on habitat types present): between 20 and 26.

High-Speed Train Alignment Option Comparisons

Although some differences have been identified among the HST alignment options, these differences do not clearly indicate that one alignment option compared to the others would potentially result in substantially fewer impacts on biological resources in this region. For example, alignment options that include the San Bernardino loop would result in slightly fewer potential impacts on wetlands and other waters for either of the two mainline HST alignments (UPRR/Colton or UPRR Riverside/UPRR Colton) compared to those not including the loop. The proposed tunneling associated with the Escondido Transit Center alignment option would result in slightly less orchard and vineyard habitat acreage being impacted and fewer potential impacts on water resources compared to the option that adheres to the I-15 corridor. The alignment option serving the Qualcomm Stadium station would result in a slightly higher level of potential impacts on sensitive vegetation, but otherwise would result in potential impacts similar to those for the two alignment options that join the coast and serve the airport and downtown San Diego. Overall, these differences would not readily distinguish the HST alignment options in terms of potential impacts on biological resources.

In the Los Angeles to March ARB segment, the three alignment options would have fairly similar potential impacts on sensitive biological resources. However, there are characteristics that would distinguish these alignments. The UPRR Riverside alignment option would encounter substantially more grassland and potentially impact slightly more water resources than the two UPRR Colton alignment options. The San Bernardino loop option (an option to both the UPRR Colton and UPRR Riverside alignments) would reduce the amount of potentially impacted waters and wetlands.

The University of California, Riverside station potentially would encounter wildlife habitat, threatened and endangered species, and a substantial amount of non-wetland waters. The Colton station site potentially would result in impacts on both categories of protected species and non-wetland waters. The El Monte station site potentially would result in impacts on species of special concern. The South El Monte station potentially would impact non-wetland waters. Otherwise, the stations in this segment would not be expected to encounter sensitive biological resources.

In the March ARB to Mira Mesa segment, the two alignment options would result in virtually identical potential impacts, except for a slight difference in the amount of orchards and vineyard habitat potentially affected, and a slightly lower acreage of non-wetland waters potentially impacted by the alignment option that would serve the Escondido Transit Center station. The difference is because this alignment option would depart the I-15 freeway corridor and pass through the more urbanized central portion of Escondido to serve the Escondido Transit Center station. This diversion would avoid a portion of the sensitive biological resources that would be potentially be affected by the other alignment option.

The March ARB station site potentially would impact threatened and endangered species as well as coastal sage scrub. The Escondido station potentially would impact species of special concern. The Murrieta at I-15/I-215 station potentially would impact a substantial amount of non-wetland waters. Otherwise, the stations in this segment would not be expected to encounter sensitive biological resources.

In the Mira Mesa to San Diego segment, the three alignment options would be expected to result in potential impacts on wildlife habitat and movement corridors and to encounter threatened and endangered species. The types of predominant vegetation and the wetlands potentially encountered would distinguish the three options.

Along the Miramar Road HST alignment option there is a predominance of mixed chaparral and southern riparian scrub, and this option would potentially encounter a substantial amount of non-wetland waters. Estuarine areas along the coast would be the majority of the potentially affected wetlands with some vernal pool wetlands in the interior portion of the segment.

Along the Carroll Canyon HST alignment option there is a predominance of southern riparian scrub, and this option would potentially encounter more non-wetland waters (as a result of the canyon alignment) compared to the other two alignment options. The Carroll Canyon HST alignment traverses areas designated in the city of San Diego's Multiple Habitat Planning Area (MHPA), with potential negative impacts. Potential wetlands impacts would be primarily estuarine along the coast, with a greater amount of vernal pool wetlands compared to the Miramar Road alignment.

Along the Qualcomm Stadium HST alignment option there is a predominance of mixed chaparral, and this option would potentially encounter a substantial amount of non-wetland waters (similar in quantity to the Miramar Road alignment). These would be mostly palustrine and vernal pool wetlands. Previous studies by the U.S. Fish and Wildlife Service concluded that there is a greater quantity of vernal pools along the I-15 corridor than either the Miramar Road or Carroll Canyon alignment.[12]

The Transit Center station site in San Diego would not be expected to result in potential impacts on protected species or wetlands, but it would potentially result in impacts on habitat and movement corridors, as well as potentially encounter southern riparian scrub and non-wetland waters. Potential impacts from the Mira Mesa station would be limited to palustrine and vernal pool wetlands. Three of the station sites—Qualcomm Stadium, San Diego International Airport, and San Diego station at Santa Fe Depot—would potentially result in impacts on threatened and endangered species. Two of the station sites (Qualcomm Stadium and San Diego International Airport) potentially would impact wildlife habitat. In addition to potential species impacts, the San Diego station at Santa Fe Depot would potentially impact estuarine wetlands not found in the other stations in this segment.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Though potential impacts would vary from segment to segment in this region along the Modal and HST Alternatives, many segments of the Modal Alternative appear to have a higher potential for affecting sensitive biological resources and water resources compared to the HST Alternatives. The proposed rail improvements, are expected to adversely affect fewer sensitive biological resources and waters, because most improvements would be made within an existing rail corridor in which any biological resources present would already have been disturbed. Figures 3.15-9 and 3.15-10 show the general locations of habitat and wetlands in the Los Angeles to San Diego region.

Modal Alternative

As defined, the Modal Alternative would require the acquisition of approximately 1,100 ac (445 ha) of adjacent right-of-way between Los Angeles and San Diego, of which 370 ac (150 ha) would be paved to accommodate the highway and interchange widening proposed under this

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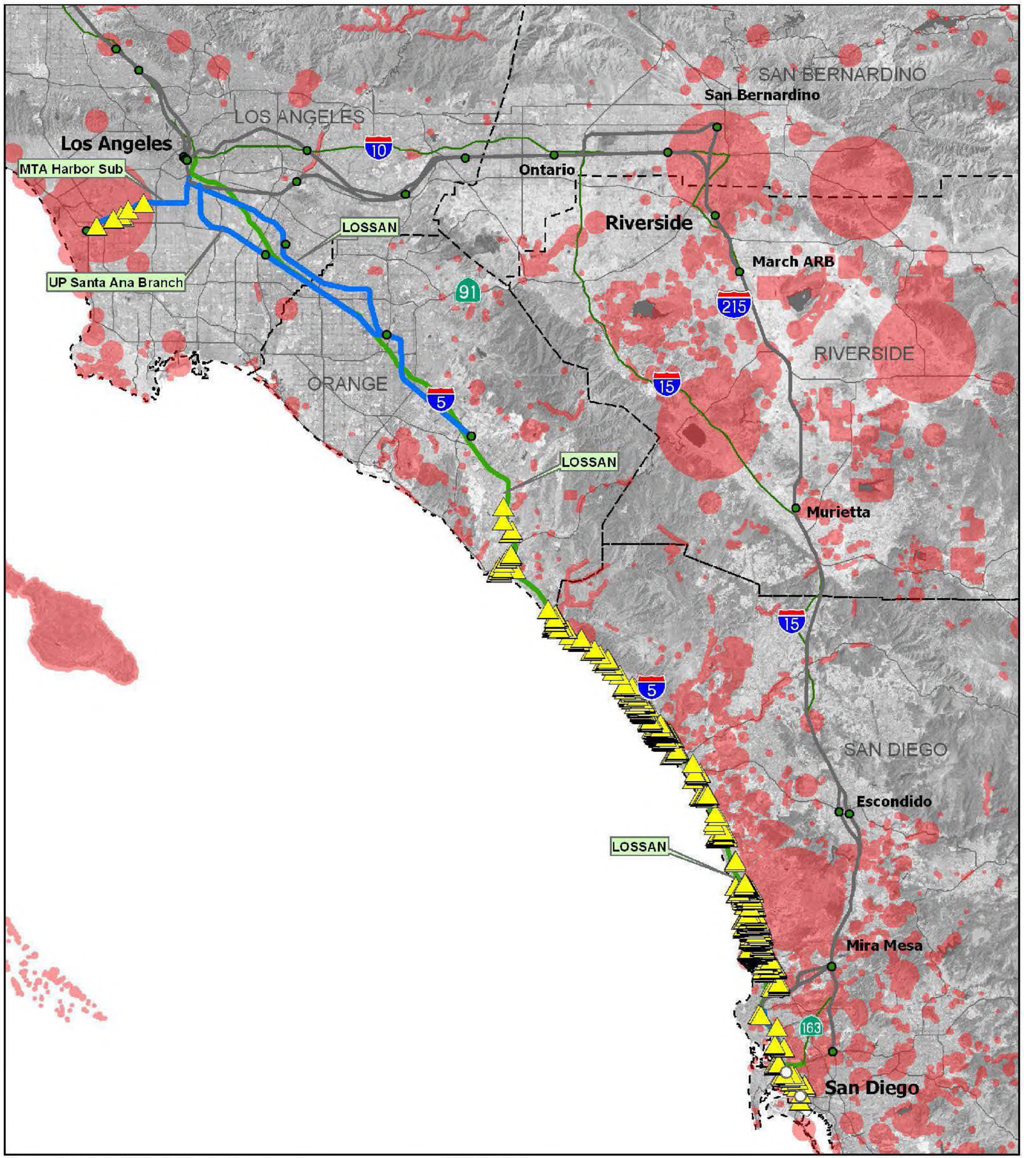
[12] U.S. Fish and Wildlife Service, "Vernal Pools of Southern California, Draft Recovery Plan," 1997

Figure 3.15-9.

Los Angeles to San Diego Habitat



Source: Landsat 1985; California Department
of Fish & Game, Natural Diversity Database 2002

July 21, 2003

California High Speed Train Program EIR/EIS

Legend

▲ California Threatened and Endangered Species Found Within 1/2 Mile of Alignment Centerline

🟥 State and Federal Threatened and Endangered Species

High Speed Train Alignment and Stations

UP/SP Alignment Description

Modal (Highway) Alignment

5 0 5 10 15 Miles

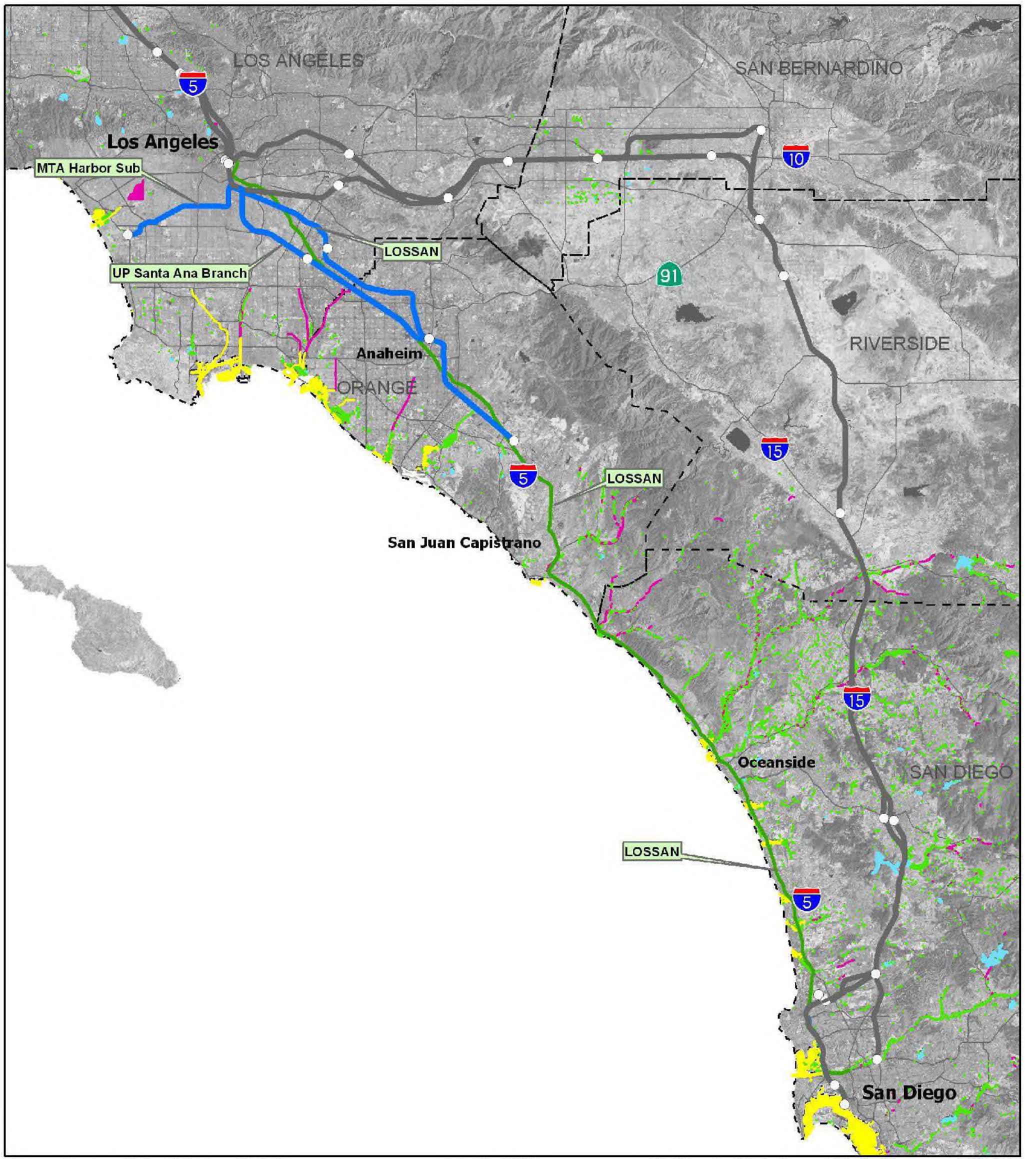
5 0 5 10 15 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Special Status Species
Los Angeles-Orange-
San Diego Region

Figure 3.15-10.

Los Angeles to San Diego Wetlands



Source: Landsat 1985; US Fish and Wildlife Service, National Wetlands Inventory 1995

July 30, 2003

California High Speed Train Program EIR/EIS

Legend

5 0 5 10 Miles

5 0 5 10 Kilometers

Wetlands Categories

- 🟨 Estuarine
- 🟪 Riverine
- 🟦 Lacustrine
- 🟩 Palustrine

- High Speed Train Alignment and Stations
- UP/SP Alignment Designation
- Rail Alignment in Adjacent Regions
- Modal (Highway) Alignment
- County Boundaries

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Wetlands
Los Angeles-Orange-
San Diego Region

alternative.[13] The additional right-of-way would include approximately 6,066 ac (2,455 ha) of natural vegetation that are found in undeveloped or unimproved open-space areas. Bridges and overpasses would be widened in urban, suburban, coastal, and open-space environments, increasing the footprint of the highway as well as shadow effects beneath the infrastructure. Bridge widening would likely be of most concern in the lagoon areas of northern San Diego County, where the existing bridges impede tidal flow. This impact could be exacerbated if the footprint of the highway bridge were enlarged within the lagoons. The increased pavement across surface waters would increase the amount of urban runoff and could increase the pollutant burden in local rivers, creeks, and lagoons. An estimated 5,224 ac (2,114 ha) of wetlands would potentially be affected by the Modal Alternative, and an estimated 103 special-status species would potentially be affected.

High-Speed Train Alternative
Both the HST alignment options would be located within existing rights-of-way and would need little right-of-way outside of existing rail corridors between LAX and San Diego. Depending on the alignment and construction options for the high-speed rail improvements, new right-of-way would be needed outside existing rail corridors to accommodate proposed curve realignments and and improved or new stations along established rail routes.

Alignment Option Comparisons
There is not a major difference in potential impacts between the route along the LOSSAN corridor and the route along the UPRR corridor. While there appear to be more non-wetland waters in the study area of the LOSSAN corridor, most of the waters in this segment are contained within constructed channels in the urban environment. Therefore, no significant difference in potential impacts is indicated between these two potential corridor routes.

3.15.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize potential impacts to biological resources bisecting sensitive areas. Nearly 70% of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). Use of these existing transportation corridors helps minimize potential impacts since they have already imposed a footprint/barrier along which the HST system would pass where not in a new corridor. Moreover, portions of the system would be on aerial structure or in tunnel, allowing for unhindered crossing of the alignment by wildlife. Only 24% percent of the preferred HST system is at-grade in new corridors (not on aerial structure or in tunnel and not within or adjacent to an existing transportation right-of way). For the HST system, underpasses or overpasses or other appropriate passageways would be designed during project-level for implementation at reasonable intervals during construction to avoid, minimize and/or mitigate any potential impacts to wildlife movement.

The HST system must be fenced when operating at-grade and thus is a barrier to much wildlife (unlike a road where wildlife species cross) and would introduce a new barrier to animal movement where not in tunnel/aerial and where no wildlife crossings are proposed.

Major portions of the potential alignments through undeveloped areas would be in mountainous terrain where the use of tunnels would avoid impacts to biological resources. To avoid or limit potential impacts along the surface above the tunnels, the HST Alternative limits surface access for ventilation and/or evacuation through the use of large diameter tunnels design. The potential impacts associated with

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[13] Acres of right-of-way for the Modal Alternative are estimated based on the need for a minimum of 25 ft (8 m) of additional pavement width and 50 ft (15 m) of unpaved width for drainage, cut and fill, and other unpaved area, for the length of I-5 between Los Angeles and San Diego.

construction access roads would be greatly limited, and avoided altogether in some segments, by using in-line construction, i.e., by using the new rail infrastructure as it is built to transport equipment to and from the construction site and to transport excavated materials away from the construction area and to appropriate re-use (e.g., as fill material, aggregate for new concrete, etc.) or disposal sites. To avoid creating access roads in sensitive areas, necessary geologic exploration would be accomplished using helicopter transport for drilling equipment and site restoration to minimize surface disruption. Small pilot tunnels would be utilized where more extensive subsurface geology information is needed.

The Authority's design practices emphasize the use or reuse of excavated materials within the confines of the project and avoidance or minimization of any additional impact on sensitive areas from placement of excess material. While the specific uses or the quantity of placement of excavation material cannot be determined at the program level of environmental study, they would be addressed during subsequent project-level environmental analysis. The vast majority of the excavated tunneling material is anticipated to be suitable for reuse in the construction of the proposed HST facilities. Potential uses include aggregate for concrete and fill material for other portions of the line. Balancing the earthwork operations will be a key objective in the subsequent project level engineering. The current conceptual HST alignment designs considered in the Program EIR/EIS use the placement of all materials excavated from tunnels to be used as fill material along adjacent HST alignments.

Uses of excavated materials would, in part, be determined by the timing of project construction. At any point in time, various construction projects (with appropriate environmental permits) will require disposal and re-use of fill material. The Authority would coordinate the exchange of such materials with other ongoing projects to the ultimate benefit of each.

3.15.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for biological resources and wetlands, the proposed HST system alternative is considered to have a significant effect when viewed on a systemwide basis. Placing the conceptual corridors for the HST system alternative largely within or along existing transportation corridors reduces the potential for adverse effects to these resources, and engineering and design practices further reduce potential adverse impacts to these resources (e.g., avoiding encroachments on habitat and wetlands, use of aerial structures or tunnels lined with impermeable surfaces to avoid sensitive areas). However, portions of the HST system would be in new corridors and some biological resources and wetlands will likely be adversely affected should a decision be made to develop the proposed HST system. At the programmatic level of analysis, it is not possible to know precisely the location, extent and particular characteristics of impacts to these resources. Mitigation strategies, as well as the design practices discussed in section 3.15.5, will be applied to reduce these impacts.

Potential strategies to mitigate remaining impacts on biological resources would include: (1) field verification of sensitive resources; (2) filling of data gaps; (3) subsequent project-specific analyses of environmental impacts; (4) consultation with appropriate resource agencies to refine avoidance and mitigation measures, and; (5) developing and adopting a mitigation monitoring program.

To the extent practicable, direct and indirect impacts to biological resources will be avoided by refinements to detailed alignments to be developed during the project-level design and environmental evaluation phase. Further possible mitigation measures for consideration at the project level include: (1) project –design changes, e.g., construction on above-ground structures, in a tunnel, or to reduce the impact footprint; (2) participation in or contribution to existing or proposed conservation banks or natural management areas, including possible acquisition, preservation, or restoration of habitats; (3) relocation of sensitive species; and (4) construction of wildlife underpasses, bridges, and/or large culverts, to facilitate known wildlife movement corridors. Wildlife crossings, such as those constructed for bobcat and coyote in San Bernardino for a highway project (National Cooperative Highway Research Program 2002), have been shown to be successful.

Specific mitigation measures would be identified at the project level of environmental review. Consultation with the appropriate resource agencies to develop site-specific avoidance and minimization strategies would be incorporated in the project-level environmental review. Special mitigation needs would be considered in the future with the appropriate authorities that are responsible for regional mitigation (conservation) banks, HCPs, NCCPs, or special area management plans. However, providing sufficient mitigation for compliance with CWA requirements for wetlands would likely be difficult and challenging.

Resource agencies have expressed interest in helping to develop and participate in a mitigation planning and monitoring program to determine impacts and mitigation effectiveness for sensitive species in the lagoon areas. This approach could include site-specific baseline conditions, monitoring mitigation effectiveness as various proposed projects (highway and rail) are constructed, and adjusting mitigation measures as needed based on effectiveness and compatibility with lagoon restoration programs.

Because specific biological resource impacts cannot be predicted with certainty at this program level, specific mitigation measures also cannot be developed at this time. However, mitigation strategies are described below from which specific mitigation measures can be developed once the extent of direct and indirect biological resource impacts have been determined at the project level.

Mitigation strategies that could be applied at the project level for potential impacts to biological resources include the following:

- Plant communities: consideration of construction monitoring, on- and/or off-site revegetation/restoration, purchase of credits from an existing mitigation bank. Mitigation ratios would vary depending on the quality of the plant community impacted and whether or not it provides habitat for sensitive plant or wildlife species. Regulatory agencies would be consulted to determine appropriate mitigation ratios. On-site mitigation would be preferred to off-site mitigation whenever possible. Off-site mitigation should be located within the same watershed or in close proximity to the impact area, where feasible.

- Biological Resources Management Plans (BRMP) would be prepared to specify the design and implementation of biological resources mitigation measures, including habitat replacement and revegetation, protection during construction, performance (growth) standards, maintenance criteria, and monitoring requirements. The USFWS, CDFG, and USACE would review Draft BRMP's.

  The primary goal of a BRMP is to ensure the long-term perpetuation of the existing diversity of habitats in the project area and adjacent urban interface zones. BRMP's shall contain the following:

  a. Specific measures for the protection of sensitive amphibian, mammal, bird, and plant species during construction.

  b. Identification and quantification of habitats to be removed, along with the locations where these habitats are to be restored or relocated.

  c. Procedures for vegetation analyses of adjacent protected habitats to approximate their relative composition, site preparation (clearing, grading, weed eradication, soil amendment, topsoil storage), irrigation, planting (container plantings, seeding), and maintenance (weed control, irrigation system checks, replanting). This information would be used to determine the requirements of the revegetation areas.

  d. Sources of plant materials and methods of propagation.

e. Specific parameters for the determination of the amount of replacement habitat for temporary disturbance areas.

f. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas.

g. Specification of performance standards for growth of re-established plant communities and cut-and-fill slopes.

h. Remedial measures to be taken if performance standards are not met.

i. Methodologies and requirements for monitoring of the restoration/replacement efforts.

j. Measures to preserve topsoil and control erosion control.

k. Design of protective fencing around Environmentally Sensitive Areas (ESAs) and the construction staging areas.

l. Specification of location and quantities of gallinaceous guzzlers (catch basin/artificial watering structures, if needed); specification of monitoring of water levels in guzzlers.

m. Location of trees to be protected as wildlife habitat (roosting sites) and locations for planting of replacement trees.

n. Specification of the purpose, type, frequency, and extent of chemical use for insect and disease control operations as part of vegetative maintenance within sensitive habitat areas.

o. Specific construction monitoring programs for sensitive species.

p. Specific measures for the protection of sensitive habitats to be preserved. These measures may include, but are not limited to, erosion and siltation control measures, protective fencing guidelines, dust control measures, grading techniques, construction area limits, and biological monitoring requirements.

q. Provisions for biological monitoring during construction activities to ensure compliance and success of protective measures. The monitoring procedures would (1) identify specific locations of wildlife habitat and sensitive species to be monitored; (2) identify the frequency of monitoring, monitoring methodology (for each habitat and sensitive species to be monitored); (3) list required qualifications of biological monitor(s); and (4) identify reporting requirements.

- Sensitive plant species: pre-construction focused surveys, construction monitoring, relocation of plants, seed collection, plant propagation, and outplanting to a suitable mitigation site, participation in an existing HCP. Prior to construction, focused surveys should be conducted for sensitive plant species identified as occurring in the study area. Locations of sensitive plant species observed should be mapped on construction drawings. Research must be conducted on appropriate methods to use on a species-by-species basis. Some plant species may require transplantation, whereas others may germinate from seed, and still others may need to be propagated in a greenhouse prior to planting on an appropriate mitigation site. Also, see reference to BRMP, above.
- Specific mitigation measures would be developed to minimize or avoid the spread of weeds during construction and operation. Preventive measures during construction could include identification of areas with existing weed problems and measures to control traffic moving out of those areas (e.g. cleaning of construction vehicles, limitations on movement of fill). Mitigation for operational impacts would also be developed.

- Sensitive wildlife species: pre-construction focused surveys, construction monitoring, restoration of suitable breeding and foraging habitat, purchase of credits from an existing mitigation bank, participation in an existing HCP. Prior to construction, focused surveys should be conducted for sensitive wildlife species identified as occurring in the study area. Locations of sensitive wildlife species observed should be mapped on construction drawings. Construction could be phased around the breeding season for sensitive wildlife species. Also, see reference to BRMP, above.
- Wildlife movement/migration corridors: Wildlife crossings would be of a design, shape and size to be sufficiently attractive to encourage wildlife use. Overcrossings and undercrossings for wildlife would be appropriately vegetated to afford cover and other species requirements. Functional corridors would be established to provide connectivity to protected land zoned for uses that provide wildlife permeability. The following process would be used in design of corridors:
  - Identify the habitat areas the corridor is designed to connect
  - Select several species of interest from the species present in these areas
  - Evaluate the relevant needs of each selected species
  - For each potential corridor, evaluate how the area will accommodate movement by each species of interest
  - Draw the corridors on a map
  - Design a monitoring program
- Jurisdictional waters and wetlands: The amount of mitigation required would be assessed on an acreage basis, with ratios depending upon the nature and condition of the jurisdictional areas located within the impact areas. When appropriate, on-site mitigation would be preferred. Off-site mitigation should be located within the same watershed or as close in proximity to the area of impact as possible. Mitigation options for unavoidable impacts to state and federal jurisdictional waters would include on- or off-site restoration, creation, or enhancement, mitigation banking, or in-lieu fee payments, as described below.
  - Restoration – Return degraded habitat to a pre-existing condition.
  - Creation – Conversion of a persistent non-wetland habitat into wetland (or other aquatic) habitat. The created habitat may be self-sustaining or dependent upon artificial irrigation.
  - Enhancement – Increase one or more functions through activities, such as plantings or non-native vegetation eradication.
  - Passive Revegetation – Allow a disturbed area to naturally revegetate without plantings.
  - Mitigation banking - Purchase of units of wetland or waters habitat that have been restored or enhanced within a larger managed conservation area. The units are typically known as "credits" and are usually sold on an acreage basis.
  - In-Lieu Fee Program – A monetary payment is made to an agency approved entity that provides habitat conservation or restoration. For instance, the Nature Conservancy may receive in-lieu fee payments for impacts in all watersheds. And the Santa Monica Mountains In-Lieu Fee Program is available for impacts to waters within Los Angeles County.
  - Current federal and state policy emphasizes a "no net loss" of wetlands habitats policy, which is usually achieved through restoration of areas subject to temporary impacts or creation of wetlands to offset permanent impacts. However, the January 27, 2003, Special Public Notice for Mitigation and Monitoring Guidelines states that the USACE favors the use of approved

mitigation banks or in-lieu fee programs in cases where they result in more regional or watershed benefit than on-site compensatory mitigation. Approved mitigation and in-lieu fee programs would include measures that ensure the no net loss of wetlands policy is met.

The above mitigation strategies, which include further study to obtain additional data and to refine site-specific mitigation measures, are expected to substantially lessen or avoid impacts to biological resources and wetlands. With the second-tier, project-level review and as a result of consultations with wildlife agencies and obtaining required permits for segments of the HST system facilities, and complying with permit terms and conditions, impacts to biological resources and wetlands will be reduced. Sufficient information is not available at the program level to conclude with certainty that mitigation will reduce impacts to affected resources to a less than significant level in all circumstances. Therefore, impacts to biological resources and wetlands are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.15.7 Subsequent Analysis

Identification of potential impacts on various biological resources for this Program EIR/EIS has primarily relied on the available GIS database, other GIS tools, and review of available literature. These sources encompass a broad range of information that may not exactly correspond to actual field conditions. Project-level studies would be required to obtain more reliable assessments of potential impacts on biological resources in the study area.

The subsequent biological resources analyses required for project environmental documentation would focus on project-specific impacts that reflect more precise definitions of the right-of-way, the proposed facility locations, and the operations. Areas of possible further study include the following.

- Field surveys to determine the extent and type of general and sensitive biological resources, including focused surveys following resource agency protocols for special-status species.
- Mapping of plant communities and sensitive biological resources within and adjacent to the proposed HST system right-of-way/impact footprint to address direct and indirect impacts on biological resources.
- Study of wildlife movement/migration corridors. Major wildlife movement/migration corridors within the study area have been identified. Field studies could identify additional locally significant corridors and provide data to assist in the design of bridges and wildlife crossings at crucial travel route points.
- Delineation of waters and wetlands to determine the extent of USACE and CDFG jurisdiction, and consultation conducted with these agencies regarding appropriate mitigation.
- Hydraulic analysis of lagoon crossings to identify potentially feasible improvements that may help improve tidal hydraulics and remove barriers to floodwaters.
- Consultation with USFWS, as needed, for potential impacts on federally listed plant and wildlife species, including the preparation of a biological assessment or assessments, and biological opinions for each phase of project implementation. Early consultation would help to refine appropriate mitigation strategies. Upon project level initiation of Section 7 consultation, for project study areas the FRA and the Authority would in principle accomplish the steps identified by DOI by: 1) identifying the conservation needs of each listed species with the potential to be impacted by the proposal; 2) identifying the threats to each listed species' conservation related to the proposed action; 3) identifying species conservation or management units and the threats affecting those units; 4) identifying species' conservation goals framed within the context of the HST program; and 5) developing conservation/management unit strategies. The FRA and the Authority would prepare Biological Assessments to address the affected conservation/management units identified.

- Consultation with CDFG regarding potential impacts on state-listed plant and wildlife species and appropriate mitigation for such impacts. Early consultation would help to refine appropriate mitigation strategies.
- Assessment of potential for participation in HCPs.
- Development of a mitigation monitoring plan for environmental compliance during construction.
- Application for necessary permits (USACE Nationwide Permit or Section 404, USFWS Biological Opinion, CDFG consistency determination with USFWS Biological Opinion, and 1600 Streambed Alteration Agreement, RWQCB Section 401).

3.16 SECTION 4(f) AND 6(f) RESOURCES (PUBLIC PARKS AND RECREATION, WATERFOWL REFUGES AND HISTORIC SITES)

Section 4(f) and 6(f) resources analyzed in this Program EIR/EIS include publicly owned parklands, recreation lands, wildlife and waterfowl refuges, and historic sites that are covered by Section 4(f) of the Department of Transportation (DOT) Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965. This section describes the existing Section 4(f) and 6(f) resources within the five project regions and identifies the potential uses of and potential impacts on Section 4(f) and 6(f) resources for each alternative. Since this is a program-level environmental document, the uses of and impacts on Section 4(f) and 6(f) resources are analyzed at a program level.

3.16.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Section 4(f)
Section 4(f) of DOT Act of 1966 (49 U.S.C. § 303) states the following.

(a) It is the policy of the United States government that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

(b) The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and with the states, in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of lands crossed by transportation activities or facilities.

(c) The Secretary may approve a transportation program or project (other than any project for a park road or roadway under Section 204 of Title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local officials; or land of an historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area refuge, or site) only if,

  (1) there is no prudent and feasible alternative to using that land; and

  (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

Similarly, California law requires a state agency that proposes a project which may result in adverse effects on historical resources listed or eligible for listing in the National Register of Historic Places (NHRP) or the California Register of Historical Resources (CRHR) to consult with the State Historic Preservation Office and to identify feasible and prudent measures that will eliminate or mitigate the adverse effects (California Public Resources Code §§ 5024 and 5024.5; CEQA Guidelines § 15064.5.)

Section 6(f)
State and local governments often obtain grants through the Land and Water Conservation Fund Act to acquire or make improvements to parks and recreation areas (16 U.S.C. §§ 460-4 through 460-11, September 3, 1964, as amended 1965, 1968, 1970, 1972–1974, 1976–1981, 1983, 1986, 1987, 1990, 1991, 1993–1996). Section 6(f) of the act prohibits the conversion to a non-recreational purpose of property acquired or developed with these grants without the approval of the U.S. Department of the Interior's (DOI's) National Park Service. Section 6(f) directs DOI to ensure that replacement lands of equal value (monetary), location, and usefulness are provided

as conditions to such conversions. Consequently, where such conversions of Section 6(f) lands are proposed for transportation projects, replacement lands must be provided.

California statutes similarly require replacement lands. The California Public Park Preservation Act of 1971 (California Public Resources Code § 5400 et seq.) provides that a public agency that acquires public parkland for non-park use must either pay compensation that is sufficient to acquire substantially equivalent substitute parkland or provide substitute parkland of comparable characteristics.

B. METHOD OF EVALUATION OF IMPACTS

This evaluation of potential impacts on Section 4(f) and 6(f) resources focuses on identifying uses of and historical, cultural, parkland, and wildlife resources under existing conditions, and potential uses of and impacts on these resources under the No Project, Modal, and High-Speed Train (HST) Alternatives. For this program document, the primary goal of the analysis was the identification of Section 4(f) and 6(f) resources on or very close to the proposed HST and Modal Alternative alignment options and the relative potential impacts of the alternatives on these resources. At this stage, it is not practical to study and measure the severity of each potential impact identified. No fieldwork was conducted as part of this analysis. In subsequent project-level analysis, should a decision be made to proceed with the HST Alternative, Section 4(f) and 6(f) resources, potential uses and impacts, and appropriate mitigation measures would be identified in detail.

Various sources were consulted to identify potential resources in each region, including available databases, studies, and other documents. These documents are listed in the references chapter of this document. To identify and quantify the potential impacts by resource type, the improvements included under each alternative (highway and rail alignments, rail stations, and airports) were overlaid on available databases and maps.

Two types of potential impacts on Section 4(f) and 6(f) resources were identified: direct and proximity.

- Direct Impact: A physical feature of a proposed improvement would be within 150 feet from centerline and could directly intersect with a portion or all of the resource and require the use of property from that resource.
- Proximity Impact: A physical feature of a proposed improvement has the potential to impact the resource as a result of its proximity to the resource.

Potential impacts were assigned a qualitative ranking of high, medium, or low based on the proximity of the resource to the centerline of the proposed improvement. The rankings are summarized in Table 3.16-1.

Table 3.16-1
Rankings for Potential Direct and Proximity Impacts on Section 4(f) and 6(f) Resources

Ranking	Distance of Resource from Centerline	Potential Impact
High	0 to 150 ft (0 to 46 m)	Direct
Medium	150 to 450 ft (46 to 137 m)	Proximity
Low	450 to 900 ft (137 to 274 m)	Proximity

3.16.2 Affected Environment

A. STUDY AREA DEFINED

The study area for the analysis of Section 4(f) and 6(f) resources encompasses the area within 900 ft (274 m) on either side of the centerline of each alignment, and within a 900-ft (274-m) radius of the stations for each alternative.

Because the proposed HST system would cross urbanized and developed areas, a variety of Section 4(f) and 6(f) resources could be affected. The proposed HST system alignment options were developed with the intent of avoiding these resources to the extent feasible. There are potential locations within the proposed HST system, however, where Section 4(f) and 6(f) resources would not be avoided. These are discussed in the environmental consequences section below.

B. GENERAL DESCRIPTION OF SECTION 4(f) AND 6(f) RESOURCES

Section 4(f) and 6(f) resources refer to publicly owned lands of a park, recreation area, or wildlife and waterfowl refuge; or land of a historical site of national, state, or local significance (as determined by the federal, state, regional, or local officials having jurisdiction over the park, recreation area, refuge, or site).

Historically, urban and suburban development follows the establishment of transportation corridors and facilities. In California in the late 19th and early 20th centuries, most cities formed around ports and rail lines, the primary modes for transporting people and goods. After World War II, in the early 1950s, highways and the automobile became the dominant mode of transportation, bringing urban and suburban development to areas along highways that were formerly farm-to-market roads connecting rural areas to cities.

The location and identification of Section 4(f) and 6(f) resources reflect this historic transportation corridor and urban development pattern. Today, in the urban areas that developed around the railroads at the turn of the century, there is a high concentration of historical resources. In many California cities, the railroad station is one of the oldest historical resources in the city. In the suburban and rural areas where development followed highways, some open space and natural areas have been preserved as public parks. In addition to these passive park[1] areas, new public parks and playgrounds have been built as part of residential developments. All of these historical resources and public parks are considered potential Section 4(f) and 6(f) resources. Therefore, in urban regions an alternative would be more likely to affect historical and archeological resources, while in suburban, wilderness, or remote areas (e.g., mountain crossings), an alternative would be more likely to affect public parks and recreation lands, and wildlife and waterfowl refuges.

C. SECTION 4(f) AND 6(f) RESOURCES BY REGION

The most significant Section 4(f) and 6(f) resources in each region (except historical and archaeological resources) are identified below. (See Section 3.12, Cultural and Paleontological Resources, for an analysis of historical and archeological resources.)

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The Bay Area to Merced region contains a wide variety of Section 4(f) and 6(f) resources, including one prominent national wildlife refuge (Don Edwards San Francisco Bay National

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[1] Passive park refers to a park that is used for picnicking or passive water sports; it also describes zoos and arboretums. An active park is a park that includes facilities such as children's play equipment, playing fields, tennis or basketball courts, etc.

Wildlife Refuge), one prominent state park (Henry W. Coe State Park), and many local parks. Historic downtown districts in Oakland and historic rail stations in San Jose, Santa Clara, and Gilroy typify many of the historical resources that can be found throughout the region. Key resources are shown in Figure 3.16-1.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Resources in this region include large parks, such as Stone Lakes National Wildlife Refuge in Sacramento County and Pixley National Wildlife Refuge in Tulare County, as well as smaller state and local (city and county) parks, including Colonel Allensworth State Historical Park and the American River Parkway. In addition, there are historic properties in downtown Sacramento and in the small, older cities of the Central Valley.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. Federal, state, local, and regional Section 4(f) and 6(f) resources in this region include Fort Tejon Historical Park, Angeles National Forest, Griffith Park, and Vasquez Rocks County Park. The region also contains a large number of smaller county and city recreation resources, including active, passive, and wilderness parks. Most of the historic properties in this region are within the urban areas of Los Angeles County. Key resources are shown in Figure 3.16-2.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas, and south to San Diego generally along the I-215 and I-15 corridors. Local and regional parks dominate the Section 4(f) and 6(f) resources of this region. There are many local parks in this region, largely because suburban communities developed small neighborhood parks with schools around the highway and rail alignments. Federal and regional resources identified in this area include the Riverside National Cemetery, Cleveland National Forest, Santa Margarita Ecological Reserve, and Old Town San Diego State Historic Park.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. Similar to the Inland Empire area discussed above, the Los Angeles to San Diego via Orange County corridor Section 4(f) and 6(f) resources are predominantly local parks. This region includes older coastal cities, however, and several areas have a high number of historic properties listed on the NRHP and the CRHR.

3.16.3 Environmental Consequences

The identification of Section 4(f) and 6(f) resources could result in significant differences among the alignment options, and between the Modal and HST Alternatives, because of the potential disruptions and costs associated with the avoidance, minimization, and possible need to mitigate impacts on such resources. These potential impacts could range from temporary construction impacts to the acquisition[2] of Section 4(f) and 6(f) resources.

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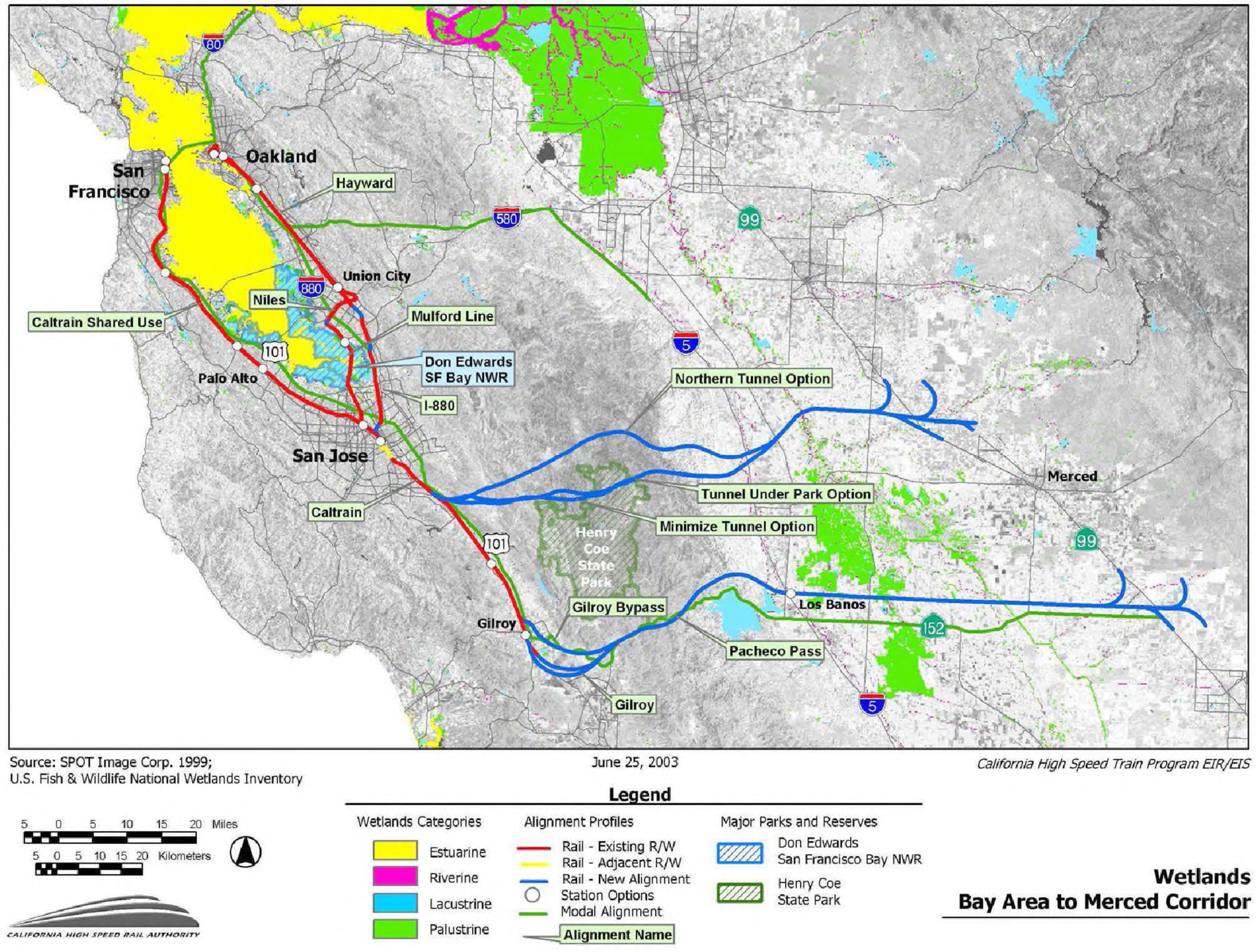
[2] In this context, acquisition means that a Section 4(f) or 6(f) resource would be directly affected by the proposed project, and the value of the resource or a portion thereof would be lost as a result of the project.

Figure 3.16-1. Bay Area Alignment Options and Major Section 4(f) and 6(f) Resources



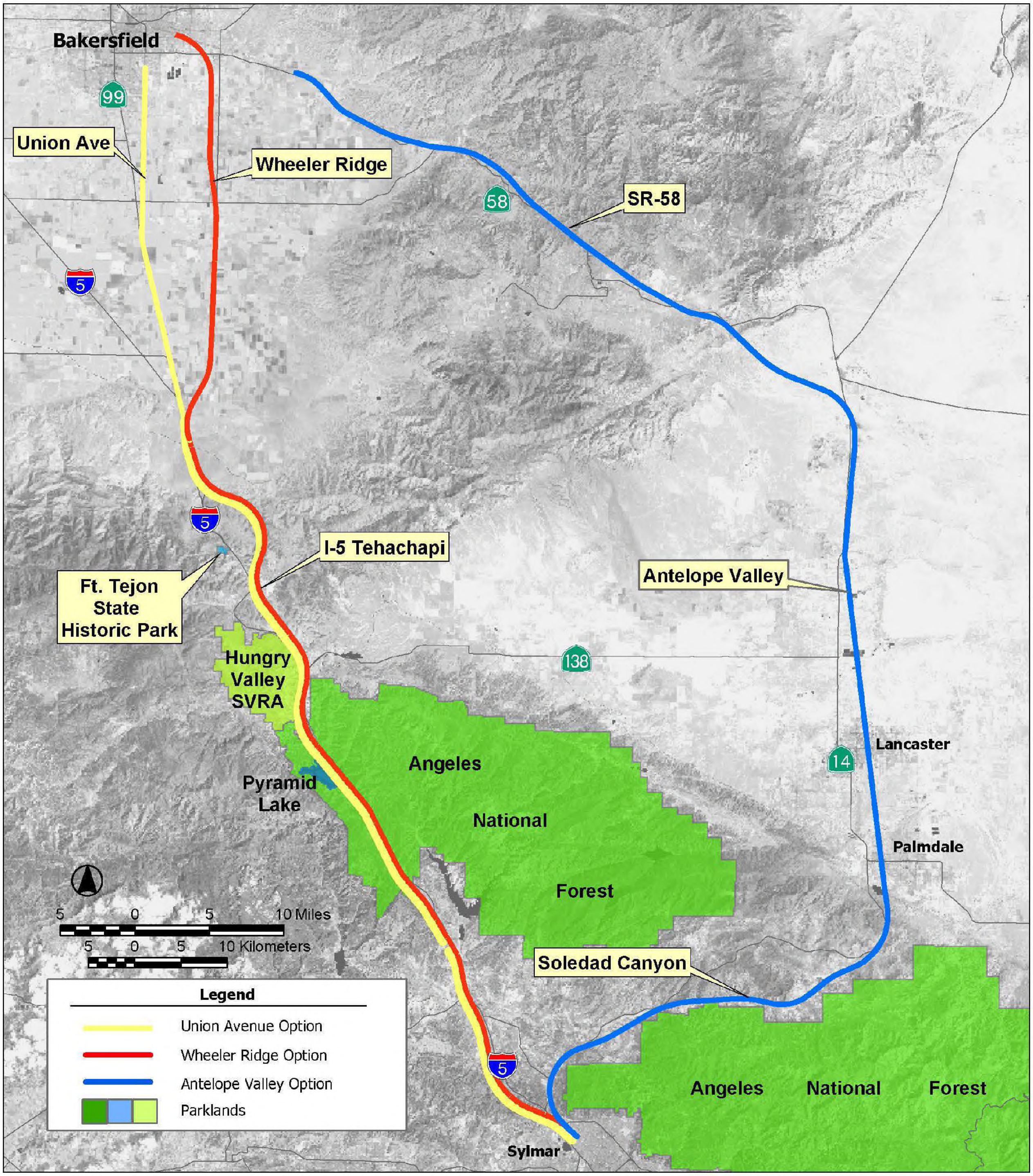
Source: SPOT Image Corp. 1999;
U.S. Fish & Wildlife National Wetlands Inventory

June 25, 2003

California High Speed Train Program EIR/EIS

Wetlands
Bay Area to Merced Corridor

Figure 3.16-2.
Bakersfield to Los Angeles Alignment Options and Major Section 4(f) and 6(f) Resources



A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions are based on transportation infrastructure that was identified as part of the alternatives definition process. The No Project Alternative is based on existing conditions and the funded and programmed transportation improvements that are projected to be developed and in operation by 2020. It is not possible as part of this study to identify or quantify the potential uses and impacts expected to occur by 2020 with implementation of the No Project Alternative. Rather, it is assumed that the improvements to be developed and implemented under the No Project Alternative would undergo typical design and construction practices that would avoid or greatly limit potential impacts. Additionally, each improvement associated with the No Project Alternative will be subject to a project-level environmental document that will identify potential uses and impacts, as well as measures to avoid, minimize, or mitigate the impacts. Although it is expected that there may be additional changes in conditions by 2020, it would speculative to attempt to estimate or quantify such changes. Thus, no impacts are quantified under the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The No Project Alternative is the assumed 2020 condition, as described above. Any potential impacts associated with the Modal or HST Alternatives would occur in addition to the impacts associated with the No Project Alternative. For this analysis, the difference in impacts between the Modal and HST Alternatives relative to the No Project Alternative (existing conditions in this case) are compared.

The Modal Alternative, which would result in expansion of existing highway and airport networks, would potentially impact a greater number Section 4(f) and 6(f) resources (particularly parks and recreation areas) than the HST Alternative, because it would follow and expand existing facilities, typically in areas where urban growth has already expanded to the edges of these facilities. In contrast, the HST Alternative would potentially impact fewer Section 4(f) and 6(f) resources because the proposed HST alignment, stations, and other facilities could be planned and located around, above, or below an identified resource to avoid or minimize potential impacts. As shown in Table 3.16-2, the Modal Alternative would potentially result in a greater number of Section 4(f) and Section 6(f) resources with “high” potential impacts. A complete listing of Section 4(f) and Section 6(f) resources within 900 feet of the Modal and HST alternatives is included as Appendix 3.16-A. Only in the Bakersfield to Los Angeles region would the proposed HST Alternative potentially impact a greater number of Section 4(f) and Section 6(f) resources than the Modal Alternative. Potential Section 4(f) and Section 6(f) impacts for the HST Alternative vary considerably depending upon the HST alignment option. While the Modal Alternative would impact a greater number of potential Section 4(f) and Section 6(f) resources, the HST Alternative has alignment options that bisect Henry Coe State Park and Don Edwards National Wildlife Refuge in the San Francisco Bay Area.

Except in the Bay Area, where the HST alignment on the Caltrain corridor travels within the existing right-of-way and consequently has few direct impacts, the Modal and HST Alternatives are estimated to have approximately the same potential impact on known and potential historical and archeological resources, primarily because these resources are generally located in urban centers where the range of possible alignment and station options is limited. (A detailed analysis of historical and archeological resources is found in Section 3.12, Cultural and Paleontological Resources.)

Table 3.16-2[a]
California High Speed Rail
Summary of Federal, State/Regional and Other 4(f) and 6(f) Resources

Location	Federal Parks	State/Regional Parks	Other[3]
Bay Area to Merced Region			
Modal Alternative	**0**	**4**	**38**
HST Alternative	**0-1**	**0-1**	**3-7**
Sacramento to Bakersfield Region			
Modal Alternative	**0**	**5**	**18**
HST Alternative	**0-1**	**1-3**	**9-15**
Bakersfield to Los Angeles Region			
Modal Alternative	**1**	**1**	**10**
HST Alternative	**0-1**	**0-3**	**4-13**
Los Angeles to San Diego via Inland Empire Region			
Modal Alternative	**2**	**2**	**40**
HST Alternative	**0-1**	**2-4**	**26-39**
Los Angeles to San Diego via Orange County Region			
Modal Alternative	**3**	**7**	**7**
HST Alternative	**0-3**	**0**	**4**
Alternative Totals			
Modal Alternative	**6**	**19**	**113**
HST Alternative	**0-7**	**3-11**	**46-78**
Note: The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various design options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a preferred option. For a complete listing of 4(f) and 6(f) resources within 900′ of the Modal and HST alternatives, see Appendix 3.16-A.			

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[3] "Other" includes local parks, schools, historic sites, and recreational sites.

3.16.4 Comparison of Alternatives by Region

This section outlines the potential impacts of the Modal and HST Alternatives on Section 4(f) and 6(f) resources by region. Differences in potential impacts between HST alignment options are also discussed. Appendix 3.16-A provides summary tables showing a more detailed comparison of the different alternatives and their potential impacts on Section 4(f) and 6(f) resources.

A. BAY AREA TO MERCED

This region contains a variety of Section 4(f) and 6(f) resources, including a federal and a state park—Don Edwards San Francisco Bay National Wildlife Refuge and Henry W. Coe State Park—and approximately 35 local parks that could be affected. In addition, historical resources in the older cities could be affected.

Modal Alternative

The Modal Alternative could impact 42 Section 4(f) and 6(f) resources, primarily local and regional parks adjacent to US-101 and I-880 in the heavily urbanized Bay Area. In addition, the O'Neill Forebay and Wildlife Area near Los Banos could be affected. The Modal Alternative would result in a higher number of potential impacts than the HST Alternative in this region.

High-Speed Train Alternative

The HST Alternative could impact between three and nine Section 4(f) and 6(f) resources, depending on the alignment option. Although approximately 25 local and regional parks are very close to the proposed HST alignment option, the HST would be in the existing railroad corridor as it passes most of these resources between San Francisco and San Jose. However, elsewhere in this region, where the HST alignment options would be adjacent to existing transportation corridors or in a new right-of-way, there would be more potential impacts on parklands (Henry W. Coe State Park) and wildlife reserves (Don Edwards San Francisco Bay National Wildlife Refuge). The HST Alternative would potentially affect more historical resources than the Modal Alternative in this region, primarily in the Bay Area. Overall however, the HST Alternative would result in potential impacts on a fewer number of Section 4(f) and 6(f) resources than the Modal Alternative.

High-Speed Train Alignment Options Comparison

The Caltrain alignment option between San Francisco and San Jose would potentially impact fewer Section 4(f) and 6(f) resources than the East Bay alignment options. The primary reason for this difference is that the HST would travel within the Caltrain right-of-way, and therefore not directly affect any Section 4(f) or 6(f) resources in and along the Caltrain corridor.

Between Oakland and San Jose, the Hayward/Niles/Mulford alignment option has the potential to impact the Don Edwards San Francisco Bay National Wildlife Refuge because the existing railroad right-of-way is not consistently wide enough for the HST. Given the high sensitivity of this area and the concerted effort of the state and federal governments, many nonprofit organizations, and individuals to restore this area, it potentially may be difficult to identify meaningful mitigation measures for this alignment option (see Figure 3.16-1). The Hayward/I-880 alignment option, which serves the same corridor, would potentially affect some local and regional resources (such as Marshall Park in Fremont), but it would not directly impact the highly sensitive Don Edwards San Francisco Bay National Wildlife Refuge.

From San Jose to Merced, the minimize tunnel option of the Diablo Range direct northern alignment could impact Henry W. Coe State Park. As with the Mulford alignment option, it may be difficult to identify meaningful mitigation measures for the impacts of the minimize tunnel option on the state park. Henry W. Coe State Park contains one of the last large public wilderness areas in this part of northern California. Thus, even with the significant tunneling included in the minimize tunnel option, the option could impact wildlife and wildlife habitat. There are several potential avoidance options under consideration. These include a tunnel under the park that would avoid use of the park, an alignment option north of the park that avoids the park, and the Pacheco Pass alignment options. While the southern crossing options (Pacheco Pass) to Gilroy would not affect as many Section 4(f) or 6(f) resources as the northern alignment options, one of them would travel through Gilroy where it could affect the historic Gilroy train station and other historic structures. The eastern end of the northern alignment may result in potential impacts on McConnell State Recreation Area.

B. SACRAMENTO TO BAKERSFIELD

The HST Alternative has the potential to affect fewer individual recreational resources than the Modal Alternative in this region. Because the Modal Alternative footprint traverses large federal and state resources in the Sacramento to Stockton and Merced to Fresno corridors, it would be likely to affect more Section 4(f) and 6(f) acreage than the HST Alternative. In downtown Sacramento, where there is a high concentration of historical resources, both the Modal and HST Alternatives would have potential impacts on historical and archeological resources.

Modal Alternative

The Modal Alternative could affect 23 resources, including the Stone Lakes National Wildlife Refuge along I-5 in Sacramento County and several state and federal parklands along SR-152 west of Fresno in Merced and Madera Counties. In addition, the Modal Alternative could affect smaller local (city and county) parks. The Modal Alternative could affect more Section 4(f) and 6(f) resources than the HST Alternative in this region.

High-Speed Train Alternative

The vast majority of the between 10and 19 Section 4(f) and 6(f) resources potentially affected by the HST Alternative are local (city and county) parks, although Burlington Northern Santa Fe (BNSF) alignment options in the Tulare to Bakersfield corridor could also affect the Pixley National Wildlife Refuge and the Colonel Allensworth State Historical Park. The HST Alternative would affect a fewer number of Section 4(f) and 6(f) resources than the Modal Alternative.

High-Speed Train Alignment Options Comparison

In the Sacramento to Stockton corridor, there is little distinction between HST alignment options with respect to Section 4(f) and 6(f) potential impacts. Alignment options to the downtown Sacramento Valley Station would potentially impact the American River Parkway. There are generally more local (city and county) parks along the Union Pacific Railroad (UPRR) alignment than the Central California Traction (CCT) alignment option in this corridor.

From Modesto to Merced, the UPRR alignment has the potential to affect more Section 4(f) and 6(f) resources than the BNSF alignment because the Stanislaus County Fairgrounds, Broadway Park, and Central Park in Turlock are adjacent to the UPRR right-of-way.

Between Madera and Fresno, there may be potential impacts on public parkway lands managed by the state San Joaquin River Conservancy along the San Joaquin River.

Section 4(f) and 6(f) resources are present from Tulare to Bakersfield, but both the UPRR and BNSF alignments have the potential to affect the same number of resources. The proposed Golden State Station would potentially affect the Metro Recreation Center, which sits adjacent to the UPRR alignment.

C. BAKERSFIELD TO LOS ANGELES

The Section 4(f) and 6(f) resources that dominate this region are the Angeles National Forest and state and county parks that cross the Tehachapi Mountains. In addition, there are many smaller county and city parks, as well as historic properties in the urban areas of Los Angeles County.

Modal Alternative

The Modal Alternative would potentially affect 12 Section 4(f) and 6(f) resources in this region. The highway portion of the Modal Alternative would potentially affect Fort Tejon State Historical Park, Griffith Park, and Vasquez Rocks County Park. The airport portion (Burbank Airport) of the Modal Alternative would potentially affect Sun Valley Park and Recreation Center in the City of Los Angeles. The Modal Alternative would potentially affect the same number of Section 4(f) and 6(f) historical and archeological resources as the HST Alternative.

High-Speed Train Alternative

Since the HST Alternative would use essentially the same transportation corridors from Bakersfield to Los Angeles as the Modal alternative, the HST and Modal Alternatives would result in a similar number of potential impacts in the region.

High-Speed Train Alignment Options Comparison

The alignment options for the HST Alternative from Bakersfield to Los Angeles would result in a considerable range of potential impacts. Between Bakersfield and the Sylmar Station, the I-5 alignment option would result in the most potential impacts (eight) of the three alignment options. Some of the resources that could be impacted include Fort Tejon State Historical Park, Angeles National Forest, Pyramid Lake, and Hungry Valley State Vehicular Recreation Area (see Figure 3.16-2).

The SR-58/Soledad Canyon alignment option would result in the fewest potential impacts (zero). From Sylmar to downtown Los Angeles, the MTA/Metrolink alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks. The I-5 option has potential impacts on Griffith Park and Elysian Park and bisects the Cornfields property. The potential for impacts on historical resources increases the closer the alignment options get to Los Angeles; however, impacts on historical resources is not a differentiating factor for the alignment options in this region.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Section 4(f) and 6(f) resources identified in this region that could be affected were generally regional and local parks and recreation areas.

Modal Alternative

The Modal Alternative could affect approximately 44 Section 4(f) and 6(f) resources in this region. The majority of these resources would be local and regional parks, with the exception of Riverside National Cemetery and Cleveland National Forest. The Modal Alternative would result in slightly more potential impacts than the HST Alternative.

High-Speed Train Alternative

Similar to the Modal Alternative, the HST Alternative could impact county and local parks. The HST Alternative could potentially impact as few as 28 resources, compared to 44 for the Modal Alternative.

High-Speed Train Alignment Options Comparison

Section 4(f) and 6(f) resources are fairly evenly distributed in the region. Therefore, the impacts of the alignment options on Section 4(f) and 6(f) resources in this region would be similar. One exception is between Mira Mesa and San Diego, where the alignment option that would follow I-15 to Qualcomm Stadium would potentially impact nine Section 4(f) resources, while the other alignment options, LOSSAN and LOSSAN via Carroll Canyon to downtown San Diego, would potentially impact five resources, respectively.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

The Section 4(f) and 6(f) resources identified in this region are primarily local and regional parks, and several state beaches. The Modal Alternative would include the acquisition of new right-of-way between Los Angeles and San Diego, which would potentially affect 20 Section 4(f) and 6(f) resources along the alignment. Overall, there is no significant difference in the number of resources that would be potentially affected by the Modal and HST Alternatives. The proposed HST alignment is within the existing right-of-way. Much as in the Bay Area, the majority of these alternative alignments would occur along existing transportation/rail corridors, and the potential for impacts would be temporary or could be reduced by mitigation strategies.

Modal Alternative

The Modal Alternative (17 potential impacts) would impact on Section 4(f) and 6(f) resources than the overall HST Alternative (4 to 7 potential impacts). Those resources that are potentially affected are primarily local parks.

High-Speed Train Alternative

Although construction of the HST Alternative is expected to occur within 150 ft (46 m) of some parks and refuge lands, the majority of the activities would be within the existing UPRR and LOSSAN rail corridors. The railroad was originally constructed in the 1800s, before most parks and conservation lands were established around it.

High-Speed Train Alignment Options Comparison

The two alignment options and proposed station locations between LAUS and Irvine are not differentiated by potential impacts on Section 4(f) and 6(f) resources because there are few such resources in this industrial area. The UPRR alignment would potentially impact three Section 4(f) and 6(f) resources, and the LOSSAN corridor would potentially impact five of these resources.

3.16.5 Impact Avoidance Strategies, Including Alternatives Screened from Further Consideration

Throughout the environmental review process, and particularly in the identification of potential HST alignment and station options, the California High Speed Rail Authority (Authority) has emphasized minimizing harm to the environment. One of the Authority's policies, as stated in Chapter 1, is "to maximize the use of existing transportation corridors and right-of-way to the extent feasible." This policy is one of the primary impact avoidance strategies for the proposed HST system. This policy and the other goals implicit in the HST project purpose and need were used in the scoping process and successive screening stages of the program environmental process (see Chapter 2, Alternatives). The screening evaluation considered the potential impacts of the various alignments and all the environmental parameters, including impacts on Section 4(f) and 6(f) resources. Based on the overall screening evaluation, several segments in the Bakersfield to Los Angeles region were removed from further consideration, in part due to potential impacts on Section 4(f) and 6(f) resources (see Figure 3.16-2). The screening alignment studies resulted in realignment of the Tehachapi segment of the HST Alternative to avoid impacts on resources, including parks, in the town of Tehachapi. In the Bay Area, different alignment options were developed to avoid Henry W. Coe State Park (see Figure 3.16-1). At the end of this process, at least two viable alignment options were identified for each segment of the entire HST system, except for a few cases where clear and documented data were available to limit the options to a single alignment. The screening recommendations were developed by the Authority and the Federal Rail Authority, with input from federal cooperating agencies; state, regional, and local agencies; and members of the public.

3.16.6 Avoidance Alternatives or Reasons for No Prudent or Feasible Alternative for Use of Section 4(f) or 6(f) Resource

If the proposed HST system is approved to go forward, the design studies and project-level environmental review for a proposed HST system would compare specific alignment alternatives selected for further study and seek additional opportunities to avoid or substantially reduce potential adverse impacts of these alternatives on identified Section 4(f) and 6(f) resources.

Potential direct impacts on many Section 4(f) and 6(f) resources could be avoided by remaining within existing railroad right-of-way, or moving horizontally within the right-of-way, where feasible. Avoidance of Section 4(f) and 6(f) resources would be further explored during project-specific design and environmental evaluation. Project-level evaluations of Section 4(f) and 6(f) resource use would include documentation of the avoidance alternatives and/or reasons for no prudent or feasible alternative for impacts on Section 4(f) and 6(f) resources for the segments being studied.

There are several potential Section 4(f) and 6(f) recreation resources and cultural resources within or immediately adjacent to the proposed alignments for the Modal and HST Alternatives. Avoidance of these resources would be possible in many cases by redesigning or narrowing the disturbance limits, in combination with noise walls and/or visual screening. However, there may be locations where avoidance could not be achieved, possibly for one of more of the following reasons.

- Shifting the centerline (and the whole facility) to avoid one or more resources could result in greater potential impacts on other resources. For example, segments of some highways include a number of very large Section 4(f) and 6(f) resources on both sides. It may not be possible to fully avoid use of all of these resources under the Modal Alternative, assuming that reconstruction of the facility in a tunnel section is not feasible.
- The HST alignment options cannot be shifted easily because of the large turning radii required for HST operations and other design considerations. A minor shift in one location on the HST alignment could result in a substantial shift elsewhere on the alignment, potentially resulting in impacts on other Section 4(f) and 6(f) resources.
- Measures to reduce potential proximity impacts, such as noise walls, could result in potential adverse visual impacts on Section 4(f) and 6(f) resources. During project-level review, potential measures to minimize harm at each potentially affected resource would need to be analyzed in consultation with the owners of the resources to ensure that measures to minimize harm would not adversely affect the values of the Section 4(f) and 6(f) resources.

3.16.7 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines for the proposed HST system in order to minimize potential impacts adjacent properties, particularly parks and recreational lands. Nearly 70% percent of the preferred HST alignments are either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way), thus minimizing potential for impacts to these important resources.

The FRA is committed to complying with Sections 4(f) and 6(f) of the DOT Act of 1966 as amended through subsequent project-level design and evaluation. Many potential 4(f) and 6(f) uses have been avoided through evaluation incorporated in this program EIR/EIS and additional steps will be taken at the project level to ensure that there is no prudent or feasible alternative to the use of 4(f) and 6(f) resources.

The Authority is committed to avoiding impacts to parklands to the extent feasible and practical through careful alignment design and selection. The avoidance of State Park units is a good example of this practice. The Authority has identified a preferred HST alignments extending over 700-miles long. Of the 278 State Parks, only five State Parks would be within 900 feet of the 700+ miles of preferred HST alignment, and no State Parks would be crossed or bisected by the HST Alternative. It is an objective of the Authority to further avoid and minimize potential impacts to the five State Parks through alignment refinement during subsequent project level environment review.

3.16.8 Mitigation Strategies and CEQA Significance Conclusions

Possible mitigation measures for potential impacts on Section 4(f) and 6(f) resources include sound walls, visual buffers/landscaping, and modification of transportation access to/egress from the resource. Some of these measures could include design modifications or controls on construction schedules, phasing, and activities. Planning efforts would be undertaken as a part of the project-level documentation phase to minimize harm to the Section 4(f) and 6(f) resources. This is anticipated to include measures that may be taken to mitigate potential adverse environmental impacts, such as beautification measures, replacement of land or structures or their equivalents on or near their existing site(s), tunneling, cut and cover, cut and fill, treatment of embankments, planting, screening, creating wildlife corridors, acquisition of land for preservation, installation of noise barriers, and establishment of pedestrian or bicycle paths. Other potential mitigation strategies could be identified during the public input process.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for recreation resources, the proposed HST system alternative would have a potentially significant effect on public parks and recreation resources when viewed on a systemwide basis. Although public parks and other recreational have largely been avoided by the placement of conceptual corridors for the HST system, and additional avoidance and mitigation strategies will be applied in the second-tier, project-level analyses, some parks and recreational resources may ultimately be affected should a decision be made to proceed with the development of the HST system. At the programmatic level of analysis, it is not possible to know precisely the location , extent and particular characteristics of impacts to park resources. Because of this uncertainty, at the programmatic level of analysis the impact is considered significant. Mitigation strategies, as well as the design practices discussed in section 3.16.7, will be applied to reduce these impacts.

In the event that HST alignments or facilities are located within or in close proximity to public parks, the following mitigations for natural, cultural, aesthetic and recreational impacts would be considered, including but not limited to:

1. Compensation for temporary and loss of park and recreation use.
2. Recordation of any historic features removed.
3. If necessary, provide alternative shuttle access service to park visitors.
4. Restore directly impacted park lands to a natural state.
5. If any facilities must be relocated, provide planning studies as well as design and appropriate replacement with minimal impact on park use.
6. Inventory and record affected historic structures. Provide appropriate mitigation for adverse effects to historic structures.
7. Require appropriate vehicle cleaning for all construction equipment used near units of the California State Park System to protect against spreading exotic plants or disease.

8. Use local native plants for revegetation.
9. Design and construct cuts, fills, and aerial structures to avoid and minimize visual impact to units of the State Park System.
10. In addressing impacts to wildlife movement corridors and habitat directly related to California State Park System units, consult with the California Department of Parks and recreation.
11. Incorporate wildlife under- or over-crossings as necessary.
12. Adopt construction practices to protect critical wildlife corridors and visitor use areas within public parks.

The above mitigation strategies are expected to substantially lessen or avoid impacts to public park resources in most circumstances. At the second-tier, project-level review it is expected that for proposed HST alignments which would result in impacts to park resources, most of the impacts to individual park resources will be avoided or mitigated to a less-than-significant level, but it is possible that for some parks impacts will be significant. Sufficient information is not available at the program level to conclude with certainty that the above mitigation strategies will reduce impacts to all affected public park resources to a less than significant effect in all circumstances. Therefore, potential impacts to parks are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses, as well as any needed 4(f) and 6(f) findings.

3.16.9 Subsequent Analysis

The Section 4(f) and 6(f) evaluation process would be more focused at the project-specific level. Given the broad focus of analysis for this Program EIR/EIS, the primary goal for project-level analysis would be to identify Section 4(f) and 6(f) resources and potential impacts in greater detail, to identify the existence of potential prudent and feasible alternatives, and to identify and analyze potential mitigation measures.

The following items would be included in the Section 4(f) and 6(f) evaluations at the project level.

- Detailed physical descriptions of a specific portion of the proposed HST system (including plans and profiles).
- Updated list of all Section 4(f) and 6(f) recreation resources in proximity to the proposed alignment centerlines and project components, using the most recent mapping available such as annually updated Thomas Bros. maps, general plans, state Web sites, local jurisdiction Web sites, etc.
- Updated list of NRHP-listed and NRHP-eligible cultural resources. As part of detailed cultural resources studies required for project-level environmental review (see Section 3.12.7), all previously identified potentially eligible resources would be further evaluated to determine NRHP eligibility. NRHP-eligible resources would be carried forward to the project-level Section 4(f) and 6(f) evaluation. Field reconnaissance would be needed to complete the required Section 4(f) inventory sheets.
- List of the CRHR-listed and eligible resources and field reconnaissance to provide a complete inventory and description of these resources.
- Descriptions of uses and functions of each Section 4(f) and 6(f) resource, including location map; size; services and facilities; annual patronage; unique qualities; relationship to other lands in the project vicinity; owner/operator; other relevant information regarding the resource; and explanation of the significance of the properties as determined by federal, state, regional, or local officials with jurisdiction over the resource.
- Detailed descriptions of the proposed uses of and potential impacts on Section 4(f) and 6(f) resources and of the methods used to identify them. Specific potential impacts on each resource

would be identified, including proximity impacts as a result of impacts on ambient noise, air quality, transportation, and visual resources.

- Identification and refinement of strategies to avoid or minimize use of and impacts on Section 4(f) and 6(f) resources by narrowing rights-of-way/disturbance limits, realigning/relocating project features, and developing other alignment adjustments. These strategies would analyze, as appropriate, the technical feasibility of possible mitigation, including cost estimates with figures showing percentage differences in total project costs, possibility of community or ecosystem disruption, and other potential significant adverse environmental impacts of each alternative; and show the financial, social, or ecological costs or potential adverse environmental impacts of each alternative, as well as any unique problems and extraordinary magnitudes of impacts.
- Documentation of consultation with the affected local jurisdictions and owners/operators of the identified Section 4(f) and 6(f) resources. This would include documentation of concurrence or efforts to obtain concurrence from the public official or officials having jurisdiction over the Section 4(f) and 6(f) resources and documentation of the planning to minimize harm to the affected resources. (Refer to Chapter 9, Persons and Organizations Contacted, for additional discussion of these consultations.) In addition to the mitigation proposed, the Section 4(f) and 6(f) evaluation should document the National Park Service's tentative position relative to any proposed Section 6(f) conversion and should address the need for replacement lands under federal and California law (Federal Highway Administration 1987).

3.17 CUMULATIVE IMPACTS EVALUATION

This section describes the potential for the No Project, Modal, and High-Speed Train (HST) Alternatives to contribute to cumulative impacts related to various environmental resources. Other sections of this chapter describe and consider the potential effects from completion of the multitude of highway and aviation elements of the Modal Alternative, and alternatively, completion of all stations and route segments of the HST Alternative. Chapter 5 describes the potential for indirect growth inducing effects of the system alternatives. Section 6B addresses policies and practices that would guide project level consideration of the HST Alternative to avoid and minimize indirect growth effects of HST stations.

As provided for in CEQA and NEPA for program documents, this Program EIR/EIS generally analyzes broad environmental effects of the program for the high-speed train system and alternatives. Site-specific environmental review will be required for implementation of the various elements of the program. The level of analysis is consistent with the level of detail of the program; for subsequent approvals, where more detail is learned about the program, more detail regarding the impacts and mitigation measures will be disclosed in subsequent CEQA and NEPA reviews. The cumulative impact analysis for this Program EIR/EIS, therefore, follows this basic tenet – cumulative impacts are analyzed at a broad scale because of the general nature of the program description. Consideration of project-specific and local area cumulative effects, including specific urban development, will be undertaken as part of future project level environmental review. Consideration of the indirect effects related to the reasonably foreseeable population and employment growth that could result from the proposed action and alternatives is addressed in Chapter 5, Economic Growth and Related Impacts.

3.17.1 Regulatory Requirements and Methods of Evaluation

NEPA and CEQA require lead agencies to evaluate a proposed undertaking's potential to contribute to cumulative impacts in the project or program area. Cumulative impact refers to the combined effect of "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts" (CEQA Guidelines Sec. 15355). As defined by the State of California, cumulative impacts reflect

> … the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time (CEQA Guidelines Sec. 15355[b]).

This is consistent with NEPA's use of the term (see CEQ NEPA regulations, 40 CFR 1508.7). The President's Council on Environmental Quality (CEQ) guidance on cumulative impacts further recognizes two categories of cumulative impacts: those that represent the additive effect of repeated activities taking place as part of a single proposed undertaking, and those that represent the combined effect of activities taking place under more than one proposed undertaking (Council on Environmental Quality Guidance Regarding Cumulative Effects, January 1997).

CEQA requires the lead agency to identify projects and programs related to the undertaking being analyzed and evaluate the combined (cumulative) effects of those related projects on the environment. If any cumulative impacts are identified as significant, the lead agency must then assess the degree to which the proposed undertaking would contribute to those impacts, and identify ways of avoiding or reducing any contribution evaluated as "cumulatively considerable" (CEQA Guidelines Sec. 15130[b]). CEQ's cumulative impact guidance similarly directs lead agencies to restrict analysis of cumulative impacts to those that are meaningful (Council on Environmental Quality 1997). Although both CEQA and NEPA include the requirement to consider "past projects" when addressing cumulative impacts, recent CEQ guidance discounts the value of this assessment of past projects directing that relevance of addressing past projects relates to the "concise description of the identifiable present effects" (CEQ June 24, 2005 Memorandum).

Under CEQA, lead agencies may use a "list" approach to identify related projects for analysis, or may base the identification of cumulative impacts on a summary of "projections" in an adopted general plan or related planning document. CEQ's guidance is consistent with CEQA's approach and offers additional strategies to identify cumulative impacts requiring analysis, such as: input from questionnaires, interviews, and panels; use of analytical tools such as checklists, matrices, and system diagrams; modeling and trends analysis; and for resources where spatial relationships are important, GIS analysis. In this Program EIS/EIR, both the list and projections approaches have been adapted and used.

This cumulative impact analysis focuses on the resources potentially affected by the proposed action and alternatives and identifies where there may be impacts to these resources, when considering past, present, and reasonably foreseeable future actions. The impact analysis focuses on other broad regional/statewide past, present and probable future projects, including other highway improvements and transit projects within the study area and within the same areas of potential effect evaluated for the conceptual corridors included as part of the No Project, Modal, and HST Alternative alignments. Because of the population growth potential and the proximity to study corridors and stations analyzed in this environmental document, a few other major projects are also considered as part of the cumulative analysis, including the University of California (UC) at Merced campus. Appendix 3.17-A lists the projects identified for consideration in this cumulative impact analysis. While other project-specific actions may be likely to occur in the study area by 2020, this Program EIR/EIS analyzes the broad environmental issues based on the broad program definition and the regional statewide cumulative impacts and, therefore, does not consider the more localized cumulative issues related to subsequent approvals.

Information from existing environmental documents completed for regional projects, such as regional transportation plans that include the highway and airport improvement projects approved for future implementation under the No Project Alternative and projections made in the state implementation plan for air quality, were used. The list of these projects is included in Chapter 2, Alternatives, Tables 2.5-1 and 2.5-2, and in the air quality section (Section 3.3) of Chapter 3. The cumulative impact analysis for each resource identifies whether there is a significant cumulative impact under the No Project Alternative, if the proposed action and alternatives have a considerable contribution to the cumulative impact, and the availability of mitigation measures at the program level to avoid, minimize, or compensate for the cumulative impact. However, specific analysis of localized impacts and related cumulative impacts, as well as mitigation related to these cumulative impacts that could occur for subsequent project-specific approvals, will need to be addressed through project-level CEQA and NEPA compliance.

3.17.2 Cumulative Impacts Analysis

The following analysis describes the potential for the Modal and HST Alternatives to contribute to cumulative impacts related to each environmental topic of Chapter 3. The environmental topics are discussed herein in the same order as they appear in Chapter 3. The No Project Alternative is mentioned only when there are potential cumulative impacts that could result from not proceeding with the Modal or HST Alternatives (examples: air quality, energy, traffic congestion). Where the No Project Alternative would not result in impacts by 2020, or where the existing conditions would not change (or future conditions were considered too speculative to predict), the No Project Alternative is not addressed.

A. TRAFFIC AND CIRCULATION AND TRAVEL CONDITIONS

As described in Chapter 3 (Sections 3.1 and 3.2), the program level impact analysis of traffic and circulation and travel conditions focused on traffic and LOS analysis of intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways accessing airports; and potential impacts on transit, goods movement, and parking for each of the regional corridors and proposed stations and airports. Impacts to travel conditions included analysis of travel time, reliability, safety, connectivity, sustainable capacity, and passenger cost. Intercity travel in California is expected to grow from 155 million trips to more than 209 million trips in the next 20 years, with an estimated 58% of these trips made by automobile, as stated in the purpose and need chapter of this Program EIR/EIS (Chapter 1). More than half of the 65 highway segments analyzed in this study would operate at unacceptable conditions (level of service F) under the No Project Alternative. The expected increase in the number of autos on the highways by 2020 would also result in significant travel delays and congestion under the No Project Alternative, which would have significant potential impacts on the state's economy and quality of life. Under the No Project Alternative there would be adverse effects related to traffic and LOS on intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways accessing airports. There would be adverse impacts on transit, goods movement, and parking for each of the regional corridors and proposed stations and airports. Therefore, the cumulative impact, when considering past, present, and reasonably foreseeable future projects related to traffic and circulation would, without implementation of either the Modal or HST alternative, be significant (See Chapter 3, Section 3.1).

The Modal Alternative and the HST Alternative would improve the existing highways and airports beyond what is approved and funded under the No Project Alternative; however, congestion and travel delays would worsen on surface streets leading to and from the intercity highways and airports, contributing to cumulative traffic impacts. Therefore, implementation of the Modal Alternative or HST Alternative would not lead to a considerable contribution to the cumulative impact related to highway and airport use but could be a considerable contribution to the cumulative impact related to surface streets leading to and from the intercity highways and airports. Program mitigation strategies, as discussed in Chapter 3 (Section 3.1.6) could be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports. Regional strategies would include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements.

Implementation of the proposed HST Alternative would result in about 38.5 million fewer long-distance passenger trips by automobile annually than would be expected with the Modal Alternative improvements, as discussed in Section 3.2, Travel Conditions. This outcome would benefit intercity highways and would potentially reduce travel delays on the affected highways and on surface streets leading to and from intercity highways. Localized traffic conditions around some HST stations would experience a decrease in level of service and some added delays, and transit lines serving the stations areas would experience increases in passengers during peak hours. Therefore, implementation of the Modal Alternative or HST Alternative could lead to a considerable contribution to the cumulative impact related to localized travel conditions. Program mitigation strategies, as discussed in Chapter 3 (Section 3.1.6) could be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports. Regional strategies would include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements. Site-specific traffic analysis would be part of subsequent project evaluation of local impacts around station locations if a decision were made to pursue the HST Alternative.

B. AIR QUALITY

As described in Chapter 3 (Section 3.3), the program level impact analysis of air quality focused on the potential statewide, regional, and localized impacts related to pollutant burdens occurring from highway vehicle miles traveled, number of plane operations, number of train movements, and power requirements. The analysis of air quality considers emissions of projected regional growth by the California Air Resources Board (CARB) for eight criteria pollutants (CO, SO_x, HC, NO_x, O_3, PM10, PM2.5, and Pb) in the six air basins potentially affected, and therefore includes past, present, and reasonably foreseeable projects/actions and population growth as part of the No Project Alternative. The analysis is structured to estimate the potential impacts on the air quality on the local and regional levels in six air basins directly affected by the project alternatives. These basins are Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Mojave Desert, South Coast, and San Diego County. Under the No Project Alternative there would be adverse cumulative effects related to air quality that are considered significant (See Chapter 3, Section 3.3).

The Modal Alternative would add about 2,970 lane mi (4,780 lane km) to existing highways. The result of the additional lane miles would be an estimated increase of 1.1% of highway vehicle miles traveled (VMT), which is predicted to increase the amount of regional pollutants generated by 1.1% over the No Project Alternative. This outcome would equate to 3,190 tons (2,894 metric tons) of CO per day; 629 tons (571 metric tons) per day of NO_x, and 1.4 million tons (1.3 million metric tons) per day of CO_2. The Modal Alternative would have a high potential impact on air quality. The ranking of high, medium, or low as discussed in Section 3.3 is based on the magnitude of the emission changes compared to the No Project Alternative emission budget and general conformity threshold levels for non-attainment and maintenance areas. Exceeding 10% of a non-attainment or maintenance inventory for a pollutant would be regionally significant. Potential localized air quality impacts associated with construction-generated dust (particulates or PM_{10}) are also expected. When combined with the potential impacts of other highway or airport or major development projects like the UC campus in Merced in other corridors and areas within the six air basins, implementation of the Modal Alternative could lead to a considerable contribution to the cumulative impact related to air quality impacts.

It is estimated that the proposed HST Alternative would be able to accommodate 68 million people annually for intercity trips, according to the Business Plan sensitivity analysis and discussed in depth in the air quality section. Intercity passengers using this alternative would otherwise use the roadways and airports, and the result is a potential 1.8% reduction in VMT on the state highway system, and a reduction in emissions from the reduced number of flights (42.7 million auto trips and 25.3 million air trips would shift to HST annually, according to the sensitivity analysis). Overall, pollutants would decrease in all air basins analyzed compared to the No Project Alternative baseline: CO 24.2%, PM10 0.62%, NO_x 4.1%, and total organic gases 3.1%. Therefore, the HST Alternative would result in an air quality benefit. The benefit could increase if the HST ridership increased beyond the levels assumed in this document. However, as described in Chapter 3 (Section 3.3.), there may be localized air quality impacts from the HST alternative.

Overall, the potential impacts of either the Modal or HST Alternatives, in combination with the air quality impacts of other highway projects or airport improvements identified for this cumulative impact analysis (Appendix 3.17-A) and those projects considered in the state implementation plan for air quality could be a considerable contribution to cumulative air quality impacts within the six-basin study area. Local adverse air quality impacts could occur near HST stations related to traffic. Program-level analysis reviews the potential statewide air quality impacts that would support determination of conformity, as discussed in Chapter 3 (Section 3.3.5). At the project level, mitigation strategies to address localized impacts could consider increasing emission controls from power plants supplying power for the Modal Alternative or HST Alternative; designing the system to utilize energy efficient, state-of-the-art equipment; promoting increased use of public transit, alternative fueled vehicles, and parking for carpools, bicycles, and other alternative transportation methods; alleviation of traffic congestion around passenger station areas; and minimizing construction air emissions.

C. NOISE AND VIBRATION

Noise and vibration impacts, particularly in growing urban areas and along highway corridors, will continue to increase as population grows and use of highways and airports increases. Therefore, the cumulative impact, when considering past, present, and reasonably foreseeable future projects related to noise and vibration would be significant (See Chapter 3, Section 3.34).

Implementation of the Modal Alternative could potentially result in high noise impacts along approximately 210 mi (338 km) of highway alignment and expansion of existing airport perimeters. When combined with the noise impacts associated with other projects, the Modal Alternative could contribute to localized cumulative noise and vibration impacts, primarily in urban areas with a higher density of receptors.

Implementation of the proposed HST Alternative could potentially result in high noise impacts along approximately 8 mi to 133 mi (13 km to 214 km) of alignment, depending on the alignment options selected. These potential impacts, when combined with the potential noise impacts of other highway, roadway, and transit expansion projects in the region, could contribute to localized potential cumulative noise impacts during construction and operation.

Overall, the potential impacts of either the Modal or HST Alternatives could be a considerable contribution to cumulative noise and vibration impacts. Program-level mitigation for noise and vibration impacts, as discussed in Chapter 3 (Section 3.4.5), relates to design practices emphasizing the use of tunnels or trenches; use of electric powered trains, higher quality track interface, and smaller lighter and more aerodynamic trainsets; and full grade separations from all roadways. At the project level, mitigation strategies to address localized noise and vibration impacts should include treatments for insulation of buildings affected by noise and vibration; sound barrier walls within the right-of-way; track treatments to minimize train vibrations; and construction mitigation (See Chapter 3, Section 3.4.6).

D. ENERGY

Continued dependence on automobiles and air travel for intercity trips would result in annual consumption of an estimated 24.3 million barrels of oil per year for the No Project Alternative, considering the past, present, and reasonably foreseeable future projects. The potential cumulative impact on energy consumption would be significant.

The Modal Alternative would result in consumption of an additional 0.2 million barrels per year (24.5 million barrels total). The Modal Alternative could cause a considerable contribution to cumulative energy impacts when considered with other highway and airport projects in the state, and with large development projects that would consume energy (like the new UC Merced campus). Program-level mitigation for energy impacts, as discussed in Chapter 3 (Section 3.5.6), relates to design features that could be included at project-level analysis, including minimizing grade changes, using energy saving equipment, maximizing intermodal transit connections, and development and implementation of an energy conservation plan.

The HST Alternative would reduce energy consumption by an estimated 4.8 to 5.3 million barrels of oil annually (an 8-22% savings compared to the No Project Alternative). This outcome compares with an annual increase under the Modal Alternative of 0.2 million barrels over the No Project Alternative energy use in 2020. This conservative estimate is based on use of average size trains that could be expanded to carry more passengers; the potential energy benefits could be substantially higher if train capacity and ridership were increased. The proposed HST Alternative would have a beneficial effect on energy consumption in the state and, therefore, would not be a considerable contribution to the cumulative energy impacts.

E. ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

As described in Chapter 3 (section 3.6.2), Electromagnetic fields (EMFs) exist in the environment both naturally and as a result of human activities. By the year 2020, EMFs along existing roadways and railroad rights-of-way would probably be affected by technological developments and by increases in total energy consumption. For example, general EMF levels along highways may be cumulatively increased by advanced automotive technologies such as collision avoidance systems and automatic vehicle guidance systems, if such technologies are implemented by 2020, and increased reliance on electrically powered automobiles. Improvements to airports may also increase environmental EMFs because of increased use of radar, radio communications, and instrument landing systems. Based on available information, these changes are not likely to cause significant changes in EMF levels, increased human exposures to EMFs, or electro-magnetic interference (EMI) in the environment; therefore, significant cumulative impacts from EMFs or EMIs associated with past, present, and reasonably foreseeable future projects within the study area are not anticipated.

The Modal and HST Alternatives would traverse a range of geographic and land use typologies and could result in potential EMF exposure in urban, suburban, rural, agricultural, and industrial areas. The various components of the HST infrastructure and the trains themselves would be sources of EMFs at both extremely low frequency (ELF) and radiofrequency (RF). It is likely that some additional potential for human exposure to EMFs and EMI would occur with the HST Alternative in combination with other proposed projects (potential activities include transmission lines and other electric rail systems); however, although the Modal and HST Alternatives could cause direct and indirect EMF and EMI impacts, there would not be a considerable contribution to in EMF and EMI levels because mitigation included in project-level analysis would include design choices (tunnel, elevated track, physical barriers between track and receptor, or facility site selection) and through shielding to avoid or minimize potential EMF and EMI impacts.

F. LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

As described in Chapter 3 (Section 3.7.3), the land use and local communities are expected to change between 2003 and 2020 as a result of past, present, and reasonably foreseeable future projects, related to population growth and changes in economic activity in the five regions (see also, Chapter 5, Economic Growth and Related Impacts). It is expected that some changes related to land use compatibility, communities and neighborhoods, property, and environmental justice will occur, even though it is assumed that reasonably foreseeable future projects would include typical design and construction practices to avoid or minimize potential impacts. Therefore, significant land-use compatibility, communities and neighborhoods, property, and environmental justice cumulative impacts associated with past, present, and reasonably foreseeable future projects within the study are anticipated.

Under the Modal Alternative, the expansion of the existing highway system would continue the historic trend of impacts from land use/urban sprawl related to population growth and impacts on land made accessible by automobile. The highway improvement options would not support local and regional planning objectives that promote transit-oriented higher-density development around transit nodes as the key to planned in-fill development for more efficient use of land and resources. Combined with other highway corridor projects in the five regions, the Modal Alternative would contribute to the promotion of sprawl along improved highways. Additionally, 309 mi (497 km) of highway alignment (20% of total highway alignment length) would affect potentially sensitive residential land uses subject to significant impacts, and 289 mi (465 km) of alignment (19% of total improved highway alignment distance) would affect medium-sensitivity land uses. When combined with the property impacts of other highway expansion projects, the Modal Alternative could cause a considerable contribution to cumulative impacts on residential neighborhoods, parks, schools, open space, and established local communities.

The HST Alternative could contribute to potential cumulative impacts associated with community and neighborhood cohesion and property loss. Although most alignment options of the HST Alternative will be within existing railroad right-of-way, some alignment options, such as the southern mountain crossings through the Antelope Valley area, would create new transportation corridors and potentially result in localized impacts on community cohesion. Combined with other transit (light rail and commuter rail) and roadway projects considered for this cumulative impact analysis, as listed in Appendix 3.17-A, these localized impacts could contribute to cumulative community/neighborhood impacts. Under the HST Alternative, between 53 mi and 88 mi (85 km and 142 km) of rail alignment and station locations (7% to 11% of total alignment distance) would affect high-impact land uses (new corridor in residential areas and parks), and between 92 mi and 145 mi (148 km and 233 km) of track alignment and station locations (11% to 17% of alignment distance) would affect medium impact land uses (widening existing corridors in residential and commercial business areas). These impacts, in combination with other transit extension and roadway projects, could cause a considerable contribution to potential cumulative impacts on various property types, neighborhoods, and communities.

Program-level mitigation for Modal and HST Alternative contributions to the land-use compatibility, communities and neighborhoods, property, and environmental justice cumulative impacts, as discussed in Chapter 3 (Sections 3.7.5, 3.7.6), include design practices to maximize use of existing rights-of-way and incorporating strategies for stations to incorporate transit oriented design; and coordination with cities and counties in each region to ensure that project facilities would be consistent with land use planning processes and zoning ordinances.

G. AGRICULTURAL LANDS

According to 2001 records (American Farmlands Trust 2003; California Department of Food and Agriculture 2002), California has approximately 27.7 million ac (11.2 million ha) of land in agricultural use, representing approximately 4% of the nation's total farmland operations. Six of the top ten California agricultural counties are located in the Central Valley (as described in Chapter 3, Section 3.8.3). According to the 2001 estimate, in the decade between 1988 and 1998, approximately 497,000 ac (201,129 ha) of farmland was converted to non-agricultural use due to urbanization. Based on the present pace of farmland conversion to non-agricultural use within the state, it is anticipated that by 2020 under the No Project Alternative, the state may have lost nearly 845,000 ac (341,960 ha) of farmland to urban development. This amount would represent a reduction of approximately 3% in the state's 27.7 million ac (11.2 million ha) of farmland. Therefore, it is anticipated that significant cumulative farmland conversion impacts associated with past, present, and reasonably foreseeable future projects within the study will occur.

For the Modal Alternative, potential impacts on farmland beyond the No Project Alternative impacts would include approximately 613 ac (248 ha) of prime farmland, 90 ac (36 ha) of unique farmland, 242 ac (98 ha) of farmland of statewide importance, and 173 ac (70 ha) of farmlands of local importance. The total agricultural land area impacted under the Modal Alternative would be approximately 1,118 ac (452 ha). Of the nearly 845,000 ac (341,960 ha) projected for conversion to non-agricultural use by 2020 (California Department of Conservation 2000), the Modal Alternative would represent less than 0.5% of additional farmland conversion. However, the potential reduction of farmland from the Modal Alternative could nonetheless be a considerable contribution to the overall potential cumulative impact on agricultural land throughout the state.[1]

Potential direct impacts on farmland from the proposed HST Alternative would vary based on the alignment options selected. The ranges of potential impacts would be 1,514 ac (613 ha) to 1,907 ac (772 ha) of prime farmland, 200 ac (81 ha) to 545 ac (221 ha) of unique farmland, 814 ac (329 ha) to 1,077 ac (436 ha) of farmland of statewide importance, and 141 ac (57 ha) to 331 ac (134 ha) of farmlands of local importance, according to the land designations in the Farmland Mapping and Monitoring Program (FMMP). The total potential impact on agricultural lands throughout the study area would vary between 2,559 ac (1,036 ha) and 3,850 ac (1,558 ha), depending on the alignment options. Of the nearly 845,000 ac (341,960 ha) projected for conversion to non-agricultural use by 2020 (California Department of Conservation 2000), the HST Alternative would represent less than 0.5% of additional farmland conversion. However, the potential reduction of farmland from the HST Alternative could nonetheless be a considerable contribution to the overall potential cumulative impact on agricultural land throughout the state.

Program-level mitigation for Modal and HST Alternative contributions to the agricultural conversion cumulative impacts, as discussed in Chapter 3 (Sections 3.8.5, 3.8.6), include design practices to avoid agricultural land conversion through maximizing use of existing rights-of-way to minimize encroachment on additional agricultural lands; utilizing aerial structure or tunnel alignments to allow for vehicular and pedestrian traffic access across the alignment; and reducing the new right-of-way to 50 feet in constrained areas. Mitigation measures may also be applied through project level environmental review and could include securing easements, participating in mitigation banks, increasing permanent protection of farmlands at the local planning level, and coordinating with various local, regional, and state agencies support farmland conservation programs.

H. AESTHETICS AND VISUAL RESOURCES

The aesthetic and visual quality analysis focused on potential impacts on visual resources (particularly scenic resources, areas of historic interest, natural open space areas, and significant ecological areas) along the proposed corridors for the Modal and HST Alternatives and around potential HST station sites, as described in Chapter 3 (section 3.9.2). Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to aesthetic and visual resources would occur.

The Modal Alternative, when combined with other projects along other corridors in the same five regions, would likely contribute to cumulative impacts on visual resources throughout the study area. The Modal Alternative would contribute to temporary cumulative impacts on visual quality from highway construction activities such as construction equipment and materials in adjacent staging areas, construction-related signage, k-rails,[2] and night lighting. The Modal Alternative, in combination with multiple projects in other highway and rail corridors in the region, would add an estimated 2,970 lane mi (4,780 lane km) to intercity highways statewide, which would require more than 10 years to complete. The construction activities (e.g., earth disturbance, removal of vegetation, dust), construction equipment (e.g., cranes, bulldozers, trucks), and materials staging areas would be highly visible to motorists and adjacent residents and businesses over a prolonged period, and would detract from landscape features along the corridors.

The Modal Alternative would also have long-term effects on visual resources from the additional pavement and added width of highway structures (interchanges, ramps, bridges), as well as noise

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[1] This analysis is based on the use of FMMP databases (California Department of Conservation, 2000) and does not include field verification of the listings.

[2] K-rails are concrete barriers used to separate travel lanes from construction areas.

barriers, retaining walls, and open cuts in steep terrain. Dominant landscape characteristics within the study area would be changed along extensive stretches of highway that traverse a variety of landscape types. These landscape changes may not be considered significant individually because they are additions to existing infrastructure. When the alterations are combined with projects in other corridors in the five regions, however, the Modal Alternative could contribute to substantial cumulative visual effects over the next 17 years, by which time the improvements are expected to be completed and in operation. In the natural open space and rural landscapes, widening a narrow two- or four-lane highway would have direct visual impacts and could contribute to cumulative visual impacts on the line, form, texture, and color of the highway. Expanding runways for airports would enlarge areas of visual effect and increase the presence of airports in the landscape. Within the suburban and urban areas, the Modal Alternative could alter the existing landscape and thereby contribute to potential cumulative visual impacts from expanded airports, widened highways, elevated portions of highway, and added noise walls.

The proposed HST Alternative could also contribute to both short- and long-term potential cumulative impacts on visual resources. Construction of the system would have short-term potential impacts on visual resources, similar to those described above for the Modal Alternative. Construction equipment, staging areas with construction materials, signage, and night lighting would be visible from adjacent properties and roadways during the construction period. The number of years such disruptions would continue would be similar for the Modal and HST Alternatives (i.e., about 10 to 17 years system-wide; however, potentially a few months to 2 years for most local areas).

Long-term visual changes would result from the introduction of 700 mi (1,127 km) to 750 mi (1,207 km) of a new transportation system that would be visible along many major highways and rail corridors connecting the metropolitan areas of the state. The track, catenary, fencing, soundwalls (where included), elevated guideway (where included), and trains themselves would introduce a linear element into the landscape that could contribute to potential cumulative visual impacts when considered with the strong linear element of the existing highway, rail facilities, and transmission lines that the HST would parallel for much of the system. HST lines in new corridors could have significant cumulative effects on visual resources. The significance of the visual change would vary by location, depending on the sensitivity of the landscape and the compatibility with existing landscape features.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to aesthetic and visual resources, as discussed in Chapter 3 (Sections 3.9.6, 3.9.7), include design practices that will incorporate local agency and community input during subsequent project level environmental review in order to develop context sensitive aesthetic designs and treatments for infrastructure. Mitigation measures may also be applied through project level environmental review and could include design of facilities that integrate into landscape contexts, reducing potential view blockage, contrast with existing landscape settings, and light and shadow effects.

I. PUBLIC UTILITIES

Construction of multiple linear facilities (e.g., highway expansions, rail extensions, pipelines, transmission lines) and other reasonably foreseeable future projects in the study area would create cumulative impacts on public utilities and future land use opportunities because of right-of-way needs and property restrictions associated with these types of improvements, as discussed in Chapter 3 (Section 3.10.3). These multiple facilities would place constraints on future development, including future development of public utilities. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to public utilities would occur.

Although the Modal Alternative would not result in construction of new linear facilities and the HST Alternative would utilize a large amount of existing right-of-way, extensive utility relocation with either alternative could cause a considerable contribution to cumulative impacts on public utilities. Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to public utilities, as discussed in Chapter 3 (Sections 3.10.6, 3.9.7), include design practices that will avoid potential conflicts, at the project-level analysis, to the extent feasible and practical. At the project-level, coordination with utility representatives during construction in the vicinity of critical infrastructure will occur. Design methods to avoid crossing or using utility rights-of-way include modifying both the horizontal and vertical profiles of proposed transportation improvements. Emphasis would be placed on detailed alignment design to avoid potential contribution to cumulative impacts from linear facilities on land use opportunities and to minimize conflicts with existing major fixed public utilities and supporting infrastructure facilities.

J. HAZARDOUS MATERIALS AND WASTES

Although past, present, and reasonably foreseeable future projects within the study area could cause cumulative impacts from hazardous materials and waste, neither improvements to highways and airports under the Modal Alternative nor implementation of the proposed HST Alternative would directly or indirectly generate hazardous materials or wastes. Any hazardous wastes encountered through ground-disturbing activities during construction of either alternative would be handled and disposed of in accordance with regulatory requirements. Therefore, neither alternative would cause a considerable contribution to cumulative hazardous material and waste impacts.

K. CULTURAL AND PALEONTOLOGICAL RESOURCES

As described in Chapter 3 (Section 3.12.3), it is not realistically feasible to identify or quantify the impacts to cultural and paleontological resources at a program level analysis. However, it is expected that as a result of past, present, and reasonably foreseeable future projects, there would be a cumulative impact related to cultural and paleontological resources.

The Modal Alternative has the potential to result in impacts on archaeological resources, historic structures, and paleontological resources in the five regions analyzed. Archaeological resources and historical structures would potentially be impacted by airport expansion and the expansion of existing highway rights-of-way necessary for additional lanes under the Modal Alternative. The greatest potential for impacts is on paleontological resources because there are many areas where existing highways cross formations with high paleontological sensitivity, and any construction in these areas could disrupt these resources. Regarding historic structures, although potential impacts could be mitigated for individual projects, the cumulative effects of projects along multiple corridors in a region over time could potentially affect the integrity of a historical district. Therefore, impacts from implementation of the Modal Alternative are expected to be a considerable contribution the cumulative impact to cultural and paleontological resources (Appendix 3.17-A).

The proposed HST Alternative could also contribute to potential cumulative impacts on archaeological resources, historical structures, and paleontological resources in the five regions analyzed, although fewer corridors would be affected overall. Potential impacts would likely occur in areas that cross formations with paleontological sensitivity and in areas where the HST Alternative alignments use existing rail corridors, because these corridors tend to be surrounded by historical structures and districts. In addition, like the Modal Alternative, the HST Alternative could contribute to potential cumulative impacts on historic districts combined with other projects over time. Therefore, impacts from implementation of the ModalHST Alternative are expected to be a considerable contribution the cumulative impact to cultural and paleontological resources.

Program level mitigation for the cumulative impacts to cultural and paleontological resources, as discussed in Chapter 3 (Section 3.12.6) relate to avoidance measures through identification of sensitive resources within the project level analysis and project design refinement and careful selection of alignments. At a program level, continued consultation with SHPO would occur to define and describe general procedures to be applied in the future for fieldwork, method of analysis, and the development of specific mitigation measures to address effects and impacts to cultural resources, resulting in a programmatic agreement between the Authority, FRA and SHPO. In addition, consultation with Native American tribes would occur. Subsequent project-level field studies to verify the location of cultural resources would offer opportunities to avoid or minimize direct impacts on resources, based on the type of project, type of property, and impacts to the resource (see Chapter 3, Section 3.12.6 for more detail on particular mitigation measures that should be applied through project-level environmental analysis.

L. GEOLOGY AND SOILS

As described in Chapter 3 (Section 3.13.3), although it is expected that planned projects within the study area would incorporate safeguards as part of the development, design, and construction process, it would not be possible to eliminate or mitigate all geologic hazards. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to geology and soils would occur.

Both the Modal and HST Alternatives could impact slope stability in various proposed locations of cut and fill. Some construction activities, such as placing a building or fill material on top of a slope or performing additional cuts at the toe of a slope, can decrease the stability of the slope. These activities, when combined with similar activities from other projects in the region, could cause a considerable contribution to the cumulative impact to geology and soils related to slope stability in areas susceptible to slope failure. Pumping or construction dewatering associated with the Modal and HST Alternatives in segments with tunneling or extensive earthwork would potentially impact the ground surface and could result in subsidence at some locations. This could cause a considerable contribution to cumulative impacts to geology and soils related to subsidence if other projects under construction in the area also needed to dewater from the same drainage basin.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to geology and soils, as discussed in Chapter 3 (Sections 3.13.5, 3.13.6), include design practices to prepare extensive alignment studies to ensure that potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas, will be avoided. Mitigation for potential impacts will be developed on a site-specific basis, based on detailed geotechnical studies to address ground shaking, fault crossings, slope stability/landslides, areas of difficult excavation, hazards related to oil and gas fields, and mineral resources.

M. HYDROLOGY AND WATER RESOURCES

As described in Chapter 3 (Section 3.14.3), although it is expected that impacts to hydrologic and water resources from planned projects within the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts to hydrology and water resources. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to hydrology and water resources would occur.

Improvements to transportation infrastructure associated with the Modal Alternative (primarily additional highway lanes and airport runways) would significantly encroach into sensitive hydrologic resources, including approximately 5,500 ac (2,226 ha) of floodplains, approximately 39,520 linear ft (12,045 linear m) of streams, and approximately 25 ac (10 ha) of lakes, and approximately 32,000 ac

(12,950 ha) of groundwater areas. New infrastructure associated with the Modal Alternative would add approximately 4,640 total ac (1,878 total ha) of impervious surface within the study area (100 ft [30 m] from the centerline of proposed alternative corridors and direct footprint of facilities, including corridors and facilities that would undergo upgrades/expansions), which would decrease groundwater recharge and increase stormwater runoff and flooding potential. Therefore, implementation of the Modal Alternative could cause a considerable contribution to potential cumulative impacts on hydrologic resources.

The proposed HST Alternative could also contribute to potential cumulative impacts on hydrologic resources but to a lesser extent than the Modal Alternative (up to 3,873 ac [1,567 ha] of floodplains, 32,400 linear ft 32,400 linear m] of streams, and 27 ac [11 ha] of lakes, and 17,113 ac [6,925 ha] of groundwater areas). The amount of impervious surface associated with the HST Alternative would be much less than that of the Modal Alternative because much of the HST facilities would consist of permeable fill (an estimated 30% of the alignment would be elevated or in tunnel). Design characteristics such as a relatively narrow alignment width and fewer columns required to support HST structures than modal structures would result in fewer hydrologic impacts. Depending on specific designs, the improvements under the HST Alternative could have fewer impacts on floodplain and surface water resources than the Modal Alternative; however, implementation of the HST Alternative could cause a considerable contribution to potential cumulative impacts on hydrologic resources.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to hydrology and water resources, as discussed in Chapter 3 (Sections 3.14.5, 3.14.6), include design practices to maximize use of existing rights-of-way to minimize potential impacts on water resources. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to flood plains; surface waters, runoff, and erosion; and groundwater.

N. BIOLOGICAL RESOURCES AND WETLANDS

The analysis of potential impacts on biological resources and wetlands includes sensitive plant communities, sensitive habitats of concern, special-status species, marine and anadromous fish habitat, riparian corridors, wildlife habitats, wildlife movement corridors, jurisdictional wetlands, and waters of the U.S. that would require a permit under Section 404 of the Clean Water Act (and would also require documentation of compliance with EPA's Section 404b(1) Guidelines) . As described in Chapter 3 (Section 3.15.3), although it is expected that impacts to biological resources and wetlands from planned projects within the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts to biological resources and wetlands. This would be in addition to existing biological habitat losses that have occurred as well as the estimated 90 percent of wetlands already lost in California due to past development (see Silva, ed., Can We Save the Last 7 percent of California's Wetlands?, 1 Envtl. Monitor 2 (1990)). Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to biological resources and wetlands would occur.

The additional land required and the linear features added under either the Modal or HST Alternative could cause a considerable contribution to the potential for cumulative impacts on biological resources and wetlands throughout the study area (1,000 ft [305 m] on either side of alignment centerlines and around stations in urbanized areas, 0.25 mi [0.40 km] on either side of alignment centerlines and around stations in undeveloped areas, and 0.50 mi [0.81 km] on either side of alignment centerlines and around stations in sensitive areas) in the five regions evaluated.

The Modal Alternative would have potential impacts on sensitive biological resources and wetland habitats. The additional highway lanes, and widening of bridges and overpasses associated with the Modal Alternative would affect approximately 1,476 ac (597 ha) of sensitive habitat, 100 ac (40 ha) of wetlands, and 90 special-status species throughout the study area. Additionally, there would be potential impacts on existing wildlife movement corridors and marine/anadromous fish resources. Therefore, when combined with the potential impacts of other highway, water, and conventional rail projects in the five regions, the Modal Alternative could contribute to potential cumulative impacts on these same resources.

Similar to the Modal Alternative, the HST Alternative would potentially have impacts on sensitive biological resources and wetlands and could contribute to potential cumulative impacts on these resources when combined with other foreseeable projects (Appendix 3.17-A) in the five-region study area. Portions of the HST Alternative would use existing rail alignments and would therefore not result in direct disturbance of sensitive habitats. The potential for indirect noise effects on biological resources is addressed in Section 3.4, Noise and Vibration. Although there is a potential for cumulative impacts on biological resources from increased noise from projects in specific areas, the information for assessing this potential additive effect cannot be considered at this program level of analysis and would be addressed when site-specific analysis is completed in a subsequent phase of evaluation.

The additional embankments and bridges associated with the proposed HST Alternative would potentially affect approximately 1,201 ac (486 ha) to 1,568 ac (635 ha) of sensitive habitat, 30 ac (12 ha) to 89 ac (36 ha) of wetlands, and 67 to 84 special-status species throughout the study area. Wildlife movement corridors may be affected where the HST alignment would not be in an existing rail or highway corridor and would traverse a natural area (e.g., Diablo Range in the Bay Area to Merced region) or where there is habitat use in existing rights-of-way (where wildlife movement occurs across roads and rail lines where fences are not obstructing movement).

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to biological resources and wetlands, as discussed in Chapter 3 (Sections 3.15.5, 3.15.6), include design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. The HST Alternative would generally be located within or adjacent to existing transportation corridors or would be in tunnel or elevated through mountain passes and sensitive habitat areas. During project-level environmental review, field studies would be conducted to verify the location, in relation to the HST alignments, of sensitive habitat, wildlife movement corridors, and wetlands. These studies would provide further opportunities to minimize and avoid potential impacts on biological resources through changes to the alignment plan and profile in sensitive areas. For example, the inclusion of design features such as elevated track structures over drainages and wetland areas and wildlife movement corridors would minimize potential impacts to wildlife and sensitive species.

O. SECTION 4(F) AND 6(F) RESOURCES (PUBLIC PARKS AND RECREATIONAL RESOURCES)

As discussed in Chapter 3 (Section 3.16), Section 4(f) and 6(f) Resources include publicly owned parklands, recreation lands, wildlife and waterfowl refuges, and historic sites that are covered by Section 4(f) of the DOT Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965. Although it is expected that impacts to 4(f) and 6(f) resources from planned projects within the study area would be limited through incorporation of typical design and construction practices to avoid these resources, it would not be possible to eliminate or mitigate all impacts. Therefore, based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to 4(f) and 6(f) resources would occur.

The expansion of existing highway and airport networks associated with the Modal Alternative would potentially impact approximately 147 various types of Section 4(f) and 6(f) resources (i.e., parkland and recreational resources). When combined with the impacts of other highway and transit expansion projects in the region, the potential impacts of the Modal Alternative could cause a considerable contribution to potential cumulative impacts on parklands and recreational resources throughout the study area.

The proposed HST Alternative could also contribute to the cumulative impact on parkland resources. The impacts on parkland resources from the HST Alternative would be less extensive than the Modal Alternative, since it is possible to plan the HST alignment, stations, and other facilities with the intent to avoid or minimize potential effects by routing the train around, above, or below an identified resource. Depending on the system of alignment options selected, the HST Alternative could result in impacts on 46 to 96 parkland resources. When combined with the impacts of other highway and transit expansion projects in the region, the potential impacts of the HST Alternative could cause a considerable contribution to potential cumulative impacts on parklands and recreational resources throughout the study area.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to 4(f) and 6(f) resources, as discussed in Chapter 3 (Sections 3.16.6, 3.16.7, 3.16.8), include design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. During project-level environmental review, field studies would offer the opportunity to avoid or minimize direct or indirect impacts on parklands by making adjustments in the alignment plan or profile. In the event that, during project level environmental analysis, it is determined that the alternative cannot avoid being located in close proximity to 4(f) and 6(f) lands, mitigations related to natural, cultural, aesthetic, and recreational impacts would be incorporated, including compensation for temporary and permanent loss of park and recreation uses; inventory and recordation of historic features removed; and provision of alternative shuttle access for park visitors; restoration of park features post construction.

3.18 CONSTRUCTION METHODS AND IMPACTS

This section describes the construction methods and related types of effects considered for the No Project, Modal, and High-Speed Train (HST) Alternatives within the five project regions. These construction methods are the basis for assessing and qualifying the potential environmental impact from construction activities. These construction methods would be applied to prepare, construct and implement typical highway, airport and HST alignment improvements that make up the alternatives.

3.18.1 Construction Method Approach

This section identifies the types of construction (highway, airport, and rail alignment) associated with the alternatives, describes the typical construction sequence and methodology for each type of construction, and discusses potential construction related impacts. The construction of highway improvements are a common element of the No Project, HST and Modal Alternative. Improvements that make up the alternatives are grouped by type of construction and their relationship to the system alternatives indicated in Table 3.18-1.

TABLE 3.18-1
System Alternative Construction Types

	System Alternative		
Improvement Type	No-Build	High Speed Train	Modal
Expanded Highway	X	X	X
Airport Runway			X
Airport Terminal			X
HST Alignment		X	
HST Station/Facility		X	

X = Common construction type.

3.18.2 Highway Improvements

Improvements to existing highways that are planned and programmed are included in the No Project, HST and Modal Alternatives. The Modal Alternative includes many additional improvements that add lanes to existing highways. Improvements to existing highways include:

- safety improvements
- straightening the alignment
- interchange improvements
- Access and terminal/station road improvements
- limiting access
- adding ramp meters
- adding a truck climbing lane
- adding new auxiliary lanes
- adding new HOV lanes
- adding new general use lanes

3.18.3 Highway Improvements

A. CONSTRUCTION WORKSITE CHARACTERISTICS

The worksite for a highway capacity improvement project is the existing highway right-of-way and additional right-of-way (including any temporary construction easements) that has been acquired for the project. The defining characteristic of this worksite is the need to maintain traffic on the existing highway during construction of the improvement.

During construction, traffic is first shifted to one side of the existing roadway while the opposite side is improved (new retaining walls and pavement installed to widen the roadway, barrier installed or replaced, etc.), then traffic is shifted back onto the newly improved portion while the other side is improved. Operational issues associated with construction are complicated and require significant coordination with the contractors and responsible agencies.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Mobilization and site preparation – Clear any remaining existing buildings or other improvements from any new right-of-way.
- Initial traffic control phase – Implement a plan for the temporary protection and direction of traffic. The initial traffic control plan phase would probably include construction of new sound walls along the new edge of right-of-way.
- Repeat for each traffic control phase – Remove the portions of existing structures scheduled to be removed during the current traffic plan phase; construct the portions of new structures and bridges, existing structure widening and existing embankment widening or excavations scheduled to be built during the current traffic plan phase; widen pavement and install temporary pavement markings. Repeat for the next phase of the traffic control plan.
- Final traffic control plan phase – Construct new pavement wearing surface across entire width of each direction of roadway and install final pavement markings.
- Finishes – Construct elements such as signage and landscaping (this phase may start prior to the final traffic control phase).

Mobilization and Site Preparation

The key mobilization activity would be to develop a traffic control plan for the temporary protection and direction of traffic. If the capacity improvement project is expanding the highway right-of-way, site preparation would include clearing the new right-of-way of conflicting structures, obstructions and utilities. If the project does not include new right-of-way, little site preparation work can be started until a plan for the traffic plan is implemented.

Minor capacity improvement projects generally don't require sufficient excavation or embankment to justify developing new material sources or waste sites. Major highway widening may justify opening (or more likely re-opening) a quarry or other aggregate source, and setting up a rock crusher. A project that includes replacement of the existing structures or pavement may well include an aggregate (pavement) crushing plant to recycle used pavement into new aggregate. The crushing plant would not be mobilized until sufficient material has been removed to allow for several months of continuous operation. (If the project doesn't require recycling, then the waste material would be disposed of by the contractor, either as embankment material or at a disposal site.)

Initial Traffic Control Phase
Each traffic control phase would shift traffic away from that phase's work zone, and install temporary barriers to protect workers in the work zone from traffic. The shift can require some combination of closed lanes, narrowed lanes, and use of the pavement shoulder for through traffic.

Earthwork
The contractor would construct the retaining walls, embankments and excavations required. The design would attempt to balance cut and fill requirements, but severe terrain or urban conditions may require imported fill or exported cut material. If the overall schedule permits, the embankments would be allow to consolidate for a year or two before pavement is placed on them. The contractor would route existing drainage that crosses the alignment through new and extended pipes or box culverts. The contractor would install inlets and pipes detention basins and outfalls for roadway drainage.

Structures
The contractor would construct grade separation, drainage and other bridges or concrete boxes required.

Pavement
The contractor would finish grading the new roadbed, install subbase, base rock and bridge approach slabs, and may pave the new roadway. The new pavement would drain to the inlets previously constructed. The contractor would construct any transition sections required. The contractor would install pavement markings on the completed roadway.

Repeat For Each Traffic Control Phase
Subsequent traffic control phases would shift traffic onto the completed portion of the work to create a new work zone. The contractor would construct/reconstruct the portion of the pavement and structures in the new work zone then shift the traffic to a new traffic control phase until all new pavement and structures are complete.

Final Traffic Control Plan Phase
For some roadway widening, when temporary barrier removed, the contractor would overlay a new pavement wearing surface across the entire roadway width. This paving could be done at night, when traffic volumes are reduced, and may take several nights. The contractor would install temporary pavement markings as the new top lift is installed. The contractor would install permanent markings after the new wearing course has aged for a week.

Finishes
Construction of the new pavement wearing course and markings may complete the project. Or construction may continue with shoulder barriers, signage and landscaping.

C. TYPICAL CONSTRUCTION IMPACTS

The impacts of any single capacity improvement project would be localized. The impacts of a program of capacity improvements underway at more or less the same time would increase, not only because of the longer work zones but also because a multitude of projects too small individually to develop their own sources may overtax commercial suppliers of aggregate and paving materials. Typical impacts may include:

- Traffic plan lane closures and lane narrowing would divert more traffic demand than would be added as a result of construction traffic.

- The existing roadway drainage would be disrupted during construction. The construction contractor would use silt fences, hay bales and other measures to control run-off and erosion.
- Roadway widening would generate waste pavement and waste structural concrete that would either be placed in landfills or recycled.
- Most roadway widening activities would not increase the ambient highway noise level. Demolition and pile driving are inherently noisy, and would be audible, but would also be of comparatively short duration.
- Much of the work setting up the traffic control phases, demolishing existing structures and final paving would take place at night, when traffic volumes are less. The night worksites would be illuminated, and the illumination may have an impact on adjacent land uses.

This section applies to the airside improvements contemplated in the Aviation element of the Modal Alternative. The purpose of the improvements would be to increase one measure of airport capacity – the number of aircraft take-offs and landings per hour – and hence the number of available passenger seats between northern and southern California. If a new runway has sufficient separation from existing runways to permit simultaneous operation, the new runway would increase airport capacity. Expanding (lengthening, widening and increasing the runway structural capacity) an existing general aviation runway could also increase an airport's commercial capacity, again only if the expanded runway is sufficiently separated from other runways to increase the number of operations.

D. CONSTRUCTION WORKSITE CHARACTERISTICS

The worksite for a new runway would be a large parcel of land contiguous with the existing airfield. Since most of the airports considered in the Modal Alternative are surrounded either by airport or commercial development or San Francisco Bay, assembling the land for a new runway would be an institutional challenge. The construction challenges would be to relocate conflicting streets and utilities, clear the site of structures, and remediate any site contamination. If the new runway is to be constructed on reclaimed land, then constructing a stable fill could be another construction challenge.

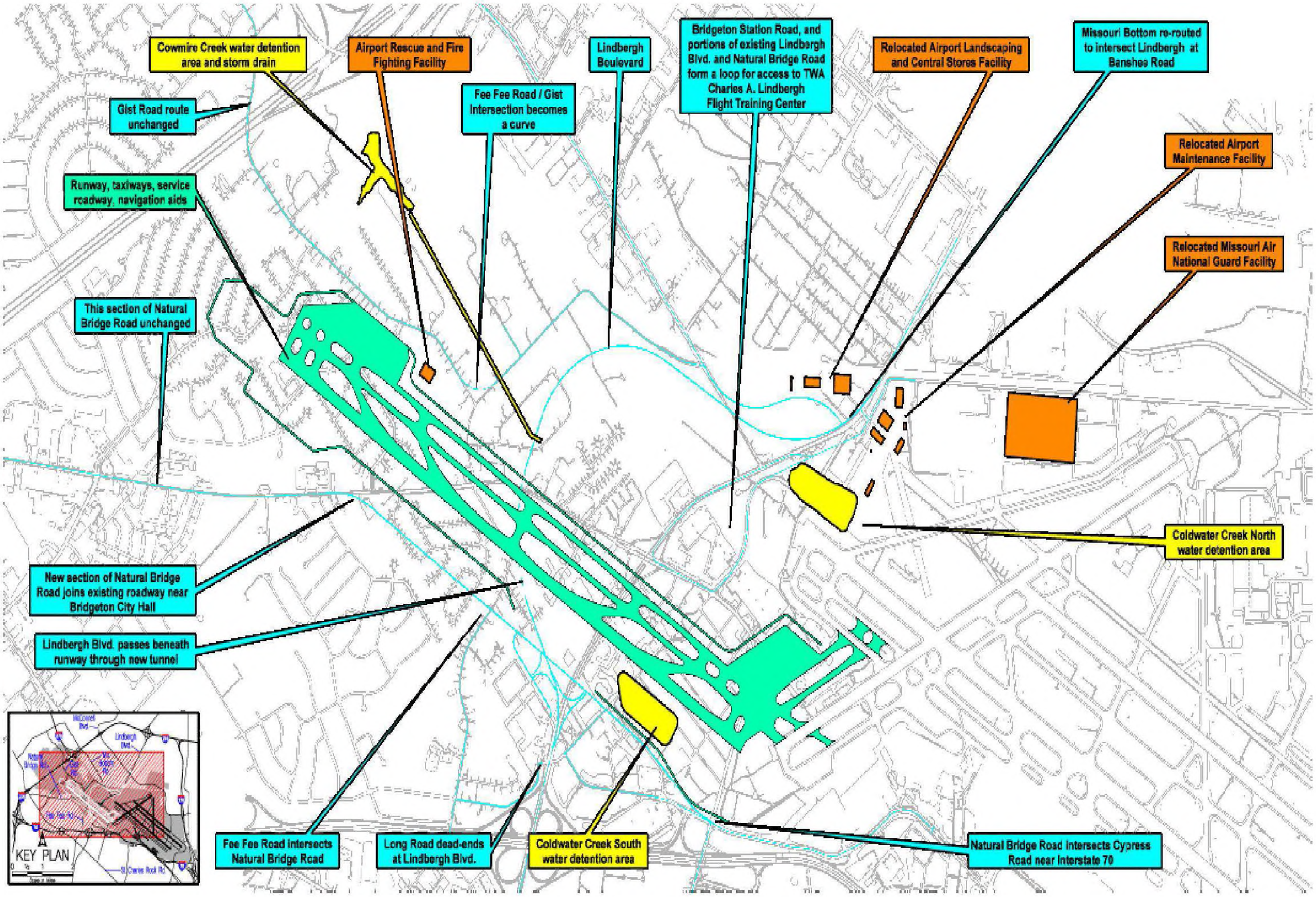
Because of the separation between runways required for simultaneous operation, there would be limited interference between new runway construction and ongoing airport operations. The new runway and associated taxiways would connect to the existing taxiway system, and that connection would have to be carefully staged to avoid interference. But the bulk of the new runway work would be sufficiently removed from airport operations so as to not limit construction. The magnitude of a new runway project is illustrated on Figure 3.18-1.

E. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Site Preparation – Extend (construct) new airport perimeter fencing around the new runway and a temporary barrier between the worksite and the active airfield. Clear existing buildings from the site and remediate any hazardous contamination. Construct any street relocations remote from the new runway that are a part of the program.
- Earthwork and Box Structures – Construct drainage and embankments for the new runway. Construct any structures to carry service or public roads under the new runway, and relocate the roads through the completed boxes.
- Runway Structure – Construct the new runway pavement structure. Connect the new taxiways to the existing taxiway system.
- Finishes – Construct elements such as striping, signage and lighting.

Figure 3.18-1
Representative New Runway in an Urban Airport (Lambert-St Louis International Airport)



Site Preparation

The contractor would construct any new streets around the airport perimeter, shift traffic, and close any existing streets through the new runway site. (If a street is to be relocated through a box under the new runway, then the contractor would maintain the surface street in service until the new box is constructed in the Earthwork and Box Structures phase below.)

The contractor would extend the airport perimeter fencing around the additional land required for the new runway site, and construct a temporary barrier between the worksite and the active airfield. The contractor would remove existing buildings, abandoned utilities, pavement and other improvements from the new runway site, and remediate any hazardous contamination.

If the new runway or associated taxiways displace an aircraft fuel tank farm or aircraft fuel pipelines, the contractor would place the replacement facilities in service before removing the conflicting portions of the existing system.

The contractor would set up a construction yard and a recycled pavement crusher and Portland cement concrete batch plant on a portion of the site.

Earthwork and Box Structures

If the new runway program includes a box under the runway for a private (airport) or public road, rail line, or other use the contractor would construct the new box and any associated roadway drainage pump station. The contractor would construct/extend the embankments for the new runway, and backfill over the road box, if present. The contractor would construct/extend the airfield drainage system, including detention basins if required. If any other airport utility systems cross the new runway or associated taxiways, the contractor would install those utilities before constructing the runway pavement.

Runway Structure

The contractor would finish grade the new runway and associated taxiways, install subbase and base aggregate, and pave the new runway. The contractor would tie the new runway taxiways to the existing airfield taxiways.

Finishes

The contractor would install striping, lighting, signage, landscaping and any other finish elements.

F. TYPICAL CONSTRUCTION IMPACTS

The land acquisition impacts may be substantial. Because of the large amount of land required for a new runway, and hence distance to the property line and surviving neighbors, the construction impacts would be comparatively minor. Other impacts may include:

- The construction trips generated by the new runway project may well be less than the trips generated by the land uses displaced by the new runway land acquisition program.
- Existing drainage would be disrupted and excavation or embankment faces would be vulnerable to erosion during construction. The construction contractor would use silt fences, hay bales and other measures to control run-off.
- There would be substantial volumes of demolition debris from the site preparation phase. If the existing pavement is recycled for aggregate or embankment material, the volume of waste would be reduced.
- The new runway construction noise would generally be lost in the ambient airport noise.
- While the connection of new taxiways associated with the new runway to the existing airfield taxiway network may require night work, night work on the airfield would have no effect beyond the airport perimeter.

3.18.4 Existing Airport Passenger Terminal Improvements

This section applies to the construction landside improvements at existing airports proposed in the Aviation element of the Modal Alternative. Airport landside improvement program would include terminal and parking improvements, while access roadway improvements are covered in Section 3.18.2 Existing Highway Improvements.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

A unique characteristic of existing airport terminal construction is the need to maintain capacity and passenger levels of service during the construction activities. Unlike highways where traffic can be diverted to other facilities during construction, airports must be able to accommodate demand and operations because passengers cannot typically be diverted to other facilities. As a result, airport terminal construction requires significant coordination and planning to accommodate safe and convenient access for air passenger and no-disruptions to operations.

The worksite for a new terminal, terminal expansion or parking expansion would most likely be a constrained parcel of land with limited contractor access and heavy passing traffic. Little more than the footprint of the new structure would be available for the contractor's exclusive use. Because of limited space at the worksite, the contractor would need a separate construction yard. The airport authority may furnish a site on airport property but remote from the terminal(s) for use of the contractor, or the contractor may have to secure a yard site on its own.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Demolition and Site Preparation – Abandon existing parking or construct detour roadways as necessary to shift traffic from the worksite. Construct new entrances to existing terminal if necessary. Close the portion of existing structures (terminals or parking garages) to be removed. Construct/install construction fence and barriers. Demolish existing structures on the worksite.
- Structural Shell and Electrical/Mechanical Rough-In – Construct foundations and structural frames. Construct walls or garage parapets. Rough-in electrical and mechanical systems.
- Finishes and Tenant Improvements – Install electrical/mechanical equipment. Install jet ways. Install finishes and communications equipment. Construct tenant improvements.

The actual construction sequence may have several additional steps if the airport authority determines that it needs to stage construction, such as completing and occupying a portion of the new work before removing the last of the existing structure for replacement.

Demolition and Site Preparation

The contractor would construct detour roadways, new terminal entrances and other elements required to take existing facilities in the worksite out of service. The other elements could be as significant as constructing a new utility company primary service and switchgear if the existing facility is in the way of the expansion.

The contractor would close the roadway, parking or portion of the terminal to be removed, install construction fences or barriers, and demolish the existing improvements. If the existing improvements include buildings or aircraft taxiways with fuel piping, remove and hazardous materials and remediate any contamination.

Structural Shell and Electrical/Mechanical Rough-In

The contractor would construct foundations and the structural frame of the new terminal or parking structure. The contractor would enclose the new building or install garage parapets and connect the structure to site utilities. The contractor would rough-in electrical and mechanical systems, and install specialty items such as elevators, escalators, and baggage handling equipment.

Finishes and Tenant Improvements

The contractor would install electrical and mechanical equipment, including jet ways and aircraft fueling piping, if required. The contractor would install communications and security equipment, finishes and signage. The airport authority contractor may install tenant improvements, or airlines and other tenants may have their own contractors construct tenant improvements.

C. TYPICAL CONSTRUCTION IMPACTS

The largest impact would be the daily disruption of airport activities. Because of the size of airports, there would be little construction impact outside of the airport site. Others impact may include:

- Because of the tight spaces in the terminal area and existing terminal traffic, the additional construction traffic would be a problem.
- The worksite is most likely already covered by impermeable surfaces. The contactor must take care to maintain or replace the existing utilities as called for in the construction documents, but with care drainage should not be a problem.
- There would be substantial volumes of demolition debris from the site preparation phase.
- Except for pile foundations, construction noise would generally be lost in the ambient airport noise.
- While there may be a significant amount of work scheduled for overnight periods, when the contractor can close airport circulation lanes, night work in the terminal area would have no effect beyond the airport perimeter.

3.18.5 High Speed Rail Alignments

This section applies to the High-Speed Train alternative and the new construction associated with track alignment, stations, maintenance facilities, and system elements. The alignment would include at-grade, aerial, bridge, and tunnel components.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

In most locations, particularly in urban areas, the worksite (new high speed rail alignment) would be close to existing railroad tracks or highway facilities. However in some locations, the worksite would follow a new alignment independent of existing railroad or highway infrastructure through undeveloped areas.

Figure 3.18-2
High-Speed Train Corridors and Stations for Continued Investigation

The new trackway, and worksite, would have three primary characteristics in high speed segments – long tangent sections connected by very large radius horizontal curves, long sections of constant grade connected by long vertical curves, and underpasses or overpasses where ever the trackway crosses any other surface transportation alignment (street or highway, railroad track, etc). In urban areas the curves are generally reduced due to development constraints, yet the curves are generally greater than the existing highway alignments.

In some locations, such as the Central Valley, the topography simplifies construction of a high speed rail trackway. The major construction effort would be to clear obstructions from an appropriately straight alignment, and to construct grade separation structures to carry crossing roads and other railroads over or under that alignment.

In other locations, especially where the high speed rail system crosses mountain ranges, the topography would challenge the construction of a high speed rail trackway. In challenging terrain the major construction effort would consist of reshaping the earth (earthwork/cut and fill), and constructing bridges and tunnels to cross over or under the existing ground surface where it is impractical to achieve the alignment geometry through reshaping.

There would be additional infrequent, but important, worksites along the alignment. These additional worksites include:

- Permanent sites such as passenger stations and terminals
- A central control facility
- Revenue service vehicle storage and maintenance facilities
- Maintenance-of-way shops and non-revenue vehicle storage
- Traction power substations and signal/communications bungalows
- Tunnel ancillary structures (tunnel emergency egress/access points, tunnel ventilation buildings, tunnel drainage pumping plants, etc).

In addition, there would be temporary (construction related) sites such as:

- Access roads and yards
- Embankment material and aggregate source sites
- Tunnel spoil and other excavation material disposal sites
- Rail welding, aggregate crushing, Portland cement concrete and asphaltic concrete plant sites.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Mobilization and Site Preparation – Clear the alignment of conflicting improvements, including existing buildings and existing utilities if not already removed, and mobilize for construction, including establish construction yards, build site access roads if necessary, develop aggregate sources and embankment material borrow pits, and prepare excavation material and tunnel spoil waste sites.
- Heavy Civil Construction – Construct the trackbed, including embankments, cuts, bridges or tunnels, construct crossing highway or railroad grade separation structures if not already in place; also construct supporting facilities, including central control building, vehicle maintenance buildings and storage yards, passenger stations, etc.
- Railroad Systems Construction – Construct trackwork and special trackwork, traction electrification, RR signaling and communications, on the trackbed and at the supporting facilities.
- Finishes – Construct elements such as signage and landscaping (this phase would overlap with railroad systems installation and system testing).
- System testing, culminating with a period of simulated revenue service.

Mobilization and Site Preparation

Construction of the high speed rail system would require a large workforce, a large fleet of construction equipment, large quantities of aggregate and embankment materials, and a large number of manufactured products. This initial phase would develop the construction yards and other temporary infrastructure required to assemble and organize these construction resources. The Authority's right-of-way acquisition program may have cleared the right-of-way of existing improvements (primarily buildings and utilities). If the existing improvements have not already been removed, the contractor would remove them during this phase.

During the construction mobilization phase, the contractor would set up construction yards to receive equipment and products; prepare sources (i.e. quarries and borrow pits) for aggregate and embankment materials, and cut pioneer roads as necessary to reach remote work sites (tunnel portals & shafts, bridge piers). The contractor would also remove or relocate any conflicting existing improvements (buildings, utilities, roads, track) that remain on the right-of-way.

Heavy Civil Construction

Construction of the high speed rail system would reshape a strip of land 40 to 100 ft wide to create a trackbed meeting the systems horizontal and vertical alignment requirements. (The width of the strip of land would be greater at special locations such as passenger stations or vehicle maintenance facilities.) The trackbed would be grade separated – all crossing roads and tracks would cross over or under the trackbed. Where the terrain is too severe, or the crossing roadways and other tracks to numerous, bridges or tunnels would carry the trackbed over or under the terrain.

Reshape the earth means that the contractor would remove the existing vegetation and topsoil, excavate further down (below the topsoil) or would bring in embankment material and construct engineered fill as necessary to reach the design subgrade elevation, and cap the subgrade with compacted crushed aggregate subballast. The contractor would construct drainage ditches or subdrains on either side of the alignment. The contractor would construct discharges from the ditches and subdrains at appropriate points.

Grade separated means that other facilities such as (existing or future roads, tracks, cattle paths, etc) would cross the alignment above or below the high speed rail tracks.

In any of these grade separation cases, the contractor would build grade separation structures and roadwork or trackwork on or though the structures during the heavy civil construction phase. If the structure carries the high speed rail alignment over the crossing road or track, the structure would be constructed prior to the trackbed. If the structure carries the crossing road or track over the high speed rail alignment, the structure could be constructed either before or after the trackbed. Grade separation construction would sometimes include the modification of existing or construction of new traffic signal systems.

To construct a grade separation bridge, the contractor would remove the existing vegetation and topsoil under the future structure, construct foundations under piers and bridge abutments, construct piers and abutments, construct the bridge superstructure (girders and deck), and install finish elements such as approach slabs, metal railings or solid concrete parapets. The foundations and superstructure types for any bridge would be selected in the design phase based on site-specific conditions from menus of likely foundations and superstructures. The foundation menu includes:

- Spread footings,
- Driven or drilled piling covered with a pile cap
- Cast-in-drilled-hole (CIDH) piers.

The superstructure menu includes:

- Steel or pre-cast concrete girders supporting a deck slab or,
- A cast-in-place or pre-cast concrete box with a deck slab integrated into the main girder.

Pre-cast concrete girders would also be pre-stressed; cast-in-place concrete boxes may be pre-stressed or reinforced without pre-stress.

To construct a grade separation cut-and-cover concrete box, the contractor would excavate to an elevation below the future box, then construct the box bottom slab, walls and roof, backfill the sides and over the top of the completed box, and install finish elements such as lighting.

Construction of any of these structures would require heavy equipment access to the site and maneuvering room. In addition, the cast-in-place concrete box option would require falsework to support the formwork that shapes the structure.

Bridges over severe terrain could be similar to grade separation bridges, or because of the difficulty in locating intermediate piers, severe terrain bridges could require more elaborate long span or pre-cast segmental superstructures. While special superstructures could reduce the access requirements for intermediate piers, they would still require access to both abutments and possible larger abutment work areas to prepare girders for launching across the ravine being bridged.

Tunnels through severe terrain must be excavated from headings. If the tunnel is short (up to six miles in length), it might be reasonable to construct it from a single heading. The identified preferred system has no tunnels longer than six miles

At each tunnel heading access site, there must be sufficient work area to accommodate:

- Worker and equipment staging
- Tunnel utility infrastructure (fresh air supply, compressed air, water, electric power and tunnel drainage)
- Tunnel spoil surge piles
- Storage of excavation support materials (steel ribs, rock bolts and shotcrete, pre-cast liner panels, etc).

There must be room to transfer materials going into the tunnel from trucks to tunnel railcars, and to transfer spoil coming out of the tunnel from tunnel railcars or conveyor belts to trucks. These heading access site requirements are generally independent of the excavation method (tunnel boring machine, drill and blast, or road-header) or number of tunnel bores (two single track tunnel or one double track tunnel).

After the tunnel is excavated, many of the tunnel construction access sites would become permanent tunnel support sites, such as ventilation plants, pump stations, traction power substations, emergency access points, etc.

To avoid or limit potential impacts along the surface above the tunnels, the proposal includes limiting surface access for ventilation and/or evacuation through tunnel design. The potential impacts associated with construction access roads would be greatly limited, and avoided altogether in some segments, by using in-line construction, i.e., by using the new rail infrastructure as it is built to transport equipment to and from the construction site and to transport excavated materials away from the construction area and to appropriate re-use (e.g., as fill material, aggregate for new concrete, etc.,) or disposal sites. To avoid the creation of access roads in sensitive areas, necessary geologic exploration using helicopter transport for drilling equipment and restoring sites after use would result in minimal surface disruption, and small pilot tunnels would be utilized where more extensive subsurface geology information is needed.

The heavy civil construction phase may also include construction of alignment elements to support the subsequent railroad systems phase:

- Construction of cable trough or duct banks
- Foundations for poles supporting the overhead contact system
- Site work for traction power substations

Railroad Systems Construction

The railroad systems include trackwork, traction electrification, signaling, and communications. (The rail vehicles are another key system, but are not discussed in this methodology.)

Trackwork includes both the typical track structure and special trackwork. Special trackwork is the track switches, frogs, crossing diamonds etc. that make up turnouts and crossovers. Trackwork is the first rail system to be constructed, and must be in place at least locally to start traction electrification and railroad signaling installation. Trackwork construction generally requires the welding of transportable lengths of steel running rail (traditionally 78 ft in length) onto longer lengths (approximately one quarter mile), which are placed in position on crossties or track slabs and field welded into continuous lengths from special trackwork to special trackwork.

Tie and ballast track construction typically requires that crossties and ballast be distributed along the trackbed by truck/tractor. In sensitive areas this operation can be accomplished with the established right of way corridor with delivery of the material via the constructed rail line, since in-line construction techniques are proposed. The top 4 inches or so of ballast can be delivered by railcar over the assembled track.

The traction electrification equipment to be installed includes traction power substations and the overhead contact system. (The running rails, which serve as the power return current conductor, are also part of the electrical circuit.) Traction power substations are typically fabricated and tested in a factory, then delivered by tractor-trailer, to a prepared site adjacent to the alignment. Substation spacing depends on the power supply technology selected, but is assumed at one substation every 30 miles per the Engineering Criteria Report, January 2004.

The overhead contact system is assembled in place over each track from components (poles, brackets, insulators, conductors and lots of hardware). The overhead contact system is connected by field wiring to adjacent substations.

The Signaling equipment to be installed includes wayside cabinets and bungalows (within established rights of way), wayside signals (at interlockings), switch machines, insulated joints, impedance bonds and connecting cabling. (The equipment supports several technologies – Automatic Train Protection, Automatic Train Control, and Positive Train Control – to control train separation, train routing at interlockings and train speed.)

The Communications equipment to be installed includes SCADA (System Control And Data Acquisition), telephone, radio, CCTV and visual messaging. The equipment is located in the system central control facility, wayside communications bungalows, passenger stations, tunnel equipment rooms, traction power substations, signal bungalows and other locations.

Communications data is would likely be carried on a fiber optic backbone running the length of the alignment.

Finishes

Landscaping, signage, architectural finishes and similar items involve different construction trades than heavy civil or railroad systems. The distinction between Finishes and earlier phases of work is important for labor and material scheduling, but not for the identification of work sites or overall construction methodology. Finishes would be installed at the same construction worksites as the earlier phases of construction, and would probably overlap the completion of the heavy civil and railroad systems work.

Testing and Start-Up

All work would be inspected and tested as stand-alone items as part of its construction. During system testing and start up, the work would be checked again to confirm that it functions as an integrated system. For example, integrated testing would confirm that the SCADA tunnel ventilation system status display at central control truly reflects the status of the ventilation systems, and that the ventilation equipment correctly responds to commands initiated at central control.

C. TYPICAL CONSTRUCTION IMPACTS

Overall, the HST construction sites would have numerous site-specific impacts on adjacent land uses. However some construction impacts would be more universal in nature. Typical impacts may include:

- The worksite would generate traffic on public roads leading to the site and on private haul routes running along the alignment or between the alignment and construction yards. The traffic would include construction worker commute traffic, delivery of construction supplies (bulk cement, asphalt, steel, fuel, manufactured products, etc) and movement of construction materials (primarily dirt from excavations to embankments and aggregate). In sensitive areas these operations can be accomplished with the established right of way corridor with delivery of the material via the constructed rail line, since in-line construction techniques are proposed.
- The worksite would be cleared of ground cover for construction. As a result, rainstorms would produce greater run-off and erosion than would otherwise be the case. The high speed rail construction contractor would use silt fences, hay bales and other measures to control run-off and erosion.
- The construction project has the potential to generate large quantities of material – from pavement demolition, clearing and grubbing, and soil/rock that is anticipated to be suitable for reuse in the construction of the proposed HST facilities. Potential uses include: aggregate for concrete and fill material for other portions of the line. The project would also generate a much smaller volume of waste – product packaging, broken equipment and site litter. The project may experience minor hydraulic fluid, motor oil and fuel spills that would result in the disposal of contaminated soil. The project may generate a comparatively tiny volume of hazardous waste from building demolition. The high speed rail construction contractor would collect and dispose of solid waste appropriately.
- Some heavy civil construction activities, notably pile driving and rock excavation with explosives, would be inherently noisy. Most construction activities would use large pieces of construction equipment, and the equipment would generate noise. Most of the construction worksite would be sufficiently remote so that construction noise would not cause adverse impacts on adjacent land uses. The portions of the worksite in urban areas may experience sufficient construction noise so as to have an impact on adjacent properties.

- Tunnel excavation would likely take place 24 hours per day. As a result, tunnel heading access sites would also be occupied 24 hours per day, and would be illuminated at night. The night-time illumination may have an impact on adjacent land uses.

Roadway grade separations would connect to active roads at both ends of the grade separation worksite. Particularly in urban areas that the surrounding areas are not sensitive to noise impacts, roadway traffic may be such that the connection work must be performed overnight, when traffic volumes are less. The night connection work, if required, would be illuminated, and the illumination may have an impact on adjacent land uses.

3.18.6 High Speed Rail Stations/Facilities

This section applies to the High-Speed Train alternative and the new construction associated with stations and maintenance facilities. These facilities would include urban and rural locations, potentially joint operated and joint developed locations, and at-grade, aerial, and underground locations. Passenger stations may include improvements to existing railroad stations and newly constructed stations. Substations and maintenance facilities would be newly constructed structures.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

In urban areas, most worksites would include expansion or improvements to existing train stations. In rural areas, most worksites would include new construction along a new alignment independent of existing railroads.

A unique characteristic of existing railroad station construction is the need to maintain capacity and passenger levels of service during the construction activities. Unlike highways where traffic can be diverted to other facilities during construction, railroad stations must be able to accommodate demand and operations because passengers cannot typically be diverted to other facilities. As a result, railroad station improvements require significant coordination and planning to accommodate safe and convenient access for passengers and no disruptions to operations.

The worksite for a new railroad station or maintenance facility would most likely be a constrained parcel of land. The footprint of the new structure and areas for parking would be available for the contractor's exclusive use. Because parking areas and tail track/storage track areas may be available, the contractor could make use of these areas as a construction yard. If necessary, adjacent land owners may furnish temporary easements for the contractor to use as a construction yard during construction.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Demolition and Site Preparation – Abandon identified areas within existing structures. Construct new entrances to existing stations if necessary. Close the portion of existing structures to be removed. Construct/install construction fence and barriers. Demolish existing structures on the worksite. For new facilities, perform earthwork, drainage work, and utility relocation/construction as necessary. For platform improvements or additional platform construction, the necessary track realignment and construction would be required.
- Structural Shell and Electrical/Mechanical Rough-In – Construct foundations and structural frames. Construct walls or platforms. Rough-in electrical and mechanical systems.
- Finishes and Tenant Improvements – Install electrical/mechanical equipment. Install finishes and communications equipment. Construct tenant improvements.

The actual construction sequence may have several additional steps if the railroad agency determines that it needs to stage construction, such as completing and occupying a portion of the new work before removing the last of the existing structure for replacement.

Demolition and Site Preparation

The contractor would construct detour roadways, new station entrances and other elements required to take existing facilities in the worksite out of service. The other elements could be as significant as constructing a new utility company primary service and switchgear if the existing facility is in the way of the expansion.

The contractor would close the roadway, parking or portion of the station to be removed, install construction fences or barriers, and demolish the existing improvements.

Structural Shell and Electrical/Mechanical Rough-In

The contractor would construct foundations and the structural frame of the new station. The contractor would enclose the new building or construct new platforms and connect the structure to site utilities. The contractor would rough-in electrical and mechanical systems, and install specialty items such as elevators, escalators, and ticketing equipment.

Finishes and Tenant Improvements

The contractor would install electrical and mechanical equipment. The contractor would install communications and security equipment, finishes and signage. The contractor may install tenant improvements, or developers and other tenants may have their own contractors construct tenant improvements.

C. TYPICAL CONSTRUCTION IMPACTS

The largest impact would be the daily disruption of station activities. There would be little construction impact outside of the station site. Other impact may include:

- Construction traffic in the vicinity of the station.
- Operations and planning coordination for platform improvements or new platforms that require trackwork realignment.
- The contactor must take care to maintain or replace the existing utilities as called for in the construction documents, but with care drainage should not be a problem.
- There may be substantial volumes of demolition debris from the site preparation phase.
- Construction noise would generally be lost in the ambient station noise.
- Night work in the urban station areas would have to be assessed for impact to residential and commercial (hotel) areas.

The additional worksites along the alignment may include:

- A central control facility
- Revenue service vehicle storage and maintenance facilities
- Maintenance-of-way shops and non-revenue vehicle storage
- Traction power substations and signal/communications bungalows
- Tunnel ancillary structures (tunnel emergency egress/access points, tunnel ventilation buildings, tunnel drainage pumping plants, etc).

4 COSTS AND OPERATIONS

4.1 INTRODUCTION

This chapter summarizes the estimated capital and operations and maintenance (O&M) costs for the Modal and High-Speed Train (HST) Alternatives evaluated in this Program EIR/EIS. To be consistent with the definition of the HST Alternative (see Chapter 2, Alternatives), the capital and O&M costs associated with the HST Alternative comprise the costs associated with only the alignment and station options that most closely reflect the "highest return on investment system" as presented in the California High Speed Rail Authority's (Authority's) final business plan (Business Plan) (California High Speed Rail Authority 2000). The O&M costs for the HST Alternative were developed based on an operations plan and network simulation model that represents the physical characteristics of the proposed HST alignment options and the performance of the proposed HST equipment.

4.2 CAPITAL COSTS

Capital costs were estimated for both the Modal and HST Alternatives in 2003 dollars. The costs are associated with infrastructure improvements defined for each alternative and do not include the costs associated with the No Project Alternative. The programmed and funded improvements included under the No Project Alternative are assumed to have been implemented by 2020 for both the Modal and HST Alternatives.

4.2.1 Modal Alternative

The total capital costs associated with the Modal Alternative include both the highway and aviation components as presented in Table 4.2-1. As described in Chapter 2, the modal improvements were defined to serve the representative (high-end) ridership demand.

Table 4.2-1
Total Cost for Modal Alternative

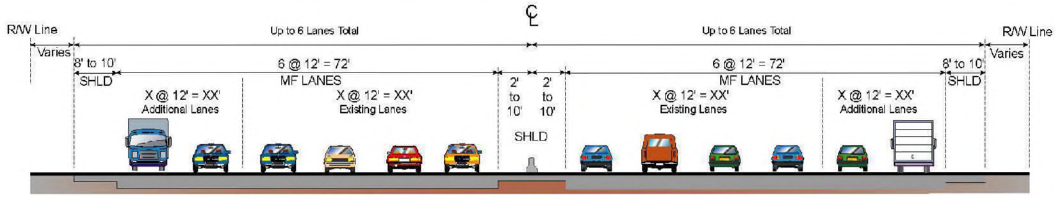
Improvement	Cost
Highway Component	$66,000,000,000
Aviation Component	$16,000,000,000
Total Cost	$82,000,000,000

A. HIGHWAY COMPONENT

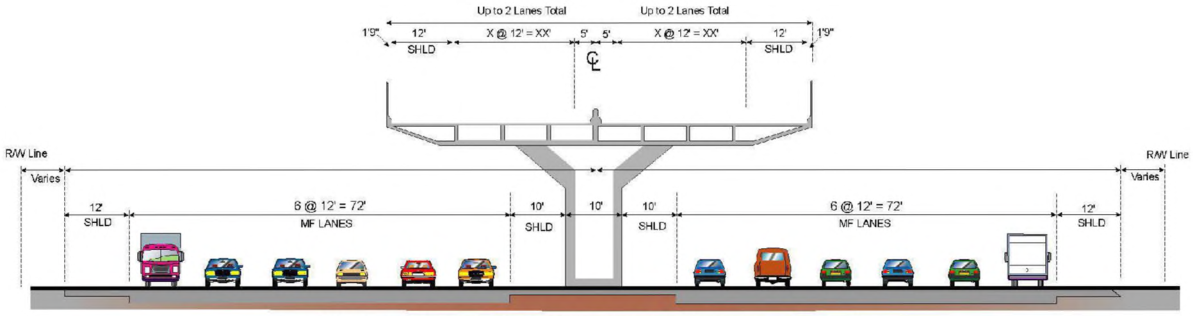
Capital costs were estimated for the highway component of the Modal Alternative based on planning-level cost estimates prepared for freeway widening and interchange improvement projects in urban areas in California. The unit material costs were compiled based on recent California Department of Transportation (Caltrans) construction cost information from various improvement projects throughout the state.

The hypothetical highway improvements include a number of additional lanes that varies per highway corridor. These improvements (additional lanes) are assumed to be in specific corridors for the Modal Alternative, but they could be made to other parallel highways/roads in some cases. The Modal Alternative improvements were compared to the number of lanes that would exist with the No Project Alternative on each route segment to determine whether the improvement would be described as a widening or a new facility. The additional lanes would widen the existing facility up to a total of 12 lanes, as shown on Figure 4.2-1, a typical cross-section of a highway widening. Beyond 12 total lanes, additional lanes are defined as a separate facility. For this analysis, it is assumed that separate facilities in urban areas would be placed on elevated structures above existing facilities because of right-of-way constraints. The vast majority of Modal Alternative improvements would be widenings rather than separate facilities.

Figure 4.2-1
Typical Highway Improvement Cross-Sections



Modal Alternative Highway Widening Cross-Section
(Up to 6 Lanes Per Direction)



Modal Alternative Separate Highway Facility
(Up to 2 Lanes Per Direction)

The total capital costs for the highway component of the Modal Alternative and a description of each of the highway cost elements are presented in Appendix 4-A. The unit costs associated with each cost element are also presented in Appendix 4-A.

B. AVIATION COMPONENT

For the aviation component of the Modal Alternative, hypothetical capacity improvements (terminal gates, runways, and other associated improvements) were identified at representative airports. Specific constraints at each representative airport were considered and improvements were assigned on a case-by-case basis. Assumptions regarding the assignment of new gates and runways to specific airports are described in Chapter 2. For estimation of capital costs, the terminal gates and associated capacity improvements are represented in terms of additional passenger terminal area, rights-of-way (additional physical footprint), parking spaces (on/off site), and primary lanes of access road.

The estimated costs for the Modal Alternative aviation component are based on recent cost information for other airport improvements in California and around the United States (Parsons Brinckerhoff 2003). The aviation component costs are for runways, gates, access roads, demolition/clearing, utility relocation, and right-of-way. Other improvements (e.g., aprons, taxiways, passenger facilities, parking) are included based on planning-level assumptions regarding their size, extent, or placement. Descriptions of each cost element, specific cost assumptions, associated unit costs, and sources for the aviation component of the Modal Alternative are presented in Appendix 4-B. The total capital costs for the aviation component are also presented by region in Appendix 4-B.

4.2.2 High-Speed Train Alternative

Capital costs were estimated for all of the proposed HST alignment and station options evaluated in this Program EIR/EIS. Because of the variations in alignment and station options being considered in the Program EIR/EIS process, there is potentially a wide range of capital costs associated with a complete statewide system. For a system of alignment and station options similar to the "highest return on investment system," as presented in the Business Plan, the costs could range from $33 to $37 billion. This is more than the estimated costs for a complete statewide system in the Business Plan; at least $2 billion of the cost increase over the previous estimate in the Business Plan is due to inflation.[1] Other differences result from the different alignment (horizontal and vertical) and station configurations being evaluated that were not considered in the Business Plan. The proposed alignment and station configuration options and design assumptions would be reviewed at the project level to identify cost savings through application of value engineering practices.

The capital costs are representative of all aspects of implementation of a proposed HST system, including construction, right-of-way, environmental mitigation, and design and management services. The construction costs include procurement and installation of line infrastructure (tracks, bridges, tunnels, grade separations, and power distribution); facilities (passenger stations, storage and maintenance facilities); systems (communications, train control); and removal or relocation of existing infrastructure (utilities, rail tracks). The right-of-way costs include the estimated costs to acquire properties needed for construction of the HST infrastructure. The environmental mitigation costs include a rough estimate of the proportion of capital cost required for mitigating environmental impacts, based on similar completed highway and rail line construction projects. No specific mitigation costs are identified at this program level of review. As with the Modal Alternative, the HST infrastructure and facilities costs account for the materials necessary to accommodate the representative (high-end) ridership forecasts. Other implementation costs are estimated in terms of add-on percentages to construction costs to account for agency costs associated with administration of the program (design, environmental review, and management). The estimated total capital costs for each of the HST alignment and station options are presented in Appendix 4-C.

A. UNIT COST ESTIMATES

The capital costs have been categorized into discrete cost elements. In general, the capital costs were estimated by determining the appropriate unit costs for the identified cost elements and the cost element quantities from conceptual HST alignment and station option plans prepared for each region. Each cost element is defined in Appendix 4-C, along with the methods, assumptions, and unit cost applied in each case. Many of the cost elements were reviewed by HST owners and operators as part of the peer review of the corridor evaluation study commissioned by the Authority (DE-Consult Deutsche Eisenbahn-Consulting GmbH 2000). The unit costs and assumptions were also reviewed as part of the alignment and station screening for this evaluation. Application of these unit costs and assumptions is consistent with past studies for the HST and provides sufficient detail for the comparison of alignment and station options at this program level.

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[1] This reflects an 8.36% increase in construction costs from early 2000 to September 2003, based on Engineering News Record Construction Cost Index.

B. ADJUSTMENTS TO UNIT COSTS

The unit costs were adjusted to account for inflation from 2000 to February 2003, based on the Engineering News Record Construction Cost Index Report. The revised unit costs are based on the unit costs developed for the Business Plan.

Adjustments were also made to the tunneling unit costs, based on the tunneling conference held in December 2001. This technical tunneling conference was held to address issues associated with the tunneling proposed for the statewide HST system. The conference was attended by seven representatives of major tunneling contractors, nine specialized tunneling consulting engineers, two geologists/geotechnical engineers, Authority staff, and representatives of the program management and regional study consultant teams. The conference reviewed past assumptions and requirements, construction methods, and cost estimating. The conference focused on gaining insights and input regarding feasibility, construction methods, and cost assumptions associated with the proposed tunneling. As a result of the conference and subsequent research and analysis, the Authority revised the tunneling-related unit costs applied in the Authority's previous studies to reflect changes in design and construction assumptions (e.g., advance rates and tunnel lining).

4.3 OPERATIONS AND MAINTENANCE COSTS

O&M costs were developed for the both the Modal and HST Alternatives. These costs are assumed to be in addition to the costs of the No Project Alternative. Therefore, only the incremental cost to operate and maintain the additional highway and airport improvements under the Modal Alternative, and the incremental cost to operate and maintain the HST Alternative were estimated.

4.3.1 Modal Alternative

Annual O&M costs for the Modal Alternative were calculated based on estimated costs of material and labor required to maintain and operate the hypothetical highway and airport improvements proposed under the Modal Alternative.

A. HIGHWAYS

An average cost per lane mi per year was calculated based on the costs of materials and labor required to maintain a highway lane mi over a 40-year lifecycle. The annual cost of maintaining the 2,970 lane mi [4,780 km] of the highway component of the Modal Alternative would be $135.6 million. The amount represents what it would cost a contractor to perform the work, and reflect typical California costs. California Highway Patrol and other emergency response costs and administrative overhead (Caltrans) are not included in this analysis. A detailed breakdown of the highway maintenance costs can be found in Appendix 4-D.

B. AIRPORTS

O&M costs were estimated for airport improvements in each of the five study regions. Annual O&M costs associated with these airports are based on the actual O&M costs for airports in each region, as reported in their annual financial statements. Average or representative unit costs were estimated and applied to each airport that was part of the study. This was done to keep the airport operations and maintenance costs uniform throughout the state.

The unit costs for airfield runway expansion projects were derived from the reported O&M costs of the airports divided by the number of linear feet for the existing runways. This O&M cost per linear foot of runway was then applied to the linear feet of each runway added under the Modal Alternative. The unit costs for the terminal expansion (e.g., new gates) projects were derived from the annual terminal O&M costs divided by the number of terminal aircraft gates for each of the airports. This cost per gate was then applied to the gate expansion plans for each airport.

The cost of operating and maintaining aircraft, marketing and reservations, and propulsion fuel are not part of this O&M calculation. It is assumed that the number of aircraft operations would be the same under the No Project, Modal, and HST Alternatives.

The Modal Alternative would require 42,000 linear ft (12,802 linear km) of runway and 91 gates to accommodate the representative demand. The annual O&M costs for the runways and gates would be $19.2 million and $46.5 million, respectively, or a total of $65.7 million per year. A detailed breakdown of the annual operating costs is found in Appendix 4-E.

4.3.2 High-Speed Train Alternative

The annual O&M costs of the HST Alternative are based on system indicators, including operating speed, travel time, station configuration, maintenance and storage facility, and operating schedule. All of these system indicators are outputs of the California high-speed rail simulation model as documented in the operations report. (Parsons Brinckerhoff 2003.)

A. OPERATING SPEEDS

For the HST system, higher operating speeds (150–220 mph [241–354 kph]) are proposed for areas where the alignment is less constrained, and lower operating speeds (less than 125 mph [201 kph]) are proposed in the more heavily developed areas. Local and semi-express services would not necessarily reach the maximum speeds on a given segment. Figures 4.3-1 and 4.3-2 show the maximum speeds that could be attained on the various alignment options of the proposed HST system.

B. TRAVEL TIMES

Table 4.3-1 shows the optimal express trip times between the city pairs considered in the Business Plan. These times represent the estimated travel times between city pairs without interference from other trains or stops at intermediate stations.

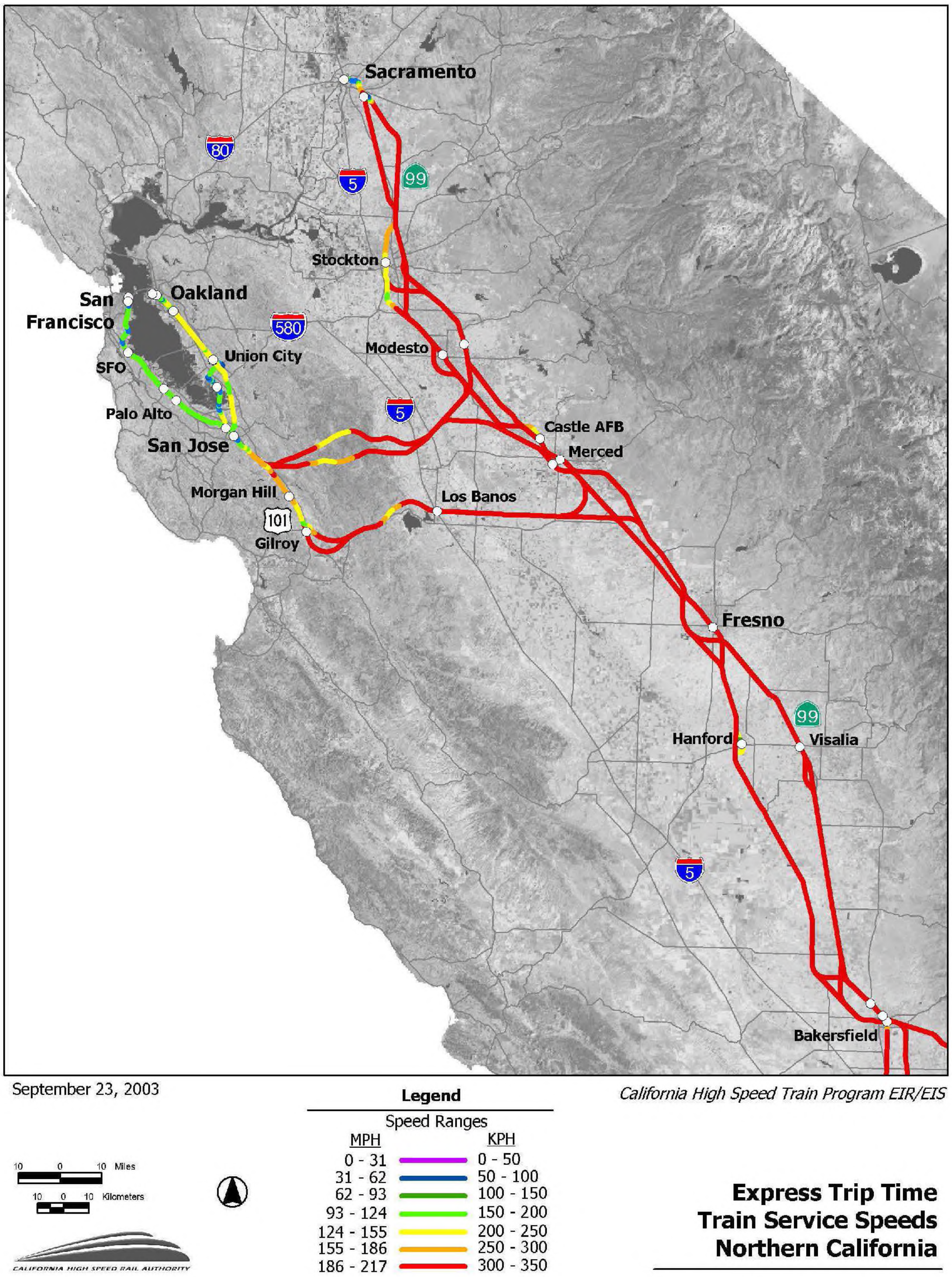
Table 4.3-1
Optimal Express Trip Times between City Pairs (220 mph [350 kph] maximum speed)

	Travel Time (Hrs:Min)							
	Los Angeles	**San Francisco**	**San Jose**	**San Diego**	**Sacramento**	**Fresno**	**Bakersfield**	**Riverside**
Los Angeles	N/A	2:25	1:56	1:06	2:00	1:12	0:41	0:30
San Francisco	2:25	N/A	0:30	3:30	1:27	1:18	1:47	2:55
San Jose	1:56	0:30	N/A	3:02	0:50	0:49	1:19	2:26
San Diego	1:06	3:30	3:02	N/A	3:07	2:19	1:49	0:39
Sacramento	2:00	1:27	0:50	3:07	N/A	0:53	1:23	2:30
Fresno	1:12	1:18	0:49	2:19	0:53	N/A	0:35	1:42
Bakersfield	0:41	1:47	1:19	1:49	1:23	0:35	N/A	1:12
Riverside	0:30	2:55	2:26	0:39	2:30	1:42	1:12	N/A

N/A = not available.

Note: Travel times based on I-5 alignment option between Los Angeles and Bakersfied (add 10 minutes for the Antelope Valley option) and the Qualcomm alignment option in San Diego (add 7 minutes for the Miramar Road or Carroll Canyon alignment options).

Figure 4.3-1
Maximum Operating Speeds for Express Service on Proposed HST System
Northern California



September 23, 2003

California High Speed Train Program EIR/EIS

Figure 4.3-2
Maximum Operating Speeds for Express Service on Proposed HST System Southern California

May 24, 2005

California High Speed Train Program EIR/EIS

10 5 0 10 20 Miles

10 5 0 10 20 Kilometers

Legend

Speed Ranges

MPH		KPH
0 - 31	🟪	0 - 50
31 - 62	🟦	50 - 100
62 - 93	🟩	100 - 150
93 - 124	🟩	150 - 200
124 - 155	🟨	200 - 250
155 - 186	🟧	250 - 300
186 - 217	🟥	300 - 350

CALIFORNIA HIGH SPEED RAIL AUTHORITY

Express Trip Time
Train Service Speeds
Southern California

C. STATIONS

There are two general station types for the proposed HST system: terminal and intermediate (line) stations. Intermediate stations would have four tracks, with two through-tracks for express service.

D. MAINTENANCE FACILITIES AND STORAGE YARDS

The train sets used for the HST system would need to be maintained at several points along the HST corridor. To estimate maintenance costs it was assumed that the system would have four maintenance facilities. Three of these facilities would be the primary locations for cleaning, servicing, inspecting, and maintaining the vehicles, as well as storing the trains overnight. A fourth facility would serve as a heavy maintenance facility. In addition to these maintenance facilities, each of the terminal stations would have some light maintenance and cleaning capabilities.

E. CONCEPTUAL OPERATING SCHEDULE

The service levels tested in the system network simulation model were 86 trains per day in each direction (i.e., north and south) (172 total), assuming 650 and 1,175 seats per train for the low- and high-end ridership forecasts, respectively. The service type and stopping patterns are summarized below.

- Express (20 trains per day in each direction): Trains running from Sacramento, San Jose, or San Francisco to Los Angeles and San Diego with one intermediate stop between origin and destination.
- Semi-Express (21 trains per day in each direction): Trains running between similar endpoints as the express, with a limited number of intermediate stops.
- Suburban-Express (20 trains per day in each direction): Trains running express between major metropolitan regions, but stopping frequently within these regions.
- Local (21 trains per day in each direction): Trains stopping at all intermediate stops, with potential for skipping stops to improve service depending on demand.
- Regional (4 trains per day in each direction): Trains running local that begin or end in the Central Valley, operating mostly during commute hours.

F. OPERATIONS AND MAINTENANCE ANNUAL COSTS

The HST projected annual O&M costs are based on the train miles resulting from the simulation model described above and the unit costs developed for the HST corridor evaluation study. A cost estimation method and unit costs were developed for the previous corridor evaluation study to provide an order of magnitude cost estimate for HST service. This method was peer reviewed by the operators of several HST systems, as discussed above in Section 4.2.2.A, and found to be adequate for this level of analysis. The same method has been applied in this analysis with updated estimates of total train miles from the simulation model to provide a cost estimate for the "highest return on investment system" from the Business Plan. The number of train miles for the proposed HST system is 81,622 per weekday, or 27,049,531 per year. For comparison with the Modal Alternative (specifically the aviation component), the HST O&M costs do not include costs for train operations, maintenance of the fleet of train sets, propulsion fuel (electricity), or the marketing and reservations for the service. Table 4.3-2 summarizes those costs.

Table 4.3-2
Annual Costs of Operating and Maintaining HST Infrastructure

Item	Dollars per Train Mile (2003 $)	Annual Cost (millions 2003 $)
Station Services	0.54	14.6
Insurance	1.32	35.7
General Support	0.95	25.7
Maintenance of Way	2.83	76.5
Total per Year [1,2,3]		152.5

[1] Total cost is based on 253 weekdays and 112 weekend days. The weekend level of service (i.e., number of trains) is 70% of a typical weekday level of service.
[2] Includes inflation (adjustment of 8.36% from 2000 figures) and additional train miles accounting for train placement (i.e., to and from the overnight storage location) and maintenance activities.
[3] Numbers are subject to rounding.

Source: Parsons Brinckerhoff 2003

Other costs associated with operating a HST train system as used in the Business Plan include train operations, equipment maintenance, marketing and reservations, and propulsion power (electricity). These HST fleet O&M costs are shown on a per-train-mi basis in Table 4.3-3.

Table 4.3-3
Annual Costs of Operating and Maintaining an HST System

Item	Annual Dollars per Train Mile (2003 $)	Annual Costs (millions 2003 $)
Train Operations	6.59	178.2
Equipment Maintenance	7.73	208.9
Marketing and Reservations	1.39	37.5
Power	4.66	126.1

Source: Parsons Brinckerhoff 2003

4.3.3 Operating Cost Comparison of the Alternatives

Table 4.3-4 summarizes the estimated annual O&M costs of the proposed Modal and HST Alternatives. The incremental O&M costs of the Modal Alternative infrastructure would be 32% higher than the O&M costs of the HST Alternative infrastructure. This analysis is based on estimated costs only and does not take into account the costs associated with potential financing mechanisms for any of the alternatives (e.g., bonds and bond financing).

Table 4.3-4
Annual Operating Costs (Millions of 2003 Dollars)[1]

Alternative	Airports[2]	Highways[3]	HST[4]	Total
Modal	$65.7	$135.6	N/A	$201.3
HST	N/A	N/A	$152.5	$152.5

N/A = not available.

[1] Incremental costs in addition to the costs associated with the No Project Alternative.

[2] Based on American Association of Airport Executive Annual Airport Financial Reporting Statements, 2002. Airport operating cost information is for the following airports: Oakland, San Jose, Sacramento, Fresno, Burbank, Ontario, Long Beach, and San Diego.

[3] Highway costs were calculated on a per-freeway-mi basis. The costs are based on industry standard costs for replacing PCC (67% of highway lane mi) and AC (33% of highway lane mi) sections. Costs do not include ancillary costs of operating roadways, such as highway patrol and other incident response costs.

[4] HST projected annual O&M costs based on train miles resulting from the simulation model described above and the unit costs developed for the HST corridor evaluation study. Costs from the evaluation study were adjusted for inflation by a factor of 8.36% to make them 2003 dollars. Costs do not include the costs from train operations, maintenance of fleet of train sets, propulsion fuel (electricity), or marketing and reservations for the service.

5 ECONOMIC GROWTH AND RELATED IMPACTS

5.1 INTRODUCTION

Transportation investments can lead to reduced travel time or cost, improved accessibility to regions or parts of regions, or reduced accidents or air pollution. These effects contribute to economic growth by allowing time and money previously spent on travel to be used for other purposes, attracting businesses and residents to places with increased accessibility or improved quality of life, and reducing overall costs to society. The population and employment growth that result comprise the growth-inducing effects of transportation investments. This growth can contribute to additional impacts beyond those directly attributable to the changes in the transportation system. These effects are known as indirect impacts.

This chapter presents an analysis of the potential growth-inducing effects and related indirect impacts of the alternatives considered in this Program EIR/EIS. The intent of the analysis is to understand the extent of potential statewide, regional, and local growth effects in terms of population and employment change and land consumption associated with these changes. This section identifies and describes the following.

- Existing population and employment conditions in the study area.
- Methodology and data sources used to assess potential growth-induced effects.
- Potential statewide and interregional employment and population changes associated with each alternative.
- Urban area size needed to accommodate projected population and employment growth associated with each alternative.
- Potential for employment and population concentration in the vicinity of high-speed train (HST) stations.
- Potential impacts related to growth and development, and potential strategies for managing these impacts.

5.2 AFFECTED ENVIRONMENT

5.2.1 Existing Conditions

Over the last 30 years, California's population has grown from 20 million to more than 34 million people. At the same time, more than 10 million additional jobs have been created in California. Starting with the Gold Rush in 1849, California has been continuously experiencing rapid population and economic growth. Distance from eastern urban areas, location on the Pacific Rim, an abundance of natural resources, a desirable climate, and many other factors have contributed to California's growth into the most populous state in the nation.

California's economy is one of the most diverse in the world. Manufacturing, wholesale and retail trade, services, and government each account for more than 10% of total employment, and together have consistently comprised more than three-quarters of total employment over the past 30 years. California's economy, like the nation's, has become less focused on production of goods and more focused on services, entertainment, and trade. Three service-sector industries—business, social, and legal—are among the 10 fastest-growing industries in California, with business services' contribution to gross state product (GSP) growing by 1,400% since 1977. The overall services sector has grown by more than 800% since 1977. The finance, insurance, and real estate (FIRE) sectors and services sector has accounted for nearly one-half of the growth in GSP since 1977, with the combined contribution of these groups growing from 33% to 46% of the total economy in California.

As of 2002, California was estimated to have about 35.8 million people and 19.8 million jobs. Table 5.2-1 lists county-level population and employment totals, as well as an estimate of current urbanization magnitudes in all 58 counties in the state for 2002. As expected, the inner Bay Area counties, as well as Orange, Los Angeles, and Sacramento Counties, have the highest levels of land considered to be urbanized, while less than 10% of land in most other counties is at urbanized densities.

Table 5.2-1
Year 2002 Population, Employment, and Urbanized Densities

County	Population	Employment	Acreage of Land at Urbanized Densities for Employment and/or Population	Percent of Land Area at Urbanized Densities
Alameda	1,513,356	899,901	141,654	30%
Contra Costa	953,069	483,812	142,467	31%
San Francisco	795,577	771,599	23,277	78%
San Mateo	770,102	501,712	70,869	25%
Santa Clara	1,826,362	1,281,313	184,481	22%
Solano	416,292	164,167	53,757	10%
Bay Area*	**6,274,758**	**4,102,504**	**616,505**	**24%**
Madera	135,695	59,123	23,255	2%
Merced	224,709	90,070	31,712	3%
Sacramento	1,259,423	756,313	157,101	25%
San Joaquin	607,331	268,325	74,250	8%
Stanislaus	485,123	216,690	55,426	6%
Yolo	170,518	113,826	26,342	4%
North Central Valley*	**2,882,799**	**1,504,347**	**368,086**	**6%**
Fresno	839,582	429,002	96,977	3%
Kern	712,198	322,774	111,468	2%
Kings	132,092	51,289	29,479	3%
Tulare	397,616	181,804	48,656	2%
South Central Valley*	**2,081,488**	**984,869**	**286,580**	**2%**
Los Angeles	10,007,779	5,452,745	763,373	29%
Orange	2,910,976	1,878,327	273,713	54%
Riverside	1,681,186	656,839	255,230	6%
San Bernardino	1,816,378	731,420	237,905	2%
San Diego	3,066,423	1,754,622	340,837	13%
Southern California*	**19,482,742**	**10,473,953**	**1,871,058**	**8%**
Rest of State	**5,080,451**	**2,722,219**	**3,142,229**	**6%**
Statewide Total	**35,802,238**	**19,787,892**	**6,284,458**	**6%**

* Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in the Rest of State category.

Sources: California Department of Finance (population data); Woods & Poole Economics, Inc. (employment); Cambridge Systematics, Inc. (urbanized acres); and U.S. Bureau of the Census (urbanization percentage).

5.2.2 Study Area and Alternatives

For the purposes of the growth inducement analysis, California's 58 counties were grouped into five geographic regions that would contain components of the HST or Modal Alternative.[1] The regions also reflect the economic interdependence among some counties and relate to widely recognized geographic regions in California. The 10 Central Valley counties were split into north and south regions based on each county's economic relationship with either the San Francisco Bay Area (Northern Central Valley) or the Los Angeles/San Diego region (Southern Central Valley). The five regions and associated counties, which are displayed in Figure 5.2-1, are as follows.

- Bay Area: Alameda, Contra Costa, San Francisco, Santa Clara, San Mateo, and Solano Counties.
- Northern Central Valley: Madera, Merced, Sacramento, San Joaquin, Stanislaus, and Yolo Counties.
- Southern Central Valley: Fresno, Kern, Kings, and Tulare Counties.
- Southern California: Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties.
- Rest of California: Remaining 37 counties not included in one of the other four regions.

For this chapter, the first four regions—Bay Area, Northern Central Valley, Southern Central Valley, and Southern California—represent the HST study area.

This analysis of potential induced growth and indirect impacts considered the three alternatives as described in Chapter 2, Alternatives, of this Program EIR/EIS—the No Project/No Action (No Project) Alternative (existing, programmed, and funded transportation facilities), the Modal Alternative (No Project Alternative plus additional highway and air improvements in many intercity corridors), and the proposed HST Alternative.

The analysis of growth-inducing effects considered a base HST scenario and several optional scenarios (Cambridge Systematics, Inc. 2003). Each of these HST Alternative scenarios includes a unique combination of alignment options and potential station options; physical characteristics of the other intercity modes were assumed to be identical for the base HST scenario and each alignment option. The key physical characteristics of each HST scenario considered in this analysis are as follows.

- Base HST Scenario: HST service would be provided between San Francisco and downtown San Diego via the Pacheco Pass, I-5/Grapevine, and Inland Empire, with an HST extension through the Northern Central Valley to Sacramento. Incremental service improvements would be made in the Los Angeles to San Diego via Orange County (LOSSAN) corridor. Stations would generally be located in the downtown area of each community (except Stockton and Sylmar). HST operating features and costs would be as assumed in the California High Speed Rail Authority's (Authority's) final business plan (Business Plan) (California High Speed Rail Authority 2000).
- Palmdale Scenario: This option is identical to the base alternative, except that the corridor would follow the Palmdale/Soledad Canyon alignment (instead of I-5/Grapevine) between Bakersfield and Los Angeles. An additional station would be provided in Palmdale.
- Diablo Range Direct Scenario: This option is identical to the base alternative, except that the corridor would follow the Diablo Range alignment (instead of Pacheco Pass) between the Bay Area and Central Valley. Stations in Gilroy and Los Banos would not be included under this design option.

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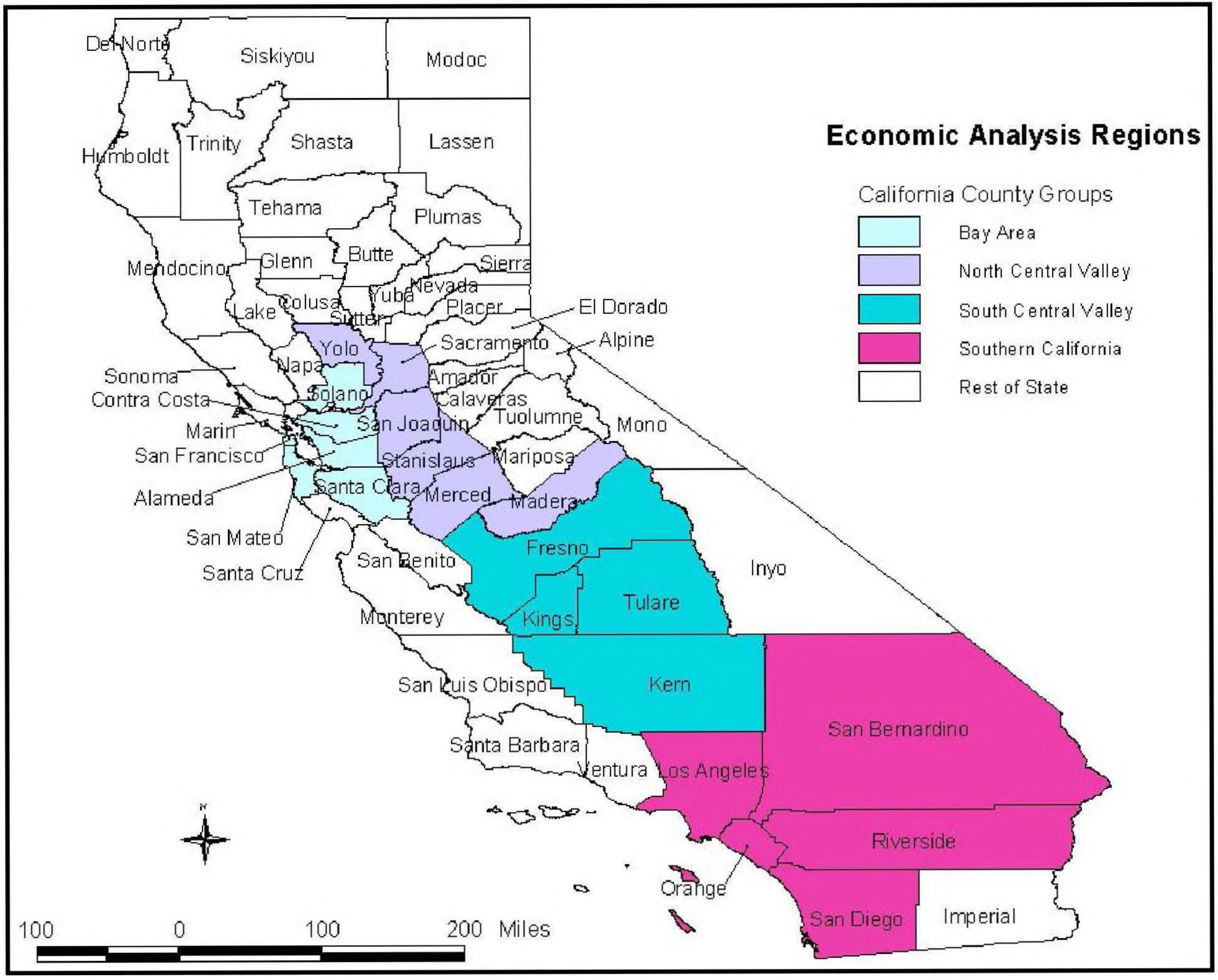
[1] All counties that would have an improvement under either the HST or Modal Alternative were grouped into one of the four core regions. "Rest of California" includes all counties without an improvement under either the HST or Modal Alternative.

- Irvine Scenario: This option is identical to the base alternative, with the addition of a stub extension, or difficult curved track configuration connection, between Los Angeles Union Station (LAUS) and Irvine. Additional stations would be provided in Norwalk, Anaheim, and Irvine.
- East Bay Scenario: This option is identical to the base alternative, except that some service north of San Jose would follow an additional alignment though the East Bay to Oakland, with additional stations at Fremont, Oakland International Airport, and near downtown Oakland. The East Bay alignment scenario would be in addition to the base alignment along the Peninsula between San Jose and San Francisco. This alignment option would involve the same service levels as provided in the base alternative, with HST service north of San Jose evenly split between the Peninsula and East Bay alignments.
- Outlying Stations Scenario: This option is identical to the base alternative, except that the San Diego terminus would be at East Mission Valley instead of downtown San Diego. Central Valley stations in Modesto, Merced, Tulare, and Bakersfield would be placed at suburban locations that are outside of the existing downtown areas.

Figure 5.2-1
Regions and Counties



5.2.3 Analysis Years

The growth-inducement analysis was conducted for forecast years of 2020 and 2035. The 2020 forecast year provides for consistency with analyses that were conducted for other resource areas, while the 2035 forecast year provides a longer time horizon to consider full market response after completion of the proposed HST or Modal Alternative. Year 2035 results are described in this Program EIR/EIS because they provide a better reflection of the full growth inducement potential of each alternative, as well as a better basis for understanding the full range of possible secondary impacts.

The extent of potential growth-inducing effects in any given year is sensitive to the length of time over which changes in economic conditions are assumed to occur. In terms of this analysis, the number of jobs or people that would be generated in an area in 2020 or 2035 is sensitive to the year in which HST service or some other transportation service is assumed to first be available in that area. As described below, planning assumptions regarding service phasing were made to identify the year in which travel changes would begin accruing in different areas.

- For the HST Alternative, HST service along a trunk line between San Francisco and LAUS would begin on January 1, 2016, for all alignment options. Service to San Diego and Sacramento would begin on January 1, 2019, for all alignment options. For the Irvine alignment scenario, service from LAUS and Irvine would begin on January 1, 2019. For the East Bay alignment scenario, service between San Jose and Oakland would begin on January 1, 2016.
- For the Modal Alternative, aviation and highway components that serve travel markets along the HST trunk line would open on January 1, 2016. This assumption would include airport and highway projects in all analysis counties except Sacramento, Yolo, San Joaquin, Stanislaus, and San Diego. All other elements of the Modal Alternative would open on January 1, 2019.

5.3 POTENTIAL GROWTH-INDUCING EFFECTS

5.3.1 Methodology and Data Sources

The potential economic growth stimulus of a transportation investment can be measured not only in terms of its overall magnitude (i.e., number of new jobs and people), but also in terms of its relative distribution (i.e., location of new jobs and people) among different geographic areas. In economic terms, this distinction is the generative (i.e., creates growth) versus distributive (i.e., redistributes existing population and infrastructure) dimensions of growth. Transportation investments, such as airports, highways, transit, and HST, comprise just one of many factors that determine how much growth will occur and whether it will be generative or distributive in nature. Other major growth factors, such as education level of residents, housing affordability, and land availability, interact in complex and sometimes unpredictable ways for communities, regions, and states. Land use planning and zoning, enterprise development zones, and infrastructure funding can also influence both the magnitude and the distribution of economic growth.

A. SCOPE OF ANALYSIS

The growth inducement results presented in this section were developed in a multi-phased process that combined the Regional Economic Models, Inc. (REMI)[2] macroeconomic simulation model, with a business attraction model, an employment allocation model, and a residential spatial allocation model. The process considered the potential effects that changes in transportation congestion and

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[2] The REMI model is a regional economic analysis that can be used to estimate the macroeconomic impacts of policies or investments that change some aspect of the business climate in the region. It is the most widely used and accepted economic impact tool in the country, with unique capabilities for transportation analyses.

delay between existing conditions and future years would have on the state's economic growth. The process also modeled several dimensions of growth and spatial reallocation that could occur under any of the alternative options, and considered many possible impacts of the proposed HST and Modal Alternatives on jobs, population, and land development, including the following.

- Increased employment because of attraction of new businesses to California, or expansion of businesses already located in the state.
- Reallocation of employment because of changes in location of businesses already located in California.
- Population growth associated with business attraction, expansion, and spatial shift.
- Shift in residential population between counties (with fixed employment location) due to changed accessibility because of the Modal or HST Alternative (i.e., long-distance commutes).
- Shift in employment for retail and personal service establishments that follow shifts in residential location.
- Changes in densification and development patterns both with and without the presence of an HST station.
- Allocation of population and employment between currently developed and undeveloped areas within each county.
- Consumption of currently undeveloped land to house projected population and employment growth.

B. KEY DATA SOURCES

The growth-inducement analysis required forecasts of future population and employment for the 2020 and 2035 analysis years. This forecast represented the No Project Alternative for the analysis years, and was also used as an economic modeling input to estimate incremental population and employment changes of the other alternatives. The analysis of potential induced growth and indirect effects necessitated that county-level population and employment forecasts be developed for 2020 and 2035, with employment forecasts broken out by one-digit standard industrial classification (SIC) codes.

The California Department of Finance (DOF) prepares county-level population forecasts for each year through 2040. However, there is no similar official state employment forecast at the county level, and no single source of employment projections provides sufficient industry, geographic, or time detail. Therefore, the No Project Alternative employment forecasts were developed using a combination of multiple sources.

Population

The DOF forecasts were used directly as the No Project Alternative population forecast for this study since they are a source of population projections prepared by and for the state, and their use in this analysis would be consistent with the approach used in earlier HST studies.

Employment

Employment data for the No Project Alternative were developed by combining forecasts from the California Department of Transportation (Caltrans) and Woods & Poole (W&P)[3] and through application of the REMI model. The Caltrans forecasts have recently been developed and provide

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[3] Woods & Poole is a private economic forecasting firm that produces employment (and other economic indicators) at the one-digit SIC level for historical years starting in 1970 and forecast years ending in 2025 for every county and state in the country.

county-level estimates by one-digit SIC code to 2020. Since the Caltrans forecasts do not account for all employment (i.e., they do not include the self-employed and other groups), W&P data were used to estimate the level of employment for all industries. The employment concept used by W&P is consistent with the U.S. Bureau of Economic Analysis full-employment data.

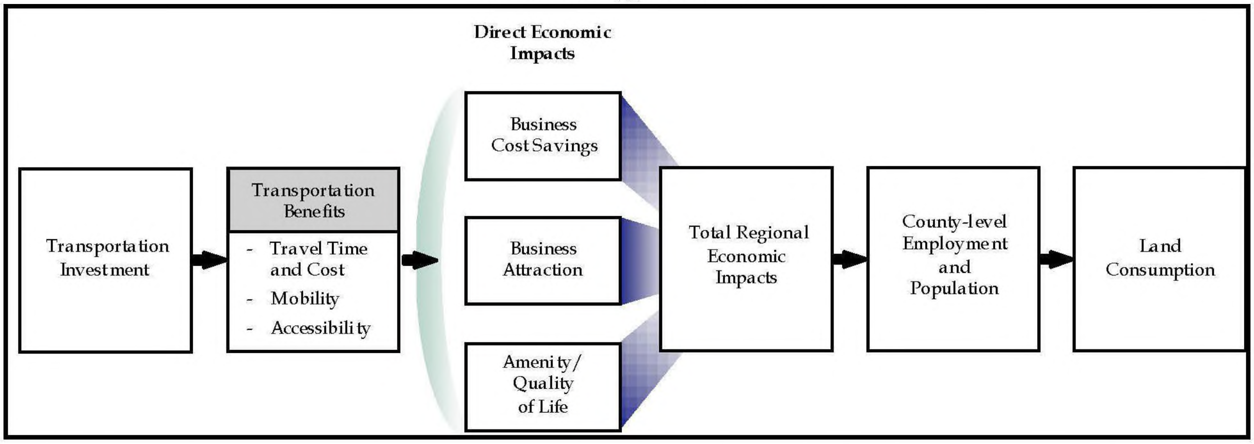
The 2020 No Project Alternative forecast was developed from Year 2002 W&P employment estimates and Year 2002–2020 industry-specific growth factors inferred from the Caltrans forecasts. These No Project Alternative forecasts were used to adjust Year 2020 employment values within the REMI model, with the REMI model then used to forecast employment changes from 2020 to 2035. The 2035 estimates essentially are a long-run extrapolation from the 2020 Caltrans/W&P estimates. These estimates were compared to historical averages and regional-level forecasts (from various councils of governments and metropolitan planning organizations) to ensure that the resulting employment-to-population ratios for 2020 were within a reasonable range.

C. METHODOLOGY OVERVIEW

The analytical process to estimate the growth-inducing effects of the alternatives required significant modeling tools and data. Nonetheless, the entire process, which is depicted in Figure 5.3-1, can be summarized in a few key steps.

- Define transportation investments: This analysis considers the alternatives and HST alignment options described in Chapter 2. For this analysis, the future baseline conditions are assumed to represent the No Project Alternative, and the economic modeling process is used to forecast the incremental changes associated with the implementation of the Modal and HST Alternatives.
- Estimate transportation benefits: Using results from the Authority's intercity travel demand model, benefits such as reduced travel times and/or costs of each alternative for air, highway, or conventional rail trips were estimated. The quantification of travel time, cost, accessibility, and societal (pollution or accident reduction) benefits reflects the mobility enhancement provided through system expansion under the Modal Alternative or additional travel options under the proposed HST Alternatives.

Figure 5.3-1
Methodology Overview



- Estimate direct economic impacts: Direct economic impacts, which are generated from the transportation benefits of each alternative, generally fall into one of three categories.
    - Business cost savings: Reductions in travel time and/or cost for long-distance business travelers and commuters benefiting from the transportation improvements.

  - Business attraction effects: New and relocated firms taking advantage of market accessibility improvements provided through transportation investments.
  - Amenity (quality of life) changes: Non-business travel time and/or cost benefits and other societal benefits improve the attractiveness of a region.
- Determine total regional economic impacts: The direct economic impacts all have the potential to create additional multiplier effects on the regional and statewide economies of California. Total regional impacts were estimated using the REMI macroeconomic simulation model. For this analysis, total economic impacts include population and industry-specific employment.
- Allocate regional economic impacts on California counties: A county-level post-processing model was developed to allocate regional employment and population impacts on California counties. The primary drivers of the post-processor are the magnitudes of direct economic impacts (generated at the county level), with adjustments made to reflect economic multiplier effects and population movements from improved long-distance commuting accessibility (especially for counties with HST stations).
- Estimate land consumption: County-level population and employment were allocated throughout each county to determine the infill potential and magnitude of land needed to accommodate growth for each alternative. This analysis was driven by three key pieces of information.
  - Local land use, zoning, and employment data.
  - National and international experience with station-area development trends related to HST and fixed guideway transit.
  - County-level industry employment and population estimates.

Essentially, this land consumption analysis provided an estimate of the population and employment growth that can fit within the currently urbanized areas of each county (i.e., infill potential), and additional acreage of currently undeveloped land that would need to be converted to urbanized densities to accommodate any remaining growth. Estimates of land needed to accommodate employment uses were developed using a statistical analysis based on current development patterns in California, adjusted to reflect expected densification trends over time.[4] The California Urbanization and Biodiversity Analysis model was used to allocate population growth to various locations in each county and to predict land consumption resulting from residential construction.

5.3.2 Financing of Alternatives

In any analysis of proposed public investments, it is important to consider the potential sources of public financing and how they may affect future public revenue needs (i.e., government expenditures) and consumer spending. The Modal and HST Alternatives are both projected to have significant capital costs in excess of the costs needed to fund the No Project Alternative. The Business Plan estimated the total capital cost of the HST Alternative to be on the order of $25 billion, while initial estimates of the capital cost of the Modal Alternative was roughly $56 billion. After this analysis was prepared, the cost estimates rose to $33-37 billion for the HST Alternative and $82 billion for the Modal Alternative and are discussed as a sensitivity analysis at the end of this chapter.

For the purposes of this analysis, it was assumed that the total cost of the HST Alternative and the first $25 billion in cost for the Modal Alternative would be funded through revenue sources that would not

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[4] Since this analysis was conducted at the county level, it does not explicitly reflect potential land designation or policy constraints that are included in each jurisdiction's general plan. Rather, the analysis reflects market forces that currently exist and are projected to exist in the future for counties of similar location, size, development intensity, and potential HST service. The densities that are allowed under zoning and general plan designations are implicitly included in the analysis to the extent that existing development patterns and market forces have been influenced by past zoning and general plan decisions.

require direct tax increases or significant diversion of general fund revenues. Examples of these revenue sources include general obligation bonds,[5] federal grants or loans, existing airport user fees and passenger facility charges, private sector participation, local funds (from existing sources), and existing state transportation revenue sources (e.g., gas tax, sales tax on gas).

The remaining cost of the Modal Alternative, about $31 billion (in Year 2002 dollars), is assumed to come from revenue sources that have traditionally been used for highway and aviation improvements in California. These additional funding requirements for the Modal Alternative would divert consumer expenditures to pay for increased gas taxes and higher airport fees, as well as reduce state and local government spending in other areas to cover bonds and grants.

5.3.3 Statewide Comparison of Alternatives

Statewide population is expected to grow by about 54% between 2002 and 2035 under the No Project Alternative (Table 5.3-1). Compared to the No Project Alternative, the statewide population growth is projected to be roughly 1% higher under the Modal Alternative and 2% higher under the HST Alternative. These population differences among alternatives represent the increased accessibility provided by the transportation investments. An investment in HST is projected to lead to greater economic growth within the state than the Modal or No Project Alternatives. These statewide figures follow the same general pattern at the regional level, with the exception of the Northern Central Valley, where population growth is projected to be about 4% higher under the HST Alternative than under the other two alternatives.

Table 5.3-1
Projected Population Growth Rate by Region

Area	Year 2002 Population (Millions)	Growth Rate (Year 2002 to 2035)		
		No Project Alternative	Modal Alternative	HST "Base" Alternative
Bay Area	6.3	28%	29%	30%
North Central Valley	2.9	77%	78%	81%
South Central Valley	2.1	87%	88%	89%
Southern California	19.5	53%	54%	55%
Rest of California	5.1	66%	66%	67%
Statewide Total	**35.8**	**54%**	**55%**	**56%**

Source: Cambridge Systematics, Inc. 2003.

The population growth rate in the study area under the HST Alternative represents a statewide increase of 700,000 people more than that projected under the No Project Alternative, and 340,000 people more than the Modal Alternative. However, the greatest population increase is projected between 2002 existing conditions and the 2035 No Project Alternative, with relatively small differences in population growth occurring between the Modal and HST Alternatives in the Year 2035.

Statewide and regional employment growth rates are projected to be generally similar to the population growth rates, although employment would grow more under the HST Alternative in the Central Valley regions, especially the Northern Central Valley, than population (Table 5.3-2). Statewide employment is

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[5] The debt service on General Fund State Revenue bonds is often paid through a commitment of the general fund revenue with no additional tax or other revenue source. A preliminary analysis by the project team suggests that the annual debt service on a $10 billion bond may be within the range of the state's historical and future bonding patterns. While this source of funding does not directly increase taxes, it does divert state expenditures from budget items to debt service. Nevertheless, this diversion is not assumed in this analysis to result in any significant reduction in state expenditures.

projected to increase by 46% under the No Project Alternative, with an additional increase of 1% under the Modal Alternative and 2% under the HST Alternative. The employment growth rate under the HST Alternative represents a statewide increase of about 450,000 jobs over the No Project Alternative, and 200,000 jobs over the Modal Alternative. As with population growth, however, this level of difference between the Modal and HST Alternatives is very small compared to the overall level of growth represented by the No Project Alternative relative to the 2002 existing conditions.

Table 5.3-2
Projected Employment Growth Rate by Region

Area	Year 2002 Employment (Millions)	Growth Rate (Year 2002 to 2035) No Project Alternative	Modal Alternative	HST Base Alternative
Bay Area	4.1	36%	37%	39%
North Central Valley	1.5	60%	62%	67%
South Central Valley	1.0	56%	57%	59%
Southern California	10.5	48%	50%	50%
Rest of California	2.7	40%	39%	40%
Statewide Total	**19.8**	**46%**	**47%**	**48%**

Source: Cambridge Systematics, Inc. 2003.

Urbanized areas in California are expected to grow by 48% between 2004 and 2035 under the No Project Alternative, as shown in Table 5.3-3. This growth would represent an increase of about 1.5 million acres (ac) (0.61 hectares [ha]) over today's 3.1 million ac (1.3 million ha) within the core analysis counties. Compared to the No Project Alternative, urbanized area growth is expected to be about 1.4% (65,500 acres [26,507 ha]) higher under the Modal Alternative and 0.1% (2,600 acres [1,052 ha]) less under the HST Alternative. As with the population and employment growth, the level of difference between alternatives for urbanized area size is small compared to the overall level of growth represented by the No Project Alternative relative to the 2002 existing conditions. Nonetheless, the results indicate that the HST Alternative would be able to accommodate more population and employment growth on less land than the other alternatives.

For the rest of California, the HST Alternative is projected to generate a small yet positive growth rate for both population and employment, while the Modal Alternative is projected to decrease both population and employment compared to the No Project Alternative. Results for the Modal Alternative are affected, in part, by increased taxation and user fees that might be needed to fund the higher initial capital costs of this alternative; these higher taxes and fees may result in a slight reduction in economic growth, and hence population and employment, compared to what would occur if no additional taxation or fees were required. Overall, it is estimated that the public financing needs for the Modal Alternative would result in decreases in employment of 20,000 and in population of 45,000 on a statewide basis, compared to what would occur if the alternative could be funded without tax or user fee increases.

Table 5.3-3
Increase in Urbanized Area by Region

Area	Year 2002 Urbanized Area Acreage (Thousands)	Percent Increase (Year 2002 to 2035) No Project Alternative	Modal Alternative	HST Base Alternative
Bay Area	617	21.7%	22.4%	22.8%
North Central Valley	368	57.1%	58.3%	55.8%
South Central Valley	287	91.8%	93.3%	95.1%
Southern California	1,871	48.0%	50.8%	47.2%
Influence Area Total	**3,143**	**47.9%**	**50.0%**	**47.8%**

Source: Cambridge Systematics, Inc. 2003.

The Modal and HST Alternatives exhibit noticeable differences in the types of jobs they are projected to attract to different regions. Table 5.3-4 depicts the percentage of growth by major industry group for the increment of jobs that may be "induced" by these two alternatives (i.e., job growth above and beyond the No Project Alternative). The HST Alternative exhibits a tendency to attract a higher proportion of jobs in the services, government, and FIRE sectors, while the Modal Alternative is relatively stronger in transportation, communications, and utilities (TCU); wholesale and retail trade; and construction and manufacturing. The strongest employment sectors for the HST Alternative tend to be the most compatible for location in higher density settings, such as near potential HST sites where offices and retail development could be expected. On the other hand, the employment sectors dominated by the Modal Alternative tend to be associated with less dense development settings, such as those currently found on the outer edges of California's urban areas.

Table 5.3-4
Percent of Incremental Growth by Industry

		Incremental Growth Rate for Induced Employment (Year 2002 to 2035)				
		Farming and Mining	Construction and Manufacturing	TCU and Trade	FIRE and Services	Government
Bay Area	Modal	0%	15%	34%	44%	7%
	HST	0%	16%	30%	46%	8%
North Central Valley	Modal	0%	14%	31%	44%	11%
	HST	0%	9%	19%	64%	9%
South Central Valley	Modal	1%	17%	23%	48%	12%
	HST	1%	14%	21%	51%	13%
Southern California	Modal	0%	17%	31%	43%	8%
	HST	0%	18%	30%	44%	9%
Statewide Total	Modal	0%	16%	31%	44%	9%
	HST	0%	15%	27%	48%	10%

Source: Cambridge Systematics, Inc. 2003.

A. DETAIL FOR NO PROJECT ALTERNATIVE

On a statewide basis, population is projected to increase from Year 2002 levels by about 19.4 million by 2035. This increase represents growth rates of 27% between now and 2020, and 54% between now and 2035. The long-term growth rate averages to about 1.4% annually, which is slightly less than California's 1.8% annual population growth rate since 1970, but would be consistent with long-term population forecasts by the California DOF and the U.S. Census Bureau. Employment growth rates are similar, with jobs increasing by 46% (9.1 million) between now and 2035. The long-term growth rate averages about 1.3% per year, which is one-half of the 2.6% annual employment growth rate since 1970.

On a statewide basis, population and employment growth under the No Project Alternative are expected to require approximately an additional 1.5 million ac (0.61 ha) of urbanized land in 2035 than the current estimated urbanized area of approximately 3,142,000 ac (1,271,523 ha).[6] This represents an increase in urbanized areas of 48% over less than 35 years. Urbanization of land is expected to occur at lower rates than overall population and employment growth, reflecting a number of factors.

- A reduction in availability of land for development in some counties in the Bay Area and Southern California, creating higher land costs and market forces for denser development.
- Slight increases in infill and redevelopment, as seen recently in many urban communities, and blighted areas that receive new development.
- An increase in marginal residential densities that has occurred over recent years[7].

B. DETAIL FOR HST ALTERNATIVE

Statewide population and employment forecasts for the HST Alternative are similar to those for the No Project Alternative. For Year 2020, the HST Alternative is projected to add about 170,000 more people and 240,000 more jobs than the No Project Alternative. These 2020 values represent relative increases of 0.4% for population and 0.9% for employment over the No Project Alternative forecasts. For year 2035, the HST Alternative is projected to add about 700,000 more people and 450,000 more jobs than the No Project Alternative. These 2035 values represent relative increases of 1.3% to 1.5% over the No Project Alternative forecasts.

These forecasts suggest that the incremental population effect (i.e., increase in population relative to the No Project Alternative) is slower to develop than the incremental employment effect. Specifically, about 25% of the population effect would occur by 2020, while about 50% of the employment effect would occur in the same timeframe. These results are consistent with economic theory that suggests that the direct employment effects from a major stimulus (i.e., a new HST system) would occur shortly after the stimulus (i.e., service initiation) occurs. Since for purposes of this analysis the HST Alternative is assumed to open between 2016 and 2019, a significant amount of the total employment effect would occur by 2020. Population growth tends to lag behind the direct employment effect for two key reasons.

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[6] Estimates of current urbanized area are based on urban land cover data provided by the California Farmland Mapping and Monitoring Program (CFMMP), a division of the California Department of Conservation.

[7] California's housing plan update (Raising the Roof: California Housing Development Projections and Constraints, 1997–2020; California Department of Housing and Community Development; May 2000; Exhibit 17) analyzed changes in gross population densities between 1984 and 1986. This analysis included data for 11 of the 21 counties in the study area (see Section 5.2). In 9 of these 11 counties, the density of new residential development that occurred between 1984 and 1996 was between 50% and 585% higher than the average residential density that existed in 1984.

- Jobs generated by the direct employment effect tend to be filled through the existing labor pool initially, rather than through migration.
- Population increases tend to be driven more by growth in indirect and induced employment, both of which tend to be spread out in time.

Land consumption for all the alternatives is projected to be of the same magnitude because of the predominant effect of population growth. When assessing the relative differences among the alternatives, the HST Alternative is projected to consume somewhat less land than the other alternatives, even though the HST Alternative is associated with slightly higher levels of population and employment growth. In 2035, approximately 2,600 ac (1,052 ha), or 0.1%, less urbanized land is expected to be needed to accommodate the population and employment under the HST Alternative than under the No Project Alternative. The HST Alternative would also need less land than the Modal Alternative; in 2035, the HST Alternative would consume approximately 68,100 ac (27,559 ha) fewer, or 1.4% less, of non-urbanized land than the Modal Alternative. These results are driven by stronger employment growth in the services and FIRE sectors and market forces supporting denser station-area development for office-style facilities.

C. DETAIL FOR MODAL ALTERNATIVE

Statewide population and employment forecasts for the Modal Alternative are similar to those for the No Project Alternative. For Year 2020, the Modal Alternative is projected to add about 85,000 more people and 135,000 more jobs than the No Project Alternative. These 2020 values represent relative increases of 0.2% for population and 0.5% for employment over the No Project forecasts. For year 2035, the Modal Alternative is projected to add about 360,000 more people and 250,000 more jobs than the No Project Alternative. These 2035 values represent relative increases of 0.7% to 0.8% over the No Project forecasts.

Statewide results for the Modal and HST Alternatives are also similar, although the Modal Alternative is projected to generate about 200,000 (0.7%) fewer jobs and about 330,000 (0.6%) fewer residents than the HST Alternative in 2035. These slightly more modest growth effects projected for the Modal Alternative can be linked in part to the need for increased gas taxes, user fees, and other funding that would be needed to pay for the additional cost of the Modal Alternative relative to the HST Alternative.

Land consumption under the Modal Alternative is projected to be of the same general magnitude as under the No Project Alternative when compared to 2002 existing conditions. By 2035, the Modal Alternative is expected to require approximately 65,500 ac (26,507 ha) more, or 1.4%, than the No Project Alternative. These land consumption increases relative to the No Project Alternative are larger than the corresponding increases in population and employment. This result suggests that the Modal Alternative stimulates slightly more lower-density development than is projected to occur under the No Project Alternative. The result also likely reflects the fact that the Modal Alternative would have its strongest relative employment growth in lower-density industrial sectors, such as TCU and retail.

5.3.4 Regional and County Effects

Each of the alternatives has varied effects on different parts of the state. Part of this difference is in terms of overall population, employment, and urbanization projections. Another part of the difference is related to the type of industries that are projected to experience employment growth under each alternative.

Table 5.3-5 presents population and employment projections for each county and region analyzed. Figures are provided for Year 2002 existing conditions, and projections are provided for the three alternatives in Year 2035. On an absolute basis, the counties that are currently most populous are projected to exhibit the largest increases in population and employment from 2002 to 2035. Los Angeles, San Diego, and Orange Counties are each projected to add about one million or more people and jobs, while San Bernardino and Riverside Counties are projected to add more than one million additional people. Under all alternatives, the 5 counties in the Southern California region are projected to add more people and jobs than the remaining 53 counties in the state. Of the remaining regions, the Bay Area is projected to add the most jobs, followed by the Rest of the State, Northern Central Valley, and Southern Central Valley. For population, the Rest of the State is projected to add the most people outside of Southern California, followed by the Northern Central Valley, Southern Central Valley, and the Bay Area.

A. POPULATION GROWTH RATES

A relative comparison of county-level population data is depicted graphically in Figures 5.3-2 through 5.3-4. Figure 5.3-2 displays the relative change in population for each county from Year 2002 to Year 2035 under the No Project Alternative. (Darker shades indicate higher relative changes.) These data suggest continuation of recent trends in which counties in the Central Valley and the high desert region east of Los Angeles exhibit disproportionately large population growth rates. The lowest relative population growth rates are projected to occur in the core areas of the Bay Area and Los Angeles basin.

Figures 5.3-3 and 5.3-4 display county-level population growth rates for the Modal and HST Alternatives, respectively, compared to the No Project Alternative. Results suggest that both the Modal and HST Alternatives have a propensity to reverse the historic trend towards dispersed population growth, with "inner" portions of the Bay Area and Southern California exhibiting strong population growth rates under both alternatives. Under the Modal Alternative, population growth rates are projected to be highest in San Francisco, Orange, and San Diego Counties, while under the HST Alternative, Merced, San Francisco, and Sacramento Counties are projected to exhibit the highest growth rates. Compared to the Modal Alternative, the HST Alternative exhibits higher population growth rates in all regions and all counties except Orange, Riverside, and San Joaquin.

Table 5.3-5
Year 2035 Employment and Population County and Regional Totals

	Employment				Population			
County	2002 Existing Conditions	2035			2002 Existing Conditions	2035		
		No Project	Modal	HST (Base)		No Project	Modal	HST (Base)
Alameda	899,901	1,273,557	1,282,085	1,287,498	1,513,356	2,004,985	2,016,457	2,027,153
Contra Costa	483,812	723,006	727,862	732,194	953,069	1,227,082	1,233,977	1,242,398
San Francisco	771,599	918,391	926,652	939,928	795,577	705,619	716,763	738,467
San Mateo	501,712	636,802	642,062	652,637	770,102	930,793	938,120	954,896
Santa Clara	1,281,313	1,785,474	1,799,462	1,816,613	1,826,362	2,498,528	2,516,989	2,546,153
Solano	164,167	251,790	253,901	256,421	416,292	661,762	664,753	669,301
Bay Area*	**4,102,504**	**5,589,020**	**5,632,024**	**5,685,292**	**6,274,758**	**8,028,769**	**8,087,059**	**8,178,369**
Madera	59,123	149,752	150,520	151,305	135,695	312,674	313,763	315,340
Merced	90,070	164,898	167,050	174,870	224,709	421,175	423,879	449,329
Sacramento	756,313	1,037,902	1,048,771	1,097,473	1,259,423	2,002,082	2,017,634	2,061,967
San Joaquin	268,325	502,655	513,877	518,037	607,331	1,153,260	1,165,636	1,164,907
Stanislaus	216,690	383,284	388,080	397,966	485,123	920,782	927,228	934,388
Yolo	113,826	174,955	175,594	178,343	170,518	278,724	279,696	282,497
North Central Valley*	**1,504,347**	**2,413,446**	**2,443,892**	**2,517,994**	**2,882,799**	**5,088,697**	**5,127,837**	**5,208,428**
Fresno	429,002	688,186	698,767	709,524	839,582	1,411,889	1,424,683	1,441,577
Kern	322,774	522,862	526,022	528,661	712,198	1,468,936	1,474,792	1,479,979
Kings	51,289	74,942	75,555	75,945	132,092	244,219	244,801	245,137
Tulare	181,804	248,178	248,800	249,205	397,616	761,893	762,731	763,163
South Central Valley*	**984,869**	**1,534,168**	**1,549,145**	**1,563,334**	**2,081,488**	**3,886,937**	**3,907,007**	**3,929,857**
Los Angeles	5,452,745	7,406,409	7,482,434	7,502,773	10,007,779	13,302,934	13,415,179	13,454,864
Orange	1,878,327	2,870,740	2,906,688	2,901,398	2,910,976	3,910,017	3,959,760	3,950,770
Riverside	656,839	1,162,051	1,172,098	1,163,500	1,681,186	3,983,299	3,999,336	3,965,826
San Bernardino	731,420	1,220,510	1,229,392	1,245,657	1,816,378	3,798,899	3,813,001	3,867,414
San Diego	1,754,622	2,867,144	2,909,471	2,921,375	3,066,423	4,789,883	4,852,256	4,870,658
Southern California*	**10,473,953**	**15,526,855**	**15,700,084**	**15,734,703**	**19,482,742**	**29,785,032**	**30,039,532**	**30,109,532**
Rest of State	**2,722,219**	**3,809,552**	**3,791,825**	**3,815,877**	**5,080,451**	**8,420,610**	**8,411,353**	**8,475,119**
Statewide Total	**19,787,892**	**28,873,042**	**29,116,970**	**29,317,201**	**35,802,238**	**55,210,045**	**55,572,788**	**55,901,305**

Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in Rest of State category.

Source: Cambridge Systematics, Inc. 2003.

Figure 5.3-2
County-Level Population Growth under No Project Alternative

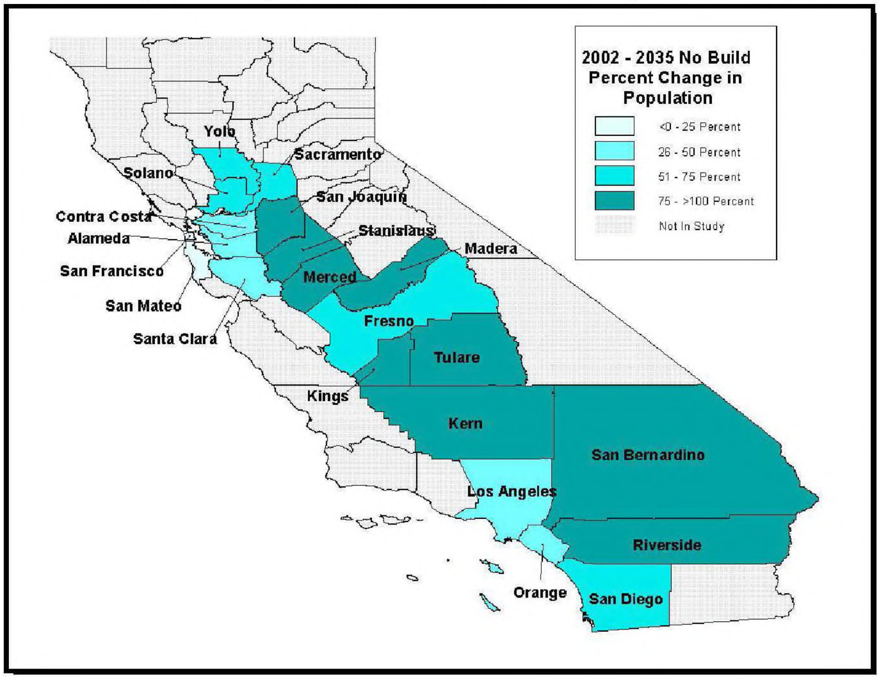


Figure 5.3-3
County-Level Population Growth under Modal Alternative

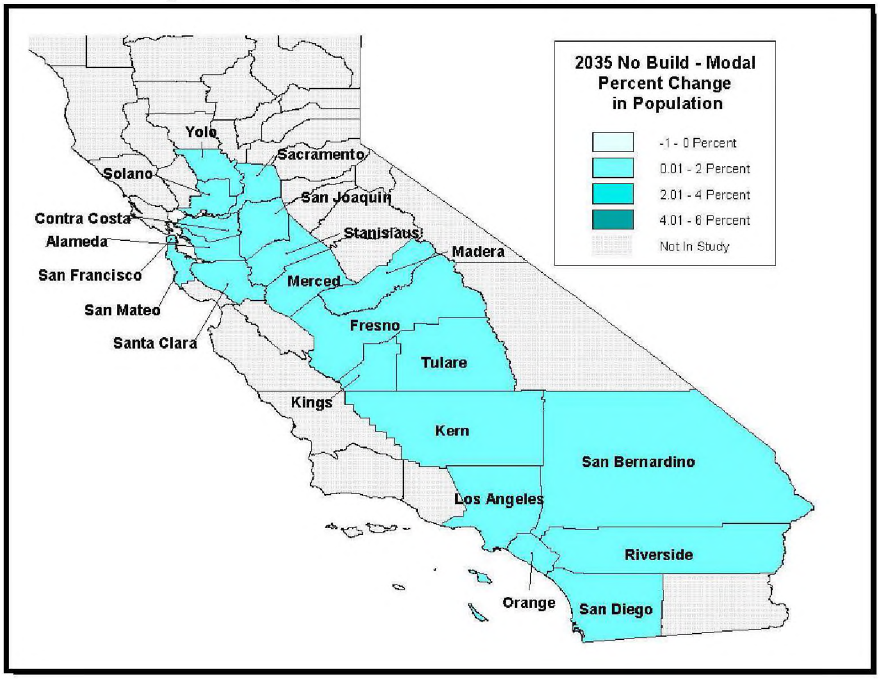
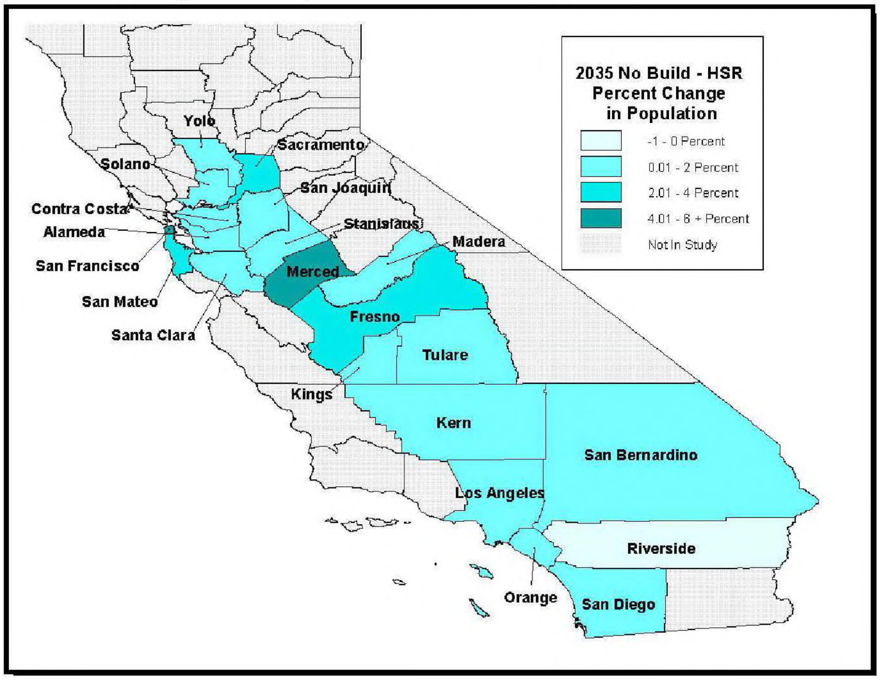


Figure 5.3-4
County-Level Population Growth under HST Alternative

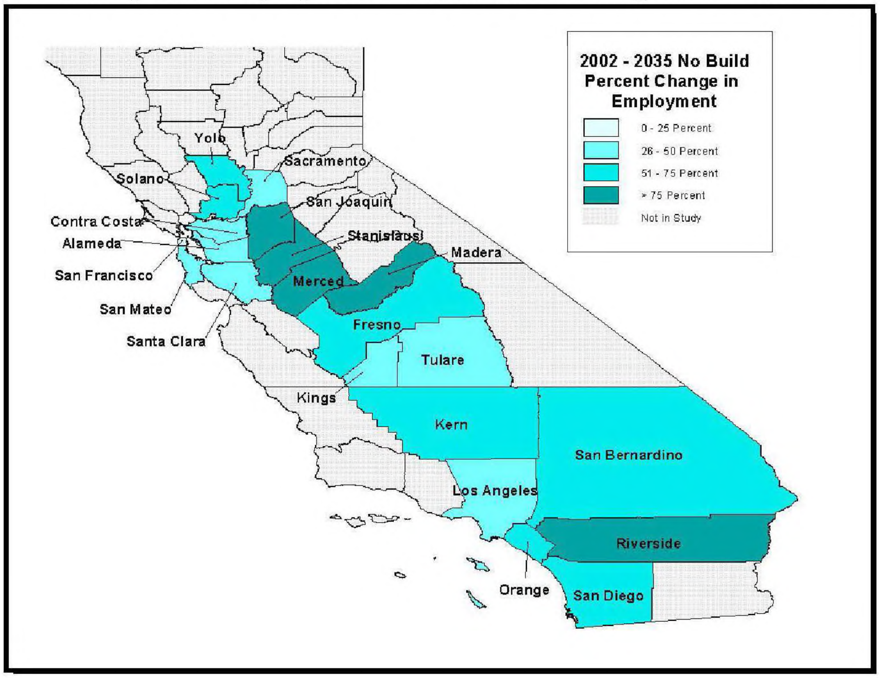


Analysis results suggest that the additional population growth under the HST Alternative is driven by internal job growth (i.e., job growth that occurs in the same county as population growth) related to initiation of HST service, rather than by potential population shifts from the Bay Area and Southern California accompanied by long-distance commuting. The results suggest a stronger propensity for redistribution of population within the Central Valley, with long-distance commuters relocating from Sacramento and San Joaquin Counties to lower-cost and better-positioned (for HST service) housing in areas such as Merced and Stanislaus Counties.

B. EMPLOYMENT GROWTH RATES

Figures 5.3-5 through 5.3-7 provide a graphic depiction of county-level employment growth rates. Figure 5.3-5 displays the relative change in employment for each county from Year 2002 to Year 2035 under the No Project Alternative. (Darker shades indicate higher relative changes.) These data suggest a continued decentralization in employment patterns, with strongest employment growth occurring in the Northern Central Valley and Riverside County. Unlike population growth, however, strong employment growth rates are also projected to exist in some of the traditional job centers such as Orange and San Diego Counties. San Francisco, Sacramento, and Los Angeles Counties are projected to experience the lowest relative employment growth.

Figure 5.3-5
County-Level Employment Growth under No Project Alternative



Figures 5.3-6 and 5.3-7 display county-level employment growth rates for the Modal and HST Alternatives, respectively, compared to the No Project Alternative. Compared to the Modal Alternative, the HST Alternative exhibits higher employment growth rates in all regions and all counties except Riverside. The Modal Alternative is projected to exhibit a more dispersed pattern of incremental employment growth with only one county, San Joaquin, exhibiting an employment growth rate in excess of 2%. The pattern is quite different for the HST Alternative, with eight counties exhibiting growth rates in excess of 2%, and Sacramento and Merced Counties exhibiting incremental employment growth in excess of 5%. While population and employment growth rates are relatively strong under the HST Alternative in most Central Valley counties, relative employment growth is larger than relative population growth in all of these cases except for Merced County.

The Northern Central Valley region has historically exceeded statewide averages for government and farming jobs while lagging in all other industry groups. This general pattern is projected to change slightly under the No Project Alternative, with employment shifts from government into farming, and from manufacturing, trade, and TCU into FIRE and services. Incremental job growth under the Modal Alternative is projected to roughly follow historical statewide averages, with 39% of job growth in manufacturing, trade, and TCU; and 44% in FIRE and services. The HST Alternative, on the other hand, is projected to have incremental job growth that is much more heavily oriented toward FIRE and services (63% of total), with manufacturing, trade, and TCU accounting for about 23% of incremental growth. This is the largest shift in the nature of employment for any region and alternative, and suggests that the HST Alternative could be a strong influence in attracting higher-wage jobs to the Central Valley.

Figure 5.3-6
County-Level Employment Growth under Modal Alternative

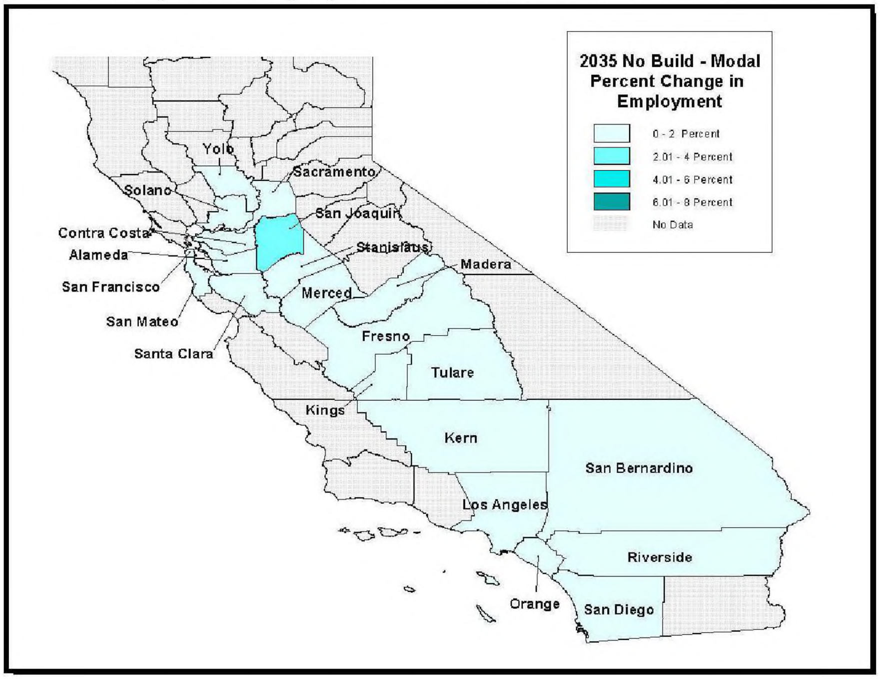
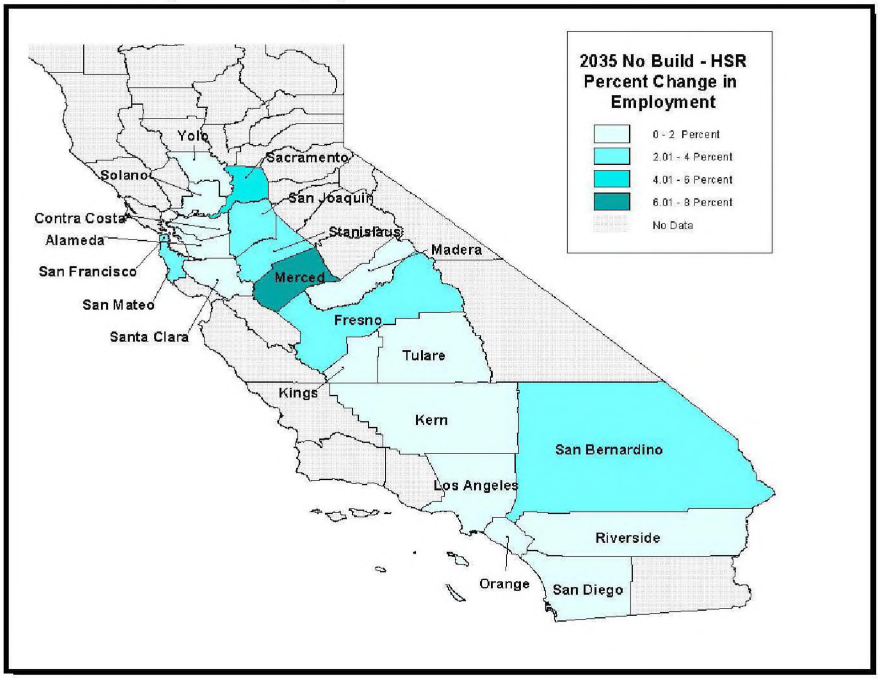


Figure 5.3-7
County-Level Employment Growth under HST Alternative



C. URBANIZATION

Table 5.3-6 presents projections for increases in urbanized areas for each region and county being analyzed. Existing conditions are provided for Year 2002, and projections are provided for the three alternatives in Year 2035. While population and employment increases were projected to be concentrated in the counties that are currently most populous, urbanization patterns do not follow this trend. Riverside and San Bernardino Counties are projected to exhibit the largest degree of urbanization under the No Project Alternative. Los Angeles, San Diego, and Orange Counties, which currently have the largest extent of land at urbanized densities, would experience a much lower rate of additional urbanization than Riverside and San Bernardino Counties.

The five counties that comprise the Southern California region would account for 60% of the future increase in urbanized acreage under the No Project Alternative for the counties included in this analysis. Outside of Southern California, the Southern Central Valley is projected to experience the most urbanization, followed by the Northern Central Valley and the Bay Area. Kern, Fresno, and San Joaquin are the only counties outside of Southern California that are projected to each experience an urbanization increase greater than 50,000 ac (20,234 ha) under the No Project Alternative; all five Southern California Counties are projected to exceed the 50,000 ac (20,234 ha) threshold.

Compared to the No Project Alternative, the Modal Alternative is projected to exhibit an increase in urbanization for all counties, with the greatest relative urbanization increase in Riverside, San Diego, Fresno, and San Joaquin Counties. The HST Alternative, on the other hand, is projected to experience a decrease in the extent of future urbanization, compared to the No Project Alternative in seven counties (Madera, San Joaquin, Stanislaus, Yolo, Tulare, Los Angeles, and Orange), the Northern Central Valley and Southern California regions, and the state as a whole.

Table 5.3-6
Year 2035 Size of Urbanized Area by Alternative
County and Regional Totals

	Urbanized Area (Acres)			
	2002	2035		
County	**Existing Conditions**	**No Project**	**Modal**	**HST (Base)**
Alameda	141,654	170,941	171,868	171,225
Contra Costa	142,467	163,617	164,216	164,874
San Francisco	23,277	27,921	28,081	28,345
San Mateo	70,869	80,517	80,930	81,267
Santa Clara	184,481	232,167	233,601	235,404
Solano	53,757	75,121	75,791	76,634
Bay Area*	**616,505**	**750,284**	**754,488**	**757,749**
Madera	23,255	46,926	47,047	45,329
Merced	31,712	55,964	56,242	57,212
Sacramento	157,101	197,843	198,820	202,471
San Joaquin	74,250	142,650	144,711	137,960
Stanislaus	55,426	96,993	97,968	93,562
Yolo	26,342	37,874	38,002	37,022
North Central Valley*	**368,086**	**578,250**	**582,790**	**573,557**
Fresno	96,977	186,908	189,641	189,503
Kern	111,468	221,030	222,407	226,851

County	Urbanized Area (Acres) 2002 Existing Conditions	2035 No Project	Modal	HST (Base)
Kings	29,479	43,576	43,655	44,910
Tulare	48,656	98,077	98,192	97,841
South Central Valley*	**286,580**	**549,590**	**553,895**	**559,105**
Los Angeles	763,373	916,904	926,720	881,982
Orange	273,713	328,269	328,795	323,189
Riverside	255,230	516,122	549,163	539,816
San Bernardino	237,905	496,637	497,983	498,004
San Diego	340,837	510,542	518,224	510,567
Southern California*	**1,871,058**	**2,768,473**	**2,820,884**	**2,753,557**
Statewide Total	**3,142,229**	**4,646,596**	**4,712,057**	**4,643,968**

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Source: Cambridge Systematics, Inc. 2003.

5.3.5 HST Alignment Options

The modeling process was also used to look at potential system-wide growth sensitivity for proposed HST alignment options. County-level growth projections were nearly identical between the base HST scenario and the different alignment options. One exception involved the Irvine alignment scenario, for which Orange County could gain about 5,000 jobs (0.2% increase in jobs) and 9,000 people compared to the base HST scenario. Nonetheless, in nearly all cases the magnitude of difference among the HST alignment options was less than the difference among the alternatives.

The analysis also suggested that most of the alignment options would not create meaningful differences in overall urban area size or station-area development density.[8] The one exception is the outlying stations alignment scenario in which the location of Central Valley and San Diego HST station sites outside of the downtown areas would likely weaken the economies of agglomeration[9] for businesses within these communities. In particular, a San Diego terminus at East Mission Valley instead of downtown San Diego is projected to increase countywide land consumption by about 12,000 ac (4,856 ha), or 0.5%, relative to the base HST scenario. The analysis suggests an advantage, both in terms of potential HST ridership inducement and growth control, with locating HST stations in or near the downtown areas instead of in suburban or undeveloped areas.

5.3.6 Summary of Effects

Overall, the alternatives and proposed HST alignment options would represent very similar levels of growth effects in terms of potential changes in urbanized area size and land consumption needs. The additional effect of the Modal and HST Alternatives relative to the No Project Alternative is small compared to the difference between the No Project Alternative relative to 2002 existing conditions.

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[8] For the Palmdale scenario analysis, results suggest that the likely growth effect in the Antelope Valley (including potential station sites in both Palmdale and Sylmar) would be on the order of 25,000 people and 15,000 jobs relative to the No Project Alternative, and 3,000 people and 1,000 additional jobs relative to the base HST scenario.

[9] Economies of agglomeration refers to the competitive advantage that a business can achieve by locating in close geographic proximity to ancillary industries.

The HST Alternative would stimulate additional growth relative to the other alternatives in some Central Valley counties between Sacramento and Fresno. In all cases except Merced County, the incremental employment effect is much larger than the incremental population effect, suggesting that the HST Alternative might be more effective at distributing employment throughout the state. Also, this result suggests that the HST Alternative would not stimulate large shifts in residential location from the Bay Area and Los Angeles into the Central Valley.

Experiences in other countries have shown that an HST system can provide a location advantage to those areas that are in proximity to an HST station, while at the same time facilitating broader economic expansion for a much wider geographic region. The HST Alternative would contribute to a potential economic boost in two ways.

- An HST system would provide user benefits (travel-time savings, cost reductions, accident reductions) and accessibility improvements for California's citizens; in addition to HST travelers, travelers on other modes of transportation can accrue these user benefits, as trips are diverted from highways and airports resulting in reduced congestion.
- An HST system would improve accessibility to labor and customer markets, thereby potentially improving the competitiveness of the state's industries and the overall economy. With this second effect, businesses that locate in close proximity to an HST station could operate more efficiently than businesses that locate elsewhere. Experience from overseas suggests that this competitive advantage may be quite pronounced in high-wage employment sectors that are frequently in high demand in many communities. This second effect would be much stronger under the proposed HST Alternative than under the other alternatives.

One of the most telling summary statistics comes from combining population and employment growth projections with land consumption forecasts, providing a measure of "land consumed per new job and resident." Essentially, this summary statistic tells us how efficient each alternative is at accommodating the projected growth. Since the alternatives have similar levels of overall growth, the efficiency by which that growth would be accommodated becomes more important. Table 5.3-7 provides the relevant data for each of the alternatives; lower values of the calculation suggest greater efficiency. The results indicate that the HST Alternative is the most efficient of the alternatives, providing an incremental development density that is 4% more efficient than the No Project Alternative, while the Modal Alternative is 2.3% less efficient than the No Project Alternative. This efficiency for the HST Alternative is achieved in conjunction with the highest population and employment growth rates of all alternatives and would be 6.3% more efficient than the Modal Alternative.

Table 5.3-7
Potential Land Consumption Efficiencies

	No Project Alternative	Modal Alternative	HST Alternative
Land Consumption (thousands of ac)	1,505	1,570	1,501
Job Growth (thousands of jobs)	9,085	9,328	9,529
Population Growth (thousands of people)	19,408	19,771	20,099
Acres Consumed per New Job and Resident*	0.0528	0.0540	0.0507
Efficiency Gain/Loss Relative to No Project Alternative	–	-2.3%	+4.0%

* Value found by dividing land consumption by the sum of job growth and population growth.

Source: Cambridge Systematics, Inc. 2003.

5.4 POTENTIAL INDIRECT IMPACTS OF INDUCED GROWTH

This section explores the potential indirect impacts related to incremental population and employment growth, and associated changes in urbanization. Potential indirect impacts are described for the Modal and HST Alternatives, with the No Project Alternative used as the reference point.

As described above, the HST and Modal Alternatives may have positive, albeit relatively small, statewide effects on population and employment growth compared to the No Project Alternative. At the county level results vary, but two-thirds of counties in the study area are projected to experience less than 2% more population growth under the HST Alternative than under the No Project Alternative in 2035. Employment also is projected to grow by less than 2% in the majority of counties under the HST Alternative compared to the No Project Alternative in 2035.

Despite the relatively small magnitude of this additional population and employment growth compared to the No Project Alternative, these changes could contribute to indirect impacts on the human or natural environment in addition to the direct impacts created by construction and operation of one of the alternatives. Many of these impacts may derive from the increased urbanization needed to accommodate the additional population and employment. In 2035, the total size of urbanized areas in California would be virtually the same under the proposed HST Alternative as under the No Project Alternative. Under the Modal Alternatives, approximately 65,500 ac (26,507 ha) more than the No Project Alternative (1.4%) are expected to become urbanized.

Much of the potential incremental growth associated with each alternative is likely to focus around points of access to the transportation system (i.e., proposed stations for the HST Alternative and interchanges or airports for the Modal Alternative). While the statewide and regional effects may differ only slightly, the localized effects could be larger near these points of access for the HST and Modal Alternatives compared to the No Project Alternative.

5.4.1 Transportation

This section discusses the potential impacts of induced growth on traffic conditions for highways, roadways, passenger transportation services (i.e., bus, rail, air, intermodal), goods movement, parking, and transit facilities within the study area.

Currently, the study area highway and roadway corridors considered in this analysis represent some of the worst traffic conditions in the nation. Traffic conditions throughout all five regions of California are expected to worsen. Vehicle volume to capacity (V/C) ratios are projected to deteriorate by 41% between Years 2002 and 2020, and each region would have more level of service F segments under the No Project Alternative compared to existing conditions. When compared to this projected degradation in traffic conditions under the No Project Alternative, the traffic conditions projected for the HST and Modal Alternatives would improve in all five regions, despite the estimated 2% increase in statewide population and employment under the proposed HST Alternative, and the estimated 1% increase for both population and employment under the Modal Alternative. The potential impacts of the induced growth, to the degree that they can be detected, would be most apparent around urban HST stations and airports, where the additional traffic generated by induced growth is expected to be concentrated. Under the Modal Alternative, however, roadway and interchange capacity would be increased in many of the areas that would otherwise see minor traffic increases from induced growth.

The largest increase in population and employment (4%) would occur in the Northern Central Valley region under the HST Alternative. This increase has the greatest potential to generate impacts from traffic accessing the potential HST station sites. Most of these communities have considerable capacity on roadways and intersections in areas surrounding potential downtown or outlying HST station sites. The potential traffic generation impacts of a projected 6% more residents and employees, such as that projected for Merced County, would be unlikely to have measurable impacts on roadway and intersection level of service.

As an overall conclusion, the indirect effects of induced growth on transportation for the Modal Alternative would be dispersed. To the degree that they are concentrated, their impacts are likely to be focused on property surrounding freeway interchanges and airports. The potential transportation impacts of induced growth under the HST Alternative are likely to concentrate around proposed HST station sites. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.2 Air Quality

Section 3.3, Air Quality, describes the potential impact of induced growth on air pollution. The induced growth analysis for the highway component of the Modal Alternative assumed that vehicle miles traveled (VMT) would likely increase approximately 1.1% above the level for the No Project Alternative. The Modal Alternative, therefore, is predicted to increase the amount of regional pollutants generated by 1.1% as compared to the No Project Alternative. Potential impacts range from low to medium within all the air basins analyzed. The analysis of direct effect found no air quality impacts from induced growth under the Modal Alternative for air travel or conventional rail.

The HST Alternative would accommodate an estimated 68 million people annually that would otherwise use the roadways and airports, leading to a potential VMT reduction on the state highway system. Thus, the HST Alternative is projected to decrease the amount of mobile-source air quality pollutants statewide and in all air basins analyzed as compared to the No Project Alternative. The additional 2% increase in population and employment from induced growth would generally be expected to increase traffic and mobile-source air pollutants by a proportional amount.

At the local level, however, the HST Alternative has more potential to affect local sites than the Modal Alternative because of expected increases in local traffic near HST station locations. It is expected that the induced growth could concentrate near HST stations, and thus the direct and indirect air quality effects could be larger around the station areas. The severity of these local impacts, however, cannot be reliably quantified without local and detailed traffic modeling and impact analysis, which is outside the scope of analysis for this Program EIR/EIS. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.3 Noise and Vibration

Increased population and employment related to induced growth would not increase the likelihood or possible levels of potential noise and vibration impacts. Therefore, no indirect impacts from induced growth are expected in the areas of noise and vibration.

5.4.4 Energy

A. STATEWIDE

There would not be any significant differences in potential energy use among the alternatives resulting from general population and employment growth projections because the magnitude of the incremental statewide population and employment growth is expected to be similar, regardless of which alternative is chosen. However, the expected propensity of the proposed HST Alternative to concentrate employment and population near HST stations, and the resulting incremental development density benefit, would tend to reduce the number and length of vehicle trips for work, leisure, and commerce compared to the No Project and Modal Alternatives. Such an effect would decrease the amount of energy directly used for transportation. The potential increased density in the vicinity of proposed HST station sites would also limit the amount of energy required for construction of and access to future infrastructure projects by reducing the distance between structures and reducing the number of structures that would be required to serve new population and employment growth. In addition, higher density would reduce demand for the large-volume transportation-related infrastructure projects required for a highly automobile-oriented transportation network.

Though little difference is projected in overall statewide employment under any of the proposed alternatives, the potential differences that are projected in the statewide industry composition associated with the alternatives considered could affect the consumption of electricity specifically and overall statewide energy in general. The Modal Alternative would promote relatively stronger growth in TCU, construction and manufacturing, and wholesale and retail trade, and therefore a relatively larger incremental growth in energy use than the proposed HST Alternative, which would encourage relatively larger incremental growth in FIRE, services, and government sectors. The latter industries would result in relatively smaller incremental growth in energy use by industry.

B. REGIONAL

The projected population and employment distributive effect of the project could create the need for some change in the incremental development of overall energy and electricity generation and/or transmission capacity among regions. For example, Merced County would exhibit the largest relative increase in both population and employment with implementation of the HST Alternative. Relatively high incremental growth is also expected in other counties within the Central Valley. San Francisco would exhibit the highest relative increase in population, while San Diego, Orange, and Fresno Counties would exhibit higher incremental employment growth relative to other counties. These differences in growth rates among counties would potentially require more incremental production and/or transmission capacity to be developed in some areas with implementation of the HST Alternative as compared to the No Project or Modal Alternatives.

The additional energy and electricity infrastructure required by population and employment growth in the Central Valley might be somewhat reduced because employment growth would be slightly higher in the FIRE and services industries, which are relatively less energy intensive than the construction and manufacturing, trade, and TCU industries. On the other hand, Southern California would see a somewhat higher relative incremental growth in the construction and manufacturing industries, which would increase the energy consumption of this region.

5.4.5 Electromagnetic Frequency and Electromagnetic Interference

Increased population or employment related to induced growth would not increase the likelihood or potential severity of electromagnetic frequency (EMF) and electromagnetic interference (EMI) associated with operation of the proposed HST or Modal Alternative. Therefore, no indirect impacts from induced growth are expected in the areas of EMF/EMI.

5.4.6 Land Use, Communities and Neighborhoods, Property, and Environmental Justice

This section describes the potential impacts of induced growth attributable to the Modal and HST Alternatives on land use compatibility, communities and neighborhoods, property, environmental justice, and socioeconomics.

A. COMPATIBILITY WITH EXISTING LAND USE AND FUTURE LAND USE PLANS

The analysis results indicate that employment is projected to increase under both the Modal and HST Alternatives, with employment potentially available for individuals possessing a broad range of education or job skills. Increased employment opportunities should lead to personal income growth in all regions of the state; this growth might be most pronounced in counties of the Northern Central

Valley under the HST Alternative, since that region is projected to experience the largest employment gain.

The relationship between employment, income growth, and the socioeconomic composition of a community is complex. Increases in employment and income opportunities, however, would tend to make a community more attractive to a broader range of individuals. Since induced growth under the Modal and HST Alternatives would be relatively small (compared to the growth from existing conditions to the No Project Alternative), it is expected that socioeconomic changes would also be small.

The Modal Alternative is projected to require approximately 79,000 ac (31,970 ha) of land more, or 1.4%, than the No Project Alternative by 2035. This additional development may make the Modal Alternative slightly less consistent with local land use plans. The Modal Alternative would add capacity to the most congested freeways and interchanges and have its strongest relative employment growth in lower density industrial sectors, such as TCU and retail. These two impacts are likely to place additional development pressure on urban and suburban areas. Furthermore, any large increase in roadway capacity and new freeway interchanges would create an opportunity for sprawl around the interchanges.

The HST Alternative is projected to push employment growth 2% higher statewide than the No Project Alternative. The development pressures associated with the HST Alternative would be concentrated in the service and FIRE industries, which generally occupy office developments and have been shown to locate close to transit stations. Recent trends among local jurisdictions show a growing consideration of land use policies that are intended to encourage high-density, mixed-use development close to downtown and other areas in which HST stations may be located.

B. COMMUNITIES AND NEIGHBORHOODS

The induced growth associated with either the Modal or HST Alternative would not create new barriers within neighborhoods and would not result in impacts on community cohesion because the growth would generally follow existing transportation corridors and rights-of-way. The induced employment growth associated with the HST Alternative would have some modest potential to increase office/commercial development densities around HST station sites.

C. PROPERTY

The induced population and employment growth that would be attributable to the Modal and HST Alternatives is not projected to create the need for any additional right-of-way for wider highways, new interchanges, additional runways, or other auto or air travel infrastructure.

The highest potential for property impacts under the HST Alternative would be expected to occur where the induced growth leads to larger or denser development adjacent to HST stations. The planning policies and general plans of most jurisdictions in which potential HST station sites would be located, however, are directing present and future development into their urban centers and to in-fill sites independent of possible future HST implementation. Thus, the additional density induced by the location of proposed HST station sites would be difficult to detect and would be expected to have little impact on adjacent property. It is possible that the induced employment growth in some of the highest-growth counties could place modest development pressure on land immediately adjacent to the most impacted stations. An increase in density, if not designed to minimize impacts on adjacent properties, would have some potential to affect property. The methods of analyzing the potential property impacts of the alternatives are discussed in Section 3.7, Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice.

D. ENVIRONMENTAL JUSTICE

The induced growth attributable to the Modal or HST Alternative should not have disproportionate impacts on minority and low-income populations. The induced growth from the Modal or HST Alternative would have the potential to offer improved employment opportunities to local communities. These opportunities may arise from more diversified regional economies and robust employment growth in regions that would not benefit in the same way under the No Project Alternative.

The role of induced growth in the patterns of personal income growth and job creation across the state is mixed. The No Project Alternative would continue the historical trends—the Northern Central Valley region exceeding statewide averages for government and farming jobs, while lagging in all other industry groups. Incremental job growth under the Modal Alternative is projected to roughly follow historical statewide averages, with 44% of job growth in FIRE and services and 39% in manufacturing, trade, and TCU. The small increase in job growth expected under the Modal Alternative would offer lower wage and seasonal workers modest improvements in employment opportunities, especially in the manufacturing, trade, and TCU sectors that offer year-round employment at somewhat higher wages than agriculture and services. Incremental job growth under the HST Alternative, on the other hand, is projected to focus more on FIRE and services (63% of total), with manufacturing, trade, and TCU accounting for about 23% of incremental growth.

The consequence of growing employment in the service industries would be a diversification in the Central Valley away from agriculture and into more non-agricultural jobs. The impact of these new jobs (and the population growth and new development that it would stimulate) on minority and low-income populations in each county cannot be identified in this Program EIR/EIS. In general, FIRE and service job growth would tend to be attracted to station areas (HST Alternative), and highway interchanges and airports (Modal and No Project Alternatives). The extent to which this development would potentially use land occupied by minority and low-income populations would deserve consideration at the project-level review of potential environmental justice issues. The growth in FIRE and service sector employment would tend to offer more jobs to high-skilled members of the work force than to low-skilled workers. Many service-sector jobs, however, would be accessible to low-skilled workers, and any increase in employment would generally have multiplier effects that would tend to generate indirect and induced job growth across many occupations.

5.4.7 Farmland and Agriculture

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in each county reflected in the analysis. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based information used in Chapter 3 showing the location of lands in agricultural use to produce estimates of the extent to which farmland might be converted to urbanized areas.

Table 5.4-1 provides estimates of farmland acreage that could be converted to urbanized land uses for the three alternatives in each analysis region. Results are presented separately for categories of prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance. The difference between the No Project and Modal and HST Alternatives provides an estimate of the indirect impact of induced growth on farmland and agriculture.

In total, induced growth associated with the Modal Alternative is projected to impact about 21,000 ac (8,498 ha) more of farmland on a statewide basis than the No Project Alternative, including about 3% more prime farmland and farmland of statewide importance, 5% more unique farmland, and 7% more farmland of local importance. Farmland of local importance is expected to experience the largest amount of conversion to non-agricultural use (about 9,300 ac [3764 ha]) of the four categories. The largest percentage difference would occur in the Bay Area and Southern California regions, with Southern California also accounting for the largest conversion of farmland (about 13,000 ac [5,261 ha]). Among individual counties, Riverside is projected to experience the largest conversion of farmland to non-agricultural use from induced growth (about 7,200 ac [2,914 ha]), with Fresno and San Joaquin Counties also expected to experience the conversion of more than 1,000 ac (405 ha) of farmland due to induced growth.

Table 5.4-1
Farmland Resources Potentially Affected by Future Urbanization

Analysis Region	Acreage of Resource Potentially Affected by Future Urbanization* (Percent Change from No Project Alternative) No Project Alternative	Modal Alternative	HST Alternative
Prime Farmland			
Bay Area	15,100	16,000 (6%)	17,000 (13%)
North Central Valley	66,900	68,500 (2%)	63,400 (-5%)
South Central Valley	111,500	113,800 (2%)	116,400 (4%)
Southern California	51,500	52,800 (3%)	53,200 (3%)
Total	**245,000**	**251,100 (3%)**	**250,000 (2%)**
Farmland of Statewide Importance			
Bay Area	4,600	5,000 (8%)	5,300 (14%)
North Central Valley	53,400	54,800 (8%)	53,600 (0%)
South Central Valley	15,800	16,100 (3%)	16,100 (2%)
Southern California	15,400	16,000 (4%)	15,200 (-1%)
Total	**89,300**	**91,900 (3%)**	**90,200 (1%)**
Unique Farmland			
Bay Area	1,900	2,000 (8%)	2,300 (19%)
North Central Valley	17,900	18,200 (2%)	16,400 (-8%)
South Central Valley	7,500	7,700 (4%)	7,700 (3%)
Southern California	26,900	28,700 (7%)	25,000 (-7%)
Total	**54,200**	**56,600 (5%)**	**51,300 (-5%)**
Farmland of Local Importance			
Bay Area	3,800	4,100 (8%)	4,400 (15%)
North Central Valley	23,000	24,400 (2%)	23,000 (0%)
South Central Valley	7,100	7,200 (1%)	6,600 (-8%)
Southern California	100,900	109,400 (8%)	93,700 (-7%)
Total	**134,800**	**144,100 (7%)**	**127,700 (-5%)**

* Values in the table indicate the resource acreage that is located within areas that are projected to become urbanized between the years 2002 and 2035 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics, Inc. and Parsons Brinckerhoff, Inc. 2003.

The potential induced growth associated with the HST Alternative is projected to impact about 4,100 ac (1,659 ha) fewer of farmland on a statewide basis than the No Project Alternative, including about 5% less unique farmland and farmland of local importance, 2% more prime farmland, and 1% more farmland of statewide importance. Prime farmland is expected to experience the largest absolute loss (about 5,000 ac [2,023 ha]) of the four categories. The largest percentage and acreage of farmland conversion to non-agricultural use is projected to occur in the Bay Area, while the Northern Central Valley and Southern California are projected to experience a reduction in farmland conversion compared to the No Project Alternative. Among individual counties, Sacramento, Santa Clara, Fresno, and Merced are each projected to experience farmland conversions of more than 2,000 ac (809 ha) due to potential induced growth under the HST Alternative. Los Angeles, San Joaquin, and Stanislaus Counties are each projected to have more than 3,000 ac (1,214 ha) less of farmland conversion under the HST Alternative than under the No Project Alternative. In Riverside County, about 7,000 ac (2,833 ha) of additional prime farmland is projected to be converted due to potential induced growth under the HST Alternative (compared to the No Project Alternative); at the same time, about 9,000 ac (3,642 ha) fewer of farmland of local importance are projected to be converted due to potential induced growth for the HST alternative; considering all four categories of farmland, about 1,600 ac (647 ha) fewer of farmland in Riverside County are projected to be converted due to potential induced growth under the HST alternative.

Except for the outlying stations scenario, the HST alignment options all would result in less farmland conversion than the base HST scenario, with the Palmdale scenario showing the largest reduction (2,800 ac [1,133 ha]). The outlying stations scenario is projected to increase farmland conversion by about 6,100 ac (2,469 ha) over the base HST scenario, with almost all of this increase occurring in San Diego County. The Diablo Range direct scenario options are projected to reduce farmland conversion in Santa Clara County by about 700 ac (283 ha) of mostly prime farmland, and the Palmdale scenario is projected to reduce prime farmland conversion in Tulare County by about 1,000 ac (405 ha). The other counties exhibit very similar results among the HST alignment options.

5.4.8 Aesthetics and Visual Resources

Aesthetics and visual resources refer to the natural and human-made features of a landscape that characterize its form, line, texture, and color. The character of the existing landscape takes shape and would change in each region over time as a result of land uses, development, and urban growth that may occur under any of the alternatives. Increased population or employment related to induced growth could contribute to these impacts, although the impact of the HST or Modal Alternative compared to the No Project Alternative would probably be insignificant. It would be speculative to attempt to characterize these potential changes at the program level without more specific information about what might be built.

5.4.9 Utilities and Public Services

To indicate potential impacts in this analysis, utilities and public services include electrical transmission lines, natural gas facilities, and wastewater treatment facilities. The capacity and extent of these utilities and services would be expected to expand gradually or in increments to accommodate the growth in population, employment, and urbanized land area expected to occur in California between now and 2035. Because the additional population, employment, and land consumption related to growth potentially induced by the HST and Modal Alternatives are relatively small compared to the total growth from existing conditions under the No Project Alternative, no considerable impacts are expected in the areas of utilities and public services.

5.4.10 Hazardous Materials and Wastes

Increased population or employment related to growth potentially induced by the HST and Modal Alternatives would not be expected to increase the likelihood or potential severity of exposure to hazardous materials and wastes. No indirect impacts from induced growth are expected in the areas of hazardous materials and wastes.

5.4.11 Cultural and Paleontological Resources

Future growth is expected to result in large areas of land within and outside of cities being developed to urban densities levels. However, it would be speculative to identify the likelihood or extent of potential impacts of development on prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, historic structures, and paleontological resources at the program level without knowledge of the precise locations where development projects may be built.

Increased population or employment related to growth potentially induced by the Modal or HST Alternative would not increase the likelihood or extent of potential impacts on cultural or paleontological resources. No indirect impacts from induced growth are expected in the areas of cultural and paleontological resources.

5.4.12 Geology and Soils

Increased population or employment related to growth potentially induced by the Modal or HST Alternative would not increase the likelihood or extent of potential impacts related to geologic formations, seismic hazards, slope stability, oil and gas fields, or mineral resources. No indirect impacts from induced growth are expected in the areas of geology and soils.

5.4.13 Hydrology and Water Resources

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in each county reflected in the analysis. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based maps showing general waterway locations to identify waterways that would be located within future areas of urbanization. Table 5.4-2 provides estimates of the miles of waterways that are within future growth areas and that, in turn, could be affected by this future growth. The difference between the No Project and the Modal and HST Alternatives provides an estimate of the potential indirect impact of induced growth on hydrology and water resources.

In total, induced growth associated with the Modal Alternative is projected to impact about 300 mi (483 km) more of waterways (8%) on a statewide basis than the No Project Alternative. The largest percentage and area difference is projected to occur in Southern California, with the other three regions exhibiting similar results for the Modal and No Project Alternatives. Among individual counties, Los Angeles is projected to have the most mileage of waterways (about 155 mi [249 km]) potentially affected by induced growth. Riverside is also expected to have more than 80 mi (129 km) of waterways potentially affected by induced growth.

Induced growth associated with the HST Alternative is projected to impact about 270 mi (435 km) more of waterways (7%) on a statewide basis than the No Project Alternative. The largest percentage and area increase is projected to occur in Southern California, with the other three regions exhibiting very similar results for the HST and No Project Alternatives. It should be noted, however, that the HST Alternative is projected to affect fewer waterways in the Northern Central Valley region than the No Project Alternative.[10] Among individual counties, Los Angeles is projected to have the most mileage of waterways (about 115 mi [185 km]) potentially affected by induced growth. Riverside, Sacramento, San Bernardino, Santa Clara, and Solano are also expected to experience noticeable increases in waterway mileage ranging from 3 mi (4.8 km) to 60 mi (96.6 km). Orange, San Joaquin, Stanislaus, and Yolo

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[10] This result occurs because the HST Alternative is projected to experience less conversion of undeveloped land to urbanized uses than the No Project Alternative in the Northern Central Valley.

Counties are each projected to have noticeably less waterway mileage potentially affected by induced growth.

Except for the outlying stations scenario, the HST alignment options all would result in about the same extent of waterway mileage potentially affected by induced growth. The outlying stations alignment scenario is projected have about 60 mi (96.6 km) more of waterway potentially affected by induced growth than the base HST scenario, with almost all of this increase occurring in San Diego, Stanislaus, and Kern Counties. In the Irvine alignment scenario, Los Angeles County is projected to have about 10 mi (16 km) more of waterways potentially affected by induced growth. The other counties exhibit very similar results among the HST alignment options.

Table 5.4-2
Hydrology and Water Resources Potentially Affected by Future Urbanization

	Waterways Within Areas of Projected Urbanization*, in Miles (Percent Change from No Project Alternative)		
Analysis Region	**No Project Alternative**	**Modal Alternative**	**HST Alternative**
Bay Area	430	450 (4%)	460 (6%)
North Central Valley	530	540 (2%)	510 (-4%)
South Central Valley	570	580 (2%)	590 (3%)
Southern California	2,170	2,430 (12%)	2,410 (11%)
Total	**3,700**	**4,000 (8%)**	**3,970 (7%)**

* Values in the table indicate the mileage that is located within areas that are projected to become urbanized between the years 2002 and 2035 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics, Inc. and Parsons Brinckerhoff, Inc. 2003.

5.4.14 Biological Resources

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in each county reflected in the analysis. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based maps showing general locations of habitats in which threatened and endangered species may be found, to identify biological resources that could be affected by areas of future urbanization. Table 5.4-3 provides estimates of the acreage of potential habitat for threatened and endangered species that could be affected by this projected future growth. The difference between the No Project and the Modal and HST Alternatives provides an estimate of the indirect impact of induced growth on biological resources.

In total, induced growth associated with the Modal Alternative is projected to impact about 17,300 ac (7,001 ha) more of threatened and endangered habitat (4%) on a statewide basis than the No Project Alternative. The largest percentage and acreage increase is projected to occur in Southern California, while the two Central Valley regions exhibit very similar results for the Modal and No Project Alternatives. Riverside County is projected to account for more than 12,000 ac (4,856 ha) of the 17,300 ac (7,001 ha) of threatened and endangered habitat affected by induced growth. Los Angeles and San Diego Counties are each projected to have more than 1,500 ac (607 ha) of threatened and endangered habitat affected by induced growth, with most other counties experiencing an increase of about 200 ac (81 ha) or less due to induced growth.

Induced growth associated with the HST Alternative is projected to impact about 8,400 ac (3,399 ha) more of threatened and endangered habitat (2%) on a statewide basis than the No Project Alternative. The largest percentage increase is projected to occur in the Bay Area, while the largest acreage increase (5,100 ac [2,064 ha]) is projected to occur in the Southern Central Valley. The Northern Central Valley is projected to experience a decrease in the acreage of threatened and endangered habitat affected by future growth. Kern and Riverside Counties are each projected to have more than 4,000 ac (1,619 ha) of threatened and endangered habitat potentially affected by induced growth. Riverside County is projected to have about 1,500 ac (607 ha) of threatened and endangered habitat potentially affected by induced growth, but this amount is much smaller than the 12,000 ac (4,856 ha) projected for the Modal Alternative. Merced County is projected to experience a decrease of about 750 ac (304 ha) in threatened and endangered habitat affected by future growth compared to the Modal Alternative.

The Palmdale, Diablo Range direct, and Irvine alignment scenarios are projected to exhibit nearly identical levels of potential impact on possible threatened and endangered habitat from induced growth to that projected for the base HST scenario. The East Bay alignment scenario is projected to experience an additional 2,000-ac (809-ha) impact on potential habitat in Alameda County, while the outlying stations scenario is projected to experience an additional 1,500 ac (607 ha) impact in Kern County.

Table 5.4-3
Biological Resources Potentially Affected by Future Urbanization

	Habitat of Threatened and Endangered Species Within Areas of Projected Urbanization*, in Acres (Percent Change from No Project Alternative)		
Analysis Region	**No Project Alternative**	**Modal Alternative**	**HST Alternative**
Bay Area	20,400	21,200 (4%)	21,500 (6%)
North Central Valley	46,700	47,600 (2%)	45,000 (-4%)
South Central Valley	129,200	129,700 (0%)	134,300 (4%)
Southern California	236,600	251,700 (6%)	240,400 (2%)
Total	**432,900**	**450,200 (4%)**	**441,300 (2%)**

* Values in the table indicate the resource acreage that is located within areas that are projected to become urbanized between the years 2002 and 2035 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics, Inc. and Parsons Brinckerhoff, Inc. 2003.

5.4.15 Wetlands

The urbanization footprints described above in the discussion of farmland and agriculture were combined with GIS-based maps showing general wetland locations to identify wetlands that could be affected by areas of future urbanization. (See Section 3.15, Biological Resources and Wetlands.) Table 5.4-4 shows estimates of the wetland acreage that could be affected by this future growth. The difference between the No Project and the Modal and HST Alternatives provides an estimate of the potential indirect impact of induced growth on wetlands.

In total, induced growth associated with the Modal Alternative is projected to impact about 600 ac (243 ha) more of wetlands (2%) on a statewide basis than the No Project Alternative. The largest percentage and acreage increase is projected to occur in the Northern Central Valley. Sacramento County is projected to have about 250 ac (101 ha) of wetlands that could potentially be affected by induced growth. Merced and San Joaquin Counties also exhibit noticeable losses in wetlands due to induced growth, while Stanislaus County exhibits no additional wetland loss under the Modal Alternative than under the No Project Alternative.

Induced growth associated with the HST Alternative is projected to impact about 330 ac (134 ha) more of wetland (1%) on a statewide basis than the No Project Alternative. The largest acreage and percentage increase is projected to occur in the Northern Central Valley, while Southern California is projected to exhibit a reduction in wetland loss due to future urbanization. Sacramento County is projected to have about 300 ac (121 ha) of wetland that could potentially be affected by induced growth. Contra Costa, Kings, Merced, and Riverside Counties also show noticeable (ranging from 17 ac [7 ha] to 54 ac [22 ha]) losses in wetlands due to induced growth; while Los Angeles, Stanislaus, and Tulare Counties exhibit less wetland loss under the HST Alternative than under the No Project Alternative.

The Palmdale, Diablo Range direct, Irvine, and East Bay alignment scenarios are projected to exhibit nearly identical levels of wetland loss from induced growth as the base HST scenario. The outlying stations scenario is projected to experience an additional 160-ac (65-ha) wetland impact in San Diego County, but no difference in other counties.

Table 5.4-4
Wetlands Potentially Affected by Future Urbanization

	Wetlands Within Areas of Projected Urbanization* (Acres) (Percent Change from No Project Alternative)		
Analysis Region	**No Project Alternative**	**Modal Alternative**	**HST Alternative**
Bay Area	16,290	16,430 (1%)	16,550 (2%)
North Central Valley	3,010	3,340 (11%)	3,310 (11%)
South Central Valley	2,590	2,600 (1%)	2,720 (5%)
Southern California	9,630	9,750 (1%)	9,260 (-4%)
Total	**31,520**	**32,130 (2%)**	**31,850 (1%)**

* Values in the table indicate the resource acreage that is located within areas that are projected to become urbanized between the years 2002 and 2035 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics, Inc. and Parsons Brinckerhoff, Inc. 2003.

5.4.16 Section 4(f) and 6(f) Resources (Public Parks and Recreation)

Increased population or employment related to induced growth would not increase the likelihood or extent of potential impacts on or uses of Section 4(f) and 6(f) resources, including publicly owned land from parks, recreation lands, wildlife and waterfowl refuges, and historic sites. No indirect impacts from induced growth are expected on Section 4(f) and 6(f) resources.

5.5 MANAGING GROWTH-INDUCING AND INDIRECT EFFECTS

5.5.1 Avoidance and Minimization Strategies

In general, HST station areas would offer a more attractive market for commercial and office development than the No Project and Modal Alternatives. Research for this project that considered urban rail systems in North America and high-speed rail systems in Europe and Asia supports this conclusion (Cambridge Systematics, Inc. 2003). This research found that industries needing many highly skilled and specialized employees are the most attracted to rail-station area development, and that a noticeable densification pattern would be likely to emerge in the vicinity of potential HST stations in response to real estate and market forces.

The research and analysis further indicates that an HST station is a considerably stronger draw for business development than a conventional intercity rail station or freeway interchange. This can encourage more compact development patterns, which has the potential to help avoid or minimize indirect impacts. These development patterns would likely offer many businesses a competitive advantage within their industry, because of close proximity to ancillary industries (i.e., industry clustering) and access to a well-educated labor force. These advantages, known as economies of agglomeration, have emerged around the French and Japanese HST stations.

The research also found that regulatory-style efforts by cities to encourage increased density and a mix of land uses near rail stations have been effective in attracting higher-density development. A Central Valley city, for example, would have an easier time redirecting new development to downtown sites adjacent to their HST station site than the outlying real estate markets created by freeway interchanges under the No Project and Modal Alternatives. Furthermore, the strong real estate markets around HST stations are likely to attract development that would otherwise locate throughout a dispersed suburban region. Thus, development around HST stations would potentially consist of both consolidation of currently projected growth (under the No Project Alternative) and new regional employment and population associated with the HST Alternative. With the HST Alternative such consolidation would lead to a lower level of indirect impacts from future urban development to natural resources as compared to the Modal Alternative.

The potential effect of regulatory style land-use strategies was tested in this analysis. Results suggest that even a modest strategy focused on the immediate station areas could reduce the potential urbanized acreage by an additional 30,000 ac (12,141 ha) (0.6% of total urbanized acreage in study area) under the HST Alternative. These results represent a low-end estimate of the possible densification effects of regulatory strategies in combination with the market forces likely to occur following the introduction of HST service. The research suggests that other jurisdictions have had some success in implementing more aggressive and region-wide regulatory-style strategies[11] in conjunction with high-capacity intercity and urban transit services. Experience in these areas suggests that more aggressive strategies might be more attractive to policy makers since HST could offer an economic rationale to developers to cluster new commercial, industrial, and residential development to provide easy access to the HST stations. In general, the No Project and Modal Alternatives do not have the potential for such market incentive.

In short, the HST Alternative provides a strong incentive for directing urban growth and minimizing a variety of impacts that are frequently associated with growth. This outcome would be seen in results for resource topics such as farmland, hydrology, and wetlands, where the indirect effects of the HST Alternative are less than the Modal Alternative, and in some cases less than the No Project Alternative, even with more population and employment expected with the HST Alternative. Additional land use strategies, which would be highly compatible with the HST Alternative, could be considered to further reduce development impacts on sensitive natural resources; provide further concentration of employment in central areas that tend to be more readily accessible to minority and low-income populations; and provide further concentration of a wide variety of activities making local transit options more feasible and, possibly, reducing local automobile travel.

5.5.2 Sensitivity of Results to Base Population and Employment Forecasts

The methodology for this analysis provides reliable estimates of the differences (or deltas) between employment and population projected to result from the No Project Alternative, and those projected to result from the Modal and HST Alternatives. The methodology, however, does not confirm, alter or change in any way the validity, reliability, or details provided in the base case population and employment forecasts. These base case forecasts relied on data developed by the DOF, Caltrans, W&P, and REMI, which represent the best available information on long-term economic and demographic

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[11] Examples of these strategies include urban growth boundaries, maximum parking requirements, jobs-housing balance, more diversity of land uses, higher densities, and higher service levels of mass transit.

conditions in the state. The base-case forecasts, however, of necessity rely on many assumptions related to future conditions and are subject to the same uncertainties as any other long-range forecast.

The population and employment deltas, measured in percentage terms, are not likely to differ as a result of changes in the base-case population and employment forecasts if these changes are somewhat equally distributed throughout the state or across many economic sectors. A change that is concentrated in one part of the state or within one sector of the economy, however, could lead to different deltas. It is reasonable, therefore, to consider how a significant change from the base-case population or employment forecasts would affect the delta calculated by the methodology. This sensitivity discussion investigates three possible scenarios to illustrate how the delta might change under alternative base-case forecasts of population and employment.

A. REDUCED EMPLOYMENT GROWTH IN THE FIRE SECTOR

The analysis indicated that the HST Alternative could lead to higher growth in the FIRE sector because this sector would be expected to benefit more than manufacturing and warehousing from accessibility to HST improvements. FIRE employment has been growing steadily in California during the past 50 years, and the economic downturns have not resulted in any significant long-term change in this growth pattern. It is possible to project a scenario in which FIRE employment would stagnate because of growing automation and offshore substitution (e.g., in-house software design and call centers moving out of California to India, for example). Such a scenario would diminish the potential advantages HST could bring to the FIRE sector and thus reduce the employment delta for FIRE under the HST Alternative. It would be expected, however, that the Central Valley region would still see disproportionately higher growth in the FIRE sector because some of the state's existing FIRE jobs would migrate to the Central Valley HST station areas because of cheaper land and lower wage rates outside of the Southern California and Bay Area regions. This scenario would be expected to reduce the extent of indirect impacts in the Bay Area and Southern California, and either slightly reduce or maintain the extent of indirect impacts in the Central Valley.

B. RAPID GROWTH IN WAREHOUSING AND MANUFACTURING ACTIVITY

The Modal Alternative is expected to stimulate stronger growth in the TCU sector because this sector depends on trucking and warehousing activities that would benefit from the Modal Alternative's increased roadway capacity. TCU employment trends have been more variable than the FIRE sector, but nonetheless growing in California due to the increase in import and export activity through California's major ports. As trade activity recovers from the Asian recessions and manufacturing continues to move overseas, warehousing and distribution throughout California could accelerate under the base-case employment forecasts. This scenario might be expected to lead to a larger increase in the TCU employment delta for the Modal Alternative (relative to the HST Alternative). Although this scenario would increase overall employment growth under both the Modal and HST Alternatives, the difference in total statewide employment between these two alternatives would be less than the 200,000-job difference, as identified in Section 5.3.3, under the original base-case forecasts. The increased TCU employment growth would be expected to increase some of the indirect effects on natural resources noted in previous sections, with the Modal Alternative exhibiting a proportionately larger increase than the HST Alternatives. Noticeable differences in indirect effects to other resource categories would not be expected.

C. HIGHER THAN EXPECTED GROWTH IN STATE POPULATION

While natural drivers of population growth (birth rates and death rates) may be projected with some certainty, political factors influencing in-migration and out-migration could lead to differences from the base-case population forecast. A prolonged recession in Mexico or other Central or South American nations, for example, could increase immigration into California. This divergence from the California DOF forecast could swell the ranks of labor throughout the state. The impacts on the employment and population deltas, however, would be minimal because the Modal and HST Alternatives would tend to attract additional population related to employment opportunities in specific industry sectors. These industry sectors tend to rely on access to skilled labor and goods movement, and even a drastic increase in unskilled labor would have a minimal effect on industry growth under the Modal and HST Alternatives. This minimal effect on population and employment would be expected to lead, in turn, to minimal changes in projected indirect impacts for all resource categories.

5.5.3 Sensitivity of Results to Project Cost and Funding Assumptions

Analysis results presented in this chapter were based on assumed costs of approximately $25 billion for the HST Alternative and $56 billion for the Modal Alternative. Since the time that this analysis was completed, project costs have been refined and will continue to be refined as each alternative evolves and the design concept and scope become more fully defined. It is reasonable, therefore, to consider how a cost increase for the Modal or HST Alternative, or a change in project funding assumptions, might affect the population and employment deltas calculated by the methodology. The following sensitivity discussion considers both project costs and funding assumptions.

As noted in Section 5.3.2, analysis results reflect an assumption that project costs for the Modal Alternative in excess of costs for the HST Alternative, would be funded through a combination of tax increases, user fees, and federal grants. This cost differential amounted to $31 billion under original project cost assumptions. Analysis results indicate that funding of this cost differential through tax increases and user fees would reduce statewide growth by about 20,000 jobs and 45,000 people for the Modal Alternative. These values correspond to a 7.7% (0.25% per $1 billion) decrease in incremental job growth and 11.1% (0.36% per $1 billion) decrease in incremental population growth compared to results that would be obtained if project costs were not considered.[12] These relationships between project cost and job and population growth are likely linear within the range of costs likely to be encountered.[13] Given this linear relationship, the following general inferences can be drawn about the sensitivity of results to project cost.

- For the Modal Alternative, an increase in the overall assumed cost from $56 billion to $82 billion might lead to an additional statewide loss of between 37,000 and 53,300 jobs, and between 83,100 and 120,000 people compared to the results shown in the last row of Table 5.3-5.[14]
- For the HST Alternative, the effect of an increase in the overall assumed cost from $25 billion to $37 billion would depend upon how the increased cost was funded.
    - If the cost increase was assumed to come from the same existing revenue sources as described in Section 5.3.2 (i.e., the cost increase would not require direct tax increases or significant diversion of general fund revenues), then there would be no effect on statewide job or population growth.
    - If the $12 billion cost increase was assumed to come from increased taxes and user fees, then a statewide loss of 13,300 jobs and 29,900 people might occur, compared to the results shown in the last row of Table 5.3-5 for the HST Alternative.

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[12] Incremental growth refers to the growth in jobs and population above and beyond the amount that is expected to occur for the No Project Alternative.

[13] This conclusion is based on the analysts' prior experience with economic forecasting in general, and the REMI model in particular.

[14] The lower values for population and employment correspond to an assumption that only the cost increase of $26 billion ($82 billion minimum $56 billion) would require funding from increased taxes and user fees. The higher values for population and employment correspond to an assumption that both the cost increase ($26 billion) and the original $25 billion in funding from existing sources (as described in Section 5.3.2) would require funding from increased taxes and user fees.

- If the entire $37 billion project cost was assumed to come from increased taxes and user fees, then a statewide loss of 41,100 jobs and 92,100 people might occur, compared to the results shown in the last row of Table 5.3-5 for the HST Alternative.

Population and employment deltas are sensitive to assumptions regarding the use of existing versus new revenue sources, as well as the extent to which new revenues are assumed to come out of the local economy (i.e., through increases in user fees or state/local taxes). The previous discussion of project cost sensitivity assumed that a mix of funding sources[15] would be used to pay for the project costs. This mix included the following.

- Federal sources: 37.5% of project costs from federal funds.
- State and local tax sources: 50% of project costs from an increase in the state gas tax, and 4.1% of project costs from local general funds.
- Private sources: 4.2% of project costs from airport passenger facility charges, and an additional 4.2% of project costs from other airport revenues.

The interaction between these individual funding sources and economic growth is somewhat complex, but some general inferences can be drawn.[16]

- As the proportion of funding from federal sources increases, the sensitivity of population and job growth to project cost increases becomes smaller. Similarly as the proportion of funding from federal sources decreases, the sensitivity of population and job growth to project cost increases becomes larger.
- Within the general category of state and local tax funding, population and employment growth is likely more sensitive to raising revenue from new taxes (which, in turn, reduces personal consumptions), as opposed to substituting one kind of government spending for another (e.g., reducing education or welfare spending in order to pay off a general obligation bond).
- Population and employment growth is likely more sensitive to a narrowly focused tax or user fee as opposed to a broad-based tax increase.[17] While an increased sales or income tax would affect more people than a narrowly-focused tax, the broad-based taxes would be a smaller per capita amount and would be more dispersed throughout the larger consumer economy. A narrowly focused tax or user fee within the transportation industry (e.g., gasoline tax, airport passenger facility charge, toll roads, etc.) would affect a smaller population base to a larger amount, and could in turn have a dampening effect on air and car travel and hence mute some of the mobility and accessibility benefits provided by a transportation system investment.

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[15] This mix was described in general terms in Section 5.3.2 and was assumed to be used for funding the incremental project cost for the Modal Alternative.

[16] These inferences are based on the analysts' prior experience with economic forecasting in general, and the REMI model in particular.

[17] In order to raise a certain amount of money, a narrow tax or user fee affecting a certain segment of the population would need to be larger (in nominal terms) than a broad-based sales or income tax that would be spread across the entire population.

6 HIGH-SPEED TRAIN ALIGNMENT OPTIONS COMPARISON

6.1 INTRODUCTION

6.1.1 Purpose and Content of this Chapter

The purpose of this chapter is to summarize and compare the physical and operational characteristics and potential environmental consequences associated with the high-speed train (HST) alignment and station options. The comparison focuses on subject areas in which there are relative differences among the potential impacts of the various HST station and alignment options in each segment of the proposed system. This chapter summarizes potential environmental consequences for each alignment comparison for the environmental resource areas where relative differences were identified. (Refer to Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Strategies, for a comprehensive presentation of potential environmental consequences in each environmental resource area.)

For many of the environmental topics discussed in this chapter, the quantities presented represent areas within which potential impacts might occur. For example, the area of floodplains includes all floodplains within 100 feet (ft) (30.5 meters [m]) of either side of the centerline of the alignment considered; whereas the right-of-way necessary for the improvements considered is smaller (e.g., only 25 ft [7.6 m] on either side of the centerline for the HST Alternative). Therefore the magnitude of potential impacts reported in this document is considerably larger than the actual impacts that would be expected from either the HST or Modal Alternative.

6.1.2 Organization of this Chapter

This chapter is organized by study region. From north to south, the five study regions are Bay Area to Merced, Sacramento to Bakersfield, Bakersfield to Los Angeles, Los Angeles to San Diego via Inland Empire, and Los Angeles to San Diego via Orange County (LOSSAN). For each region, the alignment option comparisons are presented in tabular form by segment. The station options are presented individually and compared where multiple options are considered for the same general station area. The alignment and station options are briefly described in the tables and illustrated on the associated maps. For each alignment comparison, the following summary information is presented and compared where relative differences were identified.

- Physical/operational characteristics.
    - Alignment.
    - Length.
    - Capital cost.
    - Travel time.
    - Ridership.
    - Constructability.
    - Operational issues.
- Potential environmental impacts.
    - Transportation and related topics (air quality, noise and vibration, and energy).
    - Human environment (land use and community impacts, farmlands and agriculture, aesthetics and visual resources, socioeconomics, utilities and public services, hazardous materials and wastes).

- Cultural resources (archaeological resources, historical properties) and paleontological resources.
- Natural environment (geology and seismic hazards, hydrology and water resources, and biological resources and wetlands).
- Section 4(f) and 6(f) resources (certain types of publicly owned parklands, recreation areas, wildlife/waterfowl refuges, and historical sites).

6.2 BAY AREA TO MERCED REGION

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

6.2.1 Bay Area to Merced Alignment Options

A. SAN FRANCISCO TO SAN JOSE ALIGNMENT OPTIONS

All information presented is for the area from San Francisco to San Jose. This segment is shown in Figure 6.2-1.

	Caltrain Corridor
Physical/Operational Characteristics	
Alignment Description	From San Francisco to San Jose, this alignment would use the existing Caltrain rail right-of-way. This option assumes that the HST would share tracks with express Caltrain commuter trains. The entire alignment would be four tracks and completely grade separated. Station options considered in this segment include Transbay Terminal, 4th and King, Millbrae, Redwood City, Palo Alto, and San Jose Diridon.
Length in miles (km)	47–48 mi (76–77 km)
Cost (dollars)	$3.54 billion[1]
Travel Time (min)	27–30 min (depending on terminal station)
Ridership	This alignment would directly serve downtown San Francisco and San Francisco International Airport (SFO) and would have high ridership and revenue potential. Downtown San Francisco to downtown Los Angeles HST travel times could be accomplished in less than 2.5 hrs.
Constructability	Maintaining operations on the existing commuter rail service while constructing grade separations, tunnels, elevated sections, and stations would involve major construction issues/challenges. However, the infrastructure improvements could be constructed incrementally.
Operational Issues	Average speed = 104 mph (167 kph) Maximum speed = 93–124 mph (150–200 kph) HST operations would need to be coordinated and integrated with Caltrain service. The two middle tracks would be shared by HST and Caltrain, so some of the line capacity would be used for commuter services. Sharing tracks with commuter trains could increase the potential for HST delays.

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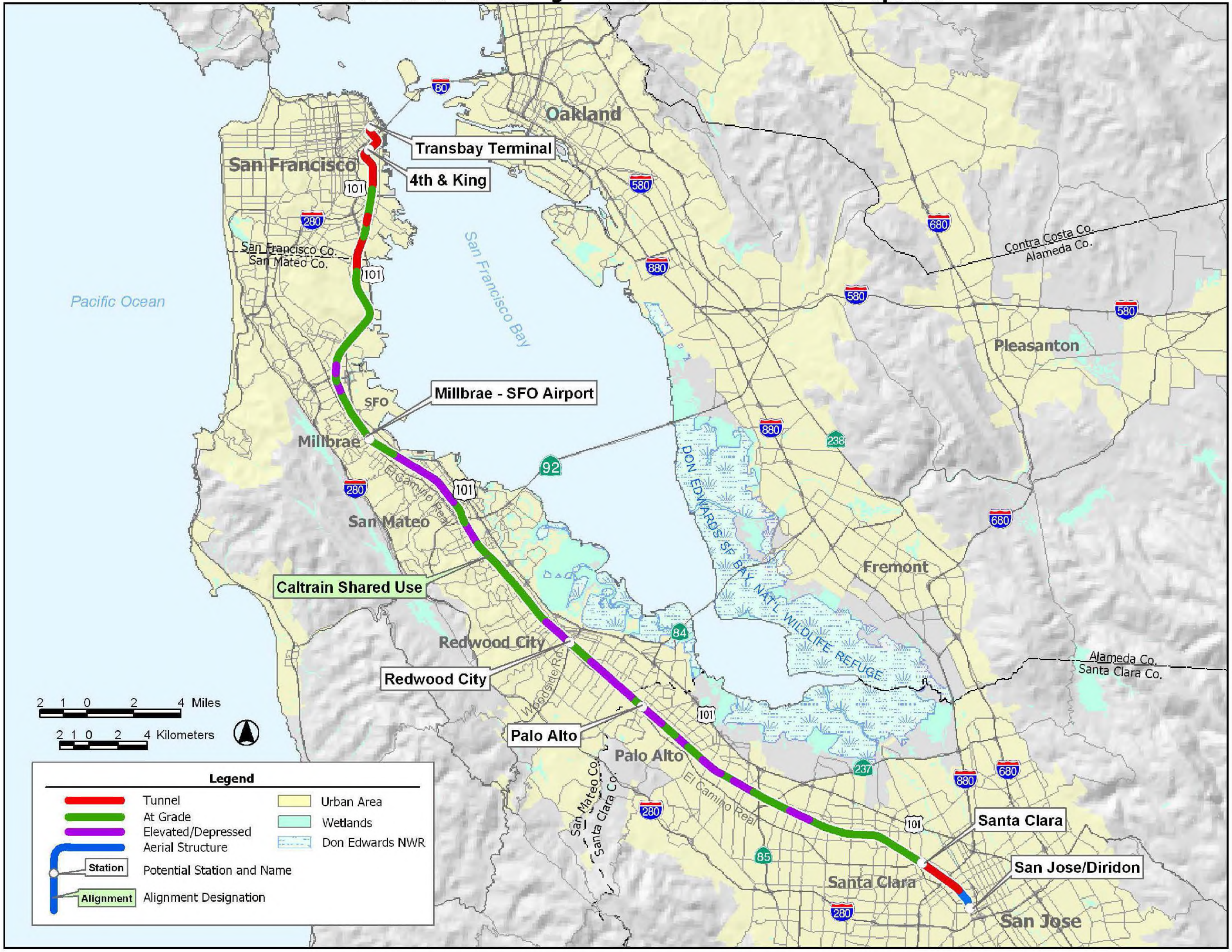
[1] Includes terminal at 4th and King. Does not include segment cost from 4th Street to Transbay Terminal or station cost for the Transbay Terminal.

Figure 6.2-1
San Francisco to San Jose Alignment and Potential Station Options



	Caltrain Corridor
Potential Environmental Impacts	
Travel Conditions	The Caltrain corridor alignment would bring direct HST service up the San Francisco Peninsula to downtown San Francisco with potential stations in downtown San Francisco, at SFO (Millbrae), a mid-Peninsula station at either Redwood City or Palo Alto, and a potential San Jose International Airport (SJC) link at Santa Clara. This alignment would increase connectivity and accessibility to San Francisco, the Peninsula, and SFO, the hub international airport for northern California. The HST system would provide a safer, more reliable, energy efficient intercity mode along the San Francisco Peninsula while improving the safety, reliability, and performance of the regional commuter service. The HST alignment would greatly increase the capacity for intercity and commuter travel and reduce existing automobile traffic. The fully grade-separated Caltrain corridor would improve local traffic flow and reduce air pollution at existing rail crossings.
Noise and Vibration:[2] High, medium, or low potential impacts	Medium potential impacts. Dense urban area surrounding land uses. The HST would travel at speeds less than 125 mph (201 kph) along this alignment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Highly compatible Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: Low potential impacts Alignment would be almost completely within the existing Caltrain right-of-way.
Aesthetics and Visual Resources: Number of potential viewing points and potentially high contrast/impact areas	Low potential impacts. Shared use of existing Caltrain right-of-way would reduce potential visual impacts. Elevated portions of alignment would have potential visual impacts.
Cultural Resources and Paleontological Resources:[3] Potential presence of historical resources in area of potential effect	22–23 known cultural resources It is estimated that the Caltrain alignment (established in the 1860s) has many historical resources and historical districts.

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[2] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, may be affected.

[3] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	Caltrain Corridor
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[4] 200 ac (81 ha) Streams:[5] 1,000 linear ft (305 linear m) Lakes[5]: 0 ac (0 ha) The stream crossings encroached upon by the existing Caltrain right-of-way are channeled and highly developed. Alignment would be almost completely within the existing Caltrain right-of-way.
Biological Resources Including Wetlands Ac (ha) of wetland and ac (ha) of special-status species habitat and number of special status species within potential impact study areas	Wetlands[5]: 0.1 ac (0.04 ha) Habitat[5]: 91 ac (37 ha) Species: 6 Shared use of existing Caltrain right-of-way would reduce potential wetlands and wildlife impacts. Alignment would be almost completely within the existing Caltrain right-of-way.
Section 4(f) and 6(f) Resources:[6] Number of resources rated high potential direct effects	Resources rated high: 0 Few potential impacts if any expected because alignment is almost completely within existing right-of-way.

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[4] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[5] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[6] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

B. OAKLAND TO SAN JOSE ALIGNMENT OPTIONS

All information presented is for the area from Oakland to San Jose. This segment is shown in Figure 6.2-2.

	Hayward/Niles/Mulford Line	**Hayward Line to I-880**
Physical/Operational Characteristics		
Alignment Description	This is the alignment currently used by the Capitol intercity rail service. From Oakland, this alignment would travel south along the Union Pacific Railroad (UPRR) Hayward Line to the UPRR Niles Line (Union City to Newark) and then onto the UPRR Mulford line (Newark to San Jose). Station options considered in this segment include West Oakland, 12th Street, Coliseum BART Station, Union City, Auto Mall Parkway, and San Jose Diridon.	From Oakland, this alignment would travel south following the UPRR Hayward rail line and then transition to the median of I-880. Between Fremont and San Jose, the alignment would be primarily on an aerial structure in the freeway median. Station options considered in this segment include West Oakland, 12th Street, Coliseum BART Station, Union City, and San Jose Diridon.
Length in miles[7] (km)	46 mi (74 km)	42 mi (68 km)
Cost[8] (dollars)	$3.16 billion	$3.30 billion
Travel Time[9] (min)	27 min	21 min
Ridership	Would have less potential ridership than the I-880/Hayward Line option.	Shortest travel times and highest ridership potential.
Constructability	Major construction issues associated with construction through Don Edwards San Francisco Bay National Wildlife Refuge (Don Edwards Wildlife Refuge).	Major construction issues associated with constructing columns and footings in the wide median of I-880 (between San Jose and Fremont), and the tunnel under the lake in Fremont Central Park.
Operational Issues	Average speed = 101–103 mph (163–166 kph) Maximum speed = 124–155 mph (200–249 kph) Greater potential for shared tracks with Capitol Rail Service. Potential conflict with UPRR freight access and operations.	Average speed = 116–120 mph (187–193) Maximum speed = 124–155 mph (200–249 kph) Potential conflict with UPRR freight access and operations from Oakland to Union City.

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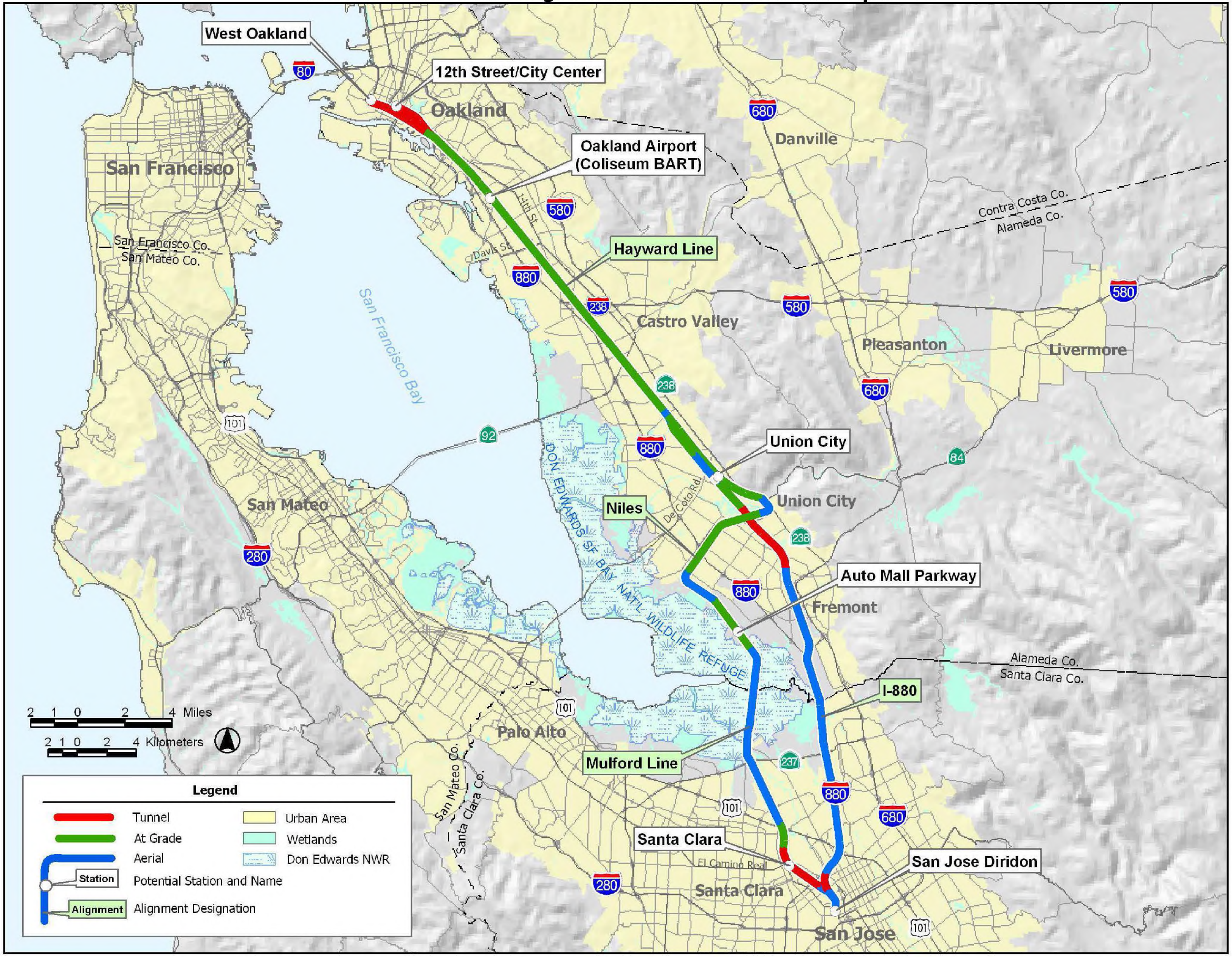
[7] Includes West Oakland terminal station.

[8] Includes West Oakland terminal station.

[9] Includes West Oakland terminal station.

Figure 6.2-2
Oakland to San Jose Alignment and Potential Station Options



	Hayward/Niles/Mulford Line	Hayward Line to I-880
Potential Environmental Impacts		
Travel Conditions	The Hayward/Niles/Mulford Line is a longer route and has tight curves that severely restrict speeds between Fremont and Union City. The line would serve additional potential station sites at Fremont (Auto Mall Parkway) and SJC (Santa Clara). The Oakland to San Jose alignments would bring direct HST service up the East Bay to Oakland with potential stations in Downtown Oakland or West Oakland, at Oakland International Airport (OAK) (Oakland Coliseum), and a potential southern Alameda County station at either Union City or Fremont (Auto Mall Parkway). These alignments would increase connectivity and accessibility to Oakland, the East Bay, and OAK. The HST system would provide a safer, more reliable, energy efficient intercity mode directly to the East Bay while improving the safety, reliability and performance of the existing Capitol intercity service (Sacramento to San Jose via I-80) through grade separation improvements between Oakland and San Jose. The HST alignment would increase the capacity for intercity travel in the East Bay and reduce highway congestion. Grade separations on the existing adjacent Mulford Line would improve traffic flow and reduce air pollution at existing grade crossings.	The I-880 alignment would provide shorter travel times to connect the HST system to the East Bay compared to the Mulford Line. For all potential markets to Oakland, the I-880 corridor would permit express and local travel times of about 6 min less than the Mulford Line. Travel times for the I-880 corridor between Oakland and Los Angeles could be 2 hrs 18 min, compared to at least 2 hrs 24 min for the Mulford Line. The Oakland to San Jose alignments would bring direct HST service up the East Bay to Oakland with potential stations in Downtown Oakland or West Oakland, at OAK (Oakland Coliseum), and a potential South Alameda County station at either Union City or Fremont (Auto Mall Parkway). These alignments would increase connectivity and accessibility to Oakland, the East Bay, and OAK. The HST system would provide a safer, more reliable, energy efficient intercity mode directly to the East Bay while improving the safety, reliability and performance of the existing Capitol intercity service (Sacramento to San Jose via I-80) through grade separation improvements between Oakland and Union City. The HST alignment would greatly increase the capacity for intercity travel in the East Bay and reduce highway congestion.
Noise and Vibration:[10] High, medium, or low potential impacts	Medium potential impacts. Potential impacts on wildlife at Don Edwards Wildlife Refuge. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.	High potential impacts. Would add noise to the grade-separated highway corridor through densely populated communities.

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[10] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Hayward/Niles/Mulford Line	Hayward Line to I-880
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Inconsistent with park use at Don Edwards Wildlife Refuge Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: High compatibility Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: High potential impacts
Aesthetics and Visual Resources: Number of potential viewing points and high contrast/impact areas	High potential impacts. Four viewing points through historic town of Niles. High contrast of elevated guideway with historic towns (Niles and Alviso) and scenic canyon (Niles). Potential impacts on Don Edwards Wildlife Refuge.	Medium potential impacts. Aerial structure in median of I-880.
Cultural Resources and Paleontological Resources:[11] Potential presence of historical resources in area of potential effect	22–23 known cultural resources. Both options have high percentages of historical development and apparent potential to affect historical architecture. The Hayward/Niles/Mulford line would potentially impact the Alviso Historical District.	22–23 known cultural resources. Both options have high percentages of historical development and apparent potential to affect historical architecture.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[12] 206 ac (83 ha) Streams[13]: 1,600 linear ft (488 m) Lakes: 17.1 ac (6.9 h) Streams crossed are sensitive estuaries with fringing coastal salt marsh at the southern end of San Francisco Bay. Potential impacts on estuaries would be reduced by use of aerial structures.	Floodplains: 180 ac (73 ha) Streams: 850 linear ft (259 m) Lakes: 0 ac (0 h) Elevated structure in freeway median would have fewer potential water impacts than the Hayward/Niles/Mulford line through the Don Edwards National Wildlife Refuge.

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[11] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[12] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[13] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	Hayward/Niles/Mulford Line	Hayward Line to I-880
Biological Resources Including Wetlands: Ac (ha) of wetland and ac (ha) of special-status species habitat and number of special status species within potential impact study areas	Wetlands:[14] 24.8 ac (10 ha) Habitat:[14] 61 ac (25 ha) Species: 9 Alignment would traverse 4 mi (6 km) of Don Edwards Wildlife Refuge, a major wildlife and bird sanctuary. Would potentially impact habitat for special-status shorebirds and waterfowl, including the endangered California clapper rail. Wetlands and tidal salt marsh support endangered species such as the salt marsh harvest mouse, steelhead, western snowy plover, and California red-legged frog.	Wetlands: 1.3 ac (0.5 ha) Habitat: 67 ac (27 ha) Species: 6 Eastern alignment in freeway median would avoid potential impacts on Don Edwards Wildlife Refuge and reduce potential wetlands and wildlife impacts.
Section 4(f) and 6(f) Resources:[15] Number of resources rated high potential direct effects	Resources rated high: 4 Alignment crosses Don Edwards Wildlife Refuge.	Resources rated high: 7 Resources are primarily local parks. Alignment would include tunneling under the lake at Fremont Central Park.

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[14] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[15] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

C. SAN JOSE TO MERCED ALIGNMENTS

All information presented is for the area from San Jose to the intersection of the north-south oriented alignment options in the Central Valley near Merced. This segment is shown in Figure 6.2-3.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	**Minimize Tunnel**	**Tunnel under Park**	**Via Gilroy**	**Via Gilroy Bypass**
Physical/Operational Characteristics					
Alignment Description	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would be north of Henry Coe State Park and cross a section of SR-130. No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would traverse through 8.2 mi (13.2 km) of Henry Coe State Park (2.6 mi [4.2 km] in tunnel and 5.6 mi [9.0 km] at grade). No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would tunnel under 5.9 mi (9.5 km) of Henry Coe State Park. No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor through Gilroy. The alignment would use the Pacheco Pass (in the vicinity of SR-152) to the Central Valley south of Merced. Station options considered in this segment include Gilroy and Los Banos.	From San Jose, this alignment would use the Caltrain corridor through Morgan Hill. The alignment would use the Pacheco Pass (in the vicinity of SR-152) to the Central Valley south of Merced. Station options considered in this segment include Morgan Hill and Los Banos.
Length in miles (km)	88 mi (142 km); 19 mi (31 km) of tunnel	86 mi (138 km); 16 mi (26 km) of tunnel	86 mi (138 km); 20 mi (32 km) of tunnel	117 mi (188 km); 10 mi (14 km) of tunnel	116 mi (187 km); 12 mi (14 km) of tunnel
Cost (dollars)[16]	$4.45 billion	$4.52 billion	$4.66 billion	$4.35 billion	$4.57 billion
Travel Time (min): (San Jose to Sacramento and San Jose to Los Angeles) Based on optimal express travel times.	San Jose to Merced: 34 min San Jose to Sacramento: 50 min San Jose to Los Angeles: 1 hr 56 min	San Jose to Merced: 32 min San Jose to Sacramento: 50 min San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 32 min San Jose to Sacramento: 50 min San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 40 min San Jose to Sacramento: 1 hr and 15 min San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 40 min San Jose to Sacramento: 1 hr and 15 min San Jose to Los Angeles: 1 hr 54 min

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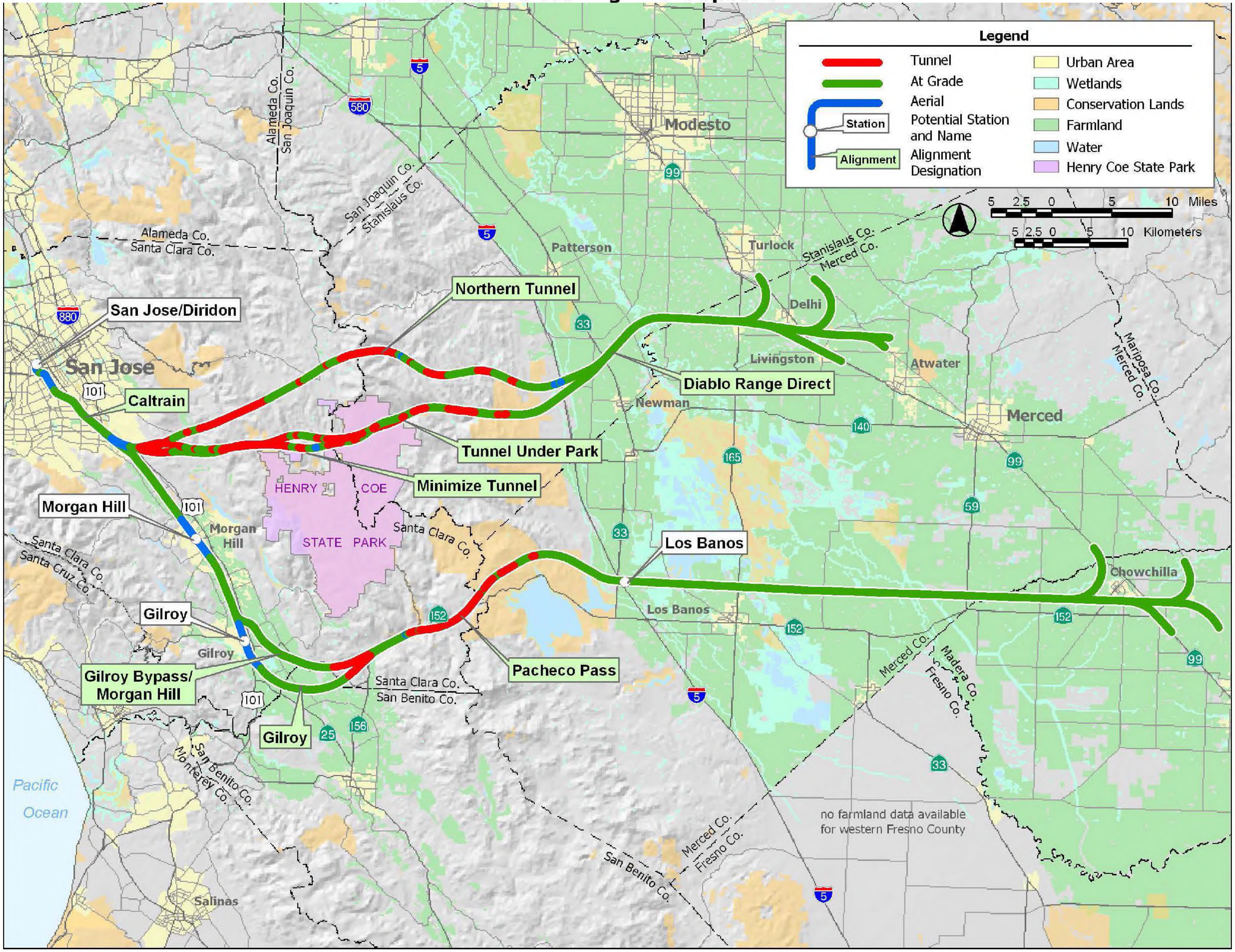
[16] Cost of Diablo Range Direct Options is estimated from San Jose Diridon Station to junction of UPRR near the Town of Dehli. Cost of Pacheco Pass Options is estimated form San Jose Diridon Station to Junction of UPRR near the Town of Chowchilla.

Figure 6.2-3
San Jose to Merced Alignment Options



	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	**Minimize Tunnel**	**Tunnel under Park**	**Via Gilroy**	**Via Gilroy Bypass**
Ridership	In comparison to the Business Plan (low-end) forecasts, total ridership was estimated to be about 0.5% less than Pacheco Pass options (150,000 annual passengers) and revenue was estimated to be 0.1% less ($900,000 less annually). Diablo Direct options would have higher ridership between Sacramento/Northern San Joaquin Valley and the Bay Area, but would have lower ridership between the Bay Area and Los Angeles since there would be no station in south Santa Clara County.			Pacheco Pass options would have less ridership between Sacramento/Northern San Joaquin Valley and the Bay Area, but would have higher ridership between the Bay Area and Los Angeles since there would be a potential South Santa Clara County station.	
Constructability	The northern tunnel alignment would cross SR-130 at the middle of the Diablo Range crossing, providing better construction access than other Diablo Range options.	The nearest road to the minimize tunnel alignment through the Diablo Range is SR-130, which is about 5.5 mi (8.9 km) north of the alignment. This alignment would need less tunneling than the other two.	The nearest road to the minimize tunnel alignment through the Diablo Range is SR-130, which is about 5 mi (8 km) north of the alignment.	The Pacheco Pass options are in the vicinity of SR-152 and have better highway access than the Diablo Range Direct options. These alignments would need less tunneling than the Diablo Direct alignments. These alignments would share right of way with Caltrain from Gilroy north.	
Operational Issues	Average speed = 153–162 mph (246–261 kph) Maximum speed = 186–217 mph (299–349 kph) Diablo Range Direct options would have somewhat lower (approximately 25% lower annually) operational and maintenance costs as a result of fewer total mi of HST system than the Pacheco Pass options.			Average speed = 172–174 mph (277–280 kph) Maximum speed = 186–217 mph (299–349 kph) Pacheco Pass options would have somewhat higher operational and maintenance costs than Diablo Range Direct options.	
Potential Environmental Impacts					
Travel Conditions	The Diablo Range Direct alignments would be shorter between the San Francisco Bay Area and Sacramento/northern San Joaquin Valley (including Stockton and Modesto) than the Pacheco Pass options, with shorter travel times between these markets. For example, for express trains between Sacramento and San Jose, the Diablo Range northern alignments travel times would be about 25 min less than the Pacheco pass (50 min for the Diablo alignments compared to 1 hr and 15 min for the Pacheco Pass). The Diablo Range Direct options would permit express travel times between Sacramento and San Francisco in 1 hr and 20 min compared to 1 hr and 45 min via the Pacheco Pass options. The Diablo Range Direct options would also provide quicker and potentially more frequent service to Merced. Travel times are estimated to be 6 or 8 min less between Merced and San Jose. Moreover, since the Diablo Range Direct options			The Pacheco Pass alignment options include potential stations at Gilroy (or Morgan Hill) and Los Banos, whereas the Diablo Range alignments would not have any stations between Merced and San Jose. The populations that would be served by the Gilroy and Los Banos stations would therefore have shorter access times and lower access costs to the nearest HST station for the Pacheco Pass alignments. The potential Gilroy/Morgan Hill station has a particularly high potential impact on connectivity, travel times, and access costs since, in addition to serving southern Santa	

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
	serve Merced from the north, Merced would be on the San Francisco to Los Angeles segment of the HST system and Would likely result in a higher frequency of travel for Merced to/from the Bay Area and Southern California.			Clara County, it would also be the most accessible station location for serving the Santa Cruz, Monterey/Carmel, and Salinas populations. These populations would have better connectivity to the Gilroy station site (Pacheco Pass via Gilroy) than the Morgan Hill site (via Gilroy Bypass). This corridor also has a longer shared corridor with Caltrain, which would benefit commuter travel from Gilroy to the Bay Area.	
Noise and Vibration:[17] High, medium, and low potential impacts	Medium potential impacts–San Jose to Diablo Jct. Low potential impacts–Diablo Jct. to Merced. Would traverse more undisturbed wilderness area than Pacheco Pass options, but potential noise impacts would be avoided where tunnels are used. Would have fewer potential urban impacts than Pacheco Pass options.	Medium potential impacts–San Jose to Diablo Jct. Low potential impacts–Diablo Jct. to Merced. Would have higher potential impacts on undisturbed wilderness area than other two northern options. Would have fewer potential urban impacts than Pacheco Pass options.	Medium potential impacts–San Jose to Diablo Jct. Low potential impacts–Diablo Jct. to Merced. Would traverse more undisturbed wilderness area than Pacheco Pass options, but potential noise impacts would be avoided where tunnels are used. Would have fewer potential urban impacts than Pacheco Pass options.	Medium potential impacts–San Jose to Gilroy. Low potential impacts–Gilroy to south of Merced. Would have the most potential urban area impacts.	Medium potential impacts–San Jose to Gilroy. Low potential impacts–Gilroy to south of Merced. Would have fewer potential urban area impacts than the Pacheco Pass via Gilroy option.

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[17] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	**Minimize Tunnel**	**Tunnel under Park**	**Via Gilroy**	**Via Gilroy Bypass**
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Low because of new corridor. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor. Also would affect Henry Coe State Park. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low overall, but higher compatibility in Gilroy Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts
Farmlands:[18] Number of ac (ha) potentially affected	Farmland: 549 ac (222 ha)	Farmland: 553 ac (224 ha)	Farmland: 551 ac (223 ha)	Farmland: 756 ac (306 ha) More potential impacts than Diablo Range Direct options.	Farmland: 770 ac (312 ha) More potential impacts than Diablo Range Direct options.
Aesthetics and Visual Resources: Number of potential viewing points and descriptions of high contrast/impact areas	Medium potential impacts Viewing points: 0 Natural open space, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal Would have less potential visual impact than at-grade option across Henry Coe State Park.	High potential impacts Viewing points: 0 Natural open space, Henry Coe State Park, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal Would have most potential visual impacts of the Diablo Range direct options.	Medium potential impacts Viewing points: 0 Natural open space, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal Would have less potential visual impact than at-grade option across Henry Coe State Park.	Medium potential impacts 10–20 viewing points Pacheco Creek Valley scenic natural open space. High contrast in line and color. Pacheco Pass options would potentially impact visual resources less than Diablo Range options since they would parallel the existing linear feature of SR-152 before going in tunnel to cross the natural area of Pacheco Pass.	

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[18] The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	**Minimize Tunnel**	**Tunnel under Park**	**Via Gilroy**	**Via Gilroy Bypass**
Cultural Resources and Paleontological Resources:[19] Potential presence of historical resources in area of potential effect	7 known cultural resources Would pass through remote terrain that avoids historical architecture. Northern tunnel option has least known cultural resources of the three Diablo Range options.	21 known cultural resources Would pass through remote terrain that avoids historical architecture.	22 known cultural resources Would pass through remote terrain that avoids historical architecture.	13 known cultural resources Pacheco Pass options have lower sensitivity rankings for archeology, but have high sensitivity ranking for historical architecture through the Santa Clara Valley.	15 known cultural resources Pacheco Pass options have lower sensitivity rankings for archeology, but have high sensitivity ranking for historical architecture through the Santa Clara Valley.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[20] 125 ac (51 ha) Streams:[21] 2,700 linear ft (823 linear m) Other water body area: 0.6 ac (0.2 ha) Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options. Would potentially impact fewer linear ft of streams than other options.	Floodplains: 180 ac (73 ha) Streams: NA Other water body area: NA Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options.	Floodplains: 171 ac (69 ha) Streams: NA Other water body area: NA Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options.	Floodplains: 589 ac (238 ha) Streams: 6,050 linear ft (1,844 linear m) Other water body area: 6.2 ac (2.5 ha) Would potentially impact substantially more floodplains, streams, and other water bodies than Diablo Direct options. Could exacerbate flooding of Pajaro River watershed.	Floodplains: 482 ac (195 ha) Streams: NA Other water body area: NA Would potentially impact substantially more floodplains, streams, and other water bodies than Diablo Direct options. Potentially impacts Pajaro River watershed.

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[19] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[20] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[21] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

		Diablo Range Direct		Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
Biological Resources Including Wetlands: Ac (ha) of wetland and ac (ha) of special-status species habitat, and special status species within potential impact study areas	Wetlands:[22] 1.6[23] ac (0.6 ha) Habitat: 108 ac (44 ha) Species: 4 Would avoid Henry Coe State Park and potentially impact fewer special-status species than other alignments. High amount of tunneling through Diablo Range would reduce potential fragmentation of wildlife habitat as compared with minimize tunnel option. This option crosses less conservation areas than other Diablo Range Direct options or Pacheco Pass options.	Wetlands: NA) Species: NA Alignment travels through Henry Coe State Park (8.2 mi [13.2 km] total with 2.6 mi [4.2 km] in tunnel). Lowest amount of tunneling through Diablo Range would increase potential fragmentation of wildlife habitat compared to other Diablo Direct options. All three Diablo Range alignments cross private conservation areas.	Wetlands: NA Species: NA Alignment tunnels under 5.9 mi (9.5 km) of Henry Coe State Park. High amount of tunneling through Diablo Range would reduce potential fragmentation of wildlife habitat compared to minimize tunnel option. All three Diablo Range alignments cross The Nature Conservancy lands, which are considered conservation areas of importance.	Wetlands: 48.0 ac (19.3 ha) Habitat: 180 ac (73 ha) Species: 10 Would potentially impact approximately 100,000 more linear ft (30,480 linear m) of waters and 3,000 ac (1,214 ha) more of special-status habitat than Diablo Direct options. Proximity to SR-152 would result in less fragmentation of undisturbed wildlife habitat than Diablo Range options. Pacheco Pass alignments cross the Romero Ranch conservation area.	Wetlands: NA Species: NA Would potentially impact approximately 100,000 more linear ft (30,480 linear m) of waters and 3,000 ac (1,214 ha) more special-status habitat than Diablo Direct options. Proximity to SR-152 would result in less fragmentation of undisturbed wildlife habitat than Diablo Range options. Pacheco Pass alignments cross the Romero Ranch conservation area.

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[22] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[23] Based on limited available information regarding wetland resources in this remote undeveloped area.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	**Minimize Tunnel**	**Tunnel under Park**	**Via Gilroy**	**Via Gilroy Bypass**
Section 4(f) and 6(f) Resources:[24] Number of resources rated high potential direct effects	High: 0 There are few documented Section 4(f) and 6(f) resources in this area.	High: 1 Henry Coe State Park Henry Coe State Park is the second largest state park and a large wilderness area in the Bay Area.	High: 0 This alignment passes under Henry Coe State park completely in a tunnel, with very few potential impacts on the park. There could be some potential temporary impacts during construction, but few potential long-term impacts due to use of tunnel boring machines and in-line construction.	High: 0 Could potentially impact historical structures through Gilroy including the Gilroy train station.	High: 0
Growth-Induced Potential Impacts: Ac (ha) of urbanized land required	Low potential impacts. These options reduce the statewide total of acres of urbanized land required for the alignment by approximately 600 ac (243 ha) in 2020 and 1,900 ac (769 ha) in 2035, compared to the Pacheco Pass options. Santa Clara, Sacramento, and Stanislaus Counties account for most of this reduction, although even in these cases the reduction is less than 0.5% of total projected urbanized acreage. The reduction in these counties is likely tied to elimination of direct or connecting access in southern Santa Clara, San Benito, and Monterey Counties with this design option. The Diablo Range Direct options are projected to reduce the conversion of mostly prime farmland in Santa Clara County by about 700 ac (283 ha).			Low potential impacts. The stations at Los Banos and Gilroy are forecast to attract a small amount of the urbanized acreage (0.5%) away from traditional urban centers in Santa Clara, Sacramento, and Stanislaus Counties.	

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[24] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.2.2 Bay Area to Merced Station Options

D. SAN FRANCISCO AND OAKLAND TO MERCED STATIONS

Station Name (Alignment)	Discussion
Downtown San Francisco	
Transbay Terminal (Caltrain)	The Transbay Terminal would offer greater connectivity to San Francisco and the greater Bay Area than the existing 4th and King site because of its location in the heart of the downtown San Francisco financial district, where many potential HST passengers could walk to the station. In addition, the Transbay Terminal would emerge as the transit hub for all major services to downtown San Francisco, with the advantage of direct connections to BART, Muni (the terminal is one block from BART/Muni), and regional bus transit (Samtrans, AC Transit, and Golden Gate Bridge District). Since the Transbay Terminal would offer greater connectivity to San Francisco and the greater Bay Area than the existing 4th and King site, total travel times to the Transbay Terminal are expected to be superior. The Transbay Terminal is very compatible with existing and planned development and is the focal point of the Transbay redevelopment plan that includes extensive high density residential, office, and commercial/retail development. The Transbay Terminal would have high ridership potential. Intercity ridership forecasts estimate between 7.8 and 17 million total boardings and alightings annually by 2020. However, the rail portion of the connection between 4th and King and the Transbay Terminal (that would be used by Caltrain and HST) requires difficult tunneling throughout the alignment and is estimated to cost nearly $1.00 billion for the 1.3-mi (2.1-km) extension (including underground HST/Caltrain station, tail tracks, and reconfiguring of the 4th and King yard). Both station options would have low potential environmental impacts. The conceptual operating plan that was assumed for the Business Plan proposed 66 trains (per day per direction - 132 total) to serve the Bay Area. Assuming dedicated use of four tracks and two island platforms by HST, the planned configuration of the Transbay Terminal could serve all of the trains proposed in the Business Plan. However, given the rail facilities planned for the Transbay Terminal (6 tracks and 3 platforms), the overall capacity available to accommodate HST and Caltrain commuter service would need subsequent cooperative operations planning analysis to determine the most efficient mix and scheduling of services to be accommodated. Any HST services (business plan levels or beyond) that are determined not to be accommodated at the Transbay terminal facility could terminate at other stations along the peninsula or East Bay.
4th and King (Caltrain)	The 4th and King station is the existing terminus for the Caltrain commuter rail service. This station site (adjacent to SBC Park) is well connected to the San Francisco Muni system, but stops more than 1 mi (1.6 km) short of the financial district and does not connect to BART or regional bus transit. The station would have about a 2.5-min shorter train travel time to San Francisco than the Transbay Terminal. The 4th and King station would also have high ridership potential. Intercity ridership forecasts (Business Plan low-end forecasts) concluded that the 4th and King terminal station would attract about 100,000 fewer annual intercity passengers than the Transbay Terminal and would also have less potential to serve long-distance commuter passengers. The underground 4th and King terminal station is estimated to cost $438 million.

Station Name (Alignment)	Discussion
Mid-Peninsula	
Redwood City (Caltrain)	This station would be multi-modal station at the existing Caltrain Redwood City station location. Intercity ridership forecasts estimate between 2.3 and 5.0 million total boardings and alightings annually by 2020. The Redwood City station option would have moderate construction and right-of-way issues and low potential environmental impacts, and is expected to cost about $10.0 million[25].
Palo Alto (Caltrain)	This station would be a multi-modal station at the existing Caltrain Palo Alto station location. The Palo Alto station would be a stop for the Caltrain express services, and therefore would have better connectivity to the regional commuter service and to the Peninsula. The Palo Alto station would be expected to have similar costs ($10.0 million[26]), construction issues, right-of-way issues, and ridership forecasts to the Redwood City station. The Palo Alto station option would be expected to have potential visual quality impacts.
San Jose	
Diridon (Caltrain, Hayward/Niles/Mulford, and I-880)	Diridon station would be a multi-modal hub maximizing connectivity to downtown San Jose and the southern Bay Area. Diridon station would have high connectivity and accessibility and would serve Caltrain, ACE Commuter Rail, Capitol Corridor, Amtrak, VTA buses, and light rail, with a possible link to BART. This station would also have high ridership potential. Intercity ridership forecasts project between 5 and 9.6 million total boardings and alightings annually by 2020. The HST platforms and tracks would be on an aerial structure constructed over the existing Diridon station platforms. As a result, there would be high construction issues but low potential environmental impacts, and a medium level of compatibility with existing land uses. This station is estimated to cost $93.4 million.
Airports	
SFO-Millbrae (Caltrain) **SJC-Santa Clara** (Caltrain and Hayward/Niles/Mulford) **OAK-Oakland Coliseum** (Hayward/Niles/Mulford and I-880)	All three potential airport stations would have direct connections to local and regional commuter rail services and would reduce potential travel times and costs for HST passengers who would use the trains for access to the airports. None of the three airport stations would be in the airport terminals, but each would permit easy access by potential people movers or shuttles (at SFO, BART currently provides a direct connection from the Millbrae Caltrain station to the SFO international terminal). All three potential airport stations would be on the alignments being investigated for service to San Francisco and Oakland. The SJC-Santa Clara station is approximately 2.6 miles from San Jose (Diridon) station. Shared-use stations at SFO and Santa Clara are each estimated to cost $10.0 million.[27] The OAK/Coliseum station is estimated to cost $27.0 million.

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[25] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

[26] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

[27] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated HST lines.

Station Name (Alignment)	Discussion
	SFO is the northern California hub airport for national and international flights. Intercity ridership forecasts project between 1.3 and 2.4 million total boardings and alightings annually by 2020 for the SFO station. The SFO station would be located in a floodplain with high potential floodplain impacts, and it would be at a historical train station with medium potential cultural impacts. The SJC station would have high connectivity, linking to Caltrain, ACE, Capitol Corridor, and VTA buses as well as SJC. It would have low potential environmental impacts, with the exception of a medium ranking for potential cultural impacts since it is at a historical train station. The OAK station would have high connectivity, linking to BART, Capitol Corridor, and AC Transit buses, as well as OAK. It would have a low potential environmental impacts.
Oakland	
West Oakland (Hayward/Niles/Mulford and I-880)	This station would directly connect with BART and would have good freeway access. Both the West Oakland and 12th Street station options would be underground and require alignments with deep-bore tunneling, with associated high construction issues and costs. The West Oakland station is estimated to cost $336 million. The 5.8-mi (9.3-km) alignment between a common point at 29th Street north of the Oakland Coliseum and West Oakland is estimated to cost $532 million (not including station, parking, or any associated right-of-way). The West Oakland station site would be adjacent to BART in a mixed-use area. It has a medium ranking for potential land-use compatibility conflicts and presence of minority populations in the vicinity of the station area.
12th Street/City Center (Hayward/Niles/Mulford and I-880)	This station would directly connect with BART and would have good freeway access. The 12th Street station would have superior connectivity, as it is located in the heart of downtown Oakland where many potential HST passengers could walk to the station. The 12th Street City Center BART station is also a transfer station, providing greater connectivity to the regional rail transit system. However, this option has more constructability issues than the Oakland West site. The 12th Street station is estimated to cost $336 million. The 5.8-mi (9.3-km) (cost) alignment between 29th Street north of the Oakland Coliseum and 12th Street is estimated to cost $557 million (not including station, parking, or any associated right-of-way). The 12th Street site would be in a deep tunnel under the 12th Street BART station and would have a low ranking for potential land-use compatibility conflicts and presence of minority populations in the vicinity of the station area.
Southern Alameda County	
Union City (Hayward/Niles/Mulford and I-880)	This station location would offer a high level of connectivity. The Union City station would connect to BART, Capitol Corridor, and AC Transit. It would have low construction issues and low potential minority population impacts, and is estimated to cost $28.7 million.
Auto Mall Parkway (Hayward/Niles/Mulford)	Auto Mall Parkway station would have good access to the I-880 freeway and connect to the Capitol Corridor, ACE Commuter Rail, and AC Transit. This site would only be served by the Hayward/Niles/Mulford alignment option. The Auto Mall Parkway station would have similar potential impacts and costs as the Union City station option, except that it would have medium potential impacts on parks and wildlife since it is located adjacent to the Don Edwards Wildlife Refuge. The Auto Mall Parkway station is estimated to cost $28.7 million.

Station Name (Alignment)	Discussion
Southern Santa Clara County	
Gilroy (Pacheco Pass via Gilroy)	Southern Santa Clara County would be served by a station at either Gilroy or Morgan Hill. Both of these potential stations would be at Caltrain commuter rail station locations. The Gilroy station is about 10 mi (16 km) south of Morgan Hill and therefore provides better connectivity and travel times and less access costs to the Santa Cruz, Monterey/Carmel, and Salinas markets. The Gilroy station is only served by the Pacheco Pass/Gilroy/Caltrain alignment; neither the Gilroy nor the Morgan Hill station sites would be served by the Diablo Range Direct alignment options. The Gilroy and Morgan Hill station options would have similar costs, construction issues, and operational issues, all of which were ranked as medium potential impacts. Both station options would be expected to have low potential environmental impacts; however, the Gilroy station site is located in a 100-yr floodplain and would have high potential floodplain impacts. Intercity ridership forecasts estimated the Gilroy station to have between 1.5 and 2.3 million annual total boardings and alightings by 2020. The Gilroy aerial station option is estimated to cost $75.6 million[28].
Morgan Hill (Pacheco Pass via Gilroy Bypass)	Southern Santa Clara County would be potentially served by a station at Morgan Hill. This station would be at a Caltrain commuter rail station location. The Morgan Hill station site would be served by the Diablo Range Direct alignment options. This site is expected to have about the same intercity ridership potential as the Gilroy site and is estimated to cost $166 million.
Western Merced County	
Los Banos (Pacheco Pass)	The potential Los Banos station would be north of Los Banos. It would have good accessibility to I-5 and would greatly reduce travel times and access costs to that population compared to the Gilroy or Morgan Hill sites. The Los Banos station would have low ridership and revenue potential, and limited connectivity and accessibility. In 2020, this station is forecast to serve a population of about 88,000 and to have between 155,000 and 190,000 annual total boardings and alightings. The Los Banos station site is located in a 100-yr floodplain and would have high potential floodplain impacts. This site would have medium potential impacts on water resources with potential impacts on the San Luis Waterway, and high potential impacts on threatened and endangered species. The station would have low construction, right-of-way, land use, and visual quality issues, and is assumed to cost about $28.7 million.

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[28] Costs are reduced because of lower proposed speed for station stopping tracks, which would require less infrastructure and right-of-way.

6.3 SACRAMENTO TO BAKERSFIELD REGION

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

6.3.1 Sacramento to Bakersfield Alignment Options

A. SACRAMENTO TO STOCKTON ALIGNMENT OPTIONS

All information presented is for the area from Sacramento to Stockton. This segment is shown in Figure 6.3-1.

	Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)	Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)
Physical/Operational Characteristics		
Alignment Description	The UPRR alignment begins at the Sacramento Rail Depot in downtown Sacramento. North of Lodi, the alignment diverges from UPRR to the CCT to bypass Lodi and reconnects to the UPRR to serve the proposed downtown Stockton station site. This alignment option includes a new alignment bypass of Stockton for express services. Station options considered in this segment include Sacramento Downtown station, Power Inn Road station and Stockton ACE Downtown.	The CCT alignment begins at the Sacramento Rail Depot in downtown Sacramento, using the UPRR alignment until transitioning to CCT near the potential Power Inn Road station site. The CCT alignment reconnects to UPRR to serve the proposed downtown Stockton station site. This alignment option includes a new alignment bypass of Stockton for express services. Station options considered in this segment include Sacramento Downtown station Power Inn Road station and Stockton ACE Downtown.
Length in miles (km)	49 mi (79 km)	50 mi (80 km)
Cost[29] (dollars)	$2.49 billion	$2.64 billion
Travel Time (min)	20 min	21 min
Ridership	The UPRR is a more direct route with slightly shorter travel times (1 min less). The UPRR and CCT rail alignments would serve the same basic populations and the same number of potential stations.	The CCT and UPRR rail alignments would serve the same basic populations and the same number of potential stations.
Constructability	The UPRR traverses more urban area than the CCT; however, HST would share freight right-of-way through Sacramento.	The transition from CCT at the Power Inn Road potential station site to the UPRR alignment to reach downtown Sacramento would include 2 mi (3 km) of property acquisition takes in urban Sacramento.

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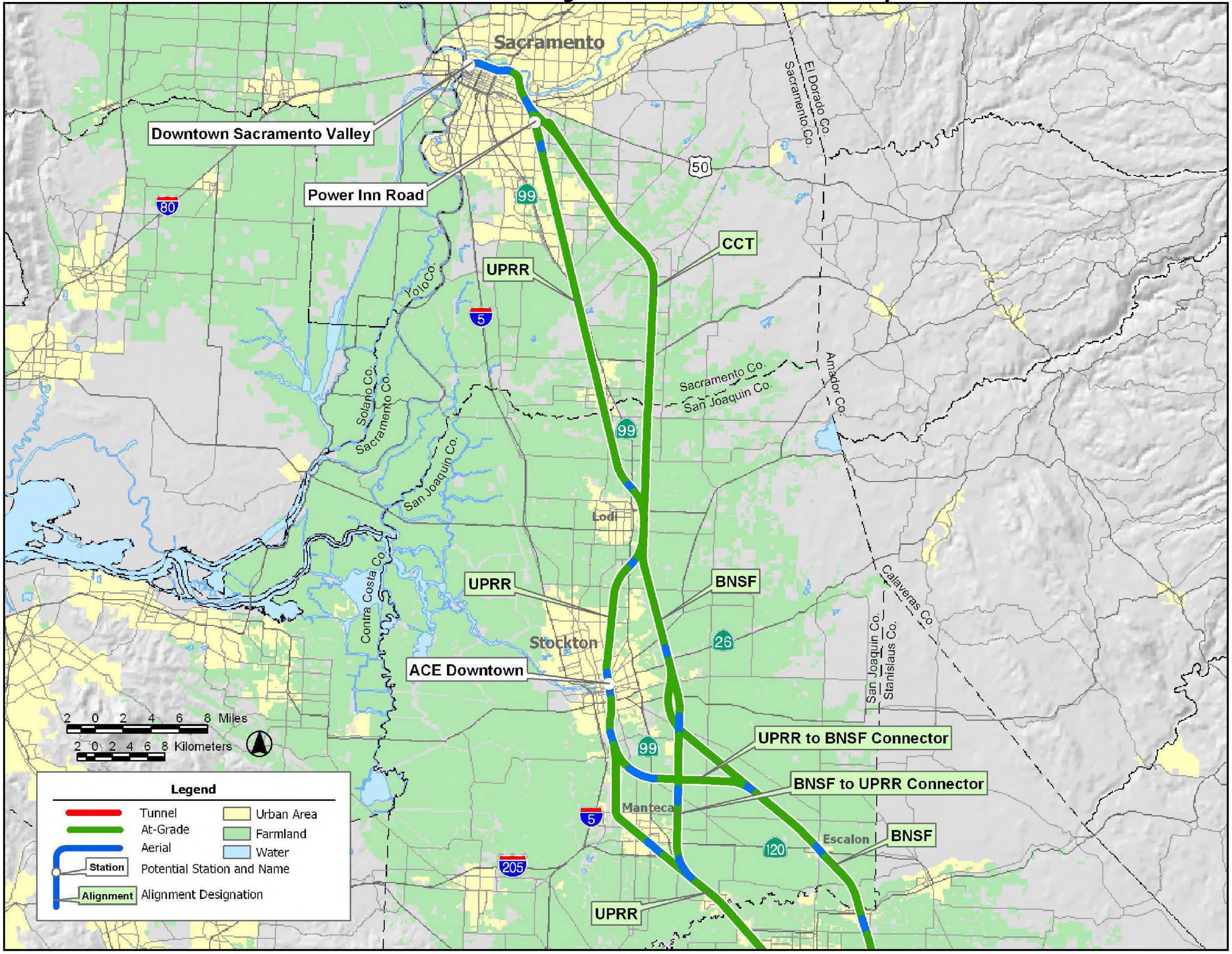
[29] Segment cost and length includes 3.8 mi south of Stockton ACE Downtown station (Little John Creek).

Figure 6.3-1
Sacramento to Stockton Alignment and Potential Station Options



	Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)	Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)
Potential Environmental Impacts		
Travel Conditions	The UPRR would result in slightly shorter travel times.	The CCT would result in slightly longer travel times.
Noise and Vibration:[30] High, medium, and low potential impacts	The UPRR alignment rates low overall because of the sparse residential development along most of the alignment. High potential impacts result through Sacramento; however, speeds are restricted below 100 mph (161 kph) through the urban core as a result of speed-restricting curves. There could be some increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings. The UPRR is a heavily used freight corridor and the grade separation improvements along this alignment would result in potential reductions in noise levels from existing conditions.	The CCT is a recently abandoned freight corridor, so there is less ambient noise in this corridor than in the UPRR. In addition, the CCT has more adjacent land designated for residential use than the UPRR alignment. In terms of potential noise impacts there is a considerable difference between introducing the HST system on the CCT alignment where there are no freight operations (this right of way is proposed as a hiking trail) and the UPRR, which is a heavily used freight corridor.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Although compatibility is considered low, the proposed alignment would be on or adjacent to the existing rail corridor. All station sites are located in areas where minority populations have been identified. Although stations would create potential impacts, they would also produce community access benefits. The Sacramento Valley and Stockton Downtown stations sites are at existing rail hub stations.	The CCT has more land designated for residential and agricultural use than the UPRR route, which would make it potentially less compatible with future land uses. The CCT alignment traverses primarily rural lands, However, there are some small segments with high potential impacts, particularly in Sacramento if the downtown station (UPRR connection) is selected. There is substantial community opposition to placing the HST on the CCT alignment. Both the Sacramento Area Council of Governments (SACOG) and City of Elk Grove (which is bisected by both alignments) support HST on the UPRR and oppose HST on the CCT as a result of potential community impacts. The CCT is an abandoned freight rail line that is proposed by the community for use as a hiking trail.

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[30] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)	**Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)**
Farmlands:[31] Ac (ha) of farmland (depending on specific configuration with loops and connections)	Farmlands: 588–599 ac (238–242 ha) RR rail alignment reduces potential impacts on farmlands between Sacramento and Lodi. Connection to CCT north of Lodi and express loop to the east of Stockton would require new alignments through farmlands, which could have potential severance impacts.	Farmlands: 449–460 ac (182–186 ha) Existing CCT rail alignment reduces potential impacts on farmlands between Sacramento and Stockton. The express loop to the east of Stockton would require new alignments through farmlands, which could have potential severance impacts.
Cultural Resources and Paleontological Resources:[32] Potential presence of historical resources in area of potential effect	Known cultural resources: 39–49 Potential for historical resources through downtown Sacramento and Stockton. However, the alignments through both cities would use existing rail right-of-way.	Known cultural resources: 44–54 Potential for historical resources through downtown Sacramento and Stockton. However, through both cities, the alignments would use existing rail right-of-way. The CCT traverses fewer urban areas.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[33] 371 total ac (150 ha) for option with express loop connection to UPRR; 610 total ac (247 ha) for option with express loop connection to Burlington Northern Santa Fe (BNSF) Streams:[34] 4,300 linear ft (1,311 linear m) Lakes: 0.88 ac (0.36 ha) Use of existing rail alignments reduces potential hydrology impacts.	Floodplains: 459 total ac (186 ha) for option with express loop connection to UPRR; 644 total ac (261 ha) for option with express loop connection to BNSF Streams: 3,500 linear ft (1,067 linear m) Lakes: 0.32 ac (0.13) ha Use of existing rail alignments reduces potential hydrology impacts.

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[31] The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

[32] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[33] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[34] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

<table>
<tr><th></th><th>Union Pacific Railroad (UPRR)
(Downtown Sacramento to Downtown Stockton)</th><th>Central California Traction (CCT)
(Downtown Sacramento to Downtown Stockton)</th></tr>
<tr><td>Biological Resources Including Wetlands:[35] Ac (ha) of wetland and ac (ha) of special-status species habitat and number of special status species within potential impact study areas</td><td>Wetlands:[36] 6.7 ac (2.7 ha)
Habitat: 79 ac (32 ha)
Species: 51
The UPRR alignment would have higher potential to disturb wetlands and to encounter threatened and endangered species. Although a new corridor would be required for Stockton express service, most of the alignment is within or adjacent to existing rail right-of-way.</td><td>Wetlands: 2.4 ac (1.0ha)
Habitat: 54 ac (22 ha)
Species: 31
The CCT alignment would have less potential disturbances to biological resources than the UPRR alignment.</td></tr>
<tr><td>Section 4(f) and 6(f) Resources:[37] Ac (ha) of parkland near HST right-of-way</td><td colspan="2">Resources rated high: 7
Alignment potentially impacts River Park, Sacramento; Tahoe Tallac Park, Sacramento; Cottonwood Park, Sacramento County; Illa Collin Park, Sacramento County; Tillotson Parkway, Sacramento County; Mendoza Park, Elk Grove; Panella Park, Stockton.</td></tr>
</table>

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[35] Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

[36] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[37] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

B. STOCKTON TO MERCED ALIGNMENT OPTIONS

All information presented is for the area from Stockton to Merced. This segment is shown in Figures 6.3-2a and 6.3-2b.

	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	**Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)**
Physical/Operational Characteristics		
Alignment Description	UPRR rail alignment from Stockton to Merced. This option includes a new alignment around the Modesto urban area for express services, which is required as a result of speed-restricting curves through Modesto. Station options considered in this segment include Modesto downtown and Merced downtown.	Both the UPRR and CCT alignments (and express loops) converge with BNSF southeast of Stockton. Just north of Merced, a new alignment is needed to transition from BNSF to UPRR through Merced. Station options considered in this segment include Amtrak Briggsmore and Merced downtown.
Length in miles (km)	67.5 mi (108.6 km)	67.3 mi (108.3 km)
Cost (dollars)	$2.45 billion[38]	$2.05 billion[39]
Travel Time (min)	25 min	24 min
Constructability	Considerable construction issues associated with urban construction, including aerial structures through downtown Modesto and Turlock.	Fewest potential construction impacts with minimal urban area traversed.

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[38] Segment cost and length ends 2.5 mi (4.0 km) southeast of Merced Downtown station (East Gerard Avenue).

[39] Segment cost and length begins 3.8 mi (6.1 km) south of Stockton ACE downtown station (Little Johns Creek).

Figure 6.3-2a
Stockton to Merced Alignment and Potential Station Options

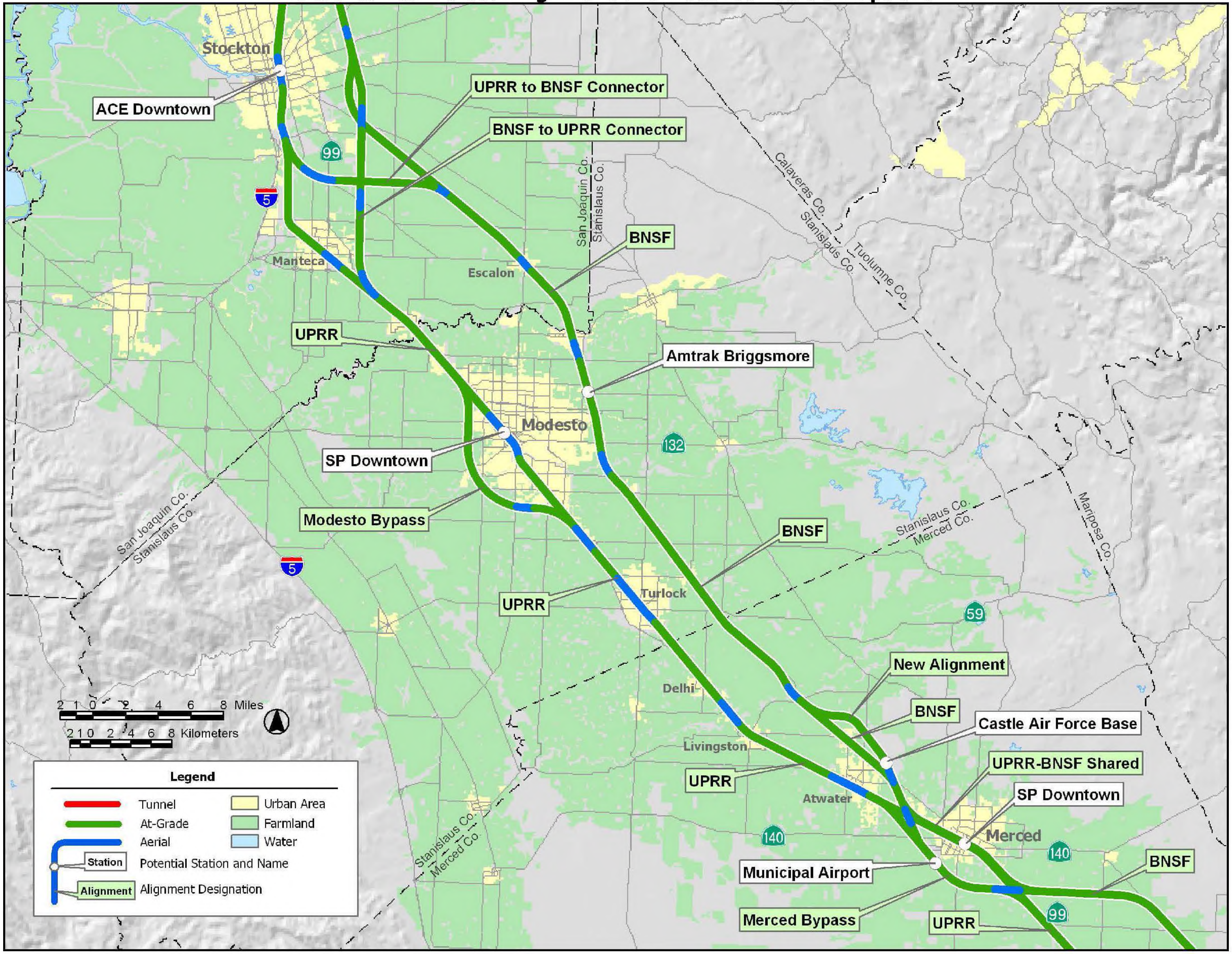
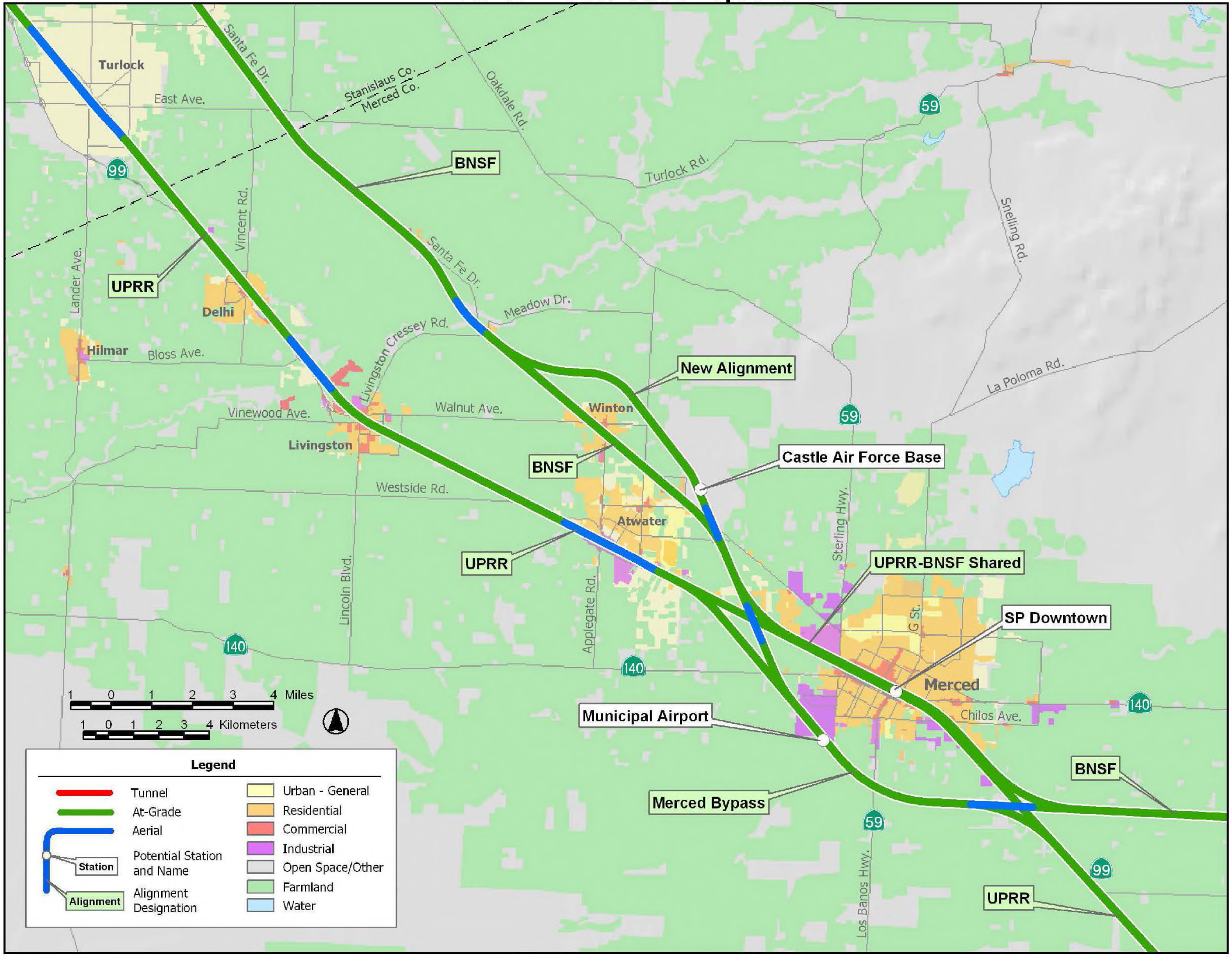


Figure 6.3-2b
Potential Merced Station Options



	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	**Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)**
Potential Environmental Impacts		
Travel Conditions	The UPRR and BNSF rail alignments would serve the same basic populations and same number of potential stations. However, the UPRR alignment serves the potential downtown Modesto station site, whereas the BNSF serves the Modesto Briggsmore station site.	The BNSF and UPRR rail alignments would serve the same basic populations and same number of potential stations. The Merced Castle Air Force Base (AFB) station site is served by the BNSF alignment.
Noise and Vibration:[40] High, medium, and low potential impacts	Low potential impacts in overall segment High potential impacts in urban areas The UPRR alignment would have higher potential noise impacts than the BNSF alignment. The UPRR goes through more urban/developed area as it passes through the cities and communities that developed along the rail line. Express services would travel at high speeds through these communities (220 mph [354 kph]). Conceptually, the UPRR alignment would have a substantial amount of aerial structure through Manteca, Modesto, Keyes, Turlock, and Atwater, which would exacerbate potential noise impacts (potential impacts would be rated high through these communities).	Low potential impacts The BNSF avoids most of the urban development between Stockton and Merced, and the alignment would be at grade through the outskirts of Modesto (Briggsmore), and through Hughson, Denair, Winton, and Atwater. Express services would travel at high speeds through these communities (220 mph [354 kph]). There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Medium Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: Medium potential impacts The UPRR would have more potential property impacts since it traverses more urban land and would have more construction issues with aerial structures through downtown areas.	Compatibility: Medium Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: Low potential impacts The BNSF alignment traverses primarily rural lands resulting in a low potential property impact and low potential minority population impacts.

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[40] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
Farmlands:[41] Ac (ha) of farmland (depending on specific configuration with loops and connections)	Farmlands: 397 ac (161 ha) The UPRR would have considerably more potential severance impacts than the BNSF as a result of the new alignment around Modesto, which would potentially impact about 97 ac (39 ha) of farmlands.	Farmlands: 512 ac (207 ha) The BNSF alignment follows the existing rail right-of-way and may have potential severance impacts. However, this alignment traverses more agricultural land than the UPRR alignment.
Cultural Resources and Paleontological Resources:[42] Potential presence of historical resources in area of potential effect	Known cultural resources: 120–126 The potential for cultural resources and historical structures is greater along the UPRR alignment. Cultural resources are particularly concentrated on this line between Keyes and Atwater.	Known cultural resources: 47–53 The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[43] 147–169 total ac (59–68 ha) Streams:[44] 2,450-3,300 linear ft (745-1006 linear m) Lakes: 10 ac (4.3 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 340 total ac (138 ha) Streams: 2,450 linear ft (745 linear m) Lakes: 1.5 ac (0.6 ha) Use of existing rail alignments reduces potential hydrology impacts.

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[41] The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

[42] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[43] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[44] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
Biological Resources Including Wetlands:[45] Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas	Wetlands:[46] 1.0-1.3 ac (0.4-0.5 ha) Habitat: 150-221 ac (61-89 ha) Species: 5 All of the threatened and endangered species along the UPRR alignment are vernal pool species.	Wetlands: 4.0 ac (1.6 ha) Habitat: 21 ac (8.5 ha) Species: 4 There are low potential impacts on vegetation communities along these alignments (land is either urban or agricultural uses).
Section 4(f) and 6(f) Resources:[47] Ac (ha) of parkland near HST right-of-way	Resources rated high: 5 Alignment potentially impacts Salida County Park, Tuolumne River Regional Park, Stanislaus County Fairgrounds, Broadway Park, and Central Park in Turlock.	Resources rated high: 3 Alignment potentially impacts Jacob Meyer Regional Park, San Joaquin County; Zerillo Park, Riverbank; Mainstreet Park, Escalon.

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[45] Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

[46] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[47] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

C. MERCED TO FRESNO ALIGNMENT OPTIONS

All information presented is for the area from Merced to Fresno. This segment is shown in Figures 6.3-3a and 6.3-3b.

	Union Pacific Railroad (Downtown Merced to Downtown Fresno)	**Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)**
Physical/Operational Characteristics		
Alignment Description	UPRR rail alignment from Merced to Fresno. Station options considered in this segment include Fresno downtown station.	A new alignment may be needed to transition from UPRR to BNSF south of Merced. Just north of Fresno, a new alignment is needed to transition from BNSF to UPRR through Fresno. Station options considered in this segment include Fresno downtown station.
Length in miles (km)	55 mi (89 km)	57 mi (92 km)
Cost (dollars)	$1.86 billion[48]	$1.45 billion[49]
Travel Time (min)	20 min	21 min
Constructability	Considerable construction issues associated with urban construction, including aerial structures through downtown Madera.	Fewest potential construction impacts with minimal urban area traversed.
Potential Environmental Impacts		
Travel Conditions	The UPRR and BNSF rail alignments would serve the same basic populations and same number of potential stations.	The BNSF and UPRR rail alignments would serve the same basic populations and same number of potential stations.

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[48] Segment cost and length begins about 2.5 mi (4.0 km) southeast of Merced downtown station (East Gerard Avenue).

[49] Segment cost and length end about 2.5 mi (4.0 km) southeast of Fresno downtown station (East Jensen Avenue).

Figure 6.3-3a
Merced to Fresno Alignment and Potential Station Options

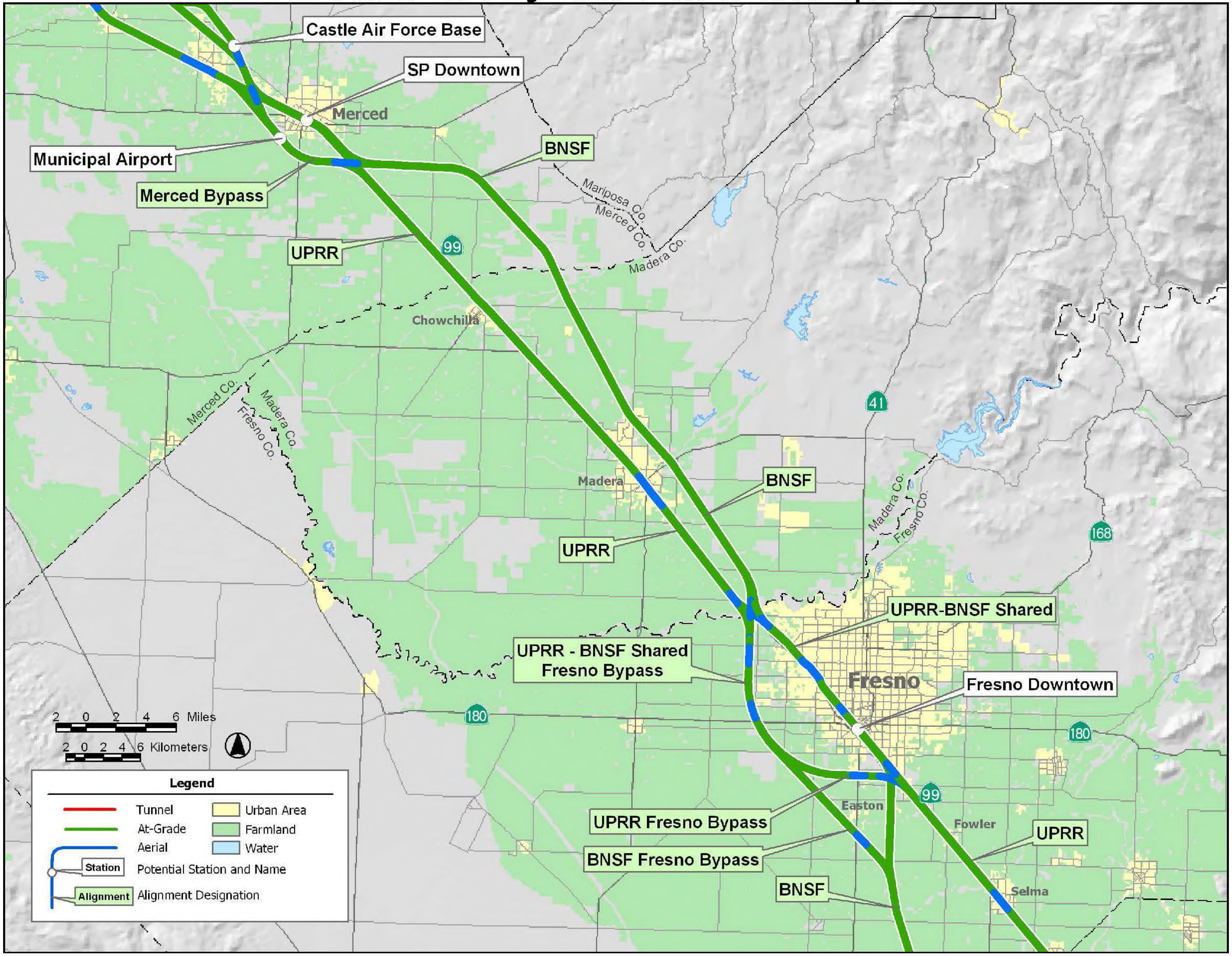
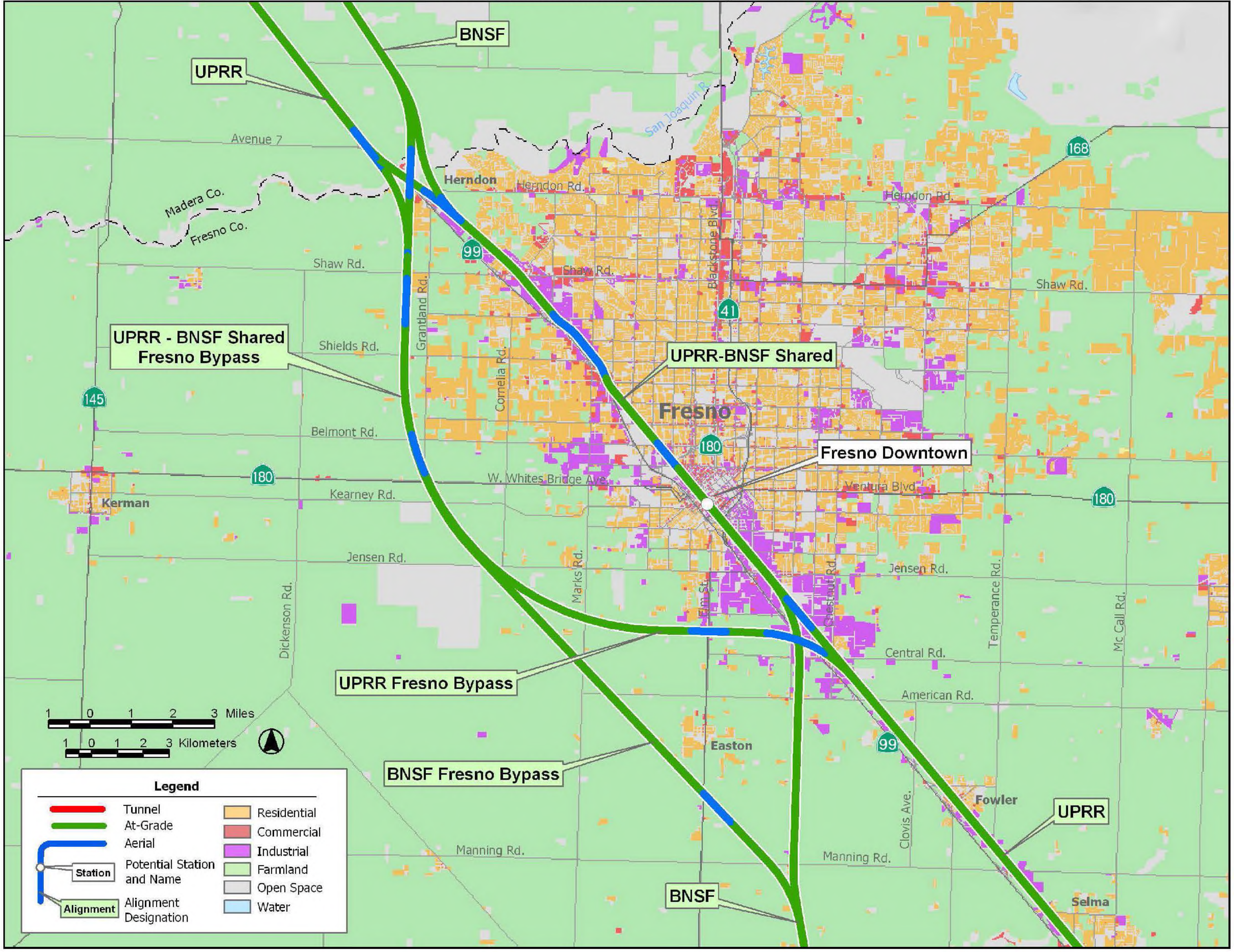


Figure 6.3-3b
Potential Fresno Station Options



	Union Pacific Railroad (Downtown Merced to Downtown Fresno)	**Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)**
Noise and Vibration:[50] High, medium, and low potential impacts	Low potential impacts in overall segment. High potential impacts in urban areas. The UPRR alignment would have higher potential noise impacts than the BNSF alignment. The UPRR goes through more urban/developed area as it passes through the towns and communities that developed along the rail line. Express services would travel at high speeds through these communities (220 mph [354 km]). Conceptually, the UPRR alignment would have a substantial amount of aerial structure through Chowchilla and Madera, which would exacerbate potential noise impacts. Potential noise impacts would be high through Madera.	Low potential impacts. The BNSF avoids most of the urban development between Merced and Fresno, and the alignment would be at grade through Le Grand and the outskirts of Madera. Express services would travel at high speeds through these communities (220 mph [354 km]). There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Medium Environmental Justice: Minority populations present at points along alignment option Community: Low potential impacts Property: The UPRR would have more potential property impacts since it traverses more urban land and would have more construction issues with aerial structures through downtown areas.	Compatibility: Medium Environmental Justice: Minority populations present at points along alignment option Community: Low potential impacts Property: The BNSF alignment traverses primarily rural lands resulting in a low potential property impact.
Farmlands:[51] Ac (ha) of farmland (depending on specific configuration with loops and connections)	Farmlands: 295–399 ac (119–161 ha) Low potential severance impacts using existing rail alignment between Merced and Fresno.	Farmlands: 497–601 ac (201–243 ha) Potential severance impacts for new alignment transitions between UPRR and BNSF south of Merced and north of Fresno.

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[50] Generally, 'vibration' is not a significant impact. However, sensitive and specific areas such as historic structures, special habitats, etc. may be affected.

[51] The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

	Union Pacific Railroad (Downtown Merced to Downtown Fresno)	Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)
Cultural Resources and Paleontological Resources:[52] Potential presence of historical resources in area of potential effect	Known cultural resources: 11–16 Potential impacts to cultural resources and historical structures are somewhat greater along the UPRR alignment than the BNSF alignment.	Known cultural resources: 5–10 The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[53] 336–338 total ac (136–137 ha) Streams:[54] 2,500 linear ft (762 linear m) Lakes: 0.6 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 321–326 total ac (130–132 ha) Streams: 3,550 linear ft (1,082 linear m) Lakes: 1.9 ac (0.8 ha) New alignment transitions (to/from UPRR) and greater number of stream crossings result in slightly higher potential impacts for BNSF.
Biological Resources Including Wetlands:[55] Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas	Wetlands: 2.0 ac (0.8 ha) Habitat: 78 ac (32 ha) Species: 9 sensitive species and habitat occurrences Both UPRR and BNSF would have relatively few potential impacts on sensitive vegetation communities.	Wetlands: 3.4 ac (1.4 ha) Habitat: 87 ac (35 ha) Species: 13 The BNSF alignment traverses annual grasslands, but minimizes potential impacts by utilizing the existing rail alignment for most of the segment.

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[52] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[53] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[54] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[55] Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

D. FRESNO TO BAKERSFIELD ALIGNMENT OPTIONS

All information presented is for the area from Fresno to Bakersfield. This segment is shown in Figures 6.3-4a and 6.3-4b.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Physical/Operational Characteristics						
Alignment Description[56]	UPRR rail alignment from Fresno to Bakersfield (Golden State station). Station options considered in this segment include Visalia Airport and Bakersfield Golden State.	UPRR rail alignment from Fresno to Bakersfield (Truxton station) with a transition north of Bakersfield to BNSF. Station options considered in this segment include Visalia Airport and Truxton (BNSF).	UPRR rail alignment from Fresno to Bakersfield using a new alignment bypass around the Tulare urban area. Station options considered in this segment include Visalia Airport and Bakersfield Golden State.	UPRR rail alignment from Fresno to Bakersfield (Truxton station) with a loop line in Bakersfield to serve the Truxton site. Station options considered in this segment include Visalia Airport and Truxton (BNSF).	BNSF rail alignment from Fresno to Bakersfield (Truxton station). Station options considered in this segment include Truxton (BNSF).	BNSF rail alignment from Fresno to Bakersfield (Golden State station) with a transition north of Bakersfield to the UPRR. Station options considered in this segment include Bakersfield Golden State.
Length in mi (km)	106 mi (171 km)	111 mi (179 km)	106 mi (171 km)	108 mi (174 km)	111 mi (179 km)	109 mi (175 km)
Cost[57] (dollars)	$2.55 billion	$3.09 billion	$2.54 billion	$2.99 billion	$2.71 billion	$2.26 billion
Travel Time (min)	35 min	37 min	35 min	35 min	36 min	36 min

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[56] Golden State option ends about 2.5 mi (4.0 km) southeast of Golden State station (at Beale Avenue). Truxton option ends at Truxton station (at Union Avenue).

[57] Segment cost and length begins about 2.5 mi (4.0 km) southeast of Fresno downtown Station (East Jensen Avenue).

Figure 6.3-4a
Fresno to Bakersfield Alignment and Potential Station Options

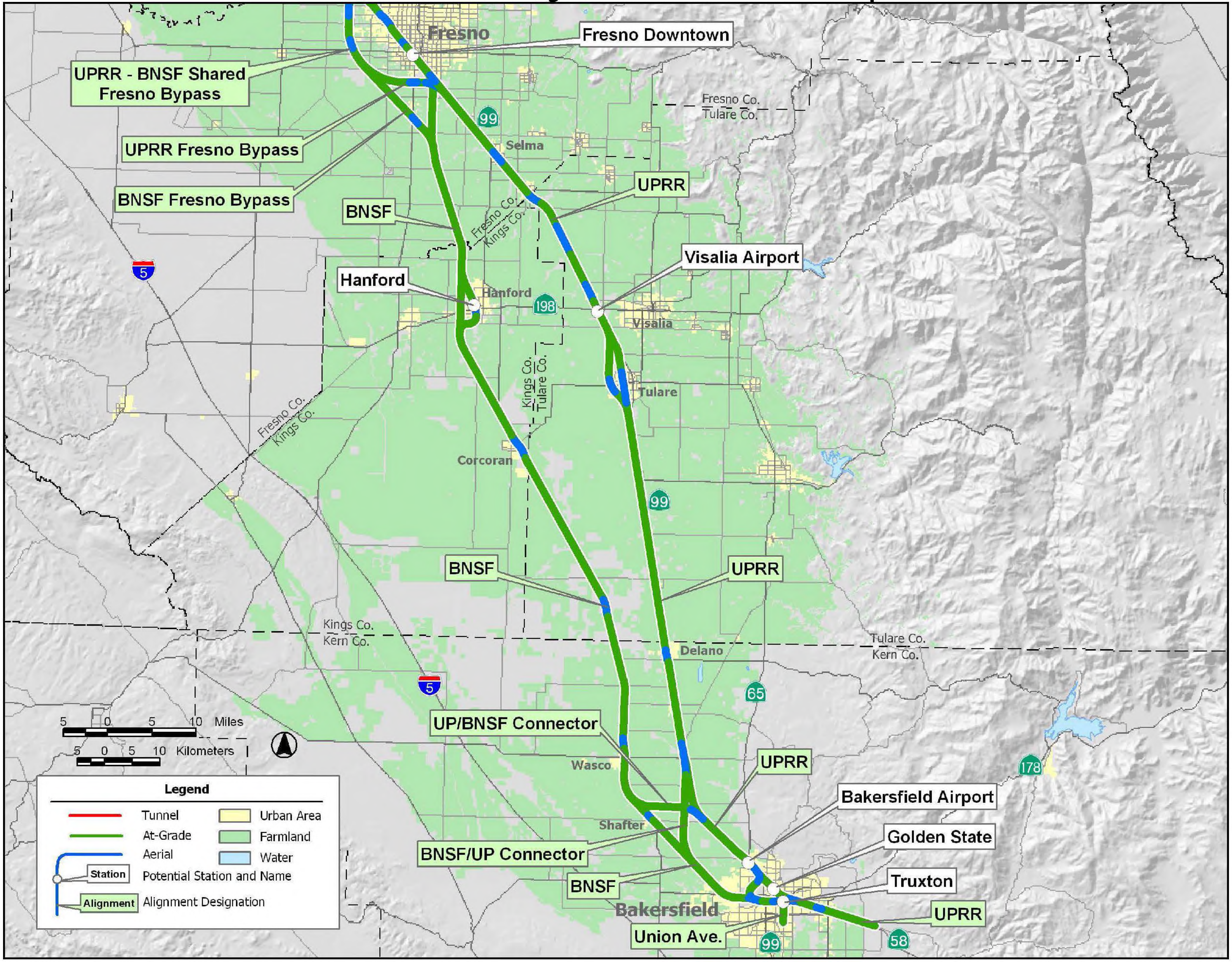
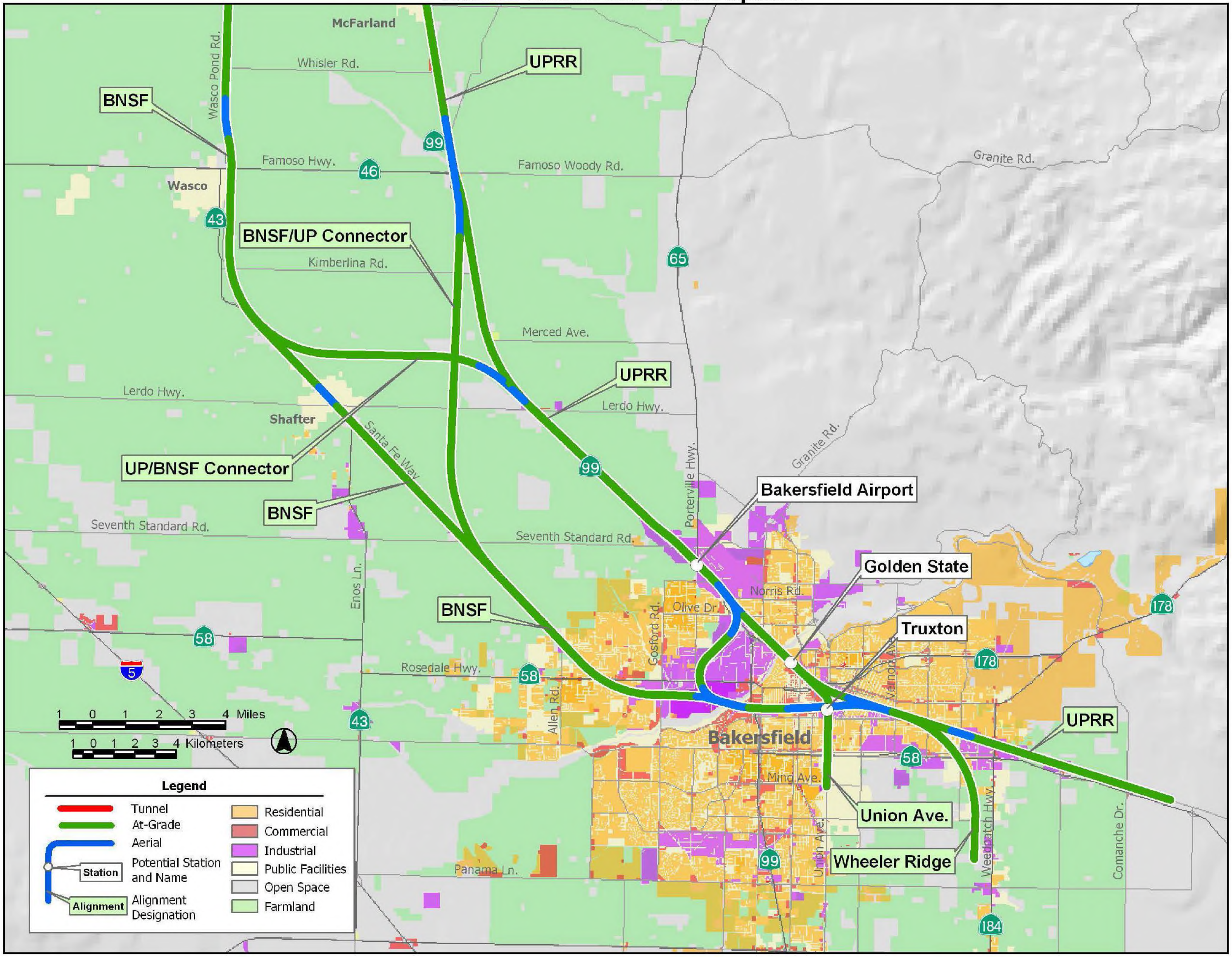


Figure 6.3-4b
Potential Bakersfield Station Options



	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Constructability	Considerable construction issues associated with urban construction, including aerial structures through downtown Selma, Traver, Goshen, Tulare, Pixley, and Delano. However, fewest potential construction impacts through Bakersfield (mostly at grade).	Same construction issues as the downtown Fresno to Golden State station option, with additional potential impacts using BNSF through Bakersfield. More aerial structure through Bakersfield would have considerable construction issues.	Same construction issues as the downtown Fresno to Golden State station option, except the alignment avoids Tulare urban area.	Same construction issues as the downtown Fresno to Golden State station option, with additional potential impacts from Truxton loop through Bakersfield. More aerial structure through Bakersfield would have considerable construction issues.	Fewer potential construction impacts with minimal urban area traversed as compared to UPRR north of Bakersfield. More difficult construction and aerial structure through Bakersfield than UPRR.	Fewer potential construction impacts with minimal urban area traversed. Fewest potential impacts through Bakersfield.
Potential Environmental Impacts						
Travel Conditions	This alignment option would serve potential stations at Visalia Airport and Bakersfield Golden State station or Bakersfield Airport station sites.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Truxton station. The Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Golden State station or Bakersfield Airport station sites.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Truxton station. The Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Hanford and Bakersfield Truxton station. Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Hanford and Bakersfield Golden State station or Bakersfield Airport station sites.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Noise and Vibration:[58] High, medium, and low potential impacts	Low potential impacts in overall segment. High potential impacts in urban areas. Although a majority of the alignment would have low potential impacts, the UPRR would have high potential noise impacts in urban areas where the alignment is predominately on aerial structure (Selma, Traver, Goshen, Tulare, Pixley, and Delano). Express services travel at high speeds through these communities (220 mph [354 km]). However, UPRR would have fewer potential noise impacts than BNSF through Bakersfield.	Low potential impacts in overall segment. High potential impacts in urban areas. High potential for noise in urban areas. Higher potential impacts in Bakersfield using BNSF.	Low potential impacts in overall segment. High potential impacts in urban areas. Potential noise impacts for Tulare area would be reduced by an estimated 12–16% compared to other alignments.	Low potential impacts in overall segment. High potential impacts in urban areas. Potential noise impacts would increase with two alignments through Bakersfield.	Low potential impacts in overall segment. High potential impacts in urban areas. BNSF alignments have less potential noise impacts than UPRR because they are outside urban areas. BNSF is assumed to need substantial aerial structure through Hanford and Shafter. Express services would travel at high speeds through Shafter (220 mph [354 km]), resulting in high potential impacts. BNSF would have more potential noise impacts than UPRR through Bakersfield (mostly aerial).	Low potential impacts in overall segment. Fewer potential noise impacts. Fewer potential impacts through Bakersfield by using UPRR alignment. This alignment avoids potential impacts on the Town of Shafter.

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[58] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatibility: Medium-low Environmental Justice: Minority populations present at points along the alignment option Community: Low potential impacts Property: Low potential impacts North of Bakersfield, UPRR would have more potential property impacts than BNSF since it traverses more urban land and would have more construction issues with aerial structures through downtown areas. However, UPRR would have less potential impact through Bakersfield and outlying metropolitan area.	Compatibility: Medium-low Environmental Justice: Minority populations present at points along the alignment option Community: Low potential impacts Property: Low potential impacts More potential impacts than UPRR alignment through Bakersfield. Potential severance impacts with transition to BNSF.	Compatibility: Medium-low Environmental Justice: Minority populations present at points along the alignment option Community: Low potential impacts Property: Low potential impacts Tulare bypass loop would decrease potential property impacts and potential community impacts through Tulare, but new alignment through agricultural lands would not be compatible with existing and future plans.	Compatibility: Medium-low Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: Low potential impacts This option would have similar potential impacts to UPRR downtown Fresno to Golden State station option.	Compatibility: Medium Environmental Justice: Minority populations present at points along the alignment option Community: Low potential impacts Property: Low potential impacts North of Bakersfield, BNSF would have fewer potential property impacts than UPRR since it traverses more urban land and would have more construction issues with aerial structures through downtown areas. However, BNSF has more potential impacts through Bakersfield and outlying metropolitan area.	Compatibility: Medium Environmental Justice: Minority populations present at points along the alignment option Community: Low potential impacts Property: Low potential impacts Fewer potential impacts than BNSF through Bakersfield. Potential severance impacts with transition to UPRR.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Farmlands:[59] Ac (ha) potentially affected	Farmland: 706 ac (286 ha) UPRR rail alignment may have potential impacts on farmlands.	Farmland: 726 ac (294 ha) Transition to BNSF adds 20 ac (8 ha) of potentially impacted farmland and may have potential severance impacts.	Farmland: 752 ac (304 ha) Bypass of Tulare adds 46 ac (19 ha) of potentially impacted farmland, and would have 119 ac (48 ha) with potential severance impacts.	Farmland: 706 ac (286 ha) UPRR rail alignment would have fewer potential impacts on farmlands.	Farmland: 1,060 ac (429 ha) BNSF would potentially impact more farmlands than UPRR.	Farmland: 1,093 ac (442 ha) BNSF would potentially impact more farmlands than UPRR. Transition to UPRR would add 33 ac (13 ha) of potentially impacted farmland and may have potential severance impacts.
Cultural Resources and Paleontological Resources:[60] Potential presence of historical resources in area of potential effect	Known cultural resources: 51–52 Potential impacts to cultural resources and historical structures are greater along the UPRR alignment.	Known cultural resources: 52–53 Potential impacts to cultural resources and historical structures are greater along the UPRR alignment.	Known cultural resources: 41–42 Potential impacts to cultural resources and historical structures are greater along the UPRR alignment. Avoids cultural and historic resources through Tulare.	Known cultural resources: 59–60 Potential impacts to cultural resources and historical structures are greater along the UPRR alignment. Additional potential impacts through Bakersfield for Truxton loop.	Known cultural resources: 19-20 BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.	Known cultural resources: 17–18 The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.

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[59] The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

[60] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Hydrology and Water Resources: Potential impacts and associated linear feet (linear m) of floodplains and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains: 113,221–113,992 linear ft (34,510–34,745 linear m) Streams: 3,400 ft (1036 m) Lakes:[62] 0.6 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains:[61] 119,389–120,144 linear ft (36,390–36,620 linear m) Streams:[62] 3,550 ft (1082 m) Lakes: 0.5 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 114,763–115,531 linear ft (34,980–35,214 linear m) Streams: 3500 ft (1067 m) Lakes: 0.9 ac (0.4 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 122,457–123,225 linear ft (37,325–37,559 linear m) Streams: 3,550 ft (1082 m) Lakes: 0.5 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.	97,244–97,998 linear ft (29,640–29,870 linear m) Stream[62] : 2,700 ft (823 m) Lakes: 0.5 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 88,008–89,435 linear ft (26,824–27,260 linear m) Streams: 2,900 ft (884 m) Lakes: 0.6 ac (0.2 ha) Use of existing rail alignment reduces potential hydrology impacts.

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[61] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[62] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	Union Pacific Railroad				**Burlington Northern Santa Fe**	
	Downtown Fresno to Golden State Station	**Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)**	**Downtown Fresno to Golden State Station (new alignment around Tulare)**	**Downtown Fresno to Truxton Station (downtown Truxton Station loop)**	**Downtown Fresno to Truxton Station**	**Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)**
Biological Resources Including Wetlands:[63] Ac (ha) of wetland Ac (ha) of wetland and ac (ha) of special-status species habitat and number of special-status species within potential impact study areas	Wetlands:[64] 3.0 ac (1.2 ha) Habitat: 258 ac (104 ha) Species: 5 UPRR alignments would have fewer potential wetland impacts than BNSF.	Wetlands: 5.1 ac (2.1 ha) Habitat: 346 ac (140 ha) Species: 5 UPRR alignments would have fewer potential wetland impacts than BNSF. The new alignment transition to BNSF would increase potential wetlands and severance impacts	Wetlands: 3.0 ac (1.2 ha)Habitat: 246 (100 ha) Species: 6 UPRR alignments would have fewer potential wetland impacts than BNSF.	Wetlands: 3.8 ac (1.5 ha) Habitat: 262 ac (106 ha) Species: 4 UPRR alignments would have fewer potential wetland impacts than BNSF. The additional loop to serve the Truxton station site would increase the wetlands potentially impacted (35–37 ac [14–15 ha] more).	Wetlands: 5.3 ac (2.1 ha) Habitat: 605 ac (245 ha) Species: 6 BNSF has more wetlands potentially impacted.	Wetlands: 3.6 ac (1.5 ha) Habitat: 537 ac (217 ha) Species: 6 BNSF has more wetlands potentially impacted. .

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[63] Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

[64] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	Union Pacific Railroad				Burlington Northern Santa Fe	
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
Section 4(f) and 6(f) Resources:[65] Ac (ha) of parkland near HST right-of-way	Resources rated high: 4 Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4 Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4 Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4 Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 2 Alignment potentially impacts Colonel Allensworth State Historical Park, Tulare County; Pixley National Wildlife Refuge, Tulare County.	Resources rated high: 2 Alignment potentially impacts Colonel Allensworth State Historical Park, Tulare County; Pixley National Wildlife Refuge, Tulare County.

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[65] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.3.2 Sacramento to Bakersfield Station Options

The station options for this region are shown in Figures 6.3-5a and 6.3-5b.

Station Name (Alignment)	Discussion
Downtown Sacramento	
Downtown Sacramento (UPRR and CCT/BNSF)	The Sacramento downtown station has better connectivity in Sacramento than the Power Inn Road station location. The downtown station site is located in downtown Sacramento and is within walking distance of the State Capitol. This multimodal station location serves the existing Amtrak services to Sacramento, including the Capitol Corridor, and the Sacramento LRT is being extended to directly link to this station site. This site also has good access to I-5. Since the downtown station would offer greater connectivity to downtown Sacramento and the Sacramento region, total travel times to the downtown station are expected to be better than to the Power Inn station. The downtown station would have high ridership potential. Intercity ridership forecasts estimate between 7.2 and 12.2 million total boardings and alightings annually by 2020. The Sacramento downtown station is estimated to cost $224 million. The alignment between Power Inn Road and the downtown station would be on 4.27 mi (6.87 km) of aerial structure with considerable potential construction impacts. The downtown station HST station platforms would be constructed on an aerial structure (above the platforms for existing rail services). The Sacramento downtown station would have low potential impacts on biological resources and hydrology, and fewer visual quality potential impacts than the Power Inn Road station option. This site would potentially impact 6.6 ac (2.7 ha) of parkland and would have high potential cultural resource impacts. There is a majority of ethnic minority and low income population near the station area.
Power Inn Road (UPRR and CCT/BNSF)	The Power Inn Road station site has good intermodal access to the Sacramento LRT and US-50. The Power Inn station would have about a 3-min shorter line-haul travel time to Sacramento than the downtown Sacramento station, since the trains would travel at relatively slow speeds between Power Inn and the downtown site (about a 7.5-mi [12-km] distance). However, it is located outside of downtown Sacramento, more than 5 mi (8 km) from the State Capitol. The Power Inn station would have less ridership potential than the downtown station and is rated as having low connectivity and accessibility. The Power Inn station is estimated to cost $224 million. The shorter alignment associated with this station option is expected to result in a total of $424 million less construction costs than the downtown station. This station site would have low potential impacts on cultural resources, biological resources, and hydrology. This site would have a greater potential for property acquisition than the downtown station. There is a majority of ethnic minority and low income population near the station area.

Figure 6.3-5a
Potential Sacramento Station Options

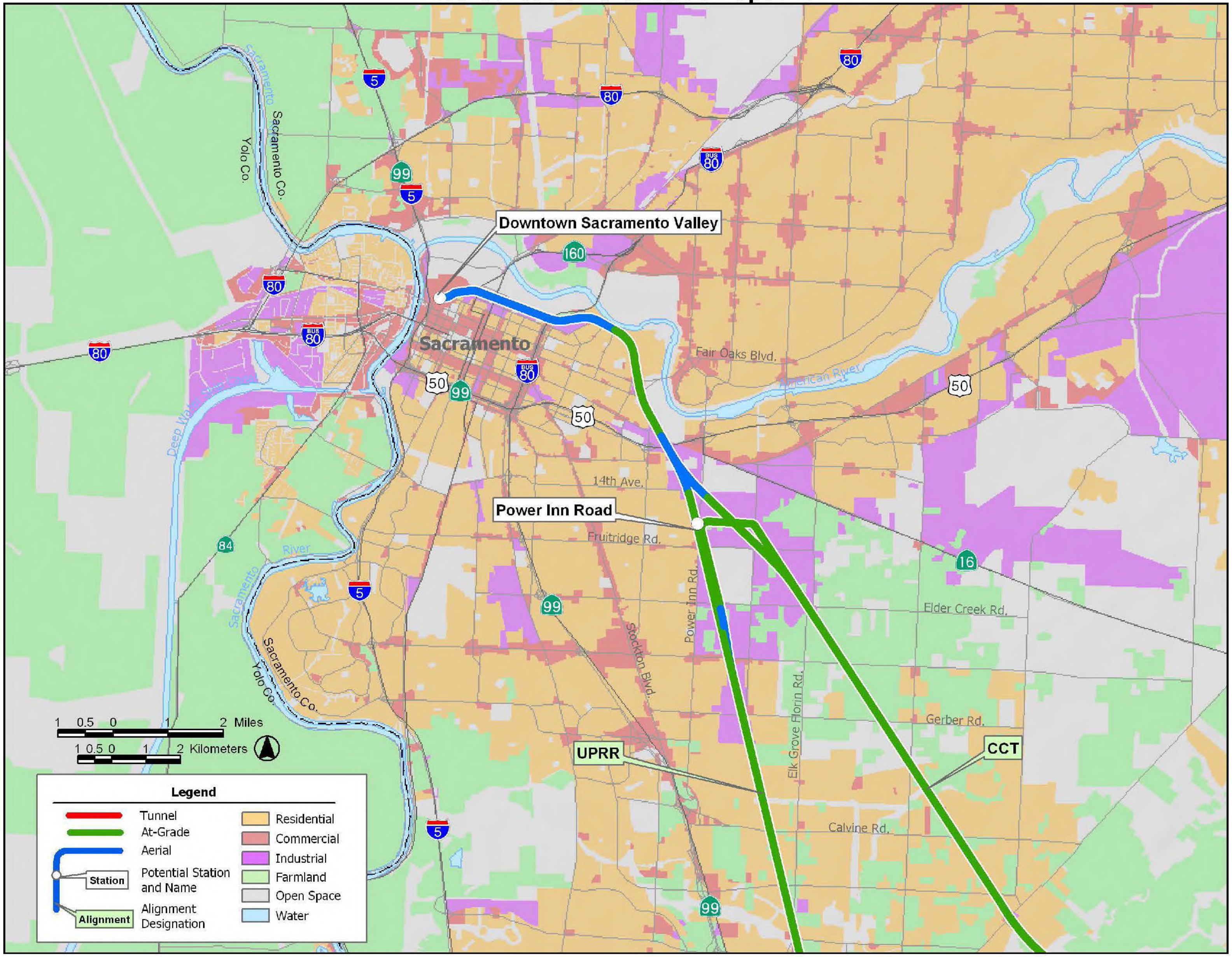
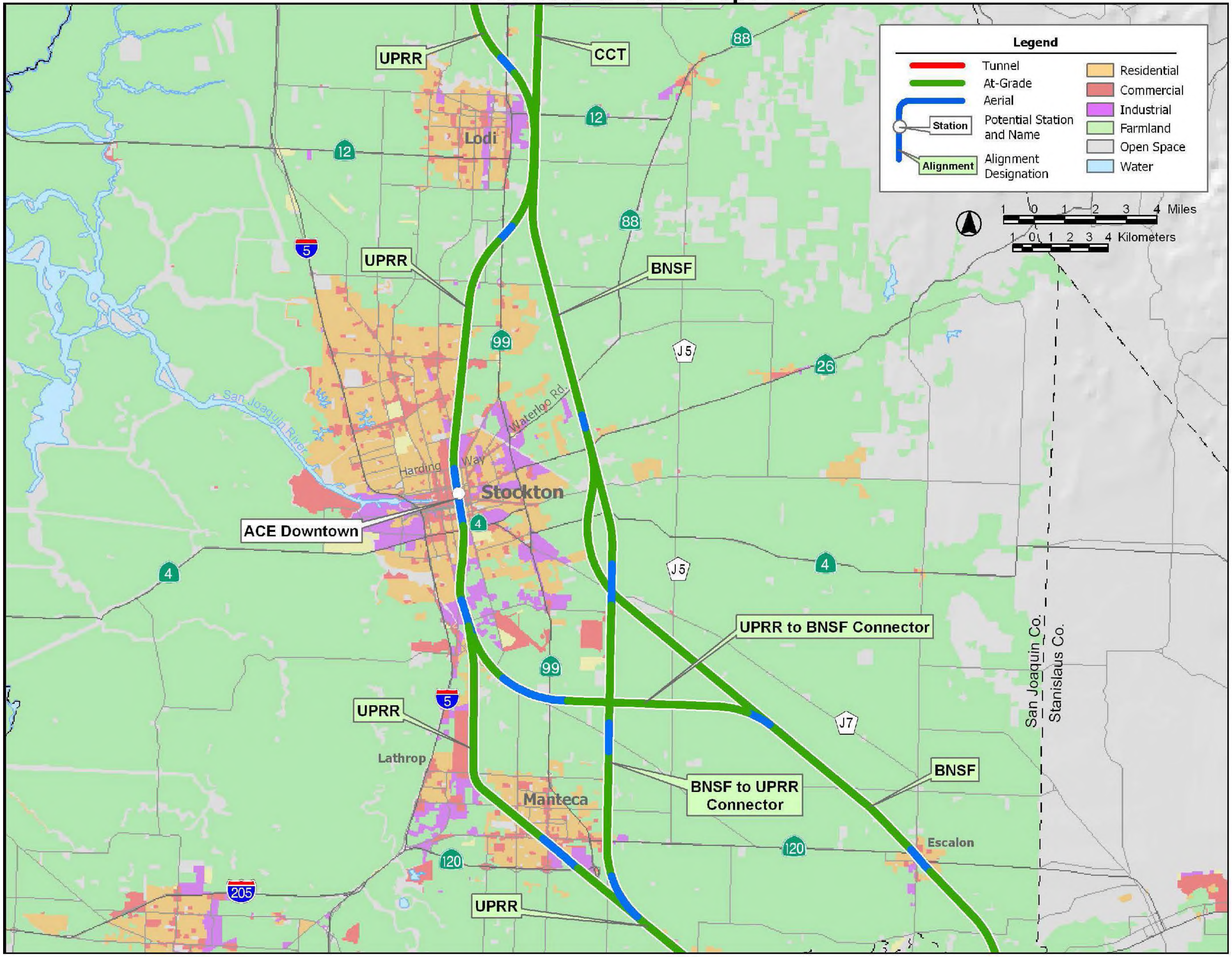


Figure 6.3-5b
Potential Stockton Station Options



Station Name (Alignment)	Discussion
Stockton	
Stockton Downtown ACE (BNSF express loop and UPRR express loop)	The Stockton downtown (ACE) station has high ridership potential, maximizes connectivity with good freeway access and bus transit services, and would share the site with ACE commuter rail and present Amtrak services. Intercity ridership forecasts estimate between 1.1 and 1.7 million total boardings and alightings annually by 2020. The station is estimated to cost $10.0 million.[66] This station would have low potential impacts on cultural resources, biological resources, and hydrology. It could potentially impact parklands. There is a majority of ethnic minority and low income population near the station area. Improvements to this existing station area would potentially impact and benefit the surrounding community.
Modesto	
Amtrak Briggsmore (BNSF)	The Amtrak Briggsmore station is about 5 mi (8 km) east of downtown Modesto. This is the site of a new Amtrak station with direct connection to Amtrak services and bus services. Intercity ridership forecasts estimate between 1.3 and 1.7 million total boardings and alightings annually by 2020 for the Modesto HST station. The station is estimated to cost $ 32.4 million. The Amtrak Briggsmore station option would have low potential impacts on cultural resources, biological resources, and hydrology. This option could have potential impacts to parkland.
Downtown Modesto SP (UPRR)	The downtown Modesto station maximizes connectivity to downtown Modesto, and provides convenient access to SR-99 and good bus transit access. This option through downtown Modesto would be on an aerial structure and have considerable construction issues as compared to the Amtrak Briggsmore site. Intercity ridership forecasts estimate between 1.3 and 1.7 million total boardings and alightings annually by 2020 for the Modesto HSR station (same as for the Amtrak Briggsmore option). The station is estimated to cost $165 million. The downtown Modesto station would have low potential impacts on biological resources and hydrology, but would have medium/high potential impacts on cultural resources. There is a majority of ethnic minority and low income population near the station area.

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[66] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
Merced	
Downtown Merced UPRR (UPRR/BNSF)	The downtown Merced station is located near the city center and transit hub of Merced, has good access to SR-99, is located at the bus transit hub for Merced, and would have the highest level of connectivity of the three Merced locations. Intercity ridership forecasts estimate between 0.4 and 0.5 million total boardings and alightings annually by 2020 for each of the Merced HST station options (assuming a Pacheco Pass alignment to connect to the Bay Area). The downtown Merced option would have higher construction issues than the other station options which are located outside of the Merced urban area, and four tracks would be needed through downtown Merced to accommodate express services. The station is estimated to cost $32.4 million. The downtown Merced station would have low potential impacts on biological resources and stream crossings and low/medium potential impacts on cultural resources. This site would have high potential floodplains impacts (18 ac [7 ha]) and would potentially impact 1.2 ac (0.5 ha) of parkland. There is a majority of ethnic minority and low income population near the station area. Although express trains would run through Merced at speeds of about 220 mph (354 kph), potential noise impacts through Merced are expected to be moderate because of mostly commercial and industrial land uses adjacent to the freight railroad. Many of the potential noise impacts could be offset by grade separating the adjacent freight services and eliminating horn noise and noise from warning gates.
Downtown Merced UPRR (UPRR/BNSF with express loop)	This option would have two tracks through Merced (for HST service stopping in Merced) and two tracks on a new alignment outside the Merced urban area for express services that would bypass Merced. This option would have the same connectivity and ridership potential as the downtown Merced option. The downtown Merced station is expected to cost $10.0 million.[67] The express loop would decrease construction issues and costs through downtown Merced, but would increase overall capital costs by $267 million because of 12.8 mi (20.6 km) of additional alignment construction required for the express loop. With this option, only HST trains stopping in Merced (and traveling at reduced speeds) would go through Merced. Noise would be reduced through Merced because there would be fewer trains, traveling at slower speeds. However, analysis for express loops in the Central Valley suggests that there would be only an estimated 12–16% reduction in potential noise impacts by moving the high-speed mainline (express) tracks outside urbanized areas. The relatively modest decrease in potential noise impacts is attributed to three factors: 1) there would be some potential residential impacts along the new express loop, 2) much of the surrounding land uses of the freight line through downtown Merced are industrial/commercial, and 3) the express loop results in potential noise impacts on two corridors as opposed to one. The express loop would potentially impact an additional 127–135 ac (51–55 ha) of farmland, and this new alignment would have potential severance impacts on farmlands. The express loop would potentially impact an additional 24–28 acres (10–11 ha) of wetlands, 4–5 stream crossings, and 280 ac (113 ha) more floodplains. This potential station site would have potential minority population impacts.

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[67] Local service station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
Castle Air Force Base (BNSF using UPRR through urban Merced)	The Castle AFB site is about 7 mi (11 km) from downtown Merced but would provide easy access to the developing UC Merced campus via a new highway alignment along Bellevue Avenue. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue. This option would have an additional two-track loop constructed on new alignment to serve the Castle AFB station site. This option would have fewer potential construction impacts (since only two tracks would be required through Merced). The station itself is expected to cost $32.4 million. This Castle AFB option would have low potential impacts on cultural resources and biological resources. This station option would have potential minority population impacts. However, it is surrounded by agricultural land that is not compatible with HST service. Castle loop would have about the same potential biological impacts as the downtown Merced station option (without the Castle loop). It would have 10 ac (4 ha) more floodplains, 1 more stream crossing, 3 ac (1 ha) more of parkland, and more potential impacts on cultural resources (25 more known cultural resources). Potential noise impacts through Merced would be about the same as the downtown Merced station option.
Castle Air Force Base (BNSF using new alignment around urban Merced)	The Castle AFB site is about 7 mi (11 km) from downtown Merced, but would provide easy access to the developing UC Merced campus via a new highway alignment along Bellevue Avenue. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue. This option would have an additional two-track new alignment loop line constructed to serve Castle AFB station site and a new alignment around Merced to bypass the urban area. This option would eliminate potential construction impacts through Merced but would have potential land use and farmland impacts along the new alignment. The station itself is expected to cost $32.4 million. The option would have low potential impacts on cultural and biological resources. This station option would have potential minority population impacts. It is surrounded by agricultural land that is not compatible with HST service. This option would potentially impact an additional 50–65 ac (20–26 ha) of farmlands and would have 127–135 ac (51–55 ha) of farmland with potential severance impacts. This option is estimated to reduce potential noise impacts through Merced by 12–16%.
Merced Municipal Airport (UPRR/BNSF)	The Merced Municipal Airport site would be less than 2 mi (3 km) from downtown Merced. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue. This option would have 12.8 mi (20.6 km) of new alignment around Merced to bypass the urban area. This option would eliminate potential construction impacts through Merced and is estimated to cost $283 million less than an alignment through downtown Merced. The station itself is expected to cost $32.4 million. The option would have low potential impacts on cultural and biological resources. There is a majority of ethnic minority and low income population near the station area. However, it is surrounded by agricultural land that is not compatible with HST service and would potentially impact 12 ac (5 ha) more floodplains than the Downtown Merced option. The alignment for this station option would potentially impact an additional 50–65 ac (20–26 ha) of farmlands but would have 127–135 ac (51–55 ha) of farmland with potential severance impacts. The alignment would also potentially impact an additional 45 ac (18 ha) of floodplains, but would have fewer potential cultural impacts. This option is estimated to reduce potential noise impacts through Merced by 12–16%.

Station Name (Alignment)	Discussion
Fresno	
Downtown Fresno (UPRR/BNSF)	The downtown Fresno station option would have high ridership potential and connectivity and accessibility, with good freeway access and good connections to bus transit. Intercity ridership forecasts estimate between 2.5 and 3.2 million total boardings and alightings annually by 2020. The downtown Fresno option would have high construction issues, and four tracks would be needed through downtown Fresno to accommodate express service. The station is estimated to cost $32.5 million. The downtown Fresno station would have low potential impacts on biological resources and stream crossings but have high potential impacts on cultural resources. This site would have high potential floodplains impacts (13 ac [5 ha]). There is a majority of ethnic minority and low income population near the station area. Although express trains would run through Fresno at speeds of about 220 mph (354 kph), potential noise impacts through much of Fresno are expected to be moderate because of mostly commercial and industrial land uses adjacent to the freight railroad. Where the alignment is at grade, some of the potential noise impacts could be offset by grade separating the adjacent freight services and eliminating horn noise and noise from warning gates. The alignment is expected to have 6 mi (10 km) of aerial structure through Fresno and 8 mi (13 km) of potentially high noise impacts.
Downtown Fresno (UPRR/BNSF with express loop)	This option would have two tracks through Fresno (for HST service stopping in Fresno) and two tracks on a new alignment outside the Fresno urban area for express services that would bypass Fresno. This option would have the same connectivity and ridership potential as the downtown Fresno option. There is a majority of ethnic minority and low income population near the downtown station area. The downtown Fresno station for the two stopping tracks is expected to cost $10.0 million.[68] The express loop would decrease construction issues and costs through downtown Fresno (since only two tracks would be required), but would increase overall capital costs by $707 million as a result of 22 mi (35 km) of additional alignment construction for the UPRR option, and $790 million as a result of 26 mi (42 km) of additional alignment construction for the BNSF option. With this option, only HST trains stopping in Fresno (and traveling at reduced speeds) would go through Fresno. Noise would be reduced through Fresno since there would be fewer trains, traveling at slower speeds. However, a focused study on the Fresno loop line suggests that there would be only an estimated 12–16% reduction in potential noise impacts by moving the high-speed mainline (express) tracks outside the urbanized areas. The relatively modest decrease in potential noise impacts is attributed to three factors: 1) there would be some potential residential impacts along the new express loop, 2) much of the surrounding land uses of the freight line through downtown Fresno are industrial, and 3) the express loop results in potential noise impacts on two corridors as opposed to one. The express loop would potentially impact an additional 224–293 ac (91–119 ha) of farmland, and this new alignment would have potential severance impacts on farmlands. The express loop would potentially impact an additional 40 ac (16 ha) of wetlands, 5–7 stream crossings, and 5–7 ac (2–3 ha) more floodplains. This station option would potentially have impacts on minority population.

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[68] Local service station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
Tulare and Kings Counties	
Hanford (BNSF)	The Hanford site would connect to the Amtrak station in Hanford. The BNSF serves Hanford and would result in faster travel times and lower access costs for Hanford residents and Kings County. Intercity ridership forecasts estimate between 140,000 and 160,000 total boardings and alightings annually by 2020 for a Tulare/Kings County station. The station is estimated to cost $28.7 million. The Hanford station option would have low potential impacts on biological resources and hydrology, and medium/high potential cultural impacts. There is a majority of ethnic minority and low income population near the station area.
Visalia Airport (UPRR)	The Visalia Airport station would best serve the more populated Tulare County cities of Visalia and Tulare. The UPRR serves Visalia and would result in faster travel times and lower access costs for the Visalia population and Tulare County. Intercity ridership forecasts estimate 140,000–160,000 total boardings and alightings annually by 2020 for a Tulare/Kings County station. The station is estimated to cost $28.7 million. The Visalia Airport station option would have low potential impacts on cultural resources, biological resources, and hydrology.
Bakersfield Area	
Truxton (UPRR)	The Truxton station would have the highest connectivity of the three locations being evaluated to serve Bakersfield. The Truxton station would connect to the new Bakersfield Amtrak Station and is in the city center of Bakersfield, within walking distance of the convention center and City Hall. The Truxton station location also has good access to SR-99. The Truxton station would have high ridership potential. Intercity ridership forecasts estimate between 1.9 and 2.6 million total boardings and alightings annually by 2020. The Truxton station would have higher construction costs and construction issues than the other Bakersfield station options, and is estimated to cost $32.4 million for the Union Avenue station option, and $165 million for the Amtrak station option. The Truxton station option would have low potential impacts on biological resources, medium/high potential impacts on cultural resources, and a high percentage of residential land uses that would not be compatible with an HST station. There is a majority of ethnic minority and low income population near the station area.
Golden State (UPRR)	The Golden State station site is less than 2 mi (3 km) northeast of the city center next to SR-204. This station would have less accessibility and connectivity than the Truxton station option. Intercity ridership forecasts suggest similar ridership potential as the Truxton station. This station option is estimated to cost $32.2 million. The Golden State station site would have low potential impacts on biological resources, and medium potential impacts on cultural resources. This option would potentially impact 12.4 ac (5.0 ha) of parkland and 26 ac (11 ha) of wildlife habitat.

Station Name (Alignment)	Discussion
Bakersfield Airport (UPRR)	The Bakersfield Airport station would be located outside of Bakersfield, about 6 mi (10 km) northeast of the city center. The airport station would provide a high level of connectivity to the airport and has good access to SR-99, but would have the least connectivity and accessibility of the three Bakersfield station options because of distance from downtown. Intercity ridership forecasts suggest similar ridership potential as the Truxton station. This station option is estimated to cost $32.4 million. The Bakersfield Airport station option would have low potential impacts on biological resources, medium/high potential impacts on cultural resources, and potential impacts on 25 ac (10 ha) of wildlife habitat.

6.4 BAKERSFIELD TO LOS ANGELES REGION

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

6.4.1 Bakersfield to Sylmar Alignment Options

All information presented is for the area from Bakersfield to Sylmar. This segment is shown in Figure 6.4-1.

	I-5		**SR-58/Soledad Canyon Corridor (Antelope Valley)**
	Union Avenue	**Wheeler Ridge**	
Physical/Operational Characteristics			
Alignment Description	This alignment extends east along UPRR from a Bakersfield station, south along Union Avenue, and generally follows I-5 over the Tehachapi Mountains through Santa Clarita to Sylmar. No station options considered in this segment.	This alignment extends east along UPRR from a Bakersfield station, south along SR-184/Wheeler Ridge Road, and generally follows I-5 over the Tehachapi Mountains through Santa Clarita to Sylmar. No station options considered in this segment.	This alignment extends east from Bakersfield along SR-58, generally following SR-58 through the Tehachapi Mountains to Mojave, along MTA/Metrolink through Antelope Valley and Soledad Canyon, and generally following SR-14 from Santa Clarita to Sylmar. Palmdale Transportation Center is the only station option considered in this segment.
Length in miles (km)	84 mi (135 km)	87 mi (140 km)	120 mi (193 km)
Cost[69] (dollars)	$6.48 billion	$6.58 billion	$6.46 billion
Travel Time (min)	33 min	34 min	45 min For express trips passing through this segment as part of a longer trip (e.g., Los Angeles to San Francisco or Sacramento), this alignment option adds 10 min to long-distance travel time).

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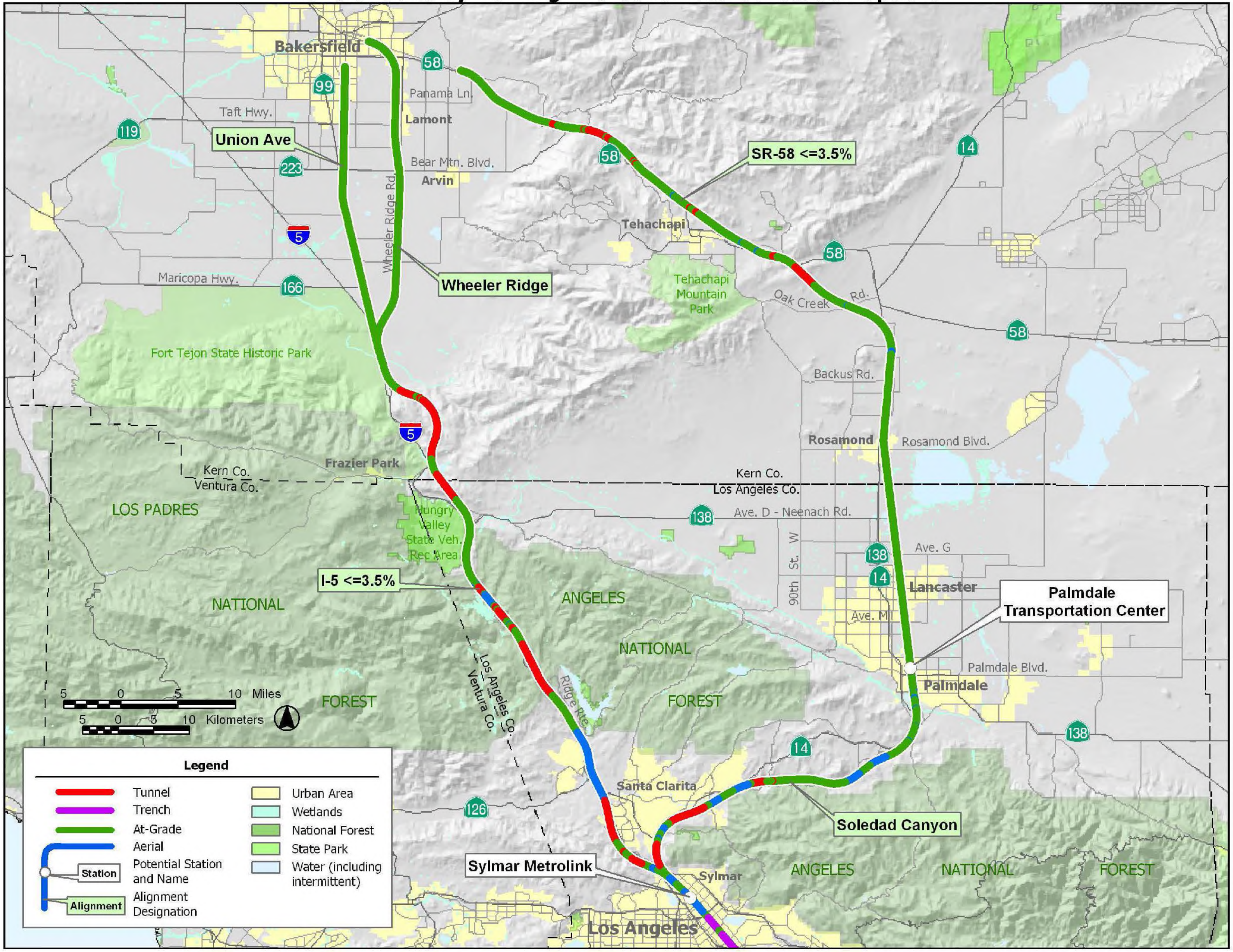
[69] Segment Cost Begins at a common point after Bakersfield Golden Station at Roxford Street.

Figure 6.4-1
Bakersfield to Sylmar Alignment and Potential Station Options



	I-5		SR-58/Soledad Canyon Corridor (Antelope Valley)
	Union Avenue	**Wheeler Ridge**	
Ridership	The I-5 alignment options have higher projected annual system-wide intercity ridership (1.7 million annual passengers, more by 2020 using the low-end forecast) than the Antelope Valley option (30.3 million) due to the shorter travel times between major northern California markets (San Francisco Bay Area and Sacramento) and southern California markets (Los Angeles and San Diego). However, the I-5 options do not directly serve the Antelope Valley.		Provides direct service to Palmdale/Lancaster area. Lower intercity ridership than I-5 options because of longer travel times between major northern California markets (San Francisco Bay Area and Sacramento) and southern California markets (Los Angeles and San Diego). There is a high potential for commute ridership between Palmdale and Los Angeles on this alignment. The commute ridership is estimated to be 1.7 million more annually than the I-5 options by 2020.
Constructability	This section of the alignment crosses five or six major seismic faults through the Tehachapi Mountains and has 23 mi (37 km) of tunnels with long sections (more than 5 mi [8 km]) at Tejon Ranch and through the Angeles National Forest. It would be one of the most challenging sections of the HST system to construct. This option, which follows the San Gabriel fault for over 20 miles, would have considerably higher seismic and constructibility issues than the Antelope Valley alignment option.		This section of the alignment crosses three major seismic faults through the Tehachapi Mountains and has 13 mi (21 km) of tunnels. This option provides less abrupt terrain than the I-5 options, which would result in considerably less tunneling overall, shorter tunnels (maximum tunnel length of 3.4 mi [5.5 km]) and fewer constructability issues through the mountains. This option would have considerable sections of construction adjacent to existing rail and highway corridors through the urban areas of Palmdale and Lancaster. Services would need to be maintained on these adjacent facilities during construction. It would be one of the most challenging sections of the HST system to construct.
Operational Issues	Average speed: 153 mph (246 kph) Maximum speed: 186–217 mph (299–349 kph) The I-5 alignment options have more than 20 mi (33 km) of sustained grades above 3.0%. These sustained grades reduce train speed and increase power consumption.		Average speed: 161 mph (259 kph) Maximum speed: 186–217 mph (299–349 kph) The Antelope Valley alignment option has a more gradual profile than the I-5 options with only 14 mi (22.5 km) of sustained grades over 3.0%.
Potential Environmental Impacts			

	I-5		**SR-58/Soledad Canyon Corridor (Antelope Valley)**
	Union Avenue	**Wheeler Ridge**	
Travel Conditions	The I-5 alignment options would have the fastest express times between northern and southern California. Express times would be about 10 min less than the SR-58/Soledad Canyon alignment, and local times would be about 12 min less. For example, the San Francisco to Los Angeles express travel time would be approximately 2 hr 25 min for the I-5 alignment options, and just over 2 hr 35 min for the SR-58/Soledad Canyon alignment. The I-5 alignment options would not directly serve the Antelope Valley.		The travel times between San Francisco and Los Angeles on the SR-58/Soledad Canyon option would be 2 hr 35 min, or about 10 min longer than the I-5 alignment. The SR-58/Soledad Canyon option includes a potential station at Palmdale, whereas the I-5 options do not have any stations between Bakersfield and Sylmar. The potential Palmdale station would have a positive effect on connectivity since it would serve the growing communities of the Antelope Valley. Trip time between Palmdale and Los Angeles would be about 26 min. The SR-58/Soledad Canyon alignment would also improve travel times, and reduce access costs to/from the Antelope Valley population.
Noise and Vibration:[70] High, medium, and low potential impacts	Low potential impacts. The HST Alternative has low potential noise impact ratings along both the I-5 and Antelope Valley alignment options because of the sparseness of residential land use and open space along most of these two routes. The I-5 alignment options would require more tunneling through the open space and natural areas, which would result in fewer potential operational noise impacts on wildlife and hiking trails.		Low potential impacts on overall segment. Medium potential impacts in the Palmdale area. The HST Alternative has low potential noise impact ratings along both the I-5 and Antelope Valley options because of the sparseness of residential land use and open space along most of these two routes. There would be medium potential impacts in the more urban areas of Palmdale and Lancaster. More of the Antelope Valley option passes through populated areas than the I-5 options.

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[70] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	I-5		SR-58/Soledad Canyon Corridor (Antelope Valley)
	Union Avenue	**Wheeler Ridge**	
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatible, although most of the alignment would be in new right-of-way because it is adjacent to the existing road (I-5). Alignment would be constructed primarily in tunnels is considered compatible. Environmental Justice: Minority populations exist and would not be affected. Community: High potential impacts; the alignment divides an established residential community. Property: Low potential impacts.	Compatible, although most of the alignment would be in new right-of-way because it is adjacent to the existing road (I-5). Alignment would be constructed primarily in tunnels and is considered compatible. Environmental Justice: Minority populations exist at points along the alignment option Community: Low potential impacts. Property: Low potential impacts.	Not compatible in Palmdale because of additional right-of-way necessary for alignment. Environmental Justice: Minority populations exist at points along the alignment option Community: Low potential impacts. Property: High potential impacts due to the alignment passing through Palmdale and Lancaster.
Farmlands:[71] Ac (ha) of farmlands	Farmlands: 20 ac (8 ha)	Farmlands: 63 ac (25 ha)	Farmlands: 0 ac (0 ha)

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[71] The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

<table>
<tr><th rowspan="2"></th><th colspan="2">I-5</th><th rowspan="2">SR-58/Soledad Canyon Corridor (Antelope Valley)</th></tr>
<tr><th>Union Avenue</th><th>Wheeler Ridge</th></tr>
<tr><td>Aesthetics and Visual Resources: Number of viewing points and high potential contrast/impact areas</td><td colspan="2">2 viewing points: Pyramid Lake scenic viewing point and Castaic Lake scenic viewing point, 0.4 mi (0.64 km) and 0.7 mi (1.13 km)
High potential contrast impacts from elevated structure and catenary at edge of Pyramid Lake adjacent to I-5, and cut and fill and tunnel portals in hillside of Santa Clarita Woodlands Park.</td><td>1 viewing point: Tehachapi Loop Marker, 0.7 mi. (1.13 km) of alignment.
Contrast with historic Tehachapi Pass Rail, and high contrast from cut and fill in hillside for about 12 mi (19 km).
The elevated guideway and catenary across the scenic Sierra Highway and adjacent to Santa Clara River SEA (Significant Ecological Area) would contrast with the existing landscape features. Cut and fill and tunnel portals would be visible against natural open space hillsides and ridges in Angeles National Forest. Would affect 1.1 mi (1.8 km) of scenic highway (Sierra Highway in City of Palmdale). The elevated guideway potentially has shadow impacts.</td></tr>
<tr><td>Cultural Resources and Paleontological Resources:[72] Potential presence of historical resources in area of potential effect</td><td>0.18 known archeological sites per mi
Based on records searches, the I-5 options have lower potential to encounter cultural resources than the Antelope Valley option. Long tunnels further reduce the potential for cultural resources impacts.</td><td>0.20 known archeological sites per mi
Based on records searches, the I-5 options have lower potential to encounter cultural resources than the Antelope Valley option. Long tunnels further reduce the potential for cultural resources impacts.</td><td>0.31–1.30 known archeological sites per mi
The Antelope Valley option would be more sensitive for cultural resources than the I-5 alignment options.</td></tr>
</table>

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[72] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	I-5 Union Avenue	 Wheeler Ridge	SR-58/Soledad Canyon Corridor (Antelope Valley)
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, linear ft (m) of streams, and ac (ha) of lakes within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains: NA Streams: NA Lakes: NA Lower potential for affecting floodplains than Antelope Valley or the Wheeler ridge option. Similar potential for impacts to streams and lakes as the Wheeler Ridge alignment option.	Floodplains:[73] 408 ac (165 ha) Streams:[74] 3,050 linear ft (930 linear m) Lakes: 4.6 ac (1.9 ha) Higher potential for affecting floodplains than Antelope Valley option, primarily due to large areas of floodplain between Bakersfield and the base of the Tehachapi Mountains at Grapevine.	Floodplains: 317 ac (128 ha) Streams: 4,700-5,000 linear ft (1,433-1,524 linear m) Lakes: 0.3-1.4 ac (0.1-0.6 ha) Lower overall potential for water-related impacts because the potential impacts are due to the relatively small seasonal streams in Soledad Canyon between Palmdale and Sylmar, and the alignment would not encroach on any lakes. Range represents inclusion of SR-14 alignment option.
Biological Resources, Including Wetlands: Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas), and linear ft (m) of non-wetland waters (waters)	Wetlands: NA[75] Habitat: NA Species: NA The I-5 options would potentially impact slightly more sensitive plant communities and wetlands than the Antelope Valley alignment. However more of the route would be in tunnel, limiting the exposure of the HST to biological resources.	Wetlands: NA Habitat: 204 ac (333 ha) Species: 8 species The I-5 options would potentially impact slightly more sensitive plant communities and wetlands than the Antelope Valley alignment. However more of the route would be in tunnel, limiting the exposure of the HST to biological resources.	Wetlands: NA Habitat: 120-132 ac (49-53 ha) Species: 10 species The Antelope Valley alignment option would potentially impact more sensitive plant and wildlife species and more wildlife movement/ migration corridors than the I-5 options. Overall, the Antelope Valley option would have slightly more potential impacts on biological resources than the I-5 options.

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[73] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[74] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[75] The comparison of potential impacts to wetland resources is not relevant due to limited wetlands data in this region, particularly in the Soledad Canyon area. Hydrologic information regarding potential impacts to streams and lakes is used as a indication of the potential for impacts to wetland resources for this area.

	I-5		**SR-58/Soledad Canyon Corridor (Antelope Valley)**
	Union Avenue	**Wheeler Ridge**	
Section 4(f) and 6(f) Resources:[76] Number of resources rated high (potential direct effects)	Resources rated high: 5 Alignment option would potentially impact Fort Tejon Historical Park, Angeles and Los Padres National Forests, Hungry Valley State Vehicular Recreation Area, and Pyramid Lake.	Resources rated high: 8 Alignment option would potentially impact Fort Tejon Historical Park, Angeles and Los Padres National Forests, Hungry Valley State Vehicular Recreation Area, Pyramid Lake, and other local parks along Wheeler Ridge.	Resources rated high: 0 The alignment would not go through major parks such as Angeles National Forest. There are only medium potential impacts on historical resources in Palmdale and Lancaster.
Growth Induced Impacts: Ac (ha) of urbanized area required in addition to baseline forecast	Low potential impact. Because these alignment options would have no stations between Bakersfield and Los Angeles, urban development is forecasted to be more concentrated in the Central Valley, and consequently slightly more land would be urbanized surrounding the Central Valley stations to accommodate the growth, as compared to the Antelope Valley option.		Low potential impact. This option includes a station at Palmdale in the Antelope Valley of Los Angeles County. The station at Palmdale is forecasted to increase projected urbanized land in Los Angeles County by more than 2,250 ac (911 ha). Due to increased travel times associated with this alignment, the Palmdale option would also slightly reduce requirements for urbanized land in nearly every study area county because of reduced population and employment growth. In total, the reductions in other counties would outweigh the increase in Los Angeles County, resulting in a net decrease in statewide urbanized area of approximately 2,100 ac (850 ha) in 2035. This option is forecasted to result in less farmland conversion (about 2,800 ac [1,133 ha] less) than the I-5 option in 2035.

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[76] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.4.2 Sylmar to Los Angeles Alignment Options

All information presented is for the area from Sylmar to Los Angeles. This segment is shown in Figure 6.4-2.

	MTA/Metrolink	**Combined I-5/Metrolink**
Physical/Operational Characteristics		
Alignment Description	This alignment extends southeast generally following the MTA/Metrolink between Sylmar and Los Angeles Union Station (LAUS) area. It is assumed that the alignment would be generally at grade between Burbank and downtown Los Angeles. There is an aerial option over I-5 and I-10 between Burbank and LAUS. Station options considered in this segment include Sylmar, Burbank, and the LAUS area.	This alignment extends southeast following MTA/Metrolink from Sylmar to Burbank Metrolink station, and then generally follows I-5 to a tunnel under Elysian Park to the LAUS area. The assumed configuration for the I-5 option is aerial from south of Burbank station to south of Glendale Boulevard, then cut and cover to south of Stadium Way. Additionally, there is an aerial option from south of Burbank station to south of Stadium Way. Station options considered in this segment include Sylmar, Burbank, and the LAUS area.
Length in miles (km)	23–25 mi (37–40 km)	24–25 mi (39–40 km)
Cost[77] (dollars)	$2.11 billion	$2.09 billion
Travel Time (min) Roxford to Los Angeles Union Station	11-12 min (depending on LAUS option)	11 min
Ridership	Ridership for these two alignment options would be about the same.	
Constructability	This alignment is a combination of at-grade, trench, and aerial construction.	This alignment is also a combination of at-grade, trench, and aerial construction, but could also require approximately 2 miles (3.2 km) of tunneling at Silver Lake. The aerial and tunneling sections are due to right-of-way constraints.
Operational Issues **Roxford to Los Angeles Union Station**	Average speed: 131 mph (211 kph) Maximum speed: 155–186 mph (249–299 kph)	Average speed: 131 mph (211 kph) Maximum speed: 155–186 mph (249–299 kph)

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[77] Segment cost begins at Roxford Street.

Figure 6.4-2
Sylmar to Los Angeles Alignment and Potential Station Options

	MTA/Metrolink	Combined I-5/Metrolink
Potential Environmental Impacts		
Noise and Vibration:[78] High, medium, and low potential impacts	Medium potential impacts. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings. Potential noise impacts would be medium where the alignment is at grade between Burbank and Los Angeles. If the alignment were aerial where it crosses the I-5 and I-10, the potential noise impacts would be higher.	Medium potential impacts. Where the alignment would be aerial between Burbank and to just south of Glendale Boulevard, the potential noise impacts would be medium. However, between Glendale Boulevard and south of Stadium Way, where the alignment would be in tunnel, the potential noise impacts would be low. If the alignment were aerial between Burbank and Stadium Way, the potential noise impacts would be considerably higher.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Not compatible because of need for new right-of-way. Environmental Justice: Minority populations are present at points along the alignment option Community: Low potential impacts. Property: Low potential impacts.	Not compatible because the alignment cuts through low-density residential areas. If cut and cover were used at Silver Lake, the alignment would be compatible because it would not divide the community. Environmental Justice: Minority populations are present at points along the alignment option Community: Low potential impacts. Property: Low–medium potential impacts.
Aesthetics and Visual Resources: Number of viewing points and high potential contrast/impact areas	It is assumed that this alignment would be at grade between Burbank and Glendale Avenue and would consequently have low to medium potential impacts. Between Glendale Avenue and Los Angeles, the alignment would be at grade and consequently would have medium potential impacts. If the aerial option were used between Glendale Boulevard and Los Angeles, there could be higher potential impacts due to higher contrast areas and shadows.	It is assumed that this alignment between Burbank and Glendale Avenue would be at grade and aerial, and would consequently have medium potential impacts due to high contrast and potential shadow impacts. From south of Glendale Boulevard to south of Stadium Way, it would be in tunnel, having few potential visual impacts. However, if the tunnel section between Glendale Boulevard and south of Stadium Way were aerial, there could be higher potential impacts due to higher contrast areas and shadows.

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[78] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	MTA/Metrolink	Combined I-5/Metrolink
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, linear ft (m) of streams, and ac (ha) of lakes within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[79] 0 ac (0 ha) Streams:[80] 350 linear ft (107 linear m) Lakes: 0 ac (0 ha) (Assumes existing LAUS option) This is a predominantly urban environment.	Floodplains: 10 ac (4 ha) Streams: 350 linear ft (107 linear m) Lakes: 0 ac (0 ha) (Assumes existing LAUS option) This is a predominantly urban environment.
Biological Resources Including Wetlands: Ac (ha) of wetlands, ac (ha) of sensitive habitat (habitat), ac (ha) of special-status species habitat within potential impact study areas, and linear ft of non-wetland waters (waters)	Wetlands: 1.5 ac (0.6 ha) Habitat: 34 ac (14 ha) Species: 4 This is a predominantly urban environment.	Wetlands: 10.5 ac (4.3 ha) Habitat: 34 ac (14 ha) Species: 4 The I-5 route would potentially impact slightly more biological resources than the MTA/Metrolink route. The I-5 route could potentially impact one sensitive plant community, whereas the MTA/Metrolink route potentially would not impact any. The I-5 route would also encounter more non-wetland waters than the MTA/Metrolink route. This is a predominantly urban environment.
Section 4(f) and 6(f) Resources:[81] Number of resources rated high (potential direct effects)	Resources rated high: 0–3 depending on LAUS option From Sylmar to downtown Los Angeles, generally the MTA/Metrolink alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks. Both the Metrolink and I-5 alignments are rated high for potential presence of historical resources.	Resources rated high: 4–5 depending on LAUS option From Sylmar to downtown Los Angeles, generally the MTA/Metrolink alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks. The I-5 option has potential impacts on Griffith Park and Elysian Park. Both the Metrolink and I-5 alignments are rated high for potential presence of historical resources.

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[79] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[80] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[81] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.4.3 Bakersfield to Los Angeles Station Options

Station Name (Alignment)	Discussion
Palmdale/Antelope Valley	
Palmdale Transportation Center (SR-58/Soledad Canyon)	The Palmdale Transportation Center would potentially serve the Antelope Valley population. This station option maximizes opportunities for intermodal connectivity. It is close to Palmdale Airport, with the opportunity for convenient shuttle or people-mover service, and it is the Metrolink station for Palmdale and a hub for local bus services. The Palmdale Transportation Center would reduce travel times and access costs for the Antelope Valley population. More than 1.3 million total intercity boardings and alightings are expected at this station annually by 2020 (low end forecast). The Palmdale Transportation Center is estimated to cost $32.4 million. The station would be at grade. Minority populations are present in the vicinity of this station option. It would have a potentially high impact on streams (6,586 linear ft [2,007 m]). There are four special-status species in the vicinity of the station. One Section 4(f) and 6(f) resource, the Sierra Highway Greenbelt, could be affected by the station.
Sylmar	
Sylmar Metrolink (MTA/Metrolink and combined I-5/Metrolink)	The Sylmar Metrolink station would provide a direct connection to the Metrolink regional commuter rail service. This potential station location would have convenient access to the freeway network. Between approximately 2.5 and 3.5 million total intercity boardings and alightings are expected at this station annually by 2020. The Sylmar Metrolink station is estimated to cost $172 million. The station would be an aerial structure. Although there are no recorded archeological sites in this station area, there is a large potential for buried prehistoric sites. This station would potentially affect 2,640 linear ft (805 m) of non-wetland waters, and one plant and one wildlife species. Two Section 4(f) and 6(f) resources could be affected by this station, Recreation Park and Layne Park in San Fernando.
Burbank	
Burbank Metrolink Media City (MTA/Metrolink and combined I-5/Metrolink)	The Burbank Metrolink station would provide the highest connectivity to the Burbank area. This station site is in downtown Burbank, has a direct connection to the Metrolink regional commuter rail service, is a hub for bus transit in the Burbank area, has adjacent access to I-5, and is only 2.4 mi (3.9 km) from Burbank Airport. Between about 2.9 and 5.4 million total intercity boardings and alightings are expected annually at this station by 2020. The Burbank Metrolink station is estimated to cost $ 172 million and would be aerial. There would be a potentially high impact on historical structures because of the historical structures surrounding the station. This station would potentially affect 3,168 linear ft (966 m) of non-wetland waters, 11 ac (4 ha) of perennial wetlands, and one plant species. Additionally, 1,384 linear ft (422 m) of streams could be affected. Griffith Manor Park, a potential Section 4(f) and 6(f) resource in Glendale, could be affected by the station.

Station Name (Alignment)	Discussion
Burbank Airport (MTA/Metrolink and combined I-5/Metrolink)	The Burbank Airport station would be nearer to Burbank Airport (1.6 mi [2.6 km]), but would be outside the city center and would not connect with a Metrolink station or regional transit. The intercity ridership potential is expected to be about the same as the Burbank Metrolink station option. The Burbank Airport station is estimated to cost $366 million. The station would be in a trench, making it considerably more difficult and expensive to build than the downtown station. There would be a high potential impact on historical structures because of the historical structures surrounding the station. This station would potentially affect 6 ac (2 ha) of wetlands.
Los Angeles	
Los Angeles Union Station (MTA/Metrolink)	The existing LAUS station has the best connectivity and therefore would also provide the fastest overall travel times. LAUS is the transit/rail transportation hub of southern California. LAUS is the primary destination for the Metrolink Commuter rail services, the Los Angeles Metro Red Line, the Pasadena Gold Line, the Amtrak Surfliner service, and the regional bus transit services. HST would serve LAUS on an elevated structure, and transfers to other modes would be made directly under HST platforms. LAUS would have between 9 and 15.3 million annual intercity boardings and alightings by 2020, which is the highest ridership of all stations in the entire system. LAUS is estimated to cost $96.3 million.[82] It would be an elevated structure constructed over the current Metrolink and Amtrak tracks. For service to Inland Empire/San Diego via the UPRR Riverside/UPRR Colton alignment option, and for service to Orange County and LAX, the HST alignment at LAUS would continue south (over US-101). The UPRR Colton alignment option to Inland Empire/San Diego would require the LAUS station site to remain a stub-end station, requiring trains traveling from northern California to Inland Empire and San Diego that stop at LAUS to reverse directions (increasing travel times between these markets by at least 10 min). The existing LAUS site would have limited potential impacts on the environment. Minority populations are present in the vicinity of this station. The El Pueblo de Los Angeles State Historic Park could be affected, particularly during construction, by the addition of the HST system. Also given the proximity of the station to the historic district, this area is considered to have high potential for impacts on cultural resources.

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[82] Costs would be reduced for this station because of lower design speed for station stopping tracks, which requires less infrastructure and right-of-way.

Station Name (Alignment)	Discussion
Los Angeles Union Station South (MTA/Metrolink)	The LAUS south site would require the construction of a pedestrian bridge/plaza across US-101 to connect with LAUS. The LAUS south station would have similar intercity ridership potential as the LAUS option. For service to Inland Empire/San Diego via the UPRR Riverside/UPRR Colton alignment option, and for service to Orange County and LAX, the HST alignment at LAUS would continue south (over US-101). The UPRR Colton alignment option to Inland Empire/San Diego would require the LAUS station site to remain a stub-end station for trains traveling from northern California to Inland Empire and San Diego (increasing travel times between their markets by at least 10 min). The station would be constructed across the US-101 corridor, creating a new aerial terminal that would have to connect via bridge to the existing LAUS. The LAUS south station would cost $96.3[83] million to build. There would be a high potential impact on historical structures because of the historical structures surrounding LAUS, which is itself a historical structure. The station would affect 2,112 linear ft (644 m) of non-wetland waters. No Section 4(f) or 6(f) resources would be directly affected by this station.
Los Angeles River East (MTA/Metrolink)	The Los Angeles River east station site would require the construction of a pedestrian bridge/plaza across US-101 to connect with LAUS. The Los Angeles River east station would have intercity ridership potential similar to the LAUS option. For service to Inland Empire/San Diego via the UPRR Colton alignment option, the HST alignment at the Los Angeles River east station would continue east on an aerial structure. This station site would not serve the UPRR Riverside/UPRR Colton alignment option to Inland Empire/San Diego or the links to Orange County or LAX. The aerial station would be constructed across the East River from the existing LAUS and would constitute a new station and structure. The station is estimated to cost $96.3 million.* There would be a high potential impact on historical structures because of the historical structures surrounding the rail yards and LAUS, which is itself a historical structure. The station would affect 3,696 linear ft (1,127 m) of non-wetland waters. No Section 4(f) or 6(f) resources would be directly affected by this station. There would be low potential impacts on biological resources in this station area.

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[83] Costs would be reduced for this station because of lower design speed for station stopping tracks, which requires less infrastructure and right-of-way.

6.5 LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

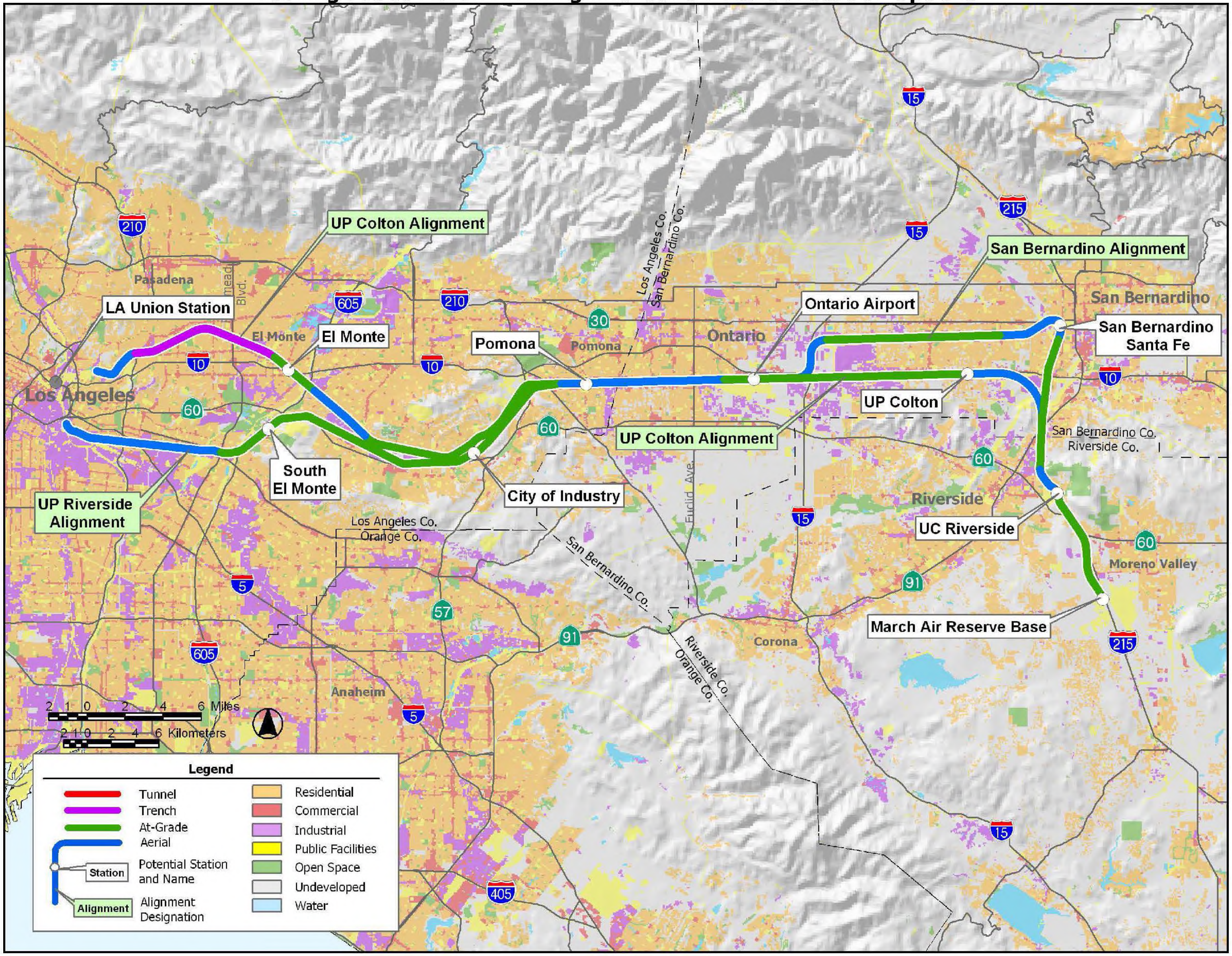
This region of southern California includes the eastern portion of the Los Angeles Basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

6.5.1 Los Angeles to March Air Reserve Base Alignment Options

All information presented is for the area from Los Angeles to March Air Reserve Base (ARB). This segment is shown in Figure 6.5-1.

	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Physical/Operational Characteristics				
Alignment Description	The Colton alignment would potentially begin at LAUS and follow the UPRR Colton Line to March ARB. Station options considered in this segment include El Monte, Pomona, Ontario, Colton, and UC Riverside.	The Riverside/Colton alignment would potentially begin at LAUS and would follow the UPRR Riverside Line to Pomona. From Pomona to March ARB, the alignment would follow the UPRR Colton Line. Station options considered in this segment include South El Monte, City of Industry, Ontario, and UC Riverside.	The Colton/San Bernardino alignment would potentially begin at LAUS and would follow the UPRR Colton Line to Ontario Airport. From Ontario Airport, the alignment would move north into San Bernardino, continue to Santa Fe station primarily along the existing BNSF/SCRRA alignment, turn south on the BNSF San Jacinto Line, and continue south on I-215 to March ARB. Station options considered in this segment include El Monte, Pomona, Ontario, San Bernardino, and UC Riverside.	The Riverside/Colton/San Bernardino alignment would potentially begin at LAUS and would follow the UPRR Riverside Line to Pomona. From Pomona to Ontario Airport, the alignment would follow the UPRR Colton Line, move north into San Bernardino, primarily along the BNSF San Bernardino line, continue to Santa Fe station, turn south on the BNSF San Jacinto Line, and continue south on I-215 to March ARB. Station options considered in this segment include South El Monte, City of Industry, Ontario, San Bernardino, and UC Riverside.
Length in miles (km)	68 mi (109 km)	68 mi (109 km)	75 mi (121 km)	74 mi (119 km)
Cost (dollars)	$4.10 billion	$2.91 billion	$4.82 billion	$3.62billion
Travel Time (min)	33 min	35 min	39 min	41 min

Figure 6.5-1
Los Angeles to March ARB Alignment and Potential Station Options



	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Ridership	Would provide the shortest and fastest route between Los Angeles and March ARB. The UPRR Colton alignment option to Inland Empire/San Diego enters LAUS and Union Station South from the north, requiring a direction reversal using LAUS as a stub-end station for trains traveling from Inland Empire to northern California (e.g., San Francisco and Sacramento), increasing travel times between these markets by at least 10 min. LA River Station East could provide through service for trains between these markets.	Would provide the second shortest and fastest route. The Riverside/Colton alignment option to Inland Empire/San Diego would allow through tracks at LAUS and Union Station South. This alignment would not provide service to the LA River Station East.	Would provide service to downtown San Bernardino. The UPRR Colton alignment option to Inland Empire/San Diego enters LAUS and Union Station South from the north, requiring a direction reversal using LAUS as a stub-end station for trains traveling from Inland Empire to northern California (e.g., San Francisco and Sacramento) increasing travel times between these markets by at least 10 min. LA River Station East could provide through service for trains between these markets.	Would provide service to downtown San Bernardino. The Riverside/Colton alignment option to the Inland Empire/San Diego would allow through tracks at LAUS Station and Union Station south. This alignment would not provide service to the LA River East Station.
Constructability	All alignment options would require construction in an urban environment, while maintaining rail service within the adjacent existing corridor.			
Operational Issues	Average speed: 110 mph (177 kph) Maximum speed: 186–215 mph (299–346 kph) Requires trains bound to points north of Los Angeles to change direction at LAUS and Union Station South. LA River Station East could provide through service to points north of Los Angeles.	Average speed: 117 mph (188 kph) Maximum speed: 186–215 mph (299–346 kph) This alignment would not serve LA River Station East.	Average speed: 115 mph (185) Maximum speed: 186–215 mph (299–346 kph) Requires trains bound to points north of Los Angeles to change direction at LAUS and Union Station South. LA River Station East could provide through service to points north of Los Angeles.	Average speed: 110 mph (177 kph) Maximum speed: 186–215 mph (299–346 kph) This alignment would not serve LA River Station East.
Potential Environmental Impacts				

	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Travel Conditions	For the alignment segment between Los Angeles and Riverside, the UPRR Colton and UPRR Riverside would serve the same basic populations and the same number of potential stations in about the same travel time.		These alignment options would provide service to San Bernardino, one of the largest Inland Empire cities, via a station in Colton. Because these alignment options are not as direct as the UPRR Colton or UPRR Riverside/Colton options, the alignment distance would be approximately 6 mi [9.7 km] longer, and the travel time would be approximately 6 min longer than the Colton or Riverside/Colton alignment.	
Noise and Vibration:[84] High, medium, and low potential impacts	High potential impacts. High potential impacts due to proximity of residential land use along the Los Angeles to East San Gabriel Valley segment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.	Medium potential impacts. Medium potential impacts due to proximity of alignment to industrial/commercial land uses. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.	High potential impacts. High potential impacts due to proximity of residential land use along the Los Angeles to East San Gabriel Valley and the San Bernardino segments. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.	High potential impacts. High potential impacts due to proximity of residential land use along the San Bernardino segment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.

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[84] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatible. Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Medium potential impacts. Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and residential uses. The residential uses are concentrated in the San Gabriel area. About 26% of the length would have high potential impacts on property.	Compatible. Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Medium potential impacts. Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and some residential uses. About 30% of length would have high potential impacts on property.	Not compatible with existing land use because of loop through low-density areas in San Bernardino. However, the potential San Bernardino station site is within a redevelopment area, which would support an HST station in the future. Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Medium potential impacts. Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and residential uses (particularly in the San Bernardino Area). More potential property impacts than the UPRR Colton or Riverside/Colton alignments. 33% of the length would have high potential impacts on property.	

	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[85] 132 ac (53 ha) Streams:[86] 1,400 linear ft (6,325 linear m) Lakes: 1.1 ac (0.4 ha) Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.	Floodplains: 57 ac (23 ha) Streams: 2,250 linear ft (11,619 linear m) Lakes: 0.5 ac (0.2 ha) Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.	Floodplains: 148 ac (60 ha) Streams: 3,000 linear ft (4,715 linear m) Lakes: 1.1 ac (0.4 ha) Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.	Floodplains: 115 ac (47 ha) Streams: 3,850 linear ft (10,010 linear m) Lakes: 0.5 ac (0.2 ha) Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.

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[85] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[86] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	Union Pacific Railroad (UPRR)			
	Colton Line	**Riverside/Colton Line**	**Colton Line to San Bernardino**	**Riverside/Colton/San Bernardino**
Biological Resources Including Wetlands: Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas	Wetlands: NA[87] Species:[88] 5 Habitat: 66 ac (27 ha) Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, potential for impacts would be limited.	Wetlands: NA Species: 4 Habitat: 65 ac (26 ha) Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, the potential for impacts would be limited.	Wetlands: NA Species: 4 Habitat: 119 ac (48 ha) Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, the potential for impacts would be limited.	Wetlands: NA Species: 3 Habitat: 118 ac (48 ha) Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore the potential for impacts would be limited.
Section 4(f) and 6(f) Resources:[89] Number of resources rated high (potential direct effects)	Resources rated high: 7 Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 9 Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 9 Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 11 Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.

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[87] The comparison of potential impacts to wetland resources is not relevant due to limited wetlands data in this region, particularly in the Soledad Canyon area. Hydrologic information regarding potential impacts to streams and lakes is used as a indication of the potential for impacts to wetland resources for this area.

[88] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[89] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.5.2 March Air Reserve Base to Mira Mesa Alignment Options

All information presented is for the area from March ARB to Mira Mesa. This segment is shown in Figure 6.5-2.

	I-215/I-15
Physical/Operational Characteristics	
Alignment Description	The I-215/I-15 alignment would begin at March ARB and follow the existing I-215 and then I-15 corridor to Mira Mesa. The majority of the alignment would follow or be adjacent to the existing transportation corridor. Station options considered in this segment include March ARB (cost not included), Temecula/Murrietta, and Escondido (I-15 or Escondido Transit Center).
Length in miles (km)	73 mi (117 km)
Cost (dollars)	$3.97 billion (with I-15 Escondido station) $4.89 billion (with Escondido Transit Center station)
Travel Time (min)	32 min
Ridership	This alignment would serve the I-15 corridor well, regardless of which Escondido station option were chosen.
Constructability	Substantial earthwork along this alignment could require additional right-of-way or extensive retaining walls. Existing traffic flow would need to be maintained during construction.
Operational Issues	Average speed: 153–215 mph (246–346 kph) Maximum speed: 186–217 mph (299–349 kph) This alignment is relatively straight and flat through undeveloped land and rural/suburban communities, thus allowing for operating speeds over 200 mph (322 kph).
Potential Environmental Impacts	
Travel Conditions	No rail corridor exists between March ARB and Mira Mesa. This alignment would provide options to increase accessibility, connectivity, and capacity to major suburban areas of Los Angeles and San Diego.
Noise and Vibration:[90] High, medium, and low potential impacts	Low to medium potential impacts. There would be low potential impacts between March ARB and Escondido, and medium potential impacts (from the Escondido Transit Center alignment and station option) between Escondido and Mira Mesa. This is largely due to the larger population south of Escondido compared to north of Escondido.

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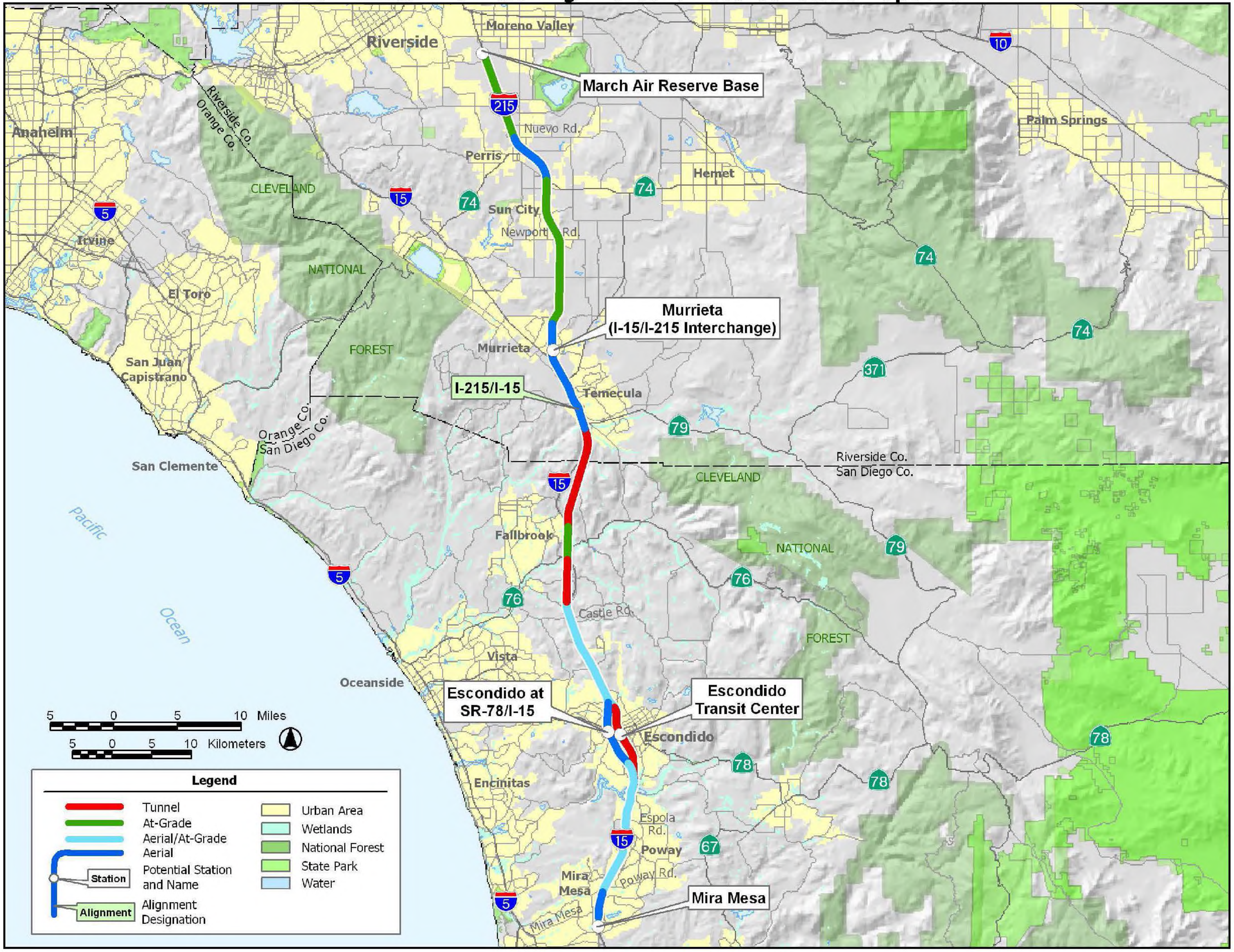
[90] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

Figure 6.5-2
March ARB to Mira Mesa Alignment and Potential Station Options



	I-215/I-15
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatible. Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Low potential impacts. Since this area is largely undeveloped, this alignment would have few potential land use impacts.
Cultural Resources and Paleontological Resources:[91] Potential presence of historical resources in area of potential effect	High potential impacts. March ARB to Mira Mesa has high potential for archeological resources. The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[92] 112 ac (45 ha) Streams:[93] 650-1,050 linear ft (198-320 linear m) Lakes: 0.7-2.1 ac (0.3-0.8 ha) Most of the potential impacts on streams and floodplains could be mitigated through typical engineering solutions.
Biological Resources Including Wetlands: Ac (ha) of wetlands, ac (ha) of special-status species habitat within potential impact study areas, and linear ft (m) of non-wetland waters (waters)	Wetlands: 1.3-2.8 ac (0.5-1.1 ha) Species: 11 Habitat: 104-106 ac (42-43 ha) Wildlife species potentially impacted include 15 sensitive species. March ARB to Escondido would result in potential impacts to jurisdictional waters.

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[91] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[92] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[93] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	I-215/I-15
Section 4(f) and 6(f) Resources:[94] Number of resources rated high (potential direct effects)	Resources rated high: 15–16, depending on station option at Escondido The parks in this region are primarily unnamed local parks with recreational uses stretching the length of the corridor.

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[94] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.5.3 Mira Mesa to San Diego Alignment Options

All information presented is for the area from Mira Mesa to San Diego. This segment is shown in Figure 6.5-3.

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
Physical/Operational Characteristics			
Alignment Description	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows an existing transportation corridor. The corridor traverses Carroll Canyon from Mira Mesa to the University City Station, connects to LOSSAN corridor, and terminates in downtown San Diego. The alignment is next to the north side of the Miramar Naval Air Station (NAS). Station options considered in this segment include University City, San Diego Airport, and downtown San Diego.	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows an existing transportation corridor. The Miramar Road alignment would provide the most direct route from Mira Mesa along Miramar Road to University City Amtrak Station, connect to LOSSAN corridor, and terminate in downtown San Diego. The alignment is adjacent to the north side of the Miramar Naval Air Station (NAS). Station options considered in this segment include Mira Mesa, University City, and downtown San Diego.	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows the I-15 alignment to Qualcomm Stadium. This alignment, along with the existing I-15 corridor, would bisect the Miramar NAS. Station options considered in this segment include Mira Mesa and Qualcomm.
Length in miles (km)	19 mi (31 km)	19 mi (31 km)	9 mi (14 km)
Cost (dollars)	$1.42 billion	$1.35 billion	$1.28 billion
Travel Time (min)	14 min	14 min	7 min
Ridership	Would provide direct service to downtown San Diego and have higher potential for commute ridership than I-15 to Qualcomm option.	Would provide most direct service to downtown San Diego and have higher potential for commute ridership than I-15 to Qualcomm option.	Would provide highest potential for intercity ridership. The low-end ridership analysis estimates 350,000 more intercity passengers for this option than the downtown options by 2020. Would not provide direct service to downtown San Diego but would provide the shortest travel time to the greater San Diego area. The station location would be an 8-mi (13-km) drive or 10-mi (16-km) (20-min) ride on light-rail transit (LRT) to the city center.

Figure 6.5-3
Mira Mesa to San Diego Alignment and Potential Station Options

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
Constructability	This alignment would require construction in a sensitive and remote area, and along the heavily constrained LOSSAN rail corridor as it enters San Diego from the north. Existing rail services would need to be maintained during construction.	This alignment would require construction in a densely suburban area, along an existing roadway, and along the heavily constrained LOSSAN rail corridor as it enters San Diego from the north. Existing traffic and rail services would need to be maintained during construction.	This alignment would require substantial earthwork and additional right-of-way or extensive retaining walls. Existing traffic flow would need to be maintained during construction. This alignment would be the shortest to be constructed relative to other alignment options.
Operational Issues	Average speed: 84 mph (135 kph) Maximum speed: 124–155 mph (200–249 kph)	Average speed: 84 mph (135 kph) Maximum speed: 124–155 (200–249 kph)	Average speed: 77 mph (124 kph) Maximum speed: 124–155 (200–249 kph)
Potential Environmental Impacts			
Travel Conditions	The Carroll Canyon alignment and the Miramar Road alignment would directly serve downtown San Diego. The Carroll Canyon alignment option provides an alternative to the potential Mira Mesa station at University City. The Carroll Canyon and Miramar Road alignment options would provide considerably shorter travel times to downtown San Diego than the I-15 to Qualcomm Stadium alignment (including alternative travel from Qualcomm to downtown).		The I-15 to Qualcomm alignment would have the shortest line-haul times (about 7 min less than the two options to downtown San Diego), but would not directly serve downtown San Diego. The in-train travel time for the light-rail between Qualcomm and the downtown San Diego Santa Fe Depot is more than 20 min.
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts). Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Medium potential impacts. Carroll Canyon option would pass well to the north of Miramar NAS, thereby avoiding potential impacts.	Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts). Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Low potential impacts. This alignment is directly adjacent to Miramar NAS on an aerial structure.	Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts). Environmental Justice: Low potential minority population impacts. Community: Low potential impacts. Property: Low potential impacts. This alignment bisects Miramar NAS along the I-15 corridor, but it is assumed to be in tunnel throughout Miramar NAS.

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
Aesthetics and Visual Resources	High potential impacts. At-grade route would cut through a residential neighborhood and an open space area. Elevated structures would also pass through a city center area and directly in front of high-rise residences, adversely affecting views and creating the potential for impacts.	High potential impacts. Elevated structure would be visible from residential neighborhoods and Balboa Park, creating moderate to high levels of visual contrast. Elevated structures would also pass through a city center area and directly in front of high-rise residences, adversely affecting views and creating the potential for impacts.	Low potential impacts. There are few aesthetic and visual resources along the I-15 corridor.
Cultural Resources and Paleontological Resources:[95] Potential presence of historical resources in area of potential effect	High potential impacts. High potential for historical resources through downtown San Diego.	High potential impacts. High potential for historical resources through downtown San Diego.	Low potential impacts. Low potential for historical resources.
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[96] 162 ac (66 ha) Streams:[97] 100 linear ft (30 m) Lakes: 0 ac (0 ha) Carroll Canyon would have the lowest potential impacts on streams, but the highest on floodplains. The Miramar corridor crosses several flood-prone areas and has several streams feeding the area.	Floodplains: 130 ac (53 ha) Streams: 600 linear ft (183 m) Lakes: 0 ac (0 ha) Miramar Road would have similar potential impacts as the Carroll Canyon alignment. The Miramar corridor runs within several flood-prone areas and has several streams feeding the area.	Floodplains: 40 ac (16 ha) Streams: 250 linear ft (76 m) Lakes: 0.3 ac (0.1 ha) The I-15 option would have potential impacts on streams. The I-15 corridor is considered a flood-prone area and has several streams feeding the area.

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[95] The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

[96] The study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[97] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
Biological Resources Including Wetlands: Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas	Wetlands:[98] 2.5 ac (1 ha) Habitat: 40 ac (16 ha) Species: 10 Characterized by a predominance of southern riparian scrub and potential encounters with more non-wetland waters (as a result of the canyon alignment) than the other two alignment options. Wetlands would be dominated by estuarine wetlands along the coast, with a greater amount of vernal pool wetlands than the Miramar Road alignment. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.	Wetlands: 0.9 ac (0.4 ha) Habitat: 34 ac (14 ha) Species: 6 Characterized by a predominance of mixed chaparral and southern riparian scrub and a potential encounter with a substantial amount of non-wetland waters. Wetlands would be dominated by estuarine areas along the coast, with some vernal pool wetlands in the interior portion of the segment. The Los Peñasquitos Canyon Preserve near Miramar NAS is a considerable regional wildlife and linkage corridor that might also be potentially impacted. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.	Wetlands: 0.2 ac (0.1 ha) Habitat: 18 ac (7 ha) Species: 6 Characterized by a predominance of mixed chaparral and a potential encounter with a substantial amount of non-wetland waters (similar in quantity to the Miramar Road alignment). Wetlands would be dominated by palustrine and vernal pool wetlands, with a quantity of vernal pool wetlands higher than either the Carroll Canyon or Miramar road alignment options[99]. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.
Section 4(f) and 6(f) Resources:[100] Number of resources rated high (potential direct effects)	Resources rated high: 5 The Section 4(f) and 6(f) resources in this corridor are primarily local parks, including the Rose Canyon Open Space Preserve. There are more potential impacts on cultural and historical resources closer to downtown San Diego.	Resources rated high: 5 Like the Carroll Canyon alignment, the Section 4(f) and 6(f) resources in this corridor are primarily local parks, including the Rose Canyon Open Space Preserve and the Miramar Memorial Golf Course. There are more potential impacts on cultural and historical resources closer to downtown San Diego.	Resources rated high: 9 This alignment contains a higher number of unnamed local parks than the other two corridors, primarily because of the suburban development of the area.

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[98] The study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

[99] Vernal Pools of Southern California Draft Recovery Plan, U.S. Fish and Wildlife Service, 1997.

[100] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
Growth-Induced Impacts	Low potential impacts. Growth is forecasted to be more concentrated in the urban (downtown) areas.	Low potential impacts. Growth is forecasted to be more concentrated in the urban (downtown) areas.	High potential impacts. Moving the terminal site from downtown San Diego to East Mission Valley is projected to increase the size of the urbanized area by about 11,500 ac (4,654 ha) (more than 2%) in 2035.

6.5.4 Los Angeles to San Diego Station Options

Station Name (Alignment)	Discussion
East San Gabriel Valley	
City of Industry Metrolink (UPRR Riverside/UPRR Colton)	The Metrolink station site at City of Industry would have a wide range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. The City of Industry site would provide a central location between the potential stations at LAUS and Ontario Airport. This station site would also have good access to the freeway network. The City of Industry station site would be served by the UPRR Riverside/Colton alignment option. The forecasted ridership (boardings and alightings) would be between 4.8 and 10.2 million annual intercity passengers in 2020. The City of Industry station would be at grade, allowing for easier and less expensive construction of the facility. The station is estimated to cost $28.7 million. There are few environmental issues with this site, except incompatibility with current land use. The surrounding area is primarily low density residential and would not be compatible with a train station.
Pomona Metrolink (UPRR Colton and UPRR Riverside/Colton)	The Metrolink station site at Pomona would have a wide range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. This station site would also provide good access to the freeway network. The Pomona station site would be served by both the UPRR Colton and UPRR Riverside/Colton alignment options. The Pomona Metrolink station would have high potential ridership. The intercity ridership (boardings and alightings) would be similar to the City of Industry station option forecast. The station would be an aerial structure next to the existing at-grade Metrolink Station. Expected cost is $165 million. The Pomona station has few environmental issues. However, there is one Section 4(f) and 6(f) resource within 150 ft (46 m) of the station. This unnamed park could be affected by station activities.
El Monte (UPRR Colton)	The El Monte station site would have good freeway access, but would only serve the UPRR Colton Line. The intercity ridership (boardings and alightings) would be similar to the City of Industry station forecasts. The El Monte station would be at grade, which would make construction easier and less expensive than if it were an aerial structure. The station is estimated to cost $27.0 million. There are few environmental issues with this site. However, the surrounding area is primarily low density residential and would not be compatible with a train station.
South El Monte (UPRR Riverside/UPRR Colton)	The South El Monte station site would have good freeway access but would only serve the UPRR Riverside/UPRR Colton Line. The intercity ridership (boardings and alightings) would be similar to the City of Industry station option forecasts. Like the El Monte station, the South El Monte station would be at grade, which would make construction easier and less expensive than if it were an aerial structure. The station is estimated to cost $27.0 million. Like the City of Industry station location, there are few environmental issues with this site, except incompatibility with current land use. The surrounding area is primarily low density residential and would not be compatible with a train station. The station would have a medium potential impact on streams, and would potentially affect 1,500 linear ft (457 linear m) of non-wetland waters.

Station Name (Alignment)	Discussion
Ontario Airport	
Ontario Airport (UPRR Colton and UPRR Riverside/UPRR Colton)	The Ontario airport station would provide a multi-modal connection to Ontario International Airport and link to regional bus transit services. The Ontario airport station would provide the fastest HST travel times and reduce access costs for passengers to Ontario International Airport. The forecasted intercity ridership (boardings and alightings) would be between 1.0 and 2.2 million annual intercity passengers in 2020. The station would be at grade, costing approximately $ 27.0 million. Since it is next to a functioning airport, particular construction techniques may need to be employed to avoid interference with airport ground and airside operations, which could have cost implications. There are few environmental issues with this station location.
East San Bernardino County/Riverside County	
San Bernardino Santa Fe Depot (Riverside/Colton/San Bernardino)	The San Bernardino station site would have the widest range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. The forecasted intercity ridership would be similar to the UC Riverside station option forecasts. The San Bernardino station would be an aerial station, which is more expensive than at-grade construction. The estimated cost of the station would be $ 86.4 million.[101] There are several environmental issues with the San Bernardino station site. There would be high visual contrast in downtown San Bernardino because it would travel through primarily low density residential areas. It would also have high potential shadow impacts. This station would be incompatible with the surrounding residential area; however, the station is in a redevelopment area with future planned uses that would be consistent with the HST station. Minority populations are present in the vicinity of this station option.
UPRR Colton (UPRR Colton and UPRR Riverside/UPRR Colton)	The UPRR Colton station site would have the least connectivity to existing transit services, but it would have the most central location for serving both the San Bernardino and Riverside populations, and good accessibility to I-10. The intercity ridership would be similar to the UC Riverside station option forecasts. The station would be at grade, making it less expensive to build than the San Bernardino station. The estimated cost of this station is $27.0 million. This station could affect 1,330 linear ft (405 m) of streams and 1,400 linear ft (427 m) of non-wetland waters.
University of California Riverside (UPRR Colton and UPRR Riverside/UPRR Colton)	The UC Riverside site is furthest away from the freeway network but provides for the most convenient access to Riverside. The forecasted ridership (boardings and alightings) would be between 2 and 4 million annual intercity passengers in 2020. The aerial station would cost $86.4 million.[102] This station could affect 690 linear ft (210 m) of streams and 1,500 linear ft (457 m) of non-wetland waters. There would be medium potential visual impacts in the residential areas near the station and along the corridor leading to the station.

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[101] Costs are reduced due to lower design speed for station stopping tracks, requiring less infrastructure and right-of-way.

[102] Costs are reduced due to lower design speed for station stopping tracks, requiring less infrastructure and right-of-way.

Station Name (Alignment)	Discussion
March Air Reserve Base (UPRR Colton and UPRR Riverside/UPRR Colton)	The March ARB site would be adjacent to the air reserve base but would have the least connectivity, longest travel times, and highest access costs because it is farthest from the Riverside/San Bernardino populations, and the air reserve base does not serve commercial air passengers. The forecasted ridership (boardings and alightings) would be less than the other stations in this region in 2020. The station would be at grade, making it less expensive to build than the San Bernardino station. The estimated cost of this station is $27.0 million. This station could affect 90 ac (36 ha) of costal sage scrub and one Section 4(f) and 6(f) resource.
Temecula Valley	
Murrieta (I-15)	A potential station at Murrieta would serve the fast-growing Temecula/Murrieta area. The Murrieta station site would have convenient freeway access to both I-15 and I-215. The forecasted ridership (boarding and alighting) would be between 1.2 and 2.0 million annual intercity passengers in 2020. This aerial station would cost $165 million. This station could affect 3,319 linear ft (1,012 m) of non-wetland waters and 640 linear ft (195 m) of streams.
Escondido	
Escondido Transit Center (I-15)	The Escondido Transit Center would have somewhat higher connectivity than the Escondido I-15 station. The Transit Center station would be closer to the Escondido Transit Center (within 1/8-mi) and provide better connectivity with the proposed Escondido-to-Oceanside commuter rail service. The forecasted ridership (boardings and alightings) would be between 1.8 and 2.8 million annual intercity passengers in 2020. This station would be in a trench or tunnel, which is the most expensive and difficult station type to build, and would cost $366 million. The alignment to serve this station would require 5.9 mi (9.5 km) of tunneling, raising the cost of the alignment between March ARB and Mira Mesa by nearly $500 million. This alignment would also add considerable construction issues and right-of-way constraints. The corridor leading to the transit center is incompatible with the surrounding low density residential properties; however, the HST station is compatible with the use of the Transit Center. There are also minority populations present around the station.
Escondido at SR-78/I-15 (I-15)	TheEscondido I-15 site is located in the City of Escondido southwest of the I-15/El Norte Parkway interchange. Access to the station is assumed to be from Hillery Drive, which has access to Westview Parkway and Black Mountain Road. The intercity ridership (boardings and alightings) would be similar to the Escondido Transit Center station option forecasts. This aerial station would most likely be less expensive than the Escondido Transit Center station. The station would cost $164 million. The station and corridor are considered moderately compatible with the surrounding land use. There are few other environmental concerns.

Station Name (Alignment)	Discussion
Mid-San Diego County	
Mira Mesa (I-15)	The Mira Mesa location would provide convenient access to the freeway and serve northern San Diego County. Mira Mesa could serve both options to San Diego (I-15/Qualcomm and San Diego Downtown via Carroll Canyon or Miramar Road). The forecasted ridership (boardings and alightings) would be between 0.9 and 1.4 million annual intercity passengers in 2020. This aerial station would cost $164 million. This stations could affect 50 ac (20 ha) of wetlands.
University City (Carroll Canyon and Miramar Road)	The University City site could be served by the Coaster commuter rail service. This 'at-grade' station would cost $33.4 million. The University City site would be located within a minority population and would have low potential impacts on biological resources, visual resources, public utilities, and cultural resources. There would be moderate potential impacts on geology due to seismic hazards and difficulty in excavations, hydrology and water quality due to the potential for erosion, and Section 4(f) and 6(f) lands at Mandell Weiss Eastgate Park.
San Diego	
Downtown San Diego Santa Fe Depot (Miramar Road and maybe I-15 to Qualcomm)	For service to San Diego, the downtown San Diego Santa Fe Depot site would have the highest connectivity. This station is located in the city center where many potential HST passengers could walk to destinations. The Santa Fe Depot is the terminus for the Coaster commuter rail service and the Amtrak Surfliner intercity service. It provides direct connections to San Diego LRT network and is a bus transit hub for San Diego. The intercity ridership forecasts concluded that the downtown San Diego Santa Fe terminus would have about 350,000 fewer passengers annually than the Qualcomm Stadium station option by 2020. The downtown station site would have considerably higher potential for serving long distance commuters than the Qualcomm site. The station would be an aerial structure with several stub-end tracks. It would be over the existing station tracks and would be difficult to construct while continuing operations of the other rail services below. The station is expected to cost $115 million. There would be medium to high potential property impacts for stations in the downtown areas. There would be high potential visual impacts on the downtown area. There are approximately 18 ac (7 ha) of estuarine wetlands that would be affected.
San Diego Airport (Miramar Road)	San Diego International Airport is a unique airport because it is located adjacent to downtown San Diego and is 2 mi (3 km) from the city center. The San Diego airport station location would provide a convenient connection to the airport and directly connect with the regional bus network and a San Diego LRT station. Although the location would not have as good connectivity to the city center as the Santa Fe Depot site, it would have a better connection to I-5 and is expected to have similar intercity ridership potential as the downtown San Diego Santa Fe station site. The station would be an aerial structure with several stub-end tracks. It would be next to the airport and, similar to the Ontario airport station, might require special construction considerations for the ongoing operation of the airport. This could increase the cost of the station, which is expected to be $115 million. There are few potential environmental impacts for this station area.

Station Name (Alignment)	Discussion
Qualcomm Stadium (I-15)	Qualcomm Stadium would provide a direct connection to the San Diego LRT network and good freeway access, but it would not have the same level of connectivity to the San Diego city center. The low-end ridership analysis estimates 350,000 more intercity passengers than the downtown option by 2020. The Qualcomm station would not provide direct service to downtown San Diego, but it would provide the shortest travel time to the greater San Diego area. The station location would be an 8-mi (13 km) drive or 10-mi (16 km) (20-min) ride on LRT to the city center. The forecasted ridership (boarding and alightings) would be between 5.4 and 11.4 million annual intercity passengers in 2020. The station would be an aerial structure with several stub-end tracks. The station is expected to cost $115 million. There would be medium potential property impacts, and the station would affect 1,430 linear ft (436 m) of non-wetland waters.

6.6 LOS ANGELES TO ORANGE COUNTY

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and Orange County, generally following the existing LOSSAN rail corridor.

6.6.1 Los Angeles to Los Angeles International Airport Alignment Options

All information presented is for the area from Los Angeles to LAX. This segment is shown in Figure 6.6-1.

	MTA Harbor Subdivision Alignment
Physical/Operational Characteristics	
Alignment Description	The LAUS to LAX alignment would follow an existing rail corridor for the majority of the distance from LAUS to LAX. Station options considered in this segment include LAX Station.
Length in miles (km)	15.4 mi (24.8 km)
Cost (dollars)	$1.93 billion
Travel Time (min)	13 min
Ridership	This alignment would provide a direct route to LAX.
Constructability	This alignment would require construction of at-grade and aerial structure segments. It would be on an aerial structure from LAUS to the MTA harbor subdivision, at grade to I-405, and then on aerial to the airport.
Operational Issues	Average speed: 69 mph (111 kph) Maximum speed: 93–124 mph (150–200 kph)
Potential Environmental Impacts	
Travel Conditions	If service to LAX is selected, frequencies to each station along the Los Angeles-Inland Empire-San Diego corridor could be less than if a single line south of Los Angeles were selected. If both LAX and the direct link to Orange County were selected in addition to the Los Angeles-Inland Empire-San Diego corridor, the potential frequency of service for each of these three corridors could be considerably reduced. However, if LAX is directly served by HST, the number of intermodal connections would be increased, the travel times and access costs to these markets would be decreased, and the competitiveness of the new mode for the southwest portions of Los Angeles County intercity transportation markets would be increased. If the airport is not directly served, local transportation (shuttle, regional transit, or the automobile) will be needed between LAUS and the airport, or to western Los Angeles County.
Noise/Vibration:[103] High, medium, and low potential impacts	High potential impacts. Dense urban area surrounding land uses. Speeds would be restricted under 100 mph (161 kph) for the majority of the alignment.

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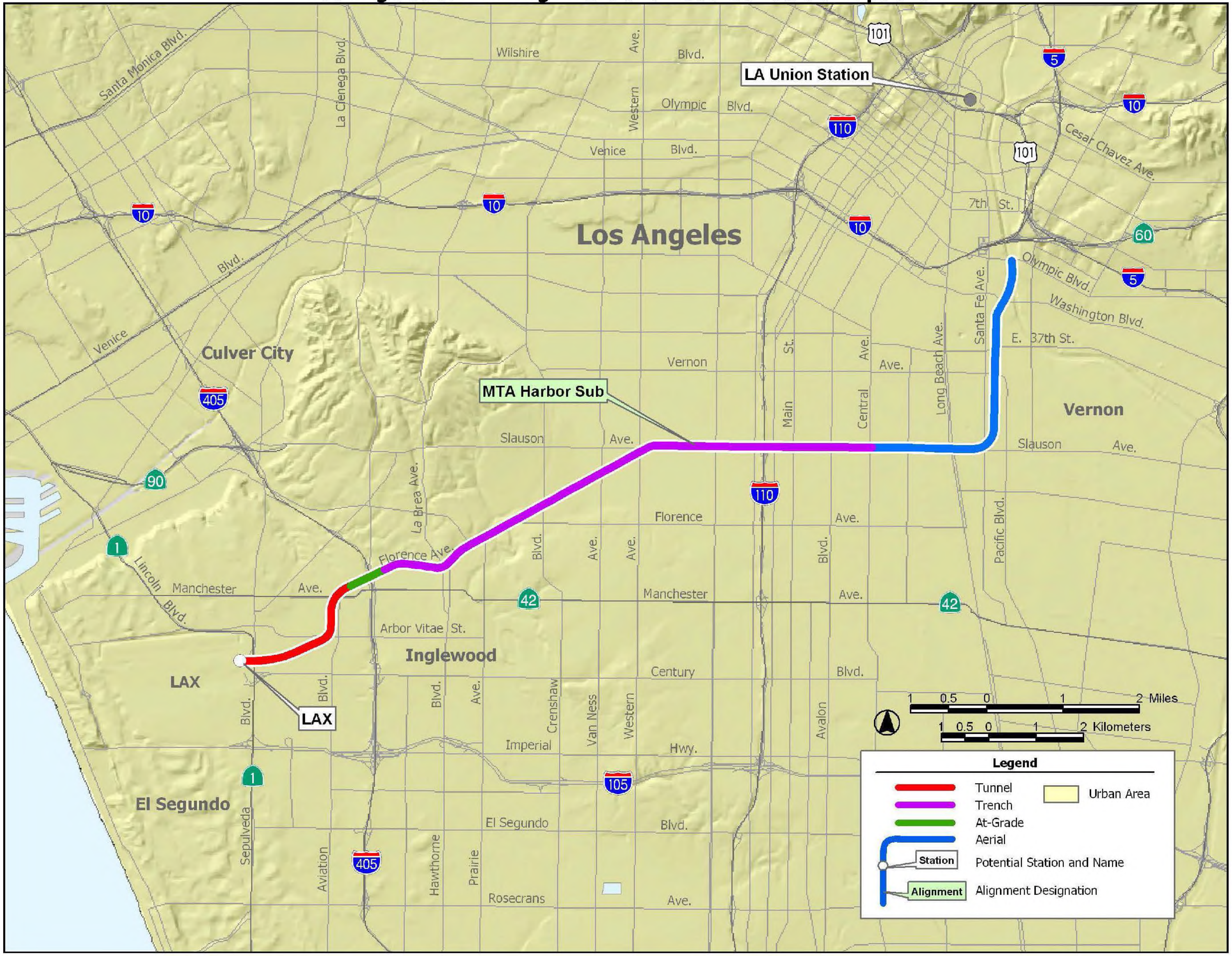
[103] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

Figure 6.6-1
Los Angeles to LAX Alignment and Potential Station Options



	MTA Harbor Subdivision Alignment
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatible. Environmental Justice: Low potential minority population impacts along alignment. Community: Low potential impacts. Property: Low potential impacts along alignment. Potential impacts at the LAX station location. Although there are minority populations in the corridor, the alignment is largely within an existing right-of-way, therefore reducing the potential impacts. The final location and type of station at LAX could influence the ultimate impact of the station on the surrounding community.
Aesthetics and Visual Resources: Potential high contrast/impact areas and possible shadow areas	Medium potential impacts. Elevated track would be visible in urban corridor and would create shadows.
Hydrology and Water Resources:[104] Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	Floodplains: 5 ac (2 ha) Streams: 1,300 linear ft (396 linear m) Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.
Biological Resources Including Wetlands:[105] Linear ft of non-wetland waters (waters) and number of special-status species (species)	Waters: 2,960 linear ft (902 linear m) Species: 8 Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.
Section 4(f) and 6(f) Resources:[106] Number of resources rated high (potential direct effects)	Resources rated high: 2 Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.

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[104] The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[105] The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

[106] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.6.2 Los Angeles Union Station to Orange County Alignment Options

All information presented is for the area from Los Angeles to Anaheim/Irvine. This segment is shown in Figure 6.6-2.

	HST Options		
	Union Pacific Santa Ana–HST (to Anaheim)	**LOSSAN Corridor–HST (to Anaheim)**	**LOSSAN Corridor–HST (to Irvine)**
Alignment Description	This alignment would provide dedicated[107] HST service using an existing UPRR right-of-way. Station options considered in this segment include Norwalk and Anaheim Transportation Center.	This shared-use[108] alignment would provide HST service along the existing LOSSAN corridor, terminating at Anaheim Transportation Center. The segment from Union Station to Fullerton would have a total of four tracks. Station options considered in this segment include Norwalk, Fullerton Transportation Center, and Anaheim Transportation Center.	This shared-use[109] alignment would provide HST service along the existing LOSSAN corridor, terminating at Irvine Transportation Center. The segment from Union Station to Fullerton would have a total of four tracks. Station options considered in this segment include Norwalk, Fullerton Transportation Center, Anaheim Transportation Center, Santa Ana Regional Transportation Center, and Irvine Transportation Center.
Length miles (km)	28.8 mi (46.3 km)	30.1 mi (48.4 km)	43.9 mi (70.7 km)
Cost (dollars)	$3.45 billion	$1.20 billion	$2.31 billion
Travel Time (min)	16 min	27 min	37 min
Ridership	Dedicated HST route provides fastest through-service with no capacity constraints from competing rail traffic.	Provides HST service to central Orange County but is frequency-constrained because of shared-use operations.	Extends HST services to south central Orange County but is frequency-constrained because of shared-use operations.
Constructability	Within existing rail right-of-way. Would require construction of at-grade, aerial structure, trenched and tunnel segments.	Within existing rail right-of-way. Would require additional right-of-way and construction of extensive grade separations while maintaining existing service.	Within existing rail right-of-way. Would require additional right-of-way and construction of extensive grade separations while maintaining existing service. Would require construction of trenched segments.

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[107] *Dedicated HST* means only HST will operate on the alignment.

[108] *Shared-use* means that HST and other passenger rail service will operate on the same alignment.

[109] *Shared-use* means that HST and other passenger rail service will operate on the same alignment.

Figure 6.6-2
Los Angeles to Anaheim/Irvine Alignment and Potential Station Options

	HST Options		
	Union Pacific Santa Ana–HST (to Anaheim)	**LOSSAN Corridor–HST (to Anaheim)**	**LOSSAN Corridor–HST (to Irvine)**
Operational Issues	No dispatching conflicts with conventional freight or passenger trains due to the dedicated right-of-way for HST operations. Few sharp curves to limit speeds. Could support up to 20 trains per hour in each direction, depending on terminal station configuration.	Shared-use alignment with delays and capacity constraints due to other rail traffic. Operational analysis suggests range of between 18 and 45 HST trains a day in each direction, depending on schedule and the effectiveness of a joint operating plan that would have to be developed in partnership with Amtrak and Metrolink. These estimated HST service levels assumed 16 Amtrak and 29 Metrolink trains daily in each direction. Improvements also benefit existing freight, passenger, and commuter services. The addition of a fourth track between Los Angeles and Fullerton would allow for the segregation of freight and passenger services, assuming additional modifications to track configurations approaching Fullerton and LAUS.	
Travel Conditions	This alignment is the most direct alternative and has fastest travel time. A new station in Norwalk would be located along the alignment. This alignment could also be extended to Irvine along the existing LOSSAN corridor. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.	This alignment would operate along the existing rail corridor, providing fast travel times and direct service. Infrastructure improvements would provide benefits to existing Amtrak and commuter rail services as well. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.	
Noise and Vibration:[110] High, medium, and low potential impacts	High potential impacts. Introduces new potential impacts in partially residential area on what is currently a sparsely used freight line.	Medium potential impacts. There would be an increase in noise levels due to increased frequency of trains consisting of HST, Amtrak, Metrolink, and BNSF trains at conventional speeds. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings. The grade crossing noise reduction (elimination of horn noise and gate noise from existing services) as a result of the grade separations would offset the increase in train frequencies	

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[110] Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	HST Options		
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor–HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)
Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice	Compatible. Environmental Justice: Minority populations are present at points along this alignment option. Community: Low potential impacts. Property: Low potential impacts.	Compatible. Environmental Justice: Minority populations are present at points along this alignment option. Community: Low potential impacts. Property: High potential impacts.	
Aesthetics and Visual Resources: Number of viewing points and potential high contrast/impact areas	Low potential impacts. No viewing points are located along this alignment. Potential impacts are medium to high contrast/ impact areas.	Low potential impacts. No viewing points are located along this alignment. Potential impacts are low to high contrast/impact areas.	
Hydrology and Water Resources: Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas, ac (ha) lakes/other water bodies within study areas.	Floodplains:[111] 15 ac (6 ha) Streams:[112] 1450 linear ft (442 linear m)	Floodplains: 75 ac (30 ha) Streams: 1050 linear ft (320 linear m)	Floodplains: 75 ac (30 ha) Streams: 1050 linear ft (320 linear m)

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[111] The Floodplains study area is defined as 100 ft (30 m) on each side of the alignment centerline.

[112] The streams, habitat and species study area is defined as a total of 50 feet (25 feet on each side of alignment centerline), per representative impact analysis.

	HST Options		
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor–HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)
Biological Resources, Including Wetlands Linear ft of non-wetland waters (waters), and ac (ha) of special-status species habitat within potential impact study areas	Habitat: 66 ac (27 ha) Species: 3 Trains would travel in existing right-of-way within an urban area.	Habitat: 65 ac (26 ha) Species: 2 Trains would travel in existing right-of-way within an urban area.	Habitat: 65 ac (26 ha) Species: 2 Trains would travel in existing right-of-way within an urban area.
Section 4(f) and 6(f) Resources:[113] Number of resources rated high (potential direct effects)	Resources rated high: 3 Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 2 Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 5 Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.

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[113] The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

6.6.3 Los Angeles to San Diego Station Options

Station Name (Alignment)	Discussion
	High-Speed Rail Stations
Los Angeles International Airport	
Los Angeles International Airport (MTA Subdivision)	The LAX station would be a below-grade station, adjacent to airport terminals, and would permit easy access by a potential people mover or shuttle, or by walking. It would have direct connections to regional bus transit services and would be the only HST station directly serving western Los Angeles County. This underground terminal station would cost $336 million. A station at LAX would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, Section 4(f) and 6(f) lands, and public utilities; and low to moderate potential impacts on hydrology and water quality (mostly groundwater). It would be located within a minority population.
Southern Los Angeles County (Gateway Cities)	
Norwalk (UPRR)	The selection of the alignment between Los Angeles and Orange County would determine the preferred station location that would serve the 17 cities that comprise the Gateway Cities of south Los Angeles County, which include the Cities of Vernon, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, and La Mirada. The Norwalk UPRR site would be an elevated station located near the Imperial Highway. There is no existing passenger rail connection (about 1 mi [2 km] east of the Green Line LRT terminus). It has existing bus connections and good freeway access. The station would cost $28.7 million. A station in Norwalk along the UPRR Santa Ana Branch Line would have low potential impacts on biological resources, paleontological resources, hydrology and water quality, public utilities, and Section 4(f) and 6(f) lands; low to moderate potential impacts on cultural resources; and moderate potential visual impacts since it would be an elevated station. It would be located within a minority population, in addition to requiring some non-residential displacements.
Norwalk (LOSSAN)	The selection of the alignment between Los Angeles and Orange County would determine the preferred station location that would serve the 17 cities that comprise the Gateway Cities of south Los Angeles County, which include the Cities of Vernon, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, and La Mirada. The Norwalk LOSSAN site would be at Norwalk Metrolink station with direct connectivity to the regional commuter rail service. It would be a bus transit hub for the area, and would be well served by I-5 and the Imperial Highway. An HST station would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains. Station improvements would cost $10.0 million.[114] An HST station in Norwalk at the existing Metrolink station would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, hydrology and water quality, public utilities, Section 4(f) and 6(f) lands at Zimmerman Park, and would be located within a minority population.

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[114] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
Central Orange County	
Anaheim Transportation Center (LOSSAN)	The Anaheim Transportation Center is an existing transit hub with high connectivity for central Orange County. The station is a bus transit hub and serves existing Amtrak and Metrolink Commuter Rail services. Depending on the alignment selected between Los Angeles and Anaheim, there are several design options for the orientation of the HST station at the transportation center. An HST station along the existing LOSSAN corridor would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains, and would cost $10.0 million.[115] For the dedicated UPRR Santa Ana Branch alignment option, a full HST terminal station would be required. The terminal station would be configured underground and would cost $336 million. The station in Anaheim would have low potential impacts on biological resources, visual resources, cultural and paleontological resource, public utilities, cultural resources, and Section 4(f) and 6(f) lands; and moderate potential impacts on hydrology and water quality, potentially affecting 15 ac (6 ha) of floodplain. The site is located within a minority population.
Southern Orange County	
Irvine Transportation Center (LOSSAN)	The master site plan for the Irvine Transportation Center indicates that this station area will develop into a transit-oriented environment serving as a station stop for improved Pacific Surfliner service, Metrolink Commuter service, and a potential southern terminus to the proposed HST network in Orange County. The Irvine Transportation Center is an existing transit hub for bus routes with high connectivity for South Orange County. An HST station would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains. In addition, certain amenities would be required, since this would be a potential terminus station. The station improvements would cost $10.0 million.[116] The station in Irvine would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, public utilities, hydrology and water quality (affecting 5 ac [2 ha] of floodplain), and Section 4(f) and 6(f) lands at the former El Toro Marine Corps Air Station. The site is located within a minority population.

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[115] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

[116] Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

6A PREFERRED HST ALIGNMENT AND STATION OPTIONS

6A.1 INTRODUCTION

In the Summary of the Draft Program EIR/EIS, the Authority and the FRA concluded that the High-Speed Train (HST) alternative is the preferred system alternative, but did not identify a preference among the HST alignment and station options presented. The Summary also stated (Next Steps in the Environmental Process) that as part of the Final Program EIR/EIS, the Authority may identify one or more potential HST alignment options as preferred for the proposed high-speed train (HST) system and may also identify preferred station locations within an identified preferred corridor for the proposed HST system. In order to facilitate the selection of preferred alignment and station locations for the HST alternative in this Final Program EIR/EIS, the Authority staff presented recommendations to the Authority in two parts. Part 1 was presented at the September 22, 2004 board meeting in Los Angeles, and Part 2 was presented at the November 10, 2004 board meeting. Based upon input from the Board and the public, staff made minor revisions to Part 1 and Part 2, which were incorporated and consolidated into one recommendation document.

On January 26, 2005 the Authority approved staff recommendations and directed that an additional study of an alignment option between Fresno and Bakersfield to serve a potential Visalia station, or variations thereof, located in an existing and/or planned urbanized area, is to be conducted prior to the commencement of project-level environmental documents for this segment and submitted to the Authority for any appropriate action.

The FRA has concurred in the preferred alignments and stations and has consulted with USEPA and USACE regarding their concurrence for compliance with the requirements of Section 404 of the Clean Water Act. Although no permit is being requested at this time under the Clean Water Act, FRA has committed to obtaining USEPA and USACE concurrence that the selection of the preferred corridor and route (alignment) is most likely to contain the "least environmentally damaging practicable alternative," consistent with the USACE's permit program (33 CFR Part 320 – 331) and USEPA's Section 404(b)(1) Guidelines (40 CFR 230 – 233). The FRA, FHWA, EPA, USACE, and FTA executed a memorandum of understanding (MOU) outlining roles and responsibilities for preparation of the Program EIR/EIS and the integration of Section 404 of the Clean Water Act (July 2003 Federal Agency MOU for the California HST Program EIR/EIS). The Authority and FRA intend to focus future project specific analysis on alignment and station options selected in this program environmental process. Site-specific location and design alternatives of the preferred alignment and station options including avoidance and minimization alternatives would be fully investigated and considered during project level environmental review.

The HST alignment and station locations preferences are based upon the data presented in this Final Program EIR/EIS and supporting technical reports, and the comments received on the Draft Program EIR/EIS (the comment period concluded on August 31, 2004). The Authority and FRA do not intend to further investigate in future project specific analysis alignment and station options that have not been identified as preferred.

Chapter 6 of this Final Program EIR/EIS summarizes and compares the physical and operational characteristics and potential environmental consequences associated with the HST alignment and station options where relative differences were identified including:

- Physical/operational characteristics:
    - Alignment
    - Length
    - Capital Cost

  - Travel Time
  - Ridership
  - Constructability
  - Operational Issues

- Potential environmental impacts:
  - Transportation related topics (air quality, noise and vibration, and energy)
  - Human environment (land use and community impacts, farmlands and agriculture, aesthetics and visual resources, socioeconomics, utilities and public services, hazardous materials and wastes)
  - Cultural resources (archaeological resources, historical properties) and paleontological resources
  - Natural environment (geology and seismic hazards, hydrology and water resources, and biological resources and wetlands).
  - Section 4(f) and 6(f) resources (certain types of publicly owned parklands, recreation areas, wildlife/waterfowl refuges, and historical sites).

In making decisions, the Authority was guided by the adopted objectives and criteria for selecting preferred alignments and station locations that were applied in the screening evaluation as documented in Section 2.6.9 of this Final Program EIR/EIS (see Table 2.6.5 below).

Table 2.6-5
High-Speed Rail Alignment and Station Evaluation Objectives and Criteria

Objective	Criteria
Maximize ridership/revenue potential	Travel time Length Population/employment catchment area
Maximize connectivity and accessibility	Intermodal connections
Minimize operating and capital costs	Length Operational issues Construction issues Capital cost Right-of-way issues/cost
Maximize compatibility with existing and planned development	Land use compatibility and conflicts Visual quality impacts
Minimize impacts on natural resources	Water resources impacts Floodplain impacts Wetland impacts Threatened and endangered species impacts
Minimize impacts on social and economic resources	Environmental justice impacts (demographics) Farmland impacts
Minimize impacts on cultural and parks/wildlife refuge resources	Cultural resources impacts Parks and recreation impacts Wildlife refuge impacts
Maximize avoidance of areas with geologic and soils constraints	Soils/slope constraints Seismic constraints
Maximize avoidance of areas with potential hazardous materials	Hazardous materials/waste constraints

Several factors were considered in identifying potential station stops, including speed, cost, local access times, potential connections with other modes of transportation, ridership potential, and the distribution of population and major destinations along the route. There is a critical tradeoff between the accessibility of the system to potential passengers, which is provided by multiple stations and stops, and the resulting HST travel times. Additional or more closely spaced stations (even with limited service) would lengthen travel times, reduce frequency of service, and the ability to operate both express and local services. The ultimate location and the configuration of stations cannot be determined at this time; this would occur during subsequent project-level environmental processes. Preferences for station options allow the Authority to pursue proposed station development at or near those locations in future studies. It is possible that some of the preferred stations described in this Final Program EIR/EIS will not be built.

The preferred station sites are all multi-modal transportation hubs that would provide links with local and regional transit, airports and highways. It is assumed that parking at the stations would be provided at market rates (no free parking). Each station site would have the potential to promote higher density, mixed-use, pedestrian oriented development around the station. Should the HST system proceed to more detailed study, local government would be expected to provide (through planning and zoning) for transit-oriented development around HST station locations, and to finance (e.g., through value capture or other financing techniques) and to maintain the public spaces needed to support the pedestrian traffic generated by hub stations if they are to have a HST station. For more details, please refer to Chapter 6B, "HST Station Area Development".

All the headings below indicate the preferred alignments and station locations for the HST Alternative. References to existing rail right-of-way as preferred alignments mean the proposed HST system would be located generally within or adjacent to the existing rail right-of-way, unless otherwise specified (e.g., shared use). "Constructability" issues refer to substantial engineering and construction complexity as well as excessive initial and/or recurring costs that present logistical constraints. "Connectivity" relates to how well a station site links with other modes of transportation (transit systems, aviation, and/or highways) and "accessibility" relates to how well the station site is located for serving the surrounding population. "Compatibility" relates to how well a station site fits within current or planned local land uses as defined in local plans.

The USEPA and USACE have participated in the development of both the Draft and Final Program EIR/EIS and in accordance with the memorandum of understanding among Federal agencies for this environmental review, were consulted concerning the selection of the preferred corridor and route most likely to yield the least environmentally damaging practicable alternative (LEDPA) and as identified as preferred in the Final Program EIR/EIS. The USEPA and USACE have concurred that the preferred HST alignment and station options are most likely to contain the LEDPA. The High-Speed Train Alternative represents the proposed action, was identified as the preferred system alternative in the Draft Program EIR/EIS, and is identified as the environmentally preferable under NEPA as well as the environmentally superior alternative under CEQA.

6A.2 BAY AREA - MERCED

The region from the Bay Area to Merced was divided into three segments: 1) San Francisco to San Jose; 2) Oakland to San Jose; and 3) San Jose to Merced.

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Bay Area and the Central Valley containing a number of feasible route options within which further study will permit the identification of a single preferred alignment option. This corridor is generally bounded by (and includes) the Pacheco Pass (SR-152) to the south, the Altamont Pass (I-580) to the north, the BNSF Corridor to the east, and the Caltrain Corridor to the west, but the Authority would not pursue alignment options through Henry Coe State Park and station options at Los Banos.[1] The future studies would focus on the identification of a preferred alignment between the Central Valley and the San Francisco Bay area.

Future studies would consider: (1) how and where the HST alignment from the Bay Area would connect with the HST alignment in the Central Valley; (2) how and where the HST alignment would enter the Bay Area and would connect to Bay Area termini; (3) the location of stations within these segments.

The following preferences for the San Francisco to San Jose and Oakland to San Jose segments are based upon current information. These recommendations are subject to change based upon the information provided in future studies.

6A.2.1 San Francisco to San Jose

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Central Valley and the Bay Area containing a number of feasible route options within which further study will permit the identification of a single preferred alignment option. Future studies would consider how much of the Caltrain alignment between San Francisco and San Jose would be included as part of the HST system.[2]

Preferred Alignment:

- Caltrain Corridor (Shared Use)

Analysis:

This Program EIR/EIS analyzes one alignment option between San Francisco and San Jose along the San Francisco Peninsula that would utilize the Caltrain rail right-of-way, and share tracks with express Caltrain commuter rail services (see Figure 6.2-1). The Caltrain Corridor (Shared Use) is the preferred alignment option for direct service to San Francisco and San Francisco International Airport (SFO).

The alignment between San Francisco and San Jose is assumed to have 4-tracks, with the two middle tracks being shared by Caltrain and HST. HST trains could operate at maximum speeds of 100-125 mph along the Peninsula providing 30-minute express travel times between San Francisco and San Jose. Environmental impacts would be minimized since this alignment utilizes the existing Caltrain right-of-way (see summary table Section 6.2.1A). This alignment would increase connectivity and accessibility to San Francisco, the Peninsula, and SFO, the hub international airport for northern California. The HST system would provide a safer, more reliable, energy efficient intercity mode along the San Francisco Peninsula

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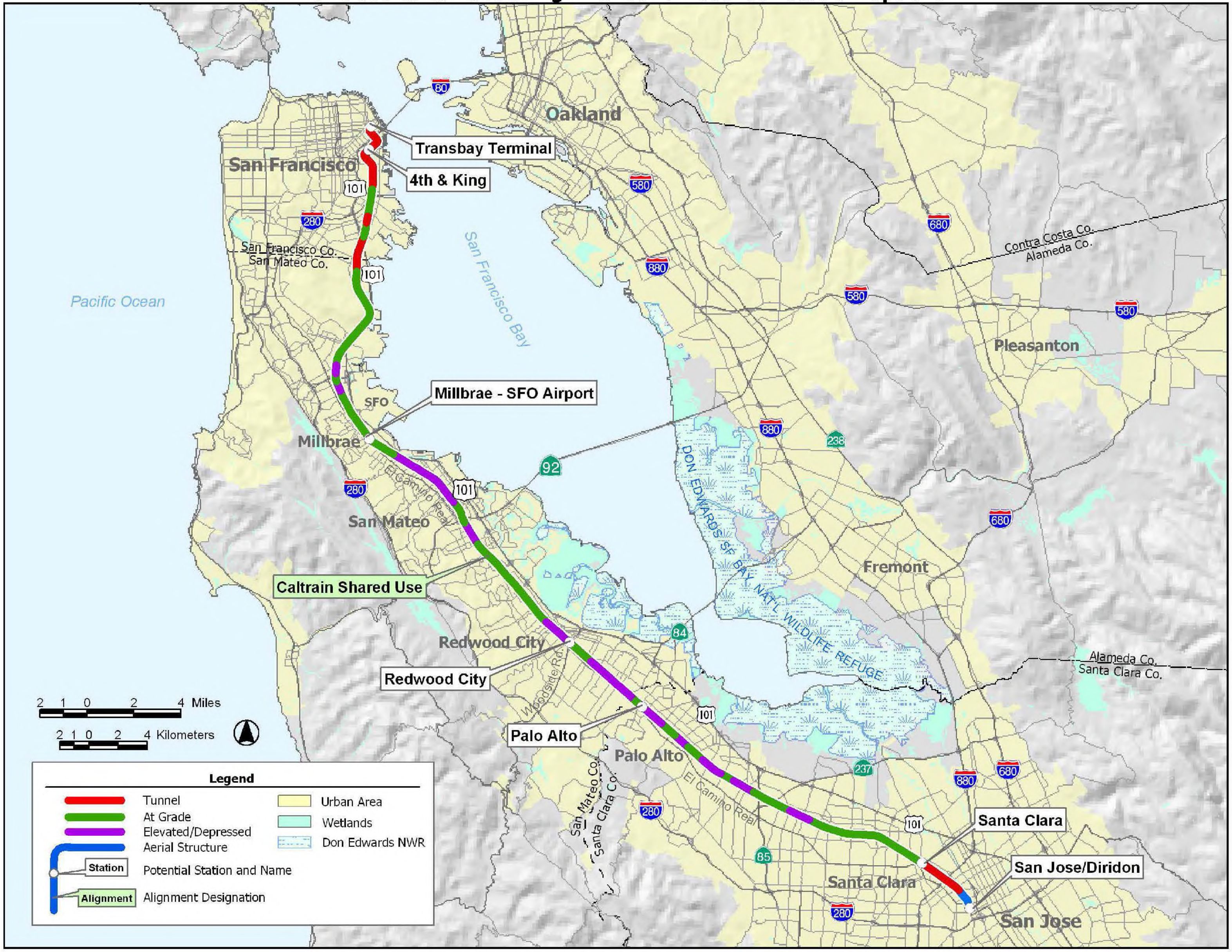
[1] Highway route numbers are provided only as a convenient reference for the reader, not as a limitation on the corridor to be considered.

[2] In the Authority's previous investigations a potential Altamont Pass alignment option included a new Bay crossing near the Dumbarton Bridge. With this previous concept involving the Altamont Pass the proposed HST service would use only that portion of the Caltrain alignment between Redwood City and San Francisco on the San Francisco Peninsula.

Figure 6.2-1
San Francisco to San Jose Alignment and Potential Station Options



while improving the safety, reliability, and performance of the regional commuter service because of the fully grade separated tracks with fencing to prevent intrusion, additional tracks, and a state-of-the-art signaling and communications system. The HST alignment would greatly increase the capacity for intercity and commuter travel and reduce automobile traffic.

Many comments in favor of the proposed HST on the San Francisco Peninsula were received from agencies and the public, including MTC, the City of San Francisco, Caltrain JPB, Samtrans, BART, the Transbay Terminal JPB, the City of Los Altos Hills, the City of Milpitas, the City of Santa Clara, the County of Santa Clara, the City of Morgan Hill and the San Francisco Chamber of Commerce. There was also opposition to improvements on the Caltrain corridor raised by some members of the pubic. The City of Menlo Park supported investigating options to avoid the SF Peninsula area by integrating HST with existing systems, and the Town of Atherton supports options that would avoid HST service through the Town of Atherton as well as investigating trench concepts through the Town of Atherton at the project-specific level.

Preferred Station Locations:

- Downtown San Francisco Terminus: Transbay Terminal

Analysis:

The Transbay Terminal site is the preferred station option for the San Francisco Terminal. The Transbay Terminal would offer greater connectivity to San Francisco and the Bay Area than the 4th and King site (about a mile from the financial district) because of its location in the heart of downtown San Francisco and since it would serve as the regional transit hub for San Francisco. The Transbay Terminal is located in the financial district where many potential HST passengers could walk to the station. The Transbay Terminal is also expected to emerge as the transit hub for all major services to downtown San Francisco, with the advantage of direct connections to BART (1 block from the terminus), Muni, and regional bus transit (Samtrans, AC Transit, and Golden Gate District). Moreover, the Transbay Terminal is compatible with existing and planned development and is the focal point of the Transbay redevelopment plan that includes extensive high density residential, office, and commercial/retail development.

The rail component of the Transbay Terminal is estimated to cost about $500 million more than the 4th and King option, however because the rail component would be shared with Caltrain services, the Transbay Joint Powers Authority funding plan assigns only a portion of the rail related Transbay Terminal costs to the HST system. The rail facilities planned for the Transbay Terminal are for 6 tracks and 3 platforms. The Authority's operational analysis indicated that to serve all of the HST trains proposed in the Authority's Business Plan, four tracks and two island platforms would have to be dedicated to HST service. Subsequent cooperative operations planning analysis of the Transbay terminal rail capacity available for HST and Caltrain commuter service would be needed to determine the most efficient mix and scheduling of services.

Public and agency comments have largely favored the Transbay Terminal site. The City of San Francisco, the Transbay Terminal JPB, Samtrans, the Caltrain JPB, the San Francisco Chamber of Commerce, and AC Transit all submitted comments in favor of the Transbay Terminal site.

- San Francisco Peninsula Airport Connector Station: Millbrae (SFO)

Analysis:

Two airport connector station options were considered for the San Francisco peninsula in the Draft Program EIR/EIS, Milbrae for San Francisco International Airport (SFO) and Santa Clara for San Jose International Airport. SFO serves as the "hub" airport for international travel in Northern California and is located about 12 miles south of downtown San Francisco. The conceptual design is to link to SFO at the Millbrae Caltrain/BART station location which is adjacent to SFO (but not directly at the airport). This multi-modal station would link to the airport by the existing BART connection and could possibly be reached in the future by the airport people mover system. The Millbrae (SFO) HST station supports the objectives of the HST project by providing an interface with the northern California hub airport for national and international flights. The Millbrae (SFO) is the preferred HST airport connector station on the San Francisco peninsula.

A potential link to San Jose International Airport would be at Santa Clara less than 3 miles north of the potential downtown San Jose station. Because the downtown San Jose (Diridon) station site would provide sufficient connectivity to San Jose airport for the foreseeable future the Authority has determined that the preferred HST alternative have no HST station at Santa Clara.

- Mid-Peninsula Station: continue study of potential sites at Palo Alto and Redwood City

Analysis:

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Central Valley and the Bay Area within which further study will permit the identification of a preferred alignment option. Future studies would consider how much of the Caltrain alignment between San Francisco and San Jose would be included as part of the HST system and whether a Mid-Peninsula station site should be recommended.[3]

6A.2.2 Oakland to San Jose

The provision of HST service to Oakland would increase connectivity and accessibility to the East Bay, including Oakland International Airport. The HST system would provide a safer, more reliable, energy efficient intercity mode directly to the East Bay while improving the safety, reliability and performance of the existing Capitol intercity service through grade separation improvements between Oakland and Union City. The HST alignment would greatly increase the capacity for intercity travel in the East Bay and reduce highway congestion. Direct service to Oakland and the East Bay is supported by MTC, the City of Oakland, BART, and the Alameda County Congestion Management Agency.

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Central Valley and the Bay Area containing a number of feasible route options within which further study will permit the identification of a single preferred alignment option. These recommendations for the Oakland to San Jose alignment and stations are based upon current information and are subject to change based upon the information provided in other future studies.

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[3] In the Authority's previous investigations a potential Altamont Pass alignment option included a new Bay crossing near the Dumbarton Bridge. With this previous concept involving the Altamont Pass the proposed HST service would use only that portion of the Caltrain alignment between Redwood City and San Francisco on the San Francisco Peninsula.

Preferred Alignment:

- Hayward Line to I-880

Analysis:

Two alignment options were considered between San Jose and Oakland, the Hayward Line/I-880 and the Hayward Branch/Niles/Mulford Line. Both options would use the Hayward Line freight railroad right-of-way (also used by the "Capitol" intercity Amtrak service) between Oakland and Union City. At Union City, the Hayward Line/I-880 option would diverge to the median of Interstate 880 (on an aerial structure) to bring the alignment to San Jose and a tunnel under a small lake in Fremont Central Park. This option is estimated to cost about $140 million more than the Hayward Line/Niles/Mulford option (about 4% of the cost between Oakland and San Jose) but would have higher ridership potential and considerably less potential environmental impact. The Hayward Line/I-880 is the preferred alignment option between Oakland and San Jose (see Figure 6.2-2).

The Hayward Line/Niles/Mulford option would require tight curves that would greatly limit operational speeds between Union City and Newark – with express travel times at least 6 minutes longer than the Hayward Line/I-880 option. This alignment also goes through the Don Edwards National Wildlife Refuge, which would result in considerably higher potential for environmental impacts (hydrology and water resources, biology and wetlands, visual impacts, and Section 4(f) and 6(f) parkland impacts) than the Hayward Line/I-880 alignment option (see summary table Section 6.2.1B).

MTC and the City of Newark support the Hayward Line/I-880 alignment option. Caltrans District 4 commented that there would be significant construction stage impacts if the alignment encroaches onto the I-880 median between Fremont and San Jose, and there is a need for a detailed analysis of potential construction impacts during project level environmental review.

Preferred Station Locations:

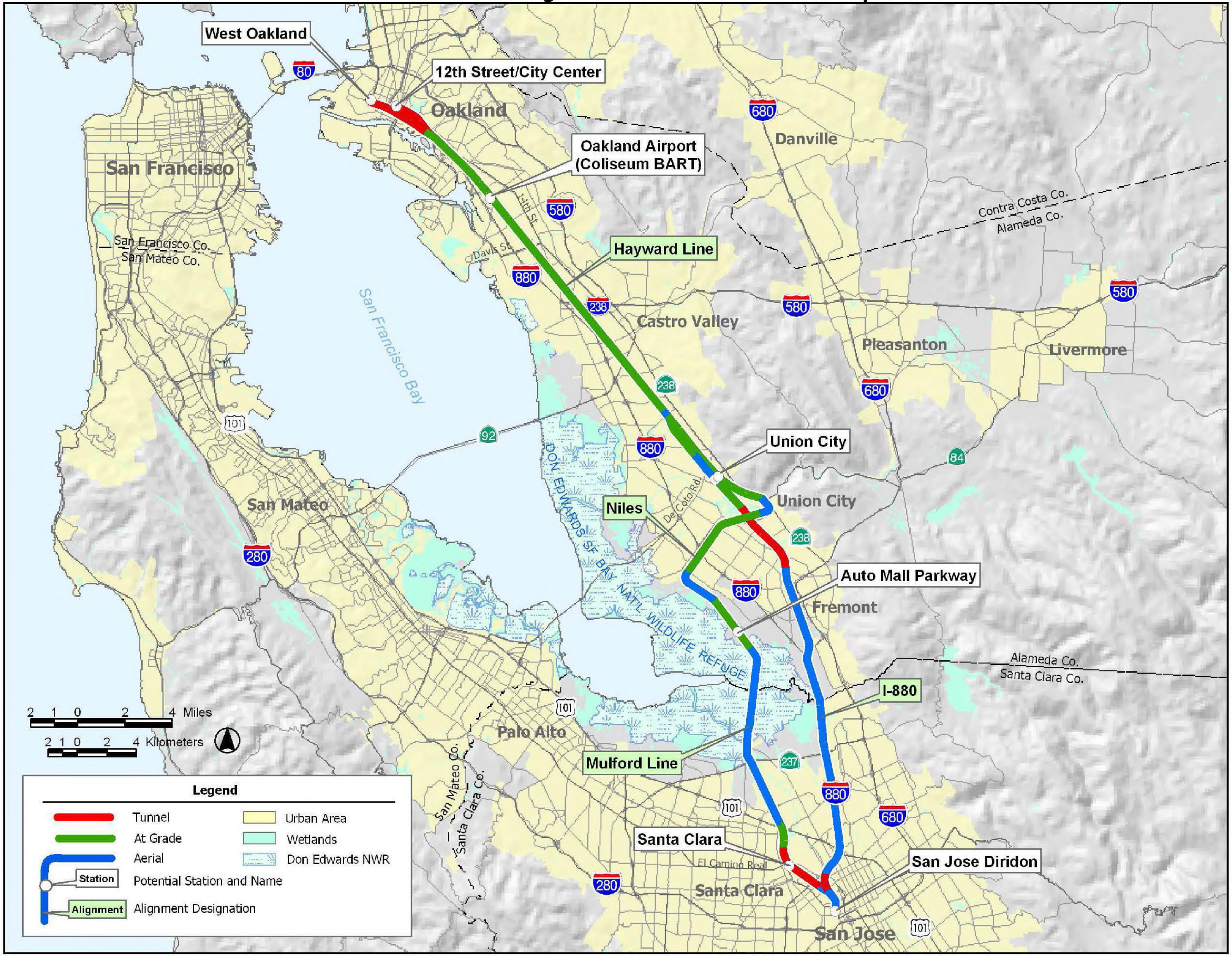
- Downtown Oakland Terminus: continue investigation of both West Oakland and 12th Street/City Center sites

Analysis:

The West Oakland station option and the 12th Street/City Center station options would both provide good connectivity with BART and would have similar potential for environmental issues. Although the 12th Street/City Center option is in the heart of downtown Oakland, it would have more construction and right-of-way issues. The MTC favors the West Oakland option, but supports continuing to investigate both station sites, while the City of Oakland believes both should be further investigated. Both the West Oakland and the 12th Street/City Center sites are preferred for future study as potential locations for a terminus station in Oakland because there is not enough information to differentiate between these two remaining station options.

- Oakland Airport Connector Station: Coliseum BART Station

Figure 6.2-2
Oakland to San Jose Alignment and Potential Station Options



Analysis:

A multi-modal station (BART/Capitols/HST) at the Coliseum BART station, which is located about two miles from the Oakland Airport passenger facilities, could connect the proposed HST system to Oakland Airport. This potential station would be about 7-miles south of downtown Oakland. The Coliseum BART HST station is preferred in support of the HST project objective to connect to major airports.

- Southern Alameda County Station: Union City

Analysis:

The Union City station location is the preferred HST station to serve Southern Alameda County. The multi-modal Union City station site offers a high level of connectivity with connections to BART, the Capitol Corridor, and AC Transit and could connect to the Altamont Commuter Express service. It would have low potential for environmental impacts, whereas the Auto Mall Parkway site is adjacent to the Don Edwards Wildlife Refuge. The Union City station site is supported by the City of Union City. Comments received by Bay Area Rapid Transit (BART) recommend a potential HST station be considered at Warm Springs (while accurately considering the planned BART Warm Springs Extension). The Authority would coordinate future studies of this potential station with planned BART improvements at Warm Springs.

- Downtown San Jose Terminus: Diridon Station

Analysis:

Diridon Station is the preferred HST station for downtown San Jose and the Southern Bay Area, serving Caltrain, ACE Commuter Rail, the Capitol Corridor, Amtrak long distance services, VTA buses and light rail, and a possible future link to BART (from Fremont). Diridon station is a multi-modal hub that maximizes connectivity to downtown San Jose and the southern Bay Area, and would have high ridership potential. The Authority identifies the Diridon Station as the preferred HST station option for San Jose and the southern Bay Area. Diridon Station is favored by the City of San Jose and the Valley Transportation Authority (VTA).

6A.2.3 San Jose to Merced: Northern Mountain Crossing

Preferred Alignment (Corridor): A broad corridor is preferred containing a number of feasible route options. This broad corridor is generally bounded by (and includes) the Pacheco Pass (SR-152) Corridor to the south, the Altamont Pass (I-580) Corridor to the north, the BNSF Corridor to the east, and the Caltrain Corridor to the west. The Authority would not pursue alignment options through Henry Coe State Park, and station options at Los Banos in future studies.

Analysis:

The Authority and the FRA, have determined that the available information supports identifying a broad corridor containing multiple route options and providing for further study. The San Jose to Merced segment involves the crossing of the Diablo Range Mountains that separate the Central Valley from the San Francisco Bay Area. This is one of the most difficult geographic features encountered by the proposed HST system and is an area of controversy. Future studies, including a next-tier EIR/EIS, will be needed in order to identify a single preferred alignment option between the Central Valley and the San Francisco Bay Area. The FRA consulted with CEQ, and CEQ concurred that the proposed approach would be consistent with NEPA and would provide for compliance with Section 404 of the Clean Water Act.

Many comments have been received urging further evaluation of the Altamont Pass as a potential alignment option. Federal agency comments and others have noted the limitations of available environmental resource information regarding the Diablo Range mountain crossing. In addition, comments have been received indicating that other undeveloped areas in the northern mountain crossing outside the current boundaries of Henry Coe State Park contain sensitive environmental resources. The Authority identifies a broad corridor between the Bay Area to Merced as preferred, that would be bounded generally by (and include) the Pacheco Pass Corridor (SR-152) to the south, the Altamont Pass Corridor (I-580) to the north, the BNSF Corridor to the east, and the Caltrain Corridor to the west[4] (see Figure 6.2-3a).[5]

Many comments have also been received opposing potential HST alignments through (or under) Henry Coe State Park (which includes the Orestimba State Wilderness Preserve). The Authority has determined that alignment options through Henry Coe State Park should <u>not</u> be pursued in any subsequent environmental analysis.

HST alignments through Henry Coe State Park would have greater potential environmental impacts than alignment options through the Diablo Range that would avoid the park to the north (see summary table Section 6.2.1C). Alignments through Henry Coe State Park would have the highest impacts to Section 4(f) and 6(f) Resources (both long-term and construction impacts). In addition, the considerable amount of public and agency input in regards to these alignment options has been overwhelmingly opposed to any construction through Henry Coe State Park.

The Authority also has determined that the Pacheco Pass alignment HST station at Los Banos (Western Merced County) should <u>not</u> be pursued in subsequent environmental reviews because of low intercity ridership projections for this site, limited connectivity and accessibility, and potential impacts to water resources and threatened and endangered species. Although the City of Los Banos supports the Pacheco Pass alignment with a potential station at Los Banos, considerable public and agency opposition has been expressed about a potential Los Banos HST station because of its perceived potential to result in growth related impacts. This station option (as well as the Visalia/Hanford option) has low ridership potential compared to other potential station locations investigated by the Authority. In 2020, this station is forecast to serve a population of only about 88,000 (forecast to only have between 155,000 and 190,000 annual total intercity boardings and alightings by 2020). Excluding this station is expected to slightly reduce the capital costs of the HST system and reduce potential environmental impacts at Los Banos.

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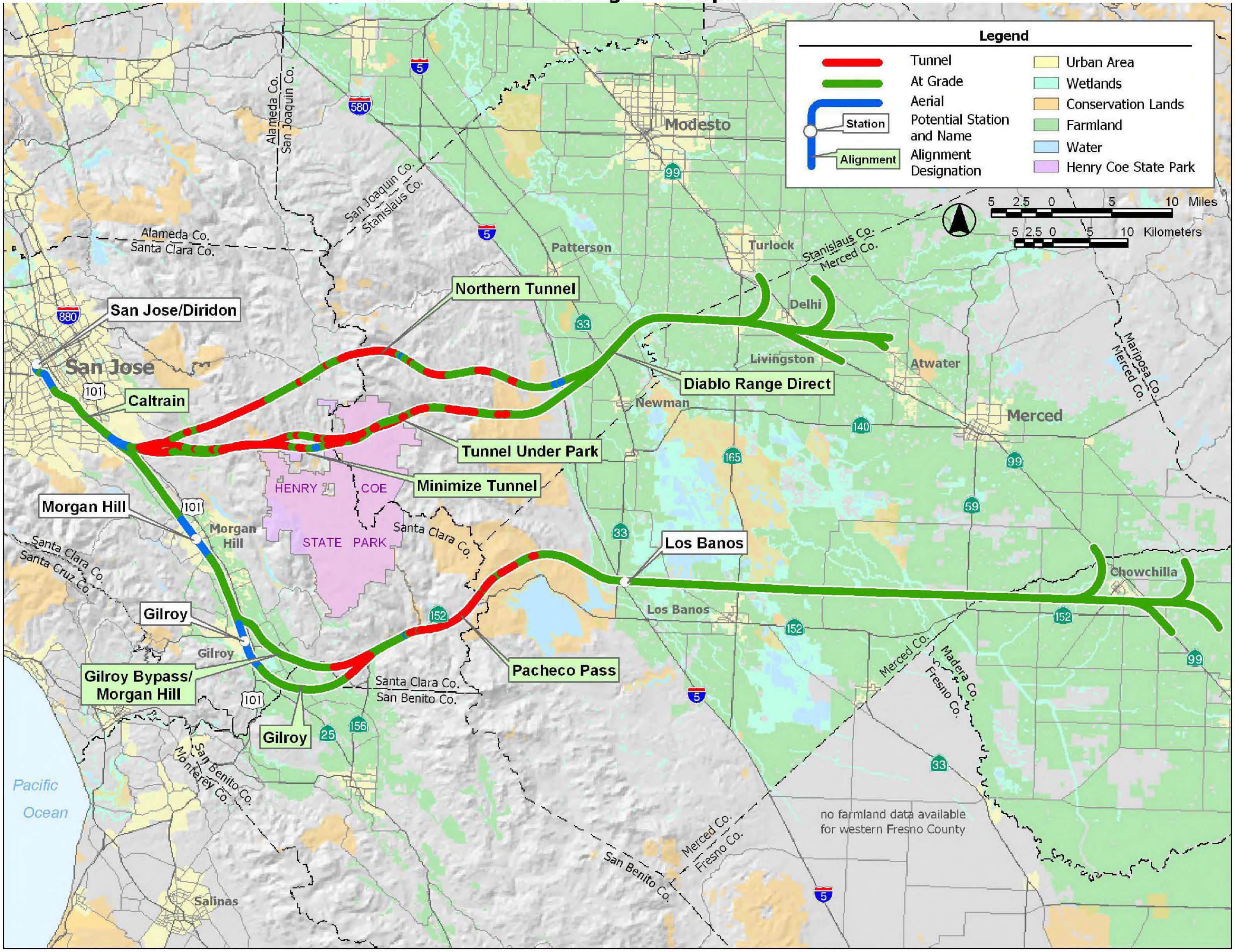
[4] The highways (SR 152 and I-580) are provided only as a point of reference for the convenience of the reader; the precise highway alignments are not limitations on the area to be considered in future studies.

[5] The Altamont Pass alignment option was recommended to be eliminated from further investigation in the Authority's and FRA's Draft Program EIR/EIS (see Section 2.6.8). However, as a result of agency and public comments received on the Draft Program EIR/EIS, it was determined that the Altamont Pass should be included as part of the broad corridor identified as the preferred HST option for the Northern Mountain Crossing.

Figure 6.2-3
San Jose to Merced Alignment Options



6A.3 SACRAMENTO - BAKERSFIELD

The region from Sacramento to Bakersfield was divided into four segments for analysis: 1) Sacramento to Stockton; 2) Stockton to Merced; 3) Merced to Fresno; and 4) Fresno to Bakersfield.

The alignments considered in the Sacramento – Bakersfield corridor generally followed the two existing freight corridors of the UP and the BNSF. With that in mind, HST impacts throughout the Central Valley that have already been reduced and avoided could be further avoided and minimized by sharing the existing freight railroad right-of-way. If a decision were made to proceed with the HST system, the Authority would seek agreements with freight operators to utilize portions of the existing rail right-of-way to the greatest feasible extent.

In the Sacramento to Stockton segment, the use of the UP freight corridor would be more consistent with HST service needs and would have less of an effect on the present environmental setting than the use of the CCT corridor, which is currently out of service. In studying the two freight corridors between Stockton and Bakersfield both offer similar travel times and provide access to the Central Valley population centers, however it has become apparent that the BNSF alignment is more compatible with HST service and operations. Throughout the corridor the UP alignment passes through more urban areas and would require more aerial structures, thereby increasing adverse impacts to communities and construction costs. Both the UP and BNSF have freight activity; however, the UP serves more local industries adjacent to the corridor that the HST alignment would have to avoid. This would typically be accomplished by using aerial structures to fly over the local freight tracks, which would add cost and cause additional adverse community impacts. The BNSF alignment traverses a more rural setting, would require fewer aerial structures and would cause fewer impacts to Central Valley communities.

A great advantage of the BNSF alignment is that much of the HST system could be constructed at-grade such that the freight track would be grade separated along with the adjacent HST tracks. This would benefit freight services and communities by reducing noise (due to the elimination of horn noise and gate noise from existing services), providing improved safety, freeing automobile traffic and improving air quality through reduced congestion.

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Bay Area and the Central Valley containing a number of feasible route options within which further study will permit the identification of a single preferred alignment option. This corridor is bounded generally by (and includes) the Pacheco Pass (SR-152) to the south, the Altamont Pass (I-580) to the north, the BNSF Corridor to the east, and the Caltrain Corridor to the west, but would not include alignment options through Henry Coe State Park and station options at Los Banos.[6] Future studies would focus on the identification of a preferred alignment between the Central Valley and the San Francisco Bay area.

Future studies would include consideration of: (1) how and where the HST alignment from the Bay Area would connect with the HST alignment in the Central Valley; (2) how and where the HST alignment would enter the Bay area and would connect to Bay Area termini; (3) the location of stations within these segments.

The preferences herein for portions of the Sacramento to Bakersfield alignment and stations, which are also in the broad corridor identified for further study between the Central Valley and the Bay Area (see above) are based upon current information. These preferences are subject to change based upon the information provided in other future studies.

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[6] Highway route numbers are provided only as a convenient reference for the reader, not as a limitation on the corridor to be considered.

6A.3.1 Sacramento to Stockton

Preferred Alignment:

- The UPRR alignment option is the CHSRA and FRA preferred option between Sacramento and Stockton. However, due to CWA Federal regulations, because the UPRR alignment option has more potential impacts to waters and biological resources, the CCT alignment option is included in the HST alternative to be further evaluated in project level environmental review.

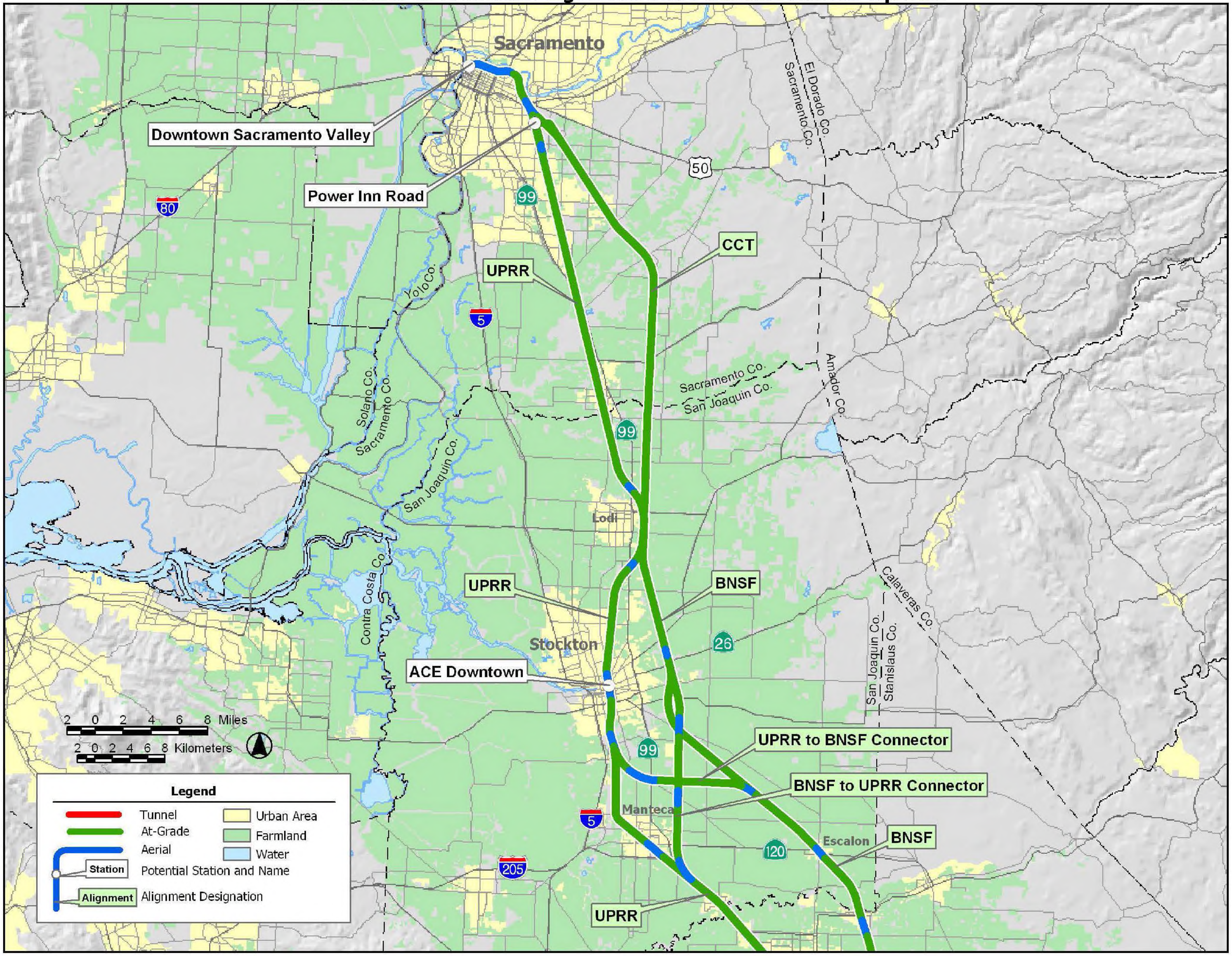
Analysis:

The UPRR alignment begins at the Sacramento Rail Depot in downtown Sacramento. North of Lodi, the alignment diverges from UPRR to CCT to bypass Lodi and reconnects to the UPRR to serve the proposed downtown Stockton station site. This alignment option includes a new alignment bypass of Stockton for express services (see Figure 6.3-1). In comparison to the out of service CCT alignment, using the existing freight corridor through most of this segment would minimize and avoid environmental impacts. The UPRR is a more direct route with slightly shorter travel times (1 minute less) and lower construction costs (an estimated $150 million less) than the CCT alignment option.

At a program level of detail, the technical analysis of these options showed slightly higher potential impacts to biological and water resources for the UPRR alignment as compared to the CCT alignment. The technical analysis of these options showed generally higher potential impacts to biological and water resources for the UPRR alignment as compared to the CCT alignment. The UPRR option was determined to have 4.3 acres more potential impacts to wetlands, 25 acres more potential impacts to habitat, 20 more potential sensitive species, 800 linear feet more potential impacts to streams, and 0.56 acres more potential impacts to lakes than the UPRR alignment, but would have 34-88 acres less potential impacts to flood plains (see summary table Section 6.3.1A), Most of the stream crossings under the UP alignment are due to canal crossings, not river crossings, which are generally smaller and could be realigned if necessary. In addition, introduction of the HST service on the abandoned CCT right-of-way could result in greater interference of wildlife movement in comparison with the UPRR alignment, which is a heavily used freight corridor.

Although the program-level analysis utilizing the sightings reported in the California Natural Diversity Database (NDDB) indicates that the UPRR alignment has the potential to affect 25 acres more of wildlife habitat and 20 more sensitive species, this information was not confirmed by biological surveys. Recent field observations indicate more vegetation and higher habitat values along the out of service CCT alignment for habitat associated with both the aquatic ecosystem and upland resources than those observed along the UPRR alignment [Derek Jansen, Wildlife Biologist, Jones & Stokes; field observations June 21, 2005]. It was observed that the out of service CCT alignment currently has greater breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species associated with the aquatic ecosystem, as well as upland habitats. It is expected that introduction of the HST service on the CCT right-of-way would result in greater adverse environmental consequences related to interference of wildlife movement and would have more severe impacts to riparian vegetation and habitat values, in comparison with the UPRR alignment, which is a heavily used freight corridor. Adverse effects to non-biological resources within the human environment would also be greater with the CCT alignment. The out of service CCT corridor currently has much less ambient noise and light. The right-of-way for the CCT alignment has undergone a re-growth of vegetation. With the introduction of HST service within the CCT alignment, noise, light and glare, and aesthetic impacts would be substantially more severe than adding HST service to the highly utilized UPRR alignment. The UPRR is a heavily used freight rail corridor and the grade separation improvements along this alignment would result in potential reductions in noise levels from existing conditions due to the elimination of horn noise and gate noise from existing services. Community use effects would occur with adding HST service to

Figure 6.3-1
Sacramento to Stockton Alignment and Potential Station Options



the out of service CCT alignment but would not occur with use of the UPRR alignment. Informal recreation uses related to hiking and wildlife viewing currently occur on the out of service CCT alignment. The local community long-term plans to develop the CCT right-of-way as a recreation corridor for trails for hiking and biking. Using the CCT alignment for HST service would preclude the current and planned recreation uses. In addition, the CCT has more adjacent land designated for residential and agricultural use than the UPRR alignment. As a result, the CCT would have more potential noise, community, and property impacts than the UPRR. While the Sacramento region is supportive of a statewide HST system serving Sacramento, there is substantial community opposition to placing the HST on the CCT alignment. Both the Sacramento Area Council of Governments (SACOG) and the City of Elk Grove (which is bisected by both alignments) support HST on the UPRR and oppose the use of the CCT alignment as a result of potential community impacts. Although SACOG supports the UPRR alignment through Elk Grove, they have expressed concern regarding the UPRR alignment bisecting the City of Galt, which is the southernmost community in Sacramento County.

The California Department of Parks and Recreation has expressed concern over both the UPRR and CCT alignments, stating both options potentially impact the Stone Lakes National Wildlife Refuge in Southern Sacramento County. Parks and Recreation prefers the CCT alignment, citing of the two alignment options the CCT alignment could have potentially fewer impacts on the wildlife and recreation areas of Stone Lakes Refuge. A comprehensive study to avoid and/or minimize the potential impacts to these sensitive areas would be completed as part of project level environmental review.

Preferred Station Locations:

- Sacramento: Downtown Sacramento

Analysis:

The Downtown Sacramento station is the preferred HST station option to serve the Sacramento metropolitan area (see Figure 6.3-5A). This station option would maximize opportunities for intermodal connectivity and is located in downtown Sacramento within walking distance of the State Capitol. This multimodal hub station location serves the existing Amtrak services to Sacramento, including the Capitol Corridor, and the Sacramento LRT, which is being extended to directly link with this station site. The HST platforms could be constructed on an aerial structure above the platforms for the existing rail services. The Downtown Sacramento station option is preferred by the City of Sacramento, and SACOG.

- Stockton: Stockton Downtown ACE

Analysis:

The Stockton Downtown ACE station option is the preferred HST station option to serve the Stockton area, and San Joaquin County (see Figure 6.3-5B). The Stockton Downtown ACE option would maximize connectivity with good freeway access and bus transit service, and would share the site with ACE commuter rail and present Amtrak services. Comments received by the Department of Transportation (Caltrans) recommend a potential HST station be considered for the BNSF rail alignment to the east of Stockton. In discussions with Caltrans they have indicated they are working on relocating the Stockton Amtrak station to a location along the BNSF alignment to the east of Stockton. A potential station along the BNSF alignment would be considered at the project level.

Figure 6.3-5a
Potential Sacramento Station Options

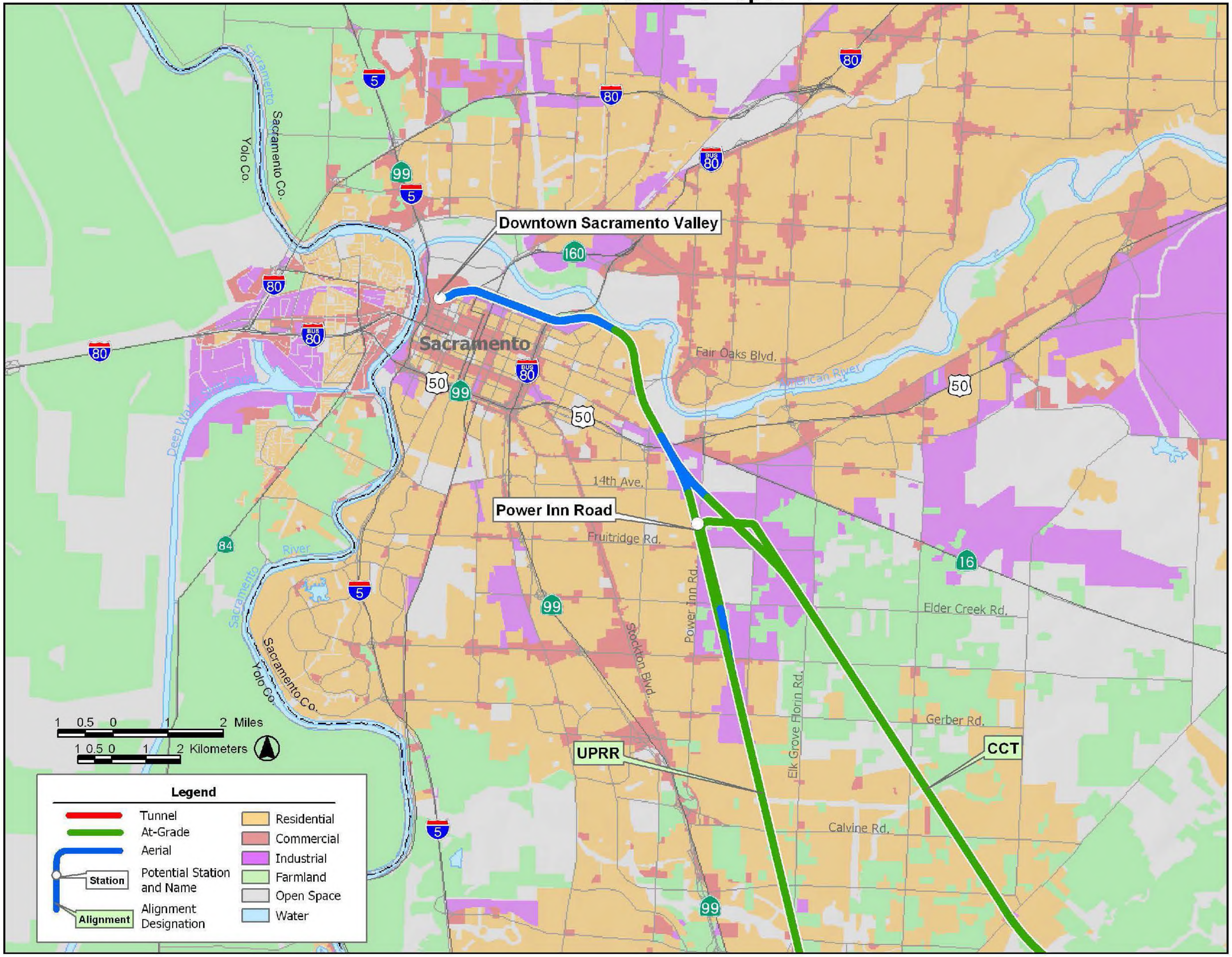
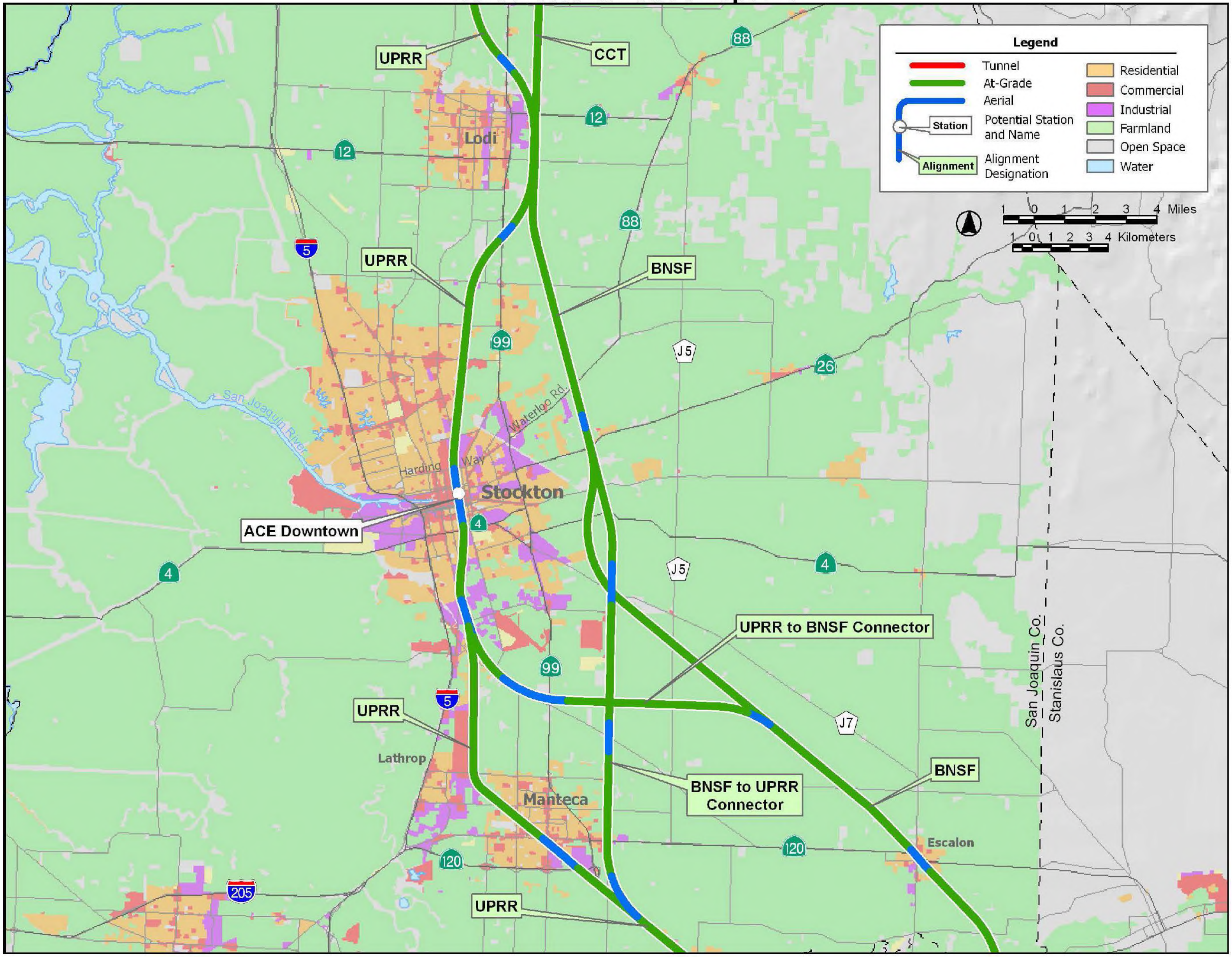


Figure 6.3-5b
Potential Stockton Station Options



6A.3.2 Stockton to Merced

The Authority, in consultation with the FRA, has identified a broad preferred corridor between the Central Valley and the Bay Area containing a number of route options within which further study will permit the identification of a single preferred alignment option. The preferences herein for the portion of the Stockton to Merced alignment and stations, which are also within the broad corridor identified for further study between the Central Valley and the Bay Area and are based upon current information. These recommendations are subject to change based upon the information provided in other future studies.

Preferred Alignment:

- Burlington Northern Santa Fe (BNSF)

Analysis:

The BNSF alignment is the preferred alignment option for HST service between Stockton and Merced (see Figure 6.3-2A).

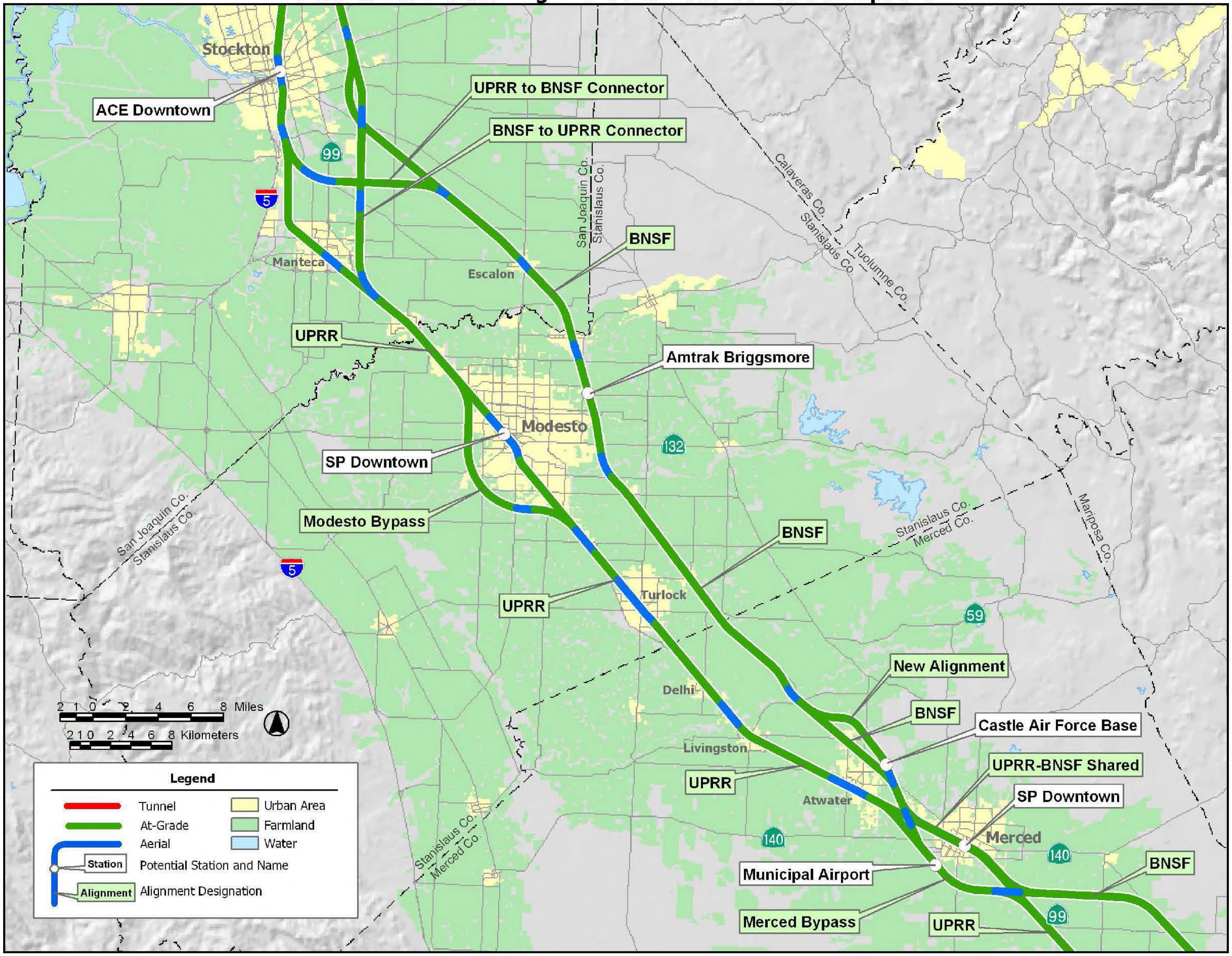
The BNSF alignment avoids most of the urban areas between Stockton and Merced and therefore would have less constructability issues, less property impacts, and cost less than the UPRR alignment. The BNSF alignment is estimated to be about $400 million less costly than the UPRR alignment since it would include less urban area construction, would be mostly at grade (the UPRR alignment option includes aerial structures through Modesto and Turlock), and would not include an express loop around Modesto.

The BNSF alignment also would have fewer potential environmental impacts, and could serve the Castle Air Force Base station option serving Merced. Since the BNSF alignment minimizes urban area construction, it would have less potential for noise, cultural, property and community impacts than the UPRR option. Moreover, while the BNSF alignment would follow existing rail-right-of-way and minimize the potential for environmental impacts, the UPRR alignment would include a new express loop through agricultural land around Modesto because of speed restricting curves through downtown Modesto, which would have considerable potential for severance impacts and direct impacts to agricultural lands (about 97 ac (39 ha)). The USEPA has expressed concern over the additional impacts caused by bypasses to farmlands, noise and visual, water and biological resources.

The technical analysis of these options showed slight differences between the BNSF and UPRR alignments in regards to the potential impacts to biological and water resources. These results do not indicate a significant difference between the two HST alignment options. The BNSF option was determined to have fewer potential impacts to lakes (8.5 acres less) and habitat (129 – 200 acres less) and streams (0 – 850 linear ft) than the UPRR alignment, but more potential impacts to floodplains (171 – 193 ac) and wetlands (2.7 – 3.0 acres) than the UP alignment. Between Stockton and Modesto, all the threatened and endangered species along the UPRR alignment are vernal pool species, by contrast, along the BNSF there are relatively few occurrences of California tiger salamander, Swainson's hawk, and vernal pool tadpole shrimp, and the UPRR crosses territories with more sightings of threatened and endangered species between Modesto and Merced than the BNSF (see summary table Section 6.3.1B).

Impacts throughout this segment could be avoided and minimized by sharing the existing freight railroad right-of-way. If a decision were made to proceed with the HST system, the Authority would seek agreements with BNSF to utilize the existing rail right-of-way to the greatest extent feasible.

Figure 6.3-2a
Stockton to Merced Alignment and Potential Station Options



Preferred Station Locations:

- Modesto: Amtrak Briggsmore

Analysis:

The Amtrak Briggsmore option is the preferred HST station location to serve Stanislaus County (see Figure 6.3-2A). This is a multi-modal hub station and is the site of a new Amtrak station with a direct connection to Amtrak services and bus services. This is the only station option investigated in Stanislaus County along the preferred BNSF alignment option.

- Merced: One station only – either Castle Air Force Base (BNSF using UP alignment through downtown Merced) or Downtown Merced

Analysis:

The Authority prefers to continue to investigate both the Castle Air Force Base (AFB) and the Downtown Merced station options to serve Merced County (see Figure 6.3-2B). The Castle (AFB) site is about 7 miles (11 km) northwest from downtown Merced, but would provide the best access to the developing UC Merced campus via a new highway alignment along Bellevue Avenue. This option would require an additional two-track alignment loop line be constructed to serve Castle AFB station site. While this option would have less connectivity and accessibility to downtown Merced, it would have fewer construction impacts (since only two tracks would be required through downtown Merced). USEPA has expressed concern over loop concepts in the Central Valley, noting that the additional tracks would increase potential environmental impacts; therefore, it is recommended that a potential station along the BNSF alignment be considered at the project level. The Castle AFB option is supported by the City and County of Merced, UC Merced, and the Merced High-Speed Rail Committee. Comments were also received from federal and state elected officials as well as local governments and organizations in support of a maintenance hub at Castle AFB.

The Downtown Merced site is located at the city center and the transit hub of Merced, has good access to SR-99, and would have higher connectivity than the Castle (AFB) site. However, the Downtown Merced option would have higher construction issues, due to the need for four tracks through downtown Merced to accommodate express services.

6A.3.3 Merced to Fresno

Preferred Alignment:

- Burlington Northern Santa Fe (BNSF)

Analysis:

The BNSF alignment is the preferred option for HST service between Merced and Fresno (see Figure 6.3-3A). The BNSF alignment avoids most of the urban areas between Merced and Fresno and would have substantially less constructability issues, would have fewer potential noise, cultural, property, and community impacts, and is estimated to cost about $400 million less then the UPRR alignment. The BNSF alignment option has been considered with new alignment transitions just south of Merced and just north of Fresno and combined with the UPRR alignment through Fresno and Merced. USEPA has expressed concern over potential impacts on new corridor segments needed to connect the UPRR to the

Figure 6.3-2b
Potential Merced Station Options

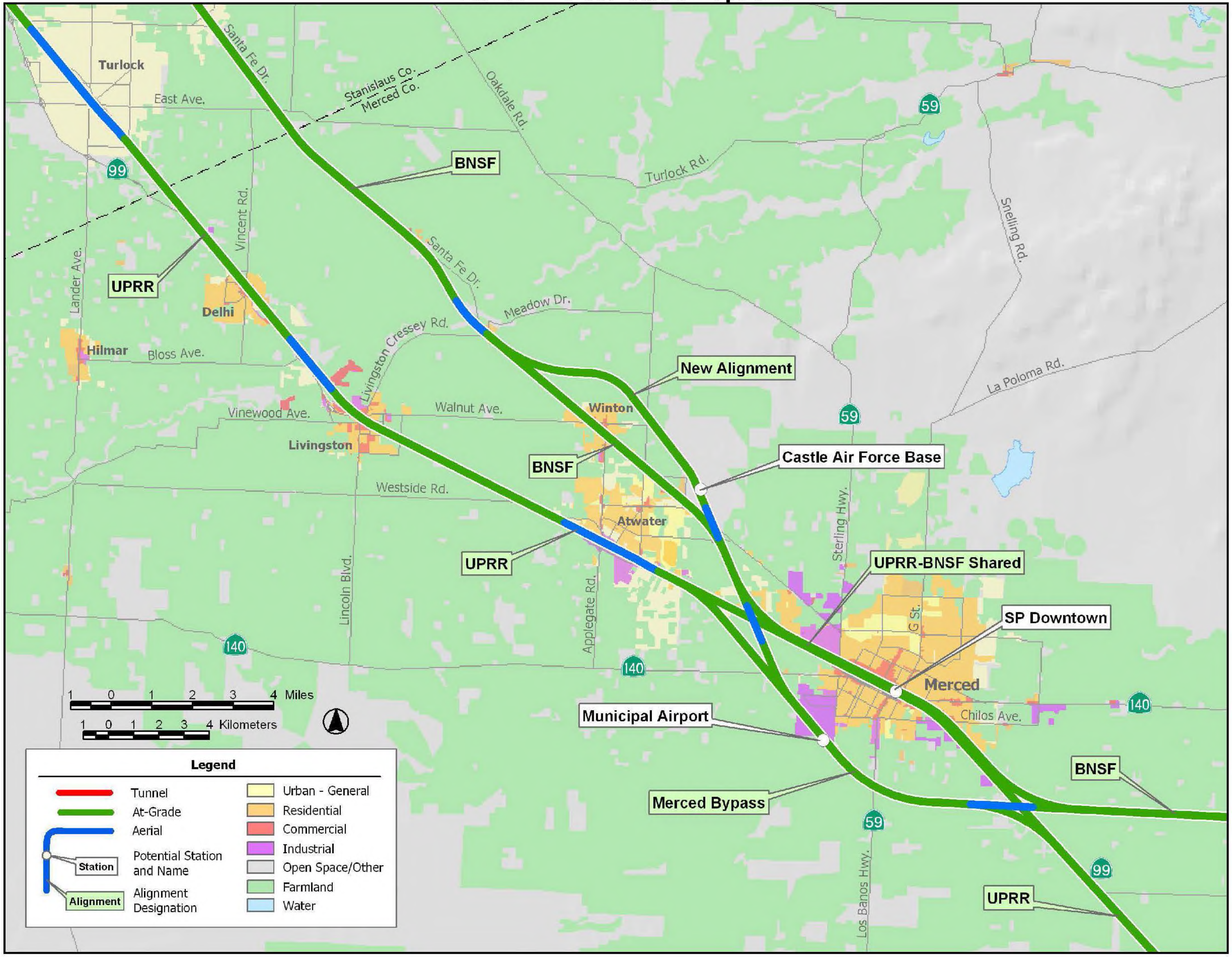
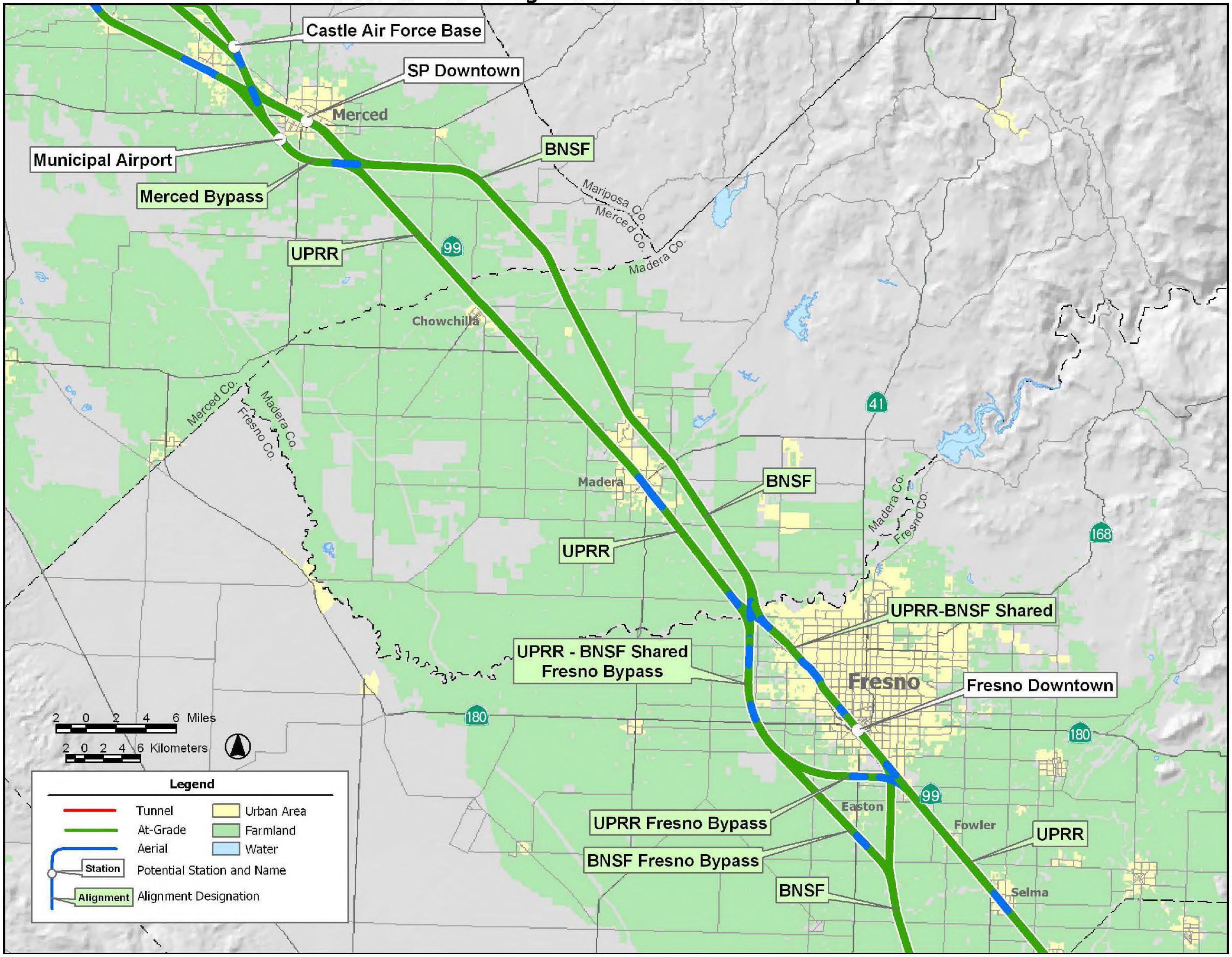


Figure 6.3-3a
Merced to Fresno Alignment and Potential Station Options



BNSF. Therefore the BNSF alignment, through Merced, would also be considered at the project level because of its potential to reduce land severance impacts.

The technical analysis of these options showed slightly higher potential impacts to biological and water resources for the BNSF alignment as compared to the UPRR alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are over 67-miles long. The BNSF option was determined to have 1.4 acres more potential impacts to wetlands, 9 acres more potential impacts to habitat, 4 more potential sensitive species, 1,050 linear feet more potential impacts to streams, and 1.3 acres more potential impacts to lakes than the UPRR alignment, but would have 10-17 acres less potential impacts to floodplains. In addition, the UPRR has greater potential impacts to the San Joaquin kit fox, with 25 records identified for the UPRR as compared with only 2 – 5 occurrence records for the BNSF (see summary table Section 6.3.1C).

Potential environmental impacts throughout this segment could be avoided and minimized to the extent the HST system could share the existing freight rail right-of-way. If a decision were made to proceed with the HST system, the Authority would seek agreements to utilize the existing rail right-of-way to the greatest extent feasible.

Preferred Station Location:

- Fresno: Downtown Fresno

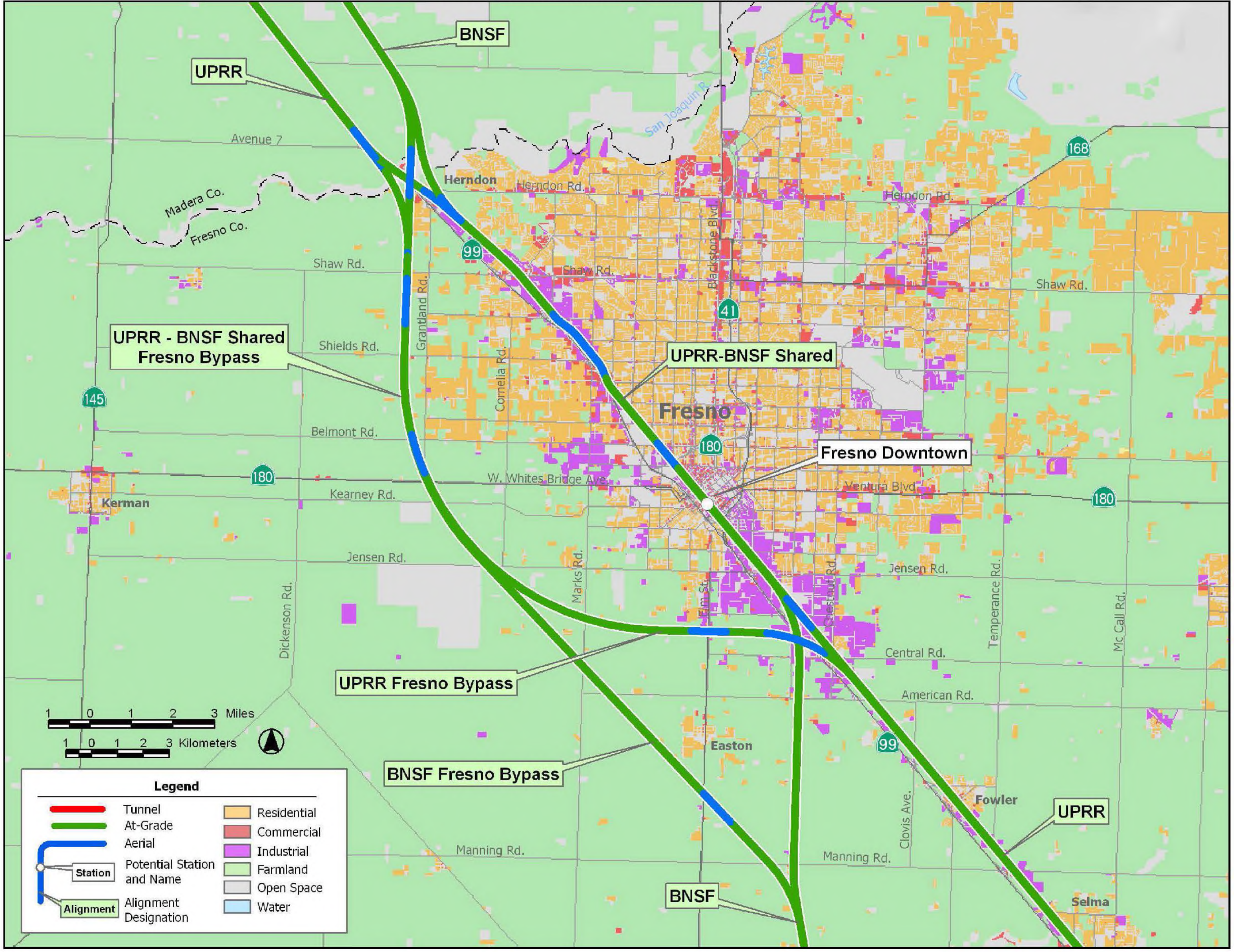
Analysis:

The Downtown Fresno option is the preferred HST station option to serve Fresno County, and the surrounding areas. The downtown Fresno station site has high connectivity and accessibility, with good freeway access and good connections to bus transit. This option is the preferred HST station site of the City of Fresno, Fresno County, and Fresno COG.

The direct option through Fresno, does not include an express loop outside of Fresno (see Figure 6.3-3B). This direct option would have high construction issues since four tracks would be needed through much of Fresno to accommodate express services, and a considerable amount of the alignment through Fresno would be on aerial structure. However, this option would have fewer potential environmental impacts (impacts to farmlands, biological resources, wetlands), and is estimated to be at least $700 million less costly than the option with the express loop (since the express loop would include 22-26 additional miles of alignment construction [35-42 km]). Analysis of the Fresno loop line option suggests that the primary benefit of moving the high-speed mainline (express tracks) outside the urban area would be a 12-16% reduction in potential noise impacts.

Comments received from Fresno County and the Fresno COG support the location of all high-speed tracks through the City of Fresno along the UPRR alignment. The City of Fresno suggests the Authority continue to investigate the "loop track", west of Fresno, for the relocation of the BNSF alignment away from Downtown Fresno. Comments have been received from BIA of the San Joaquin Valley and Granville Homes suggesting pushing the express loop further west, due to planned development. Moving the loop further to the west would increase the potential farmland impacts and costs. Additionally, USEPA has expressed concern over the loop concept throughout the Central Valley, noting that the extra tracks and system requirements may more than double the acreage of potentially affected farmland, would increase noise and visual impacts, and would increase potential impacts to water and biological resources.

Figure 6.3-3b
Potential Fresno Station Options



6A.3.4 Fresno to Bakersfield

Preferred Alignment:

- Burlington Northern Santa Fe (BNSF)

Analysis:

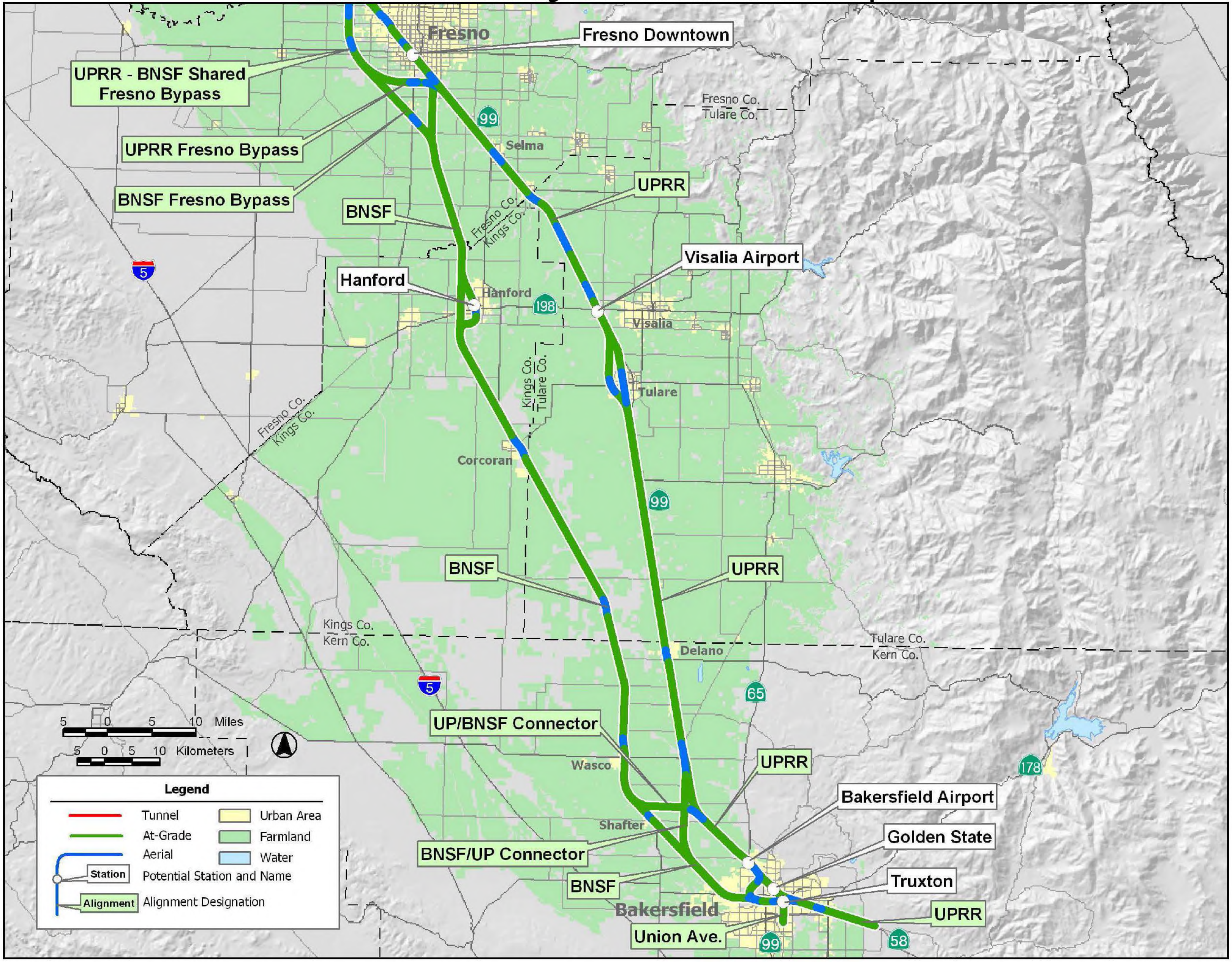
The BNSF alignment is the preferred option for HST service between Fresno and Bakersfield (see Figure 6.3-4A). The BNSF avoids most of the urban areas between Fresno and Bakersfield and is recommended as the preferred alignment because it would have fewer constructability issues, would have fewer potential noise, cultural, community, and property impacts, and is estimated to cost between $590-800 million less the UPRR alignment options. In order to maintain high-speed service on the BNSF alignment, construction of a new HST alignment around Hanford would be needed.

Potential environmental impacts throughout this segment could be avoided and minimized if the HST system could share the existing freight rail right-of-way. If a decision is made to proceed with the proposed HST system, the Authority would seek agreements with BNSF to utilize the existing rail right-of-way to the greatest extent feasible.

The technical analysis resulted in differences between the BNSF and UPRR alignments in regards to the potential impacts to biological and water resources. However, these results do not indicate a significant difference between the BNSF and UP alignment options that vary between 106 to 111 miles in length. The BNSF option was determined to have fewer potential impacts to floodplains (22,116-25,227 linear feet less), streams (500-850 linear feet less), and lakes (0.0-0.3 ac less), but more potential impacts to habitat (259-343 ac more), number of special status species (0-2), and wetlands (0.6-1.5 ac more) than the UP alignment (see summary table Section 6.3.1D). The program-level analysis, utilizing the sightings reported in the CNDDB, indicates that the BNSF alignment is considered San Joaquin kit fox habitat, while the UPRR alignment is not described as habitat. However, this information was not confirmed by biological surveys and appears to be a mapping anomaly of the CNDDB. The habitat indicators for kit fox in the Bakersfield area include annual grassland and salt scrub vegetation within ruderal open space areas [Steve Avery, senior wildlife biologist and San Joaquin kit fox expert, Jones & Stokes]. There is no indication that these habitat indicators differ within the two alignments [Steve Avery]. In addition, the entire area encompassing both alignments is considered habitat for the San Joaquin kit fox according to USFWS [Kit Fox Habitat coverage information provided to FRA on January, 2005; Cheryl Hickman, USFWS]. Due to concern over the potential bisecting of the communities south of Fresno, the City and County of Fresno, Fresno COG, and the cities of Fowler, Selma, and Kingsburg are opposed to the UPRR alignment as proposed and suggest if the UPRR alignment is selected that a trench be considered to reduce the impacts to these smaller communities. The California Department of Parks and Recreation has stated a preference for the UPRR alignment between Fresno and Bakersfield. Parks and Recreation notes potential visual, noise and vibration impacts to the Colonel Allensworth State Historical Park, located south of Hanford along the BNSF alignment. A comprehensive study would be undertaken as part of project level environmental review to avoid and/or minimize the potential impacts to these sensitive areas and the historical park.

Considerable public and agency comments were received supporting the UPRR alignment with a Visalia Airport station stop, including comments from the Tulare County Association of Governments and the cities of Visalia and Tulare. The BNSF alignment is the preferred option for the HST services between Fresno and Bakersfield (see Figure 6.3-4A) with no potential station between Fresno and Bakersfield, however the Authority will undertake an additional study of an alignment option between Fresno and Bakersfield, or variations thereof, to serve a potential Visalia station located in an existing and/or planned urbanized area prior to the commencement of project-level environmental review for this segment. The

Figure 6.3-4a
Fresno to Bakersfield Alignment and Potential Station Options



Authority will work with local, state, and federal agencies as well as the public in carrying out these planning studies. Should a feasible and practicable alignment option be identified through these planning studies that is likely to be less damaging to water and biological resources, the alignment would be fully evaluated during project level environmental review.

Preferred Station Locations:

- Tulare and Kings County**:** No HST Station

Analysis:

The Authority has concluded that the existing Amtrak intercity rail service should link Kings County and Tulare County to the HST system and the preferred HST alternative has no station to directly serve Hanford (the Hanford site is the only station option for Tulare/Kings counties on the recommended BNSF alignment). The Hanford/Visalia station options would have the lowest ridership potential of all the potential stations investigated by the Authority. In 2020, a Hanford or Visalia station is forecast to have only between 140,000 and 160,000 annual total intercity boardings and alightings by 2020. In addition, as a result of not having the Hanford HST station would eliminate the alignment through Hanford, resulting in cost savings of about $420 million plus less potential environmental impact since the HST alignment would avoid the Hanford urban area.

- Bakersfield: Truxtun (Downtown Bakersfield)

Analysis:

The Truxtun station option in downtown Bakersfield is the preferred HST station option to serve Kern County (see Figure 6.3-4B). The Truxtun HST station would have the highest connectivity and would connect to the new Bakersfield Amtrak Station and has good access to SR-99. The Truxtun site is in the city center of Bakersfield and is within walking distance the convention center and City Hall. This multi-modal station site would have the greatest potential for promoting transit-oriented development around the HST station and infill development within downtown Bakersfield. The City of Bakersfield, Kern County, Kern County COG, and the Kern County Transportation Foundation for HST service for Kern County prefer this station option.

6A.4 BAKERSFIELD-LOS ANGELES

The region from Bakersfield to Los Angeles was divided into two segments: 1) Bakersfield to Sylmar; and 2) Sylmar to Los Angeles.

6A.4.1 Bakersfield to Sylmar

Preferred Alignment:

- SR-58/Soledad Canyon Corridor (Antelope Valley)

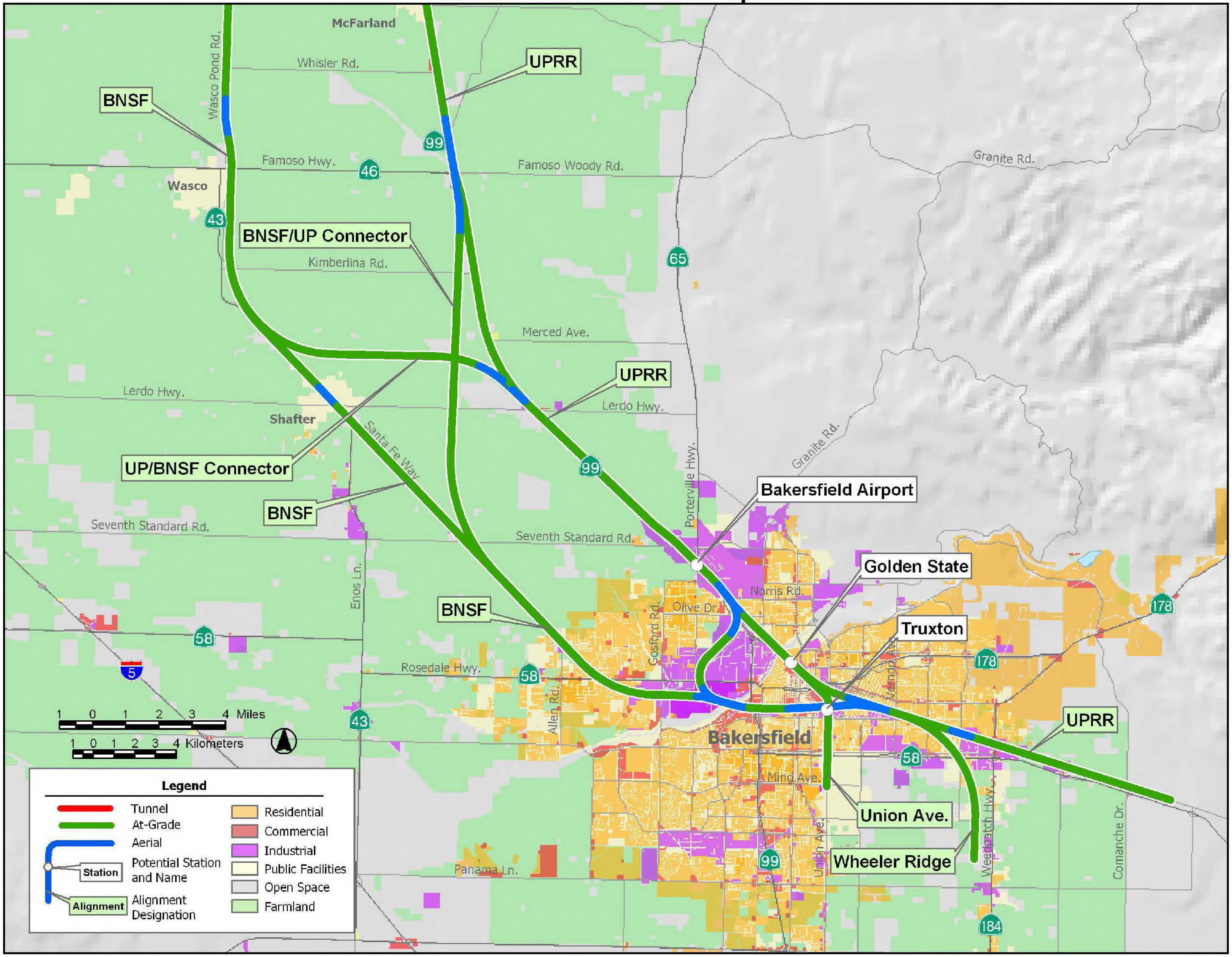


Figure 6.3-4b
Potential Bakersfield Station Options

Analysis:

The alignment through the SR-58/Soledad Canyon Corridor (Antelope Valley) with an HST station at Palmdale is the preferred option for crossing the Tehachapi Mountains between the Central Valley and Southern California. Although the longer Antelope Valley alignment would add about 10 minutes to express service travel times between northern and southern California and have less intercity ridership potential (trips between regions) than the I-5 alignment option, it would have fewer potential environmental impacts, it would be less subject to seismic activity and have considerably less tunneling and thereby have fewer constructability issues, and would increase connectivity and accessibility.

The Antelope Valley alignment is estimated to have more potential to impact cultural resources than the I-5 alignment options, and slightly more potential to impact biological resources. However, the Antelope Valley alignment would have a lower overall potential for water-related impacts because the potential impacts are related to the relatively small seasonal streams in Soledad Canyon and it would not encroach on any lakes. The Antelope Valley option would also have less potential impacts to wetlands and non-wetland waters than the I-5 options[7]. In addition, the Antelope Valley option was forecast to have less growth inducing impacts on urbanized land and farmland conversion than the I-5 options – because the I-5 options would result in more growth in the Central Valley. The most significant difference in regards to potential environmental impacts between the Antelope Valley option and I-5 alignments is in regards to major parklands (see Figure 6.4-1). The Antelope Valley alignment would not go through major parks. In contrast, the I-5 options would potentially impact Fort Tejon Historic Park, Angeles and Los Padres National Forests, Hungry Valley State Vehicular Recreation Area, Pyramid Lake and other local parks (see summary table Section 6.4.1).

The Antelope Valley alignment traverses less challenging terrain than the I-5 options, which would result considerably less tunneling overall (13 miles [21 km] of tunneling for the Antelope Valley option versus 23 [37 km] miles for I-5 options), and considerably shorter tunnels (maximum length of 3.4 miles [5.5 km] for the Antelope Valley option versus two tunnels greater than 5 miles [8 km] for the I-5 options) which would result in fewer constructability issues. Although the Antelope Valley option is about 35 miles longer than the I-5 alignment options, it is estimated to be slightly <u>less</u> expensive to construct as a result of less tunneling through the Tehachapi Mountains. In addition, due to its more gentle gradient, geology, topology and other features, the SR-58/Soledad Canyon Corridor offers greater opportunities for using potential HST alignment variations, particularly through the mountainous areas of the corridor, to avoid impacts to environmental resources. In contrast, the more challenging terrain of the I-5 Corridor greatly limits the ability to avoid sensitive resources and seismic constraints. The alignment optimization system (Quantm) that was utilized to identify and evaluate approximately 12 million alignment options for each mountain crossing could only find one practicable alignment option through the Tehachapi Mountains for the I-5 Corridor.

Submittals by the City of Palmdale (oral testimony by U.C. Berkeley Professor Ashraf Mahtab at the April 13, 2004 public hearing and technical report by Geodata that is included as an attachment to the City of Palmdale's written comments) show additional seismic hazards relating to the I-5 alignment that further differentiate these options from the Antelope Valley alignment. These submittals suggest that since the I-5 alignment options follow the San Gabriel fault for over 20 miles (see Figure 3.13-2) and cross through the area where the San Andreas and Garlock faults meet, they would have greater seismic hazard and constructability issues than the Antelope Valley option. The Draft Program EIR/EIS described both the I-5 and the Antelope Valley alignment options as having "high" potential for seismic hazards and active fault crossings, but did not differentiate between them. After reviewing the information submitted by the

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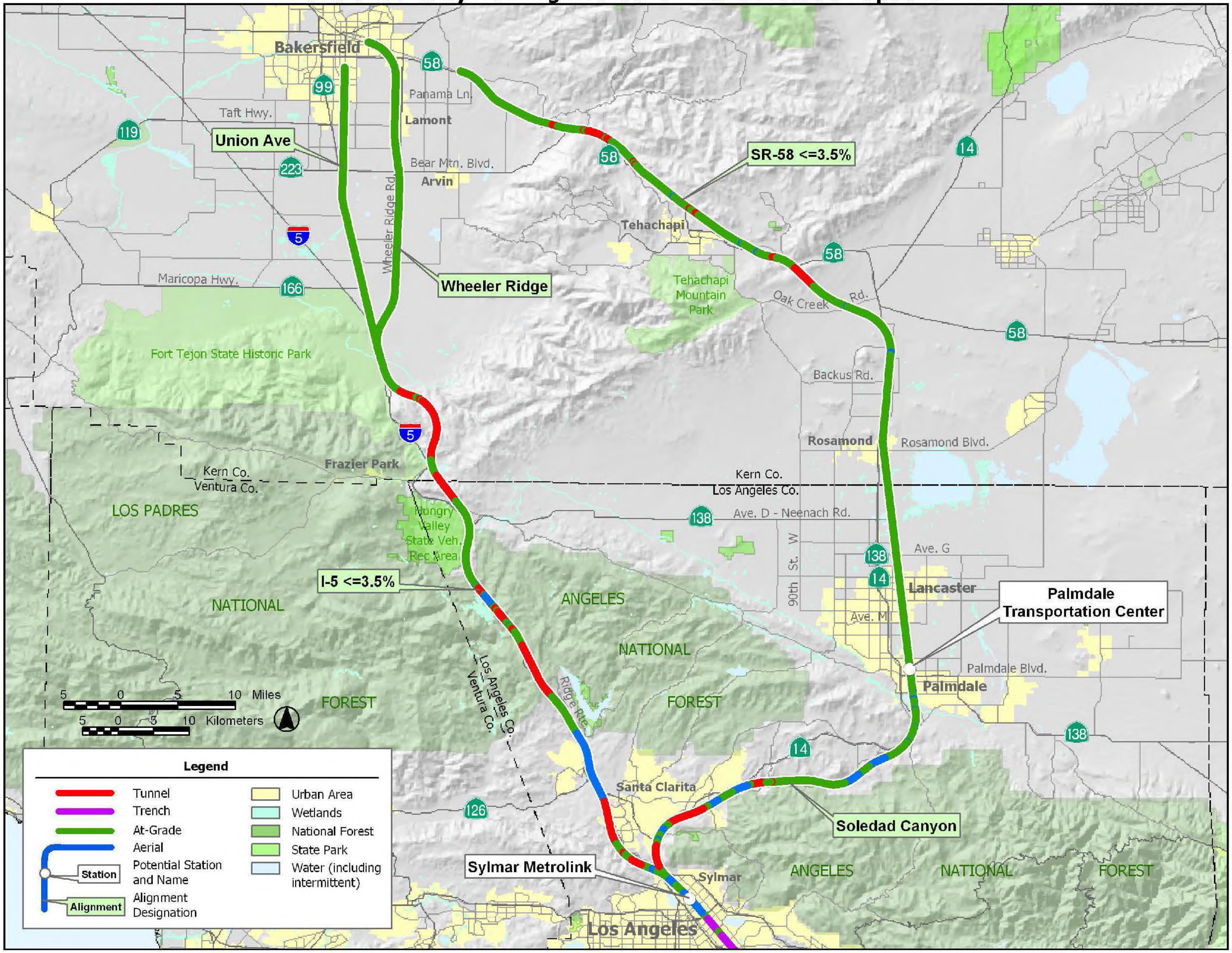
[7] An error was found on page 6-52 of the Draft Program EIR/EIS. For the Antelope Valley alignment under Biological Resources, waters should read 65,562 linear feet. The error was also made in Appendix 3, on page 3.15-D-8, Soledad Canyon Corridor, perennial non-wetland jurisdictional waters should read 146 linear feet as stated in the Bakersfield to Los Angeles: Biological Resources Technical Evaluation Report (January 2004)

Figure 6.4-1
Bakersfield to Sylmar Alignment and Potential Station Options



City of Palmdale, the Authority and its technical consultants believe that while the ratings for the alignments should not change, they concur that there are additional seismic hazards and risks for the I-5 alignment options from paralleling the San Gabriel fault, and also from traversing the "triangle" where the San Andreas and Garlock faults meet. The limited constructability of the I-5 alignment option combined with a high risk of seismic impacts makes the I-5 alignment option likely to be impracticable.

The Antelope Valley option would provide direct service to the Palmdale/Lancaster area, which increases the connectivity and accessibility of the HST network. The Antelope Valley is the fastest growing area in Los Angeles County and currently regional population forecasts estimate the Antelope Valley population could exceed 1 million by the year 2020. The HST system would also provide connectivity to Palmdale Airport and Metrolink commuter rail service.

Some public comments received on the Draft Program EIR/EIS supported the I-5 alignment options primarily because these would enable shorter travel times between Northern California and Los Angeles, and/or due to concerns regarding potential growth inducing impacts from an HST station at Palmdale. However, a number of the comments received indicated support for the Antelope Valley alignment. Public and agency support for the Antelope Valley option is strong in Los Angeles County because of the increased connectivity and accessibility it would provide for the Antelope Valley. Agencies which have indicated support for the Antelope Valley alignment include: the City of Los Angeles, the County of Los Angeles, Los Angeles County Metropolitan Transportation Authority (LAMTA), Los Angeles Department of Transportation, Southern California Association of Governments (SCAG), the City of Palmdale, City of Lancaster, County of Kern, Kern Council of Governments, and the City of Bakersfield.

Comments from the US Environmental Protection Agency (USEPA) and the US Army Corps of Engineers (USACE) on the Draft Program EIR/EIS stated concerns regarding potential impacts to the Santa Clara River through the Soledad Canyon portion of the Antelope Valley alignment. This Program EIR/EIS defines Soledad Canyon as "a relatively wide corridor area that includes both the SR-14 and UPRR alignments between the Antelope Valley and Santa Clarita" (Section 2.6.9C). Future study of the Antelope Valley alignment would consider an option that closely follows the SR-14 through Soledad Canyon as an avoidance option for potential impacts to the Santa Clara River. The Program EIR/EIS describes design practices to assure the avoidance of impacts to the Santa Clara River (see Section 3.15).

Preferred Station Locations:

- Palmdale/Antelope Valley: Palmdale Airport/Transportation Center

Analysis:

The Palmdale Airport/Transportation Center is the preferred HST station option to serve the Antelope Valley population. The Palmdale Airport/ Transportation Center would maximize opportunities for intermodal connectivity. It would be at or near (with the opportunity for convenient shuttle or people-mover service) the Palmdale Airport, directly link with Metrolink service, and be a hub for local bus services.

- Sylmar: Sylmar Metrolink

Analysis:

The Sylmar Metrolink option is the preferred HST station option to serve the San Fernando Valley, Simi Valley and Newhall/Santa Clarita areas. The Sylmar Metrolink option would provide a direct connection to the Metrolink regional commuter rail service and convenient access to the Los Angeles freeway network.

6A.4.2 Sylmar to Los Angeles

Preferred Alignment:

- MTA/Metrolink

Analysis:

The MTA/Metrolink is the preferred option for HST service between Sylmar and Los Angeles (See Figure 6.4-2). Between Burbank and Los Angeles Union Station, the MTA/Metrolink refers to a relatively wide corridor within which alignment variations will be studied at the project level. It is recommended because it would have less potential for environmental impact, and would have less constructability issues than the Combined I-5/Metrolink alignment option.

The MTA/Metrolink option would have fewer potential impacts to local and regional parks than the Combined I-5/Metrolink option. The Combined I-5/Metrolink alignment option has the potential to impact Griffith Park, Elysian Park and the Cornfield property (See Figure 6.4-2A). The Combined I-5/Metrolink route would also potentially impact slightly more biological resources than the MTA/Metrolink route (see summary table Section 6.4.2).

A considerable number of comments have been received regarding potential impacts to the Taylor Yard and Cornfield properties owned by California State Parks. The MTA/Metrolink alignment would potentially impact the periphery of Taylor Yard property, whereas the I-5/Metrolink alignment would bisect the Cornfield property. Taylor Yard and the Cornfield site were not identified in the Section 4(f) analysis (public parks and recreation) of the Draft Program EIR/EIS because at the time of the analysis in 2002, neither site was identified as an existing or future park in the sources reviewed for the analysis. However, since that time, the California Department of Parks and Recreation has acquired and initiated general plans for these two properties.

The MTA/Metrolink corridor is an existing rail corridor used by Metrolink commuter services and Amtrak intercity services. Use of the MTA/Metrolink corridor offers opportunities to mitigate potential HST impacts (e.g. by putting the alignment underground, on aerial structure, or by aligning it away from sensitive resources). The conceptual HST current design for the Program EIR/EIS assumes that the HST alignment would be along San Fernando Road adjacent to Taylor Yard (primarily to avoid curves). Locating the HST alignment along the existing Metrolink right-of-way around the Taylor Yard area should also be considered in future studies. In contrast the I-5/Metrolink alignment option would bisect the Cornfield property with a new, at-grade alignment. Constructing the I-5/Metrolink alignment underground through the Cornfield property would not be practical because of the need to transition to an aerial structure to serve the LAUS HST station site.

The MTA/Metrolink and Combined I-5/Metrolink options are expected to have similar construction costs. However, the Combined I-5/Metrolink could require approximately 2 miles (3.2 km) of tunneling (including segments under Silver Lake and Elysian Park), and therefore is considered to have more constructability issues than the MTA/Metrolink option. The combined I-5/Metrolink alignment is opposed by the City of Burbank because they believe it would have high impacts to established residential neighborhoods from the use of high-elevated structures over existing freeway overpasses through Burbank.

During the project-level review, in the Sylmar – Los Angeles segment, as well as other highly urbanized areas throughout the system, the Authority would work closely with the potentially affected communities to avoid, reduce, and/or include feasible measures to mitigate potential impacts to local communities.

Figure 6.4-2
Sylmar to Los Angeles Alignment and Potential Station Options

The Authority will seek to identify new feasible and practicable alignment variations less damaging to parklands, water, and biological resources as well having less community impacts, to evaluate during the project level environmental review. The Authority will work with local, state, and federal agencies as well as the public (including local neighborhoods) in carrying out future project-level studies.

Preferred Station Locations:

- Burbank: Burbank Metrolink Media City

Analysis:

The Burbank Metrolink Media City (Downtown) station is the preferred HST station option to serve the Burbank/Glendale area and the San Fernando Valley. It would be an aerial structure and would be less costly and easier to construct than the Burbank Airport site (which would have to be constructed in a trench). The Burbank Metrolink Media City station site would offer higher connectivity to the Burbank area. This station site is in downtown Burbank, and would provide a direct connection to the Metrolink regional commuter rail service, a hub for bus transit in the Burbank area, and good access to Burbank Airport. The Burbank Metrolink Media City station would be about 2.4 miles (3.9 km) from the Burbank Airport terminal, as compared to the airport access provided by the Burbank Airport site, which is about 1.6 miles (2.6 km) from the airport terminal.

- Los Angeles: Los Angeles Union Station

Analysis:

The existing Los Angeles Union Station (LAUS) is the preferred HST station option to serve Los Angeles. The LAUS HST station would be an elevated structure constructed over the current Metrolink and Amtrak tracks. LAUS is the transit/rail transportation hub of southern California and would have the highest connectivity and accessibility for serving the Los Angeles metropolitan area. LAUS is the primary destination for the Metrolink Commuter rail services, the Los Angeles Metro Red Line, the Pasadena Gold Line, the Amtrak Surfliner service, and the regional bus transit services. The existing LAUS option would have limited potential impacts on the environment. This option is the preferred by the City of Los Angeles Department of Transportation and LOSSAN Rail Corridor Agency.

6A.5 LOS ANGELES – INLAND EMPIRE – SAN DIEGO

The region from Los Angeles to San Diego via the Inland Empire was divided into three segments: 1) Los Angeles to March ARB; 2) March ARB to Mira Mesa; and 3) Mira Mesa to San Diego.

6A.5.1 Los Angeles to March ARB

Preferred Alignment:

- UPRR Riverside/UPRR Colton Line

Between LA Union Station and March ARB, each of the alignment options considered utilize existing freight railroad alignments and the HST would be either in or immediately adjacent to the freight railroad right-of-way. The UPRR Riverside/Colton alignment option is preferred between Los Angeles and March ARB (see Figure 6.5-1).

Comparing the two alignments between Los Angeles and Pomona, although the UPRR Riverside/Colton option is a more heavily used freight corridor (with more freight related constraints and future potential for freight expansion) than the UPRR Colton Line, the UPRR Riverside/Colton option would provide a much better connection to Los Angeles Union Station (LAUS) and to Northern California (since it connects to Union Station from the south). The UPRR Colton line enters LAUS from the north, and would likely require a direction reversal using LAUS as a stub-end station for trains traveling from the Inland Empire to northern California thereby could increase travel times between these markets by at least 10 minutes with the recommended HST station at LAUS. Between LAUS and March ARB, the alignment options considered would have similar potential for environmental impacts. The Riverside/Colton option would have the least potential costs, about $1.2 billion less than the Colton Line option (see summary table Section 6.5.1).

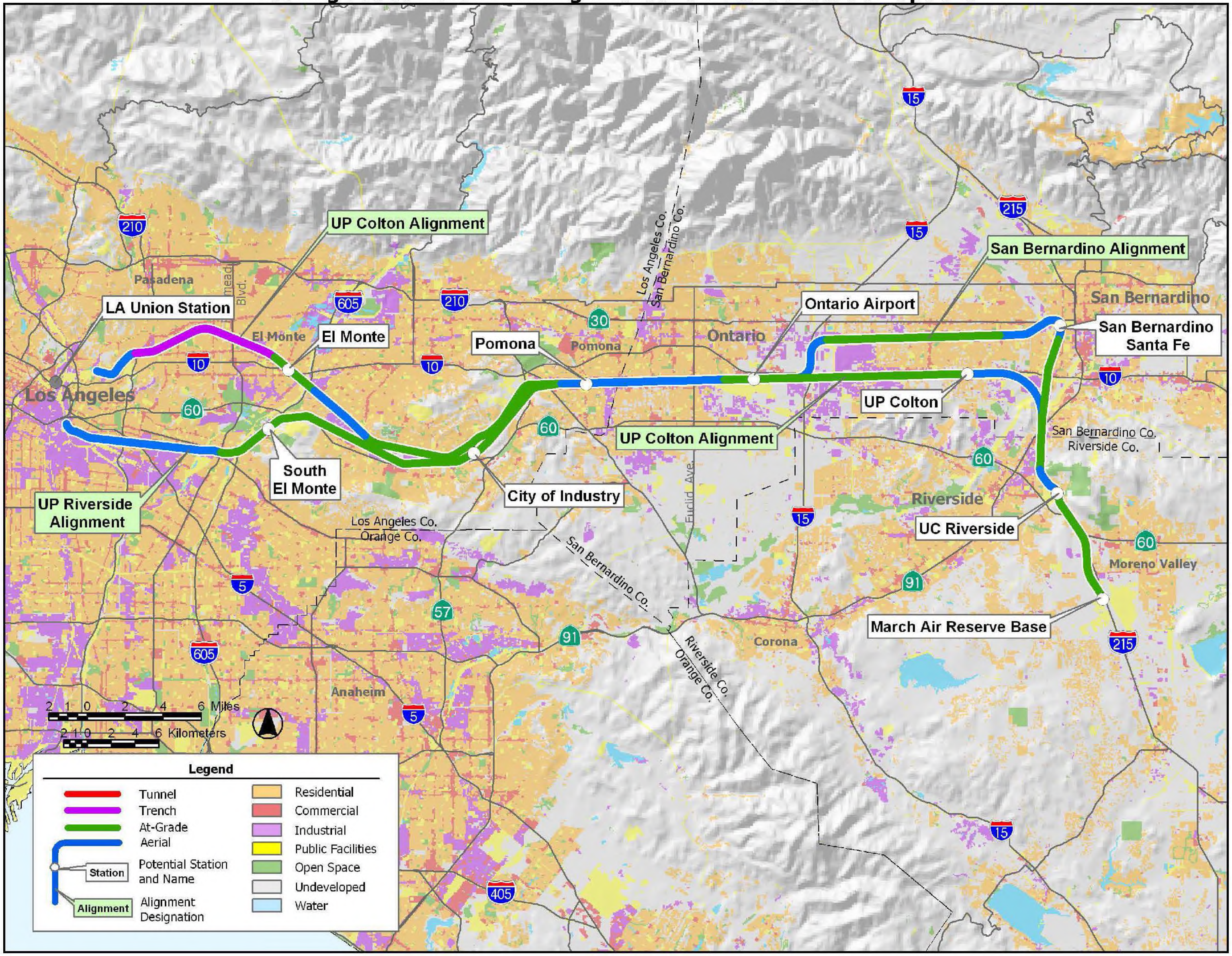
For the segment between Ontario and March ARB, the UPRR Colton Line (considered part of both the UPRR Riverside/Colton and UPRR Colton alignment options) would provide considerably higher speeds and faster travel times (estimated at 6 minutes less between LA and San Diego) than the option that would directly serve San Bernardino. A direct link to San Bernardino is estimated to cost $700 million more (than either the Riverside/Colton option or the Colton option) and would not avoid or substantially reduce potential environmental impacts.

The San Bernardino Associated Governments (SANBAG) supports further investigation of both the direct link to San Bernardino and the freight alignment through Colton. The California Regional Water Quality Control Board supports the selection of the San Bernardino loop alignment. Southern California Regional Rail Authority (SCRRA) is opposed to having a stub-end station at LAUS, and commented that a potential revision of track configuration could remove existing passenger services from the Riverside Line (LA – Pomona) to open up capacity for freight operations.

Preferred Station Locations:

- East San Gabriel Valley Station Location: City of Industry

Figure 6.5-1
Los Angeles to March ARB Alignment and Potential Station Options



Analysis:

The City of Industry site is the preferred HST station option to serve East San Gabriel Valley (East Los Angeles County). The City of Industry site would have a wide range of multimodal connections to local and regional bus services, and Metrolink commuter rail service, and have good access to the freeway network. The City of Industry site would provide a central location between potential HST stations at LAUS and Ontario Airport. The City of Industry station would be constructed at grade and minimizes both cost and construction issues.

- Ontario Airport Connector Station

Analysis:

The Ontario Airport is a preferred HST station option. The UPRR Colton Line creates the northern boundary of the airport and is about a quarter of a mile from the air passenger terminal. The Ontario Airport HST station would supports the objectives of the HST project by providing an interface with one of the larger airports in southern California. This station would also provide direct HST service to San Bernardino County.

- Riverside County/East San Bernardino County: University of California Riverside

Analysis:

The UC Riverside station option is the preferred HST station to serve the City of Riverside and Riverside County. The UC Riverside station site would provide the best access to Riverside. Should the HST project move forward, project level environmental review will involve continued work with the City of Riverside and the region to further define the HST alignment and the potential sites for the Riverside station option.

6A.5.2 March ARB to Mira Mesa

Preferred Alignment:

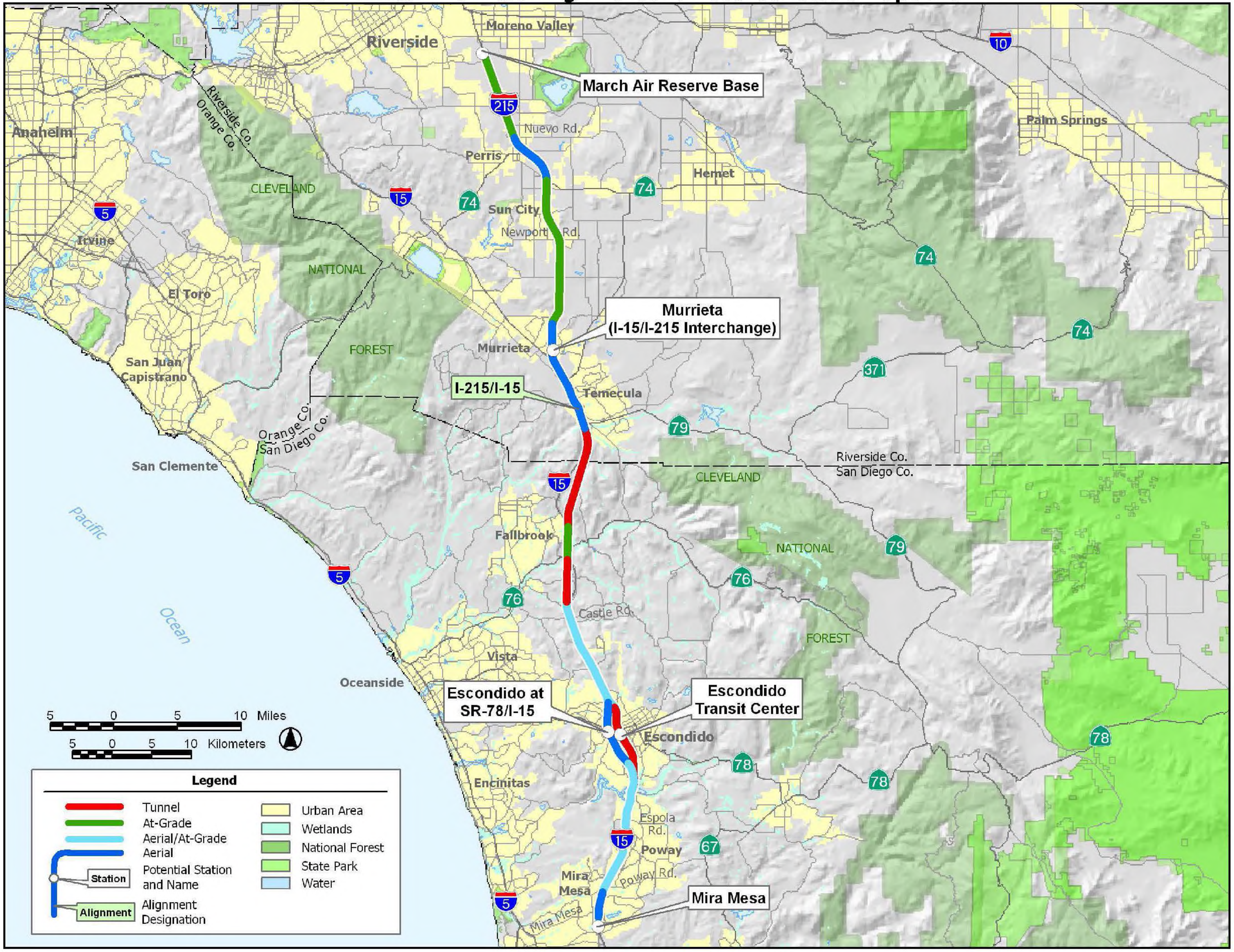
- I-215/I-15

Analysis:

The I-215/I-15 alignment option is preferred between March ARB and Mira Mesa (see summary table Section 6.5.2). The HST alignment option between March ARB and Mira Mesa would generally follow the Interstate 215 and then the Interstate 15 corridor to Mira Mesa (see Figure 6.5-2). This is the only existing major transportation corridor directly connecting the Inland Empire to San Diego. SANDAG, NCTD, MTDB, Caltrans District 11, Murrieta, Escondido and the City of San Diego all support direct HST service to San Diego via the Inland Empire (I-15 Corridor).

The USEPA is concerned with potential impacts to the Santa Margarita Ecological Reserve and the Santa Margarita River. In addition, the mountainous terrain just south of Temecula is considered to contain important tribal cultural areas and concerns have been raised regarding potential impacts to this area and the Exeava Temeku village (near the I-15/I-79 interchange). Ways of avoiding and minimizing potential impacts to these resources would be investigated during project level environmental review.

Figure 6.5-2
March ARB to Mira Mesa Alignment and Potential Station Options



Preferred Station Locations:

- Temecula Valley Station**:** Murrieta

Analysis:

The Murrieta station site is the preferred HST option to serve the Temecula and Murrieta area of Riverside County. The Murrieta Station site would have convenient access to I-15 and I-215. The City of Murrieta submitted comments in support of an HST station in Murrieta.

- Escondido Station Area: Escondido I-15

Analysis:

The Escondido Transit Center option would have better connectivity (within 1/8 of a mile of the transit center, and could link to Bus Rapid Transit and the Sprinter light rail transit service) and is strongly favored by the City of Escondido, SANDAG and NCTD. However, serving the Escondido Transit Center would require leaving the I-15 alignment and tunneling under the Centre City Parkway which would be more difficult and costly (estimated at over $900 million more) to construct than the I-15 station option and the Escondido Transit Center would not avoid or substantially reduce potential environmental impacts. The I-15 station option is considered to be moderately compatible with the surrounding land uses, and would have few environmental concerns.

The I-15 station option is the preferred station option to serve Escondido, the I-15 corridor and North/East San Diego County since it is considerably less costly to construct and would be easier to construct than tunneling under Escondido. However, ultimate locations and the configurations of stations cannot be determined until project-level environmental review. Should the HST project move forward, project level environmental review would involve continued work with the City of Escondido and the region to further define the HST alignment and potential sites for the I-15 station.

6A.5.3 Mira Mesa to San Diego

Preferred Alignment:

- Continue to investigate both the Carroll Canyon and Miramar Road alignment options.

Analysis:

Both the Carroll Canyon and Miramar Road alignment options between Mira Mesa and San Diego are preferred for further investigation (see Figure 6.5-3). Either of these options would enable the HST system to directly serve downtown San Diego, whereas the I-15 to Qualcomm option would terminate about 8-miles from the city center at the Qualcomm Stadium (20 minutes by light rail). SANDAG, NCTD, MTDB, Caltrans District 11, and the City of San Diego all support direct HST service to downtown San Diego via the Inland Empire (I-215/I-15 Corridor).

The Qualcomm Stadium concept would be about $140 million less to construct than the Carroll Canyon option, and $70 million less than the Miramar Road option, but would not provide the same level of connectivity to downtown San Diego as the other alignment options. Although the I-15 option terminating at Qualcomm Stadium was forecast to have higher intercity ridership (350,000 more for 2020), the options that would directly serve Downtown San Diego would provide better connections to the regional transit system and airport.

Figure 6.5-3
Mira Mesa to San Diego Alignment and Potential Station Options

As compared to the I-15 option, the Carroll Canyon and Miramar Road options would have less potential impacts to parklands, vernal pools[8], and less potential for growth-induced impacts, but more potential visual, cultural, and floodplains impacts (see summary table Section 6.5.3).

The United States Marine Corps has raised concern regarding the Miramar Road option which is directly adjacent to the Miramar housing complex and "sensitive habitats" and has noted that any efforts related to the proposed HST system that would limit or impact on the Marine Corps ability to perform its mission would be opposed. The City of San Diego commented that building the alignment below grade should be considered from Old Town to Downtown San Diego. SANDAG commented that the I-15 corridor would be attractive to long-distance commuters and has requested that the Authority consider a future partnership to look at details for an intercity/commuter service in the I-15 Corridor. However, the USEPA recommends avoiding placement of a HST route in canyons due to the "significant" permitting challenges such alternatives may face as a result of potentially large amounts of cut and fill, and increased potential for erosion, sedimentation, and other stream impacts. The US Department of the Interior (USDOI) has also raised concerns regarding a potential HST alignment through Carroll Canyon open space which is within the city of San Diego's MSCP preserve and an important feature in the San Diego County regional conservation strategy. Further project-level study of both the Carroll Canyon and Miramar Road alignment options would provide necessary information to avoid and minimize potential adverse impacts to the natural environment.

<u>Preferred Station Locations:</u>

- Mid-San Diego County Station: University City

Analysis:

The University City station option is the preferred HST option to serve the University City/University Town Centre/La Jolla area. A station to serve this high-density area of San Diego County is supported by the City of San Diego. SANDAG's commented that they support having a HST station to serve the North City (San Diego) area. SANDAG wants to continue to work with the Authority to determine the appropriate site for a North City station.

- San Diego Station: Downtown San Diego Santa Fe Depot

Analysis:

The Downtown San Diego Santa Fe Depot station option is the preferred station option to serve San Diego. The Downtown San Diego Santa Fe Depot is the transit "hub" station for downtown San Diego and locating the HST station here would result in the highest level of connectivity. This station option would be located in the city center where many potential HST passengers could walk to their destination and would offer good connectivity with San Diego International Airport, which is about two miles from this site. The Downtown San Diego Santa Fe Depot is also the terminus for the Coaster commuter rail service and the Amtrak Surfliner service, a major San Diego LRT station, and a bus transit hub.

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[8] U.S. Fish and Wildlife Service, "Vernal Pools of Southern California, Draft Recovery Plan," 1997

The Downtown San Diego station option is preferred by SANDAG, NCTD, MTDB and the City of San Diego. In addition, the San Diego Regional Airport Authority commented that the HSR station option at San Diego Airport may hamper their ability to improve airport facilities and could cause considerable traffic and parking problems.

6A.6 LOS ANGELES-ORANGE COUNTY-SAN DIEGO

The proposed HST system would extend no further south than Irvine (as a result of environmental constraints along the coast and in coastal communities between South Orange County and San Diego). For this region, non-electric "conventional" rail improvements to the existing state-supported "Surfliner" (Amtrak) service were the only design options considered between Irvine and San Diego in the Draft Program EIR/EIS.

The Authority has been working in a partnership with California Department of Transportation (Caltrans) Division of Rail to examine the potential "non electric" improvements for the existing rail corridor connecting Los Angeles, Orange County, and San Diego (LOSSAN). Caltrans has relied upon the Authority's technical studies to issue the LOSSAN Rail Improvements Draft Program EIR/EIS [State clearinghouse #2002031067]. The Authority has recognized that implementation of "non-electric" improvements in the Irvine to San Diego portion of the LOSSAN corridor for intercity service is the current responsibility of Caltrans Division of Rail and the Authority decided to take no further action in this Program EIR/EIS regarding conventional improvements in this area.

The Authority has, however, submitted separate recommendations for identifying preferred alternatives for the proposed LOSSAN conventional improvements as comments to Caltrans and the FRA.

6A.6.1 Los Angeles to Anaheim/Irvine

Preferred Alignment:

- LOSSAN Corridor – HST (Los Angeles to Irvine)

Analysis:

Direct service to Orange County as far south as Irvine along the LOSSAN corridor is the preferred option for HST service between Los Angeles and Orange County (see Figure 6.6-2). The conceptual design for this option assumes shared operations with other passenger services and separation from freight with 4 total tracks (2 for passenger rail services and 2 for freight) between Los Angeles and Fullerton. South of Fullerton the alignment would be two tracks with additional passing tracks at intermediate stations. The electrified HST would need to share tracks (at reduced speeds) with non-electric Metrolink commuter rail, Surfliner intercity service and occasional freight trains (there are fewer freight operations south of Fullerton).

Further analysis at the project level could indicate somewhat greater infrastructure requirements with potentially increased costs and environmental impacts. However, the cost and potential for environmental impact associated with the LOSSAN corridor option are expected to still be considerably less than those associated with the UPRR Santa Ana option. The preference for the LOSSAN alignment option is based on the assumption that the capacity and compatibility issues associated with the shared operations with existing non-electric service (Surfliners, Metrolink, and freight) can be resolved.

Shared use improvements to the LOSSAN corridor would be considerably less costly (about $2.25 billion less) and would have considerably fewer environmental impacts than a new dedicated alignment along

Figure 6.6-2
Los Angeles to Anaheim/Irvine Alignment and Potential Station Options

the UPRR Santa Ana line, but the travel times would be longer (27 minutes LA-Anaheim vs. 16 minutes LA-Anaheim for UPRR Santa Ana) and HST operations could be constrained (capacity constraints, scheduling constraints, which are estimated to limit operations to between 18-45 trains a day in each direction by sharing tracks on the LOSSAN alignment (see summary table Section 6.6.2)).

This alignment would increase connectivity and accessibility to Orange County, California's second most populated county, and the transportation hubs of Anaheim and Irvine. Improvements to the LOSSAN corridor would provide a safer, more reliable, energy efficient intercity mode to serve Orange County and Southern Los Angeles County while improving the safety, reliability, and performance of the regional commuter, and "Surfliner" intercity service because of the fully grade separated tracks, separation from freight, and a state-of-the-art signaling and communications system. The HST service would greatly increase the capacity for intercity and commuter travel and reduce automobile traffic. Moreover, environmental impacts would be minimized since this alignment utilizes the existing LOSSAN right-of-way. Noise impacts from existing operations could be reduced due to the elimination of horn noise and gate noise from existing rail services as a result of adding grade separations at existing grade crossings.

Considerable support for direct HST service to Orange County utilizing the LOSSAN rail alignment has been expressed by the public and agencies in Orange County including: the Orange County Transportation Authority (OCTA), the City of Anaheim, the City of Irvine, the City of Fullerton, the LOSSAN Rail Corridor Agency, and Amtrak. Moreover, OCTA is opposed to the use of the UP Santa Ana Line for HST service. However, some concerns and opposition have been expressed to use of the LOSSAN alignment. The Burlington Northern Santa Fe (BNSF) made a general comment that the ability for BNSF to grow and expand with demand must be preserved. While Metrolink supports a fully grade separated LOSSAN corridor to Irvine, they have raised concerns that using LOSSAN as the HST alignment would hinder their ability to expand services. In addition, Metrolink commented that LOSSAN should be avoided as a route for "new modes" unless additional right-of-way width is purchased for any new HST tracks. The Gateway Cities Council of Governments comments raised concerns about potential impacts on land use, communities, neighborhoods, property and environmental justice for both the LOSSAN alignment and the UPRR Santa Ana Line, and stated their belief that significant property acquisition would be needed for the LOSSAN alignment through residential neighborhoods in Pico Rivera, and unincorporated portions of Los Angeles County. The Gateway Cities Council of Governments comments state, "the amount of data available in the EIR/EIS is not yet sufficient to make a decision regarding which corridor should be selected through our area and such a selection must be deferred to the future when such data have been compiled."

The goal of HST service reaching the Irvine Transportation Center is supported by OCTA. However, OCTA and cities in Orange County have raised concerns about extending HST service south of Anaheim because of difficulties due to the alignment, possible environmental justice issues, noise and vibration concerns, and other issues. The OCTA comment letter states, "Numerous cities south of Anaheim have documented their concerns for the trench option. We are concerned about how this proposal may affect existing and future rail capacity." The City of Orange raised concerns regarding potential property, community, and land use impacts adjacent to rail corridor and the City of Tustin submitted comments opposing HST service through Tustin (between Anaheim and Irvine). More detailed project-level environmental analysis and preliminary engineering will be required to determine whether OCTA and Orange County cities would continue to support HST service south of Anaheim.

<u>Potential Station Locations:</u>

- Southeast Los Angeles County (Gateway Cities): Norwalk (LOSSAN)

Analysis:

The Norwalk (LOSSAN) station is the preferred station to serve the Gateway Cities of south Los Angeles County, which include the cities of Vernon, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, and La Mirada. The Norwalk site would be at the Norwalk Metrolink Station with direct connectivity to the regional commuter rail service and is the bus transit hub for the area.

- Central Orange County: Anaheim Transportation Center

Analysis:

The Anaheim Edison Field Amtrak/Metrolink station option is the preferred station option to serve Anaheim. The Anaheim Transportation Center is the existing transit hub for Central Orange County with high connectivity for Central Orange County. This station serves Amtrak (Surfliner) intercity and Metrolink commuter rail services, is a bus transit hub, and has low potential for environmental impacts. The City of Anaheim and OCTA support having a HST station stop at Anaheim, and the Anaheim Transportation Center is their preferred station location. The City of Fullerton has requested that there be an additional Central Orange County HST station at Fullerton.

- Southern Orange County: Irvine Transportation Center

Analysis:

The Irvine Transportation Center station option is the preferred station option to serve Irvine and South Orange County. The Irvine Transportation Center HST station option located at the existing Amtrak/Metrolink Station on the LOSSAN corridor would be a multi-modal transit hub that would serve Southern Orange County. This station serves Amtrak (Surfliner) intercity and Metrolink commuter rail services, is a bus transit hub, and has low potential for environmental impacts. The City of Irvine and OCTA support having a HST station stop at Irvine and the Irvine Transportation Center is their preferred station location.

6A6.2 Los Angeles to LAX

Preferred Alignment: No direct HST service

Analysis:

The Authority has determined that a direct HST service to LAX not be part of the initial statewide HST network. The HST system would be connected to LAX and Western Los Angeles County by local transportation (shuttle, regional transit, or the automobile). A direct HST link to LAX requires a costly spur line with very limited maximum speeds that would have lower ridership potential than HST links to the San Diego (via the Inland Empire) and to Orange County.

The proposed HST system would serve the Inland Empire and San Diego using the I-215/I-15 corridor, and it is also recommended that the initial HST network serve Orange County via the LOSSAN alignment. Direct HST service to LAX would require an additional spur line south of Los Angeles Union Station (LAUS). Having the HST system to split in three different directions south of LAUS would considerably reduce the potential frequency of service for each of these corridors. Moreover, since a majority of the HST trains would be continuing from LAUS to either San Diego or Orange County, it is likely that many HST passengers wanting to reach LAX would still require a transfer at Union Station.

The MTA Harbor Subdivision rail right-of-way alignment is a little over 15 miles long and would cost about $1.9 billion to construct, with an additional $340 million needed for a sub-terrain station at LAX. Curves along the alignment would severely restrict speed throughout the alignment (average speed would be about 70 mph) resulting in a 13-minute travel time LA Union to LAX. This low-speed urban alignment could function very appropriately as a commuter rail line, which would be a feeder service to the HST system, or it could be considered for a future extension of the HST system once the initial network was operational (see summary table Section 6.6.1).

San Diego County Association of Governments (SANDAG) supports a direct link to LAX via the I-15 Corridor, and NCTD supports a direct link to LAX via Orange County. However, in Los Angeles County and the SCAG region, airport planning has been focused on trying to shift future growth away from the severely capacity constrained LAX to satellite airports such as Ontario, Burbank and Palmdale. Comments were received from Friends of the Green Line advocating that the MTA Harbor Subdivision right-of-way should be used for a future northern extension of the Green Line to serve local/regional transit. In addition, the Los Angeles Department of Transportation suggests moving the existing Green Line to the Harbor Subdivision and using the I-105 right-of-way (existing Green Line) for HST. The Southern California Association of Governments (SCAG) commented that they are planning a regional Maglev system. The SCAG Maglev system as currently envisioned would link LAUS and LAX as part of the regional Maglev network.

6A.7 CAPITAL COSTS FOR HST SEGMENTS WITH A PREFERRED ALIGNMENT

Estimated capital costs for HST alignment segments and stations have been described in the Program EIR/EIS and are summarized in Chapter 6. Although a representative HST system cost of $33 to $37 billion has been described in Chapter 4, the cost of the preferred HST system may differ. With the identification of a "broad corridor" as preferred between the San Francisco Bay Area and the Central Valley overall HST system capital cost is uncertain. The broad preferred corridor between the Bay Area and the Central Valley contains a number of feasible routes – some of which have not been investigated as part of this program EIR/EIS process. Previous analysis by the Authority has suggested that an Altamont Pass alignment option could reduce capital costs as compared with other options. Although preferred alignments are identified for the San Francisco to San Jose and Oakland to San Jose segments (based on current information), these recommendations (as previously noted) are subject to change based upon the information provided in future studies. Less extensive options that serve fewer Bay Area cities than the options studied in this Program EIR/EIS will be studied in the future. The alignment concepts identified between Stockton and Fresno also may change as a result of future studies of the mountain crossing between the Bay Area and Central Valley. A different mountain crossing alignment may require a considerably different alignment between Stockton and Fresno to facilitate connection and to avoid and minimize environmental impacts.

Other potential variation within the preferred HST Alternative adds further uncertainty to the overall capital cost, including: 1) in Southern California, relatively wide corridors have been identified between Palmdale and Sylmar (in "Soledad Canyon" between the Santa Clara River and State Route 14), and between Burbank and Los Angeles Union Station; 2) the Authority has acknowledged that all the station locations identified are "potential" HST stations, and that it is possible that some of the station locations identified in this Final Program EIR/EIS will not be built; 3) shared use of the LOSSAN corridor from Los Angeles to Orange County.

Based upon the existing data and the large range of options identified, the cost of the preferred HST system alternative is expected to cost at least $33 billion (in 2003 dollars). Table 6A.7-1 below shows the estimated cost for construction of major segments where a preferred alignment has been chosen.

Table 6A.7-1
Capital and Project Level Analysis Cost Estimates
(Millions of 2003$$)

Segment	Length (miles)	Capital Cost
Fresno to Bakersfield[9]	116	$3,100
Bakersfield to Palmdale	84	$3,900
Los Angeles to Irvine	44	$2,300
Los Angeles to Anaheim	30	$1,200
Los Angeles to Riverside	66	$2,900
Riverside to Mira Mesa	74	$4,000
Mira Mesa to San Diego	19	$1,200

The estimated total capital costs (in 2003 dollars) for each of the alignment segments of the preferred HST Alternative account for all types of implementation costs of a proposed high-speed train system, including construction, right-of-way, environmental mitigation, and design and management services. The construction costs include procurement and installation of line infrastructure (tracks, bridges, tunnels, grade separations and power distribution); facilities (passenger stations, storage and maintenance facilities); systems (communications, train control); and removal or relocation of existing infrastructure (utilities, rail tracks). The right-of-way costs include the estimated costs to acquire properties needed for construction of the high-speed train infrastructure. The environmental mitigation costs include a rough estimate of the proportion of capital cost required for mitigating environmental impacts, based on similar completed highway and rail line construction projects. No specific mitigation costs are identified at this program level of review. Other implementation costs are included as estimated add-on percentages to construction costs to account for agency costs associated with administration of the program (design, environmental review and management).

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[9] This segment includes additional length (approximately 10 miles) and a station in downtown Fresno that was not included in the cost included in the Fresno to Bakersfield segment as it was defined in Chapter 6.

6B HST STATION AREA DEVELOPMENT

There would be great benefits to enhancing development patterns and increasing development densities near proposed HST stations. To provide maximum opportunity for station area development in accordance with the purpose and need and objectives for the HST system, the preferred HST station locations are all multi-modal hubs and are typically in traditional city centers. To further these objectives, when making decisions regarding both the final selection of station locations and the timing of station development, the Authority would consider the extent to which appropriate Station Area Plans and development principles have been adopted by local authorities.

In addition to potential benefits from minimizing land consumption needs for new growth, dense development near HST stations will concentrate activity conveniently located to stations. This would increase the utilization of the HST system, generating additional HST ridership and revenue to benefit the entire state. Reducing the land needed for new growth should reduce pressure for new development on nearby habitat areas and agricultural lands. Denser development allowances would also enhance joint development opportunities at and near the station, which in turn could increase the likelihood of private financial participation in construction related to the HST system. A dense development pattern can better support a comprehensive and extensive local transit system that can serve the local communities as well as providing access and egress to HST stations. The Authority's adopted policies will ensure that implementation of the HST in California would maximize the potential for station area development.

6B.1 General Principles for HST Station Area Development

HST station area development principles draw upon transit-oriented development (TOD) strategies that have been successfully applied to focus compact growth within walking distance of rail stations and other transit facilities. Applying TOD measures around HST stations is a strategy that works for large, dense urban areas, as well as smaller central cities and suburban areas. TOD can produce a variety of other local and regional benefits by encouraging walkable compact and infill development. Local governments would play a significant role in implementing station area development by adopting plans, policies, zoning provisions, and incentives for higher densities, and by approving a mix of urban land uses. Almost all TOD measures adopted by public agencies involve some form of overlay zoning that designates a station area for development intensification, mixed land uses, and improvements to the pedestrian environment. TOD measures are generally applied to areas within one-half mile of transit stations and this principal would be followed for HST stations.

Station area development principles that would be applied at the project-level for each HST station and the areas around the stations would include the following features:

- Higher density development in relation to the existing pattern of development in the surrounding area, along with requirements for density.
- A mix of land uses (retail, office, hotels, entertainment, residential, etc.) and mix of housing types to meet the needs of the local community should be included.
- A grid street pattern and compact pedestrian-oriented design that promotes walking, bicycle and transit access with streetscapes that include landscaping, small parks and pedestrian spaces.
- Context sensitive building design that considers the continuity of the building sizes, that coordinates the street-level and upper-level architectural detailing, roof forms, and the rhythm of windows and doors, should be provided and should include consideration of the general relationship of buildings to public spaces such as streets, plazas, other open space areas, and public parking structures.
- Limits on the amount and location of development related parking, with a preference that parking be placed in structures. TOD areas typically have reduced parking as compared to conventional parking requirements typical for retail, office and residential uses due to transit access and their walk-ability,

which would be expected for HST station area development, while sufficient train passenger parking would be essential to the system viability.

6B.2 Implementation of HST Station Area Development Guidelines

The statewide high-speed train system is likely to have more than 20 stations. The Authority has the powers necessary to oversee the construction and operation of a statewide high-speed rail system, and to purchase the land required for the infrastructure and operations of the system. The responsibility and powers needed to focus growth and station area development guidelines in the areas around high-speed stations are likely to reside primarily with local government.

The primary ways in which the Authority can help ensure that the HST system becomes an instrument for encouraging maximizing implementation of station area development principles include:

- Select station locations that are multi-modal transportation hubs with a preference for traditional city centers.
- Adopt HST station area development policies and principals that require TOD, and promote value-capture at and around station areas as a condition for selecting a HST station site.
- Encourage local governments where potential HST stations may be located to prepare and adopt Station Area Plans and amend City and County General Plans that incorporate station area development principles in the vicinity of HST stations.

1. Select Station Locations that are Multi-Modal Transportation Hubs preferably in Traditional City Centers.

HST stations in California will be multi-modal transportation hubs. To meet the Authority's adopted objectives[1], all the potential high-speed rail station locations that were selected would provide linkage with local and regional transit, airports, and highways. In particular, convenient links to other rail services (heavy rail, commuter rail, light rail, and conventional intercity) will promote TOD at stations by increasing ridership and pedestrian activity at these "hub" stations. A high level of accessibility and activity at the stations can make the nearby area more attractive for additional economic activity.

As described in Section 6A of this Program EIR/EIS, the preferred station sites are all multi-modal transportation hubs that would provide links with local and regional transit, airports and highways. Most of the potential stations identified for further evaluation are located in heart of the downtown/central city area of California's major cities. By identifying preferred downtown multi-modal station sites and eliminating potential "greenfield" sites[2], the Authority has described a proposed HST system that meets the objectives of minimizing potential impacts on the environment and maximizing connectivity with other modes of transportation. These locations also would have the most potential to support infill development and TOD.

2. Adopt HST Station Area Development Policies that Require TOD, and Promote Value-Capture At and Around Stations as a Condition for Selecting a HST Station Site.

Through subsequent CEQA and NEPA processes, the Authority will determine where stations will be located and how many HST stations there will be. The Authority intends to encourage the adoption of transit oriented development measures and to promote value-capture at and around the locations of HST

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[1] See Section 1.2.1 "Purpose of High-Speed Train System".

[2] Sites in rural areas with very limited or no existing infrastructure.

stations.[3] The Authority has identified TOD and value-capture at and around stations sites that support and promote high-speed rail ridership as essential components of high-speed train station locations. Local government will be expected to promote TOD, and to use value capture techniques to finance and maintain station amenities and the public spaces needed to create an attractive pedestrian environment. Since the HST stations will be public gathering places, value-capture techniques should be used to enhance station designs with additional transportation or public facilities. The Authority has also adopted a policy that parking for the HST stations would be provided at market rates (no free parking). The Authority will maximize application of TOD principles during the site-specific review of proposed station locations.

The Authority has prescribed the following criteria for HST station locations:

- Each station site must have the potential to promote higher density, mixed-use, pedestrian oriented development around the station.
- As the HST project proceeds to more detailed study, local governments are expected to provide (through planning and zoning) for TOD around HST station locations.
- As the project proceeds to more detailed study, local governments are expected to finance (e.g., through value capture or other financing techniques) and to maintain the public spaces needed to support the pedestrian traffic generated by hub stations.

3. Encourage Local Governments in which Potential HST Stations Would Be Located to Prepare and Adopt Station Area Plans, Amend City and County General Plans and Encourage TOD in the Vicinity of HST Stations.

Throughout future environmental processes and the implementation of HST, the Authority will continue to work closely with the communities being considered for HST stations. There are a number of mechanisms that local governments can use to encourage higher density HST oriented development in and around potential HST station locations and minimize undesirable growth effects. These include planning measures (such as specific plans, community plans, transit village plans, regional plans, and greenbelts), development agreements, zoning overlays, and, in some cases, use of redevelopment authority.

Increased density of development in and around HST stations provides a means to increase public benefits beyond the benefits of access to the HST system itself. Such benefits could include relief from traffic congestion, improved air quality, promotion of infill development and preservation of natural resources, increased stock of affordable housing, promotion of job opportunities, reduction in energy consumption, and improved cost-effectiveness of public infrastructure. The Authority and local government working together will need to determine which mechanisms best suit each community and could be implemented to enhance the benefits possible from potential HST station development.

Most successful contemporary examples of rail-influenced urban development have been the direct products of long-term strategic planning. For example, in France, and Japan, where there has been considerable success guiding new development around HST stations, local governments typically prepare long-term plans that focus growth at each HST station area. Regional plans are also typically used to coordinate station area development with existing urban areas and reserves for parks, agriculture and natural habitat.

A useful starting point for station-area development should be the preparation of an illustrative site and phasing plan for a selected station area that is realistic from a market perspective. Then a "Station Area Plan" can be prepared which will assure the community and potential developers of a public commitment to promote compact, and efficient, pedestrian-oriented development around station-areas. Local

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[3] As part of the "Staff Recommendations" adopted at the January 26, 2005 Authority Board Meeting in Sacramento.

government can review the availability of land around potential station sites to achieve development that is of sufficient size to be economically viable. In addition, infrastructure improvements for station area development may require public investment, either directly or through tax increment financing. These elements along with other development incentives can appropriately be included in the Station Area Plan.

Significant growth is expected in large areas of California with or without an HST system. The proposed HST system, however, would be consistent with and promote the State's adopted smart growth principles,[4] and should be a catalyst for wider adoption of smart growth principles in communities near HST stations. It should encourage infill development, help to protect environmental and agricultural resources by encouraging more efficient land use, and encourage efficient and compact development, along with infrastructure that provides adequate transportation and other utilities and minimizes ongoing cost to taxpayers.

The incorporation of Station Area Plans and development principles will affect the Authority's decisions regarding both the final selection of station locations and the timing of station development. The Authority would encourage the local government authority having development jurisdiction at and around potential HST stations to take the following steps:

- In partnership with the Authority, develop a Station Area Plan[5] for all land within one-half mile of the HST pedestrian entrance that adheres to the station area development principles (described above).
- Incorporate the Station Area Plan through amendment of the City or County General Plan and Zoning.
- Use a community planning process to plan the street, pedestrian, bicycle environment, and park and open spaces, and to establish appropriate zoning adopting the station area development principles.
- Use community planning processes to develop regional plans, and conforming amendments to general plans, which would focus development in existing communities and would provide for long-term protection of farmland, habitat, and open space.

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[4] As expressed in the Wiggins Bill (AB857, 2003), and in government code 65041.1

[5] Such a plan could take the form of a specific plan pursuant to California Government Code sections 65450-65457, or a Transit Village Development Plan pursuant to California Government Code sections 65460-65460.10, which specifies the content for such a plan, or another form as determined appropriate by local government.

7 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

This chapter of the Program EIR/EIS describes any potentially significant adverse environmental effects, identifiable at the program level of environmental review, which cannot be avoided should the proposed HST system or an alternative be implemented and any unavoidable adverse impacts of the alternatives, as required by CEQA and NEPA, respectively. This chapter also describes any significant irreversible or irretrievable commitments of resources or foreclosures of future options, identifiable at the program level of environmental review, that would be involved in the proposed HST system or alternatives should one be implemented.

This Program EIR/EIS represents the first conceptual planning stage of a tiered environmental evaluation that analyzes a broad range of alternatives and HST alignment options. Most potentially significant impacts that have been described in previous sections of this document can be avoided or minimized by selecting an alternative or alignment option that avoids or minimizes impacts on environmental resources through refinement to the design or specific location of the alignment or station, or through incorporation of mitigation measures. For example, some potentially significant impacts on sensitive habitat or wetlands would occur in areas where alignment options are available that would avoid or minimize the impact, such as tunneling or designing the alignment to avoid the sensitive area. In addition, potential noise impacts would occur in residential areas along the alignment corridors where significant noise levels could be reduced to less than significant with implementation of mitigation measures such as noise walls between the train track or highway and the residential receptors. However, there are some unavoidable potentially significant impacts that could occur as a result of implementation of the alternatives under consideration. Those impacts are discussed below.

7.1 ADVERSE UNAVOIDABLE POTENTIALLY SIGNIFICANT IMPACTS

7.1.1 Fuel Consumption and Energy Use

Potentially significant impacts of the No Project and Modal Alternatives that cannot be mitigated or reduced to less than significant include consumption of an estimated 24.3 million barrels of oil per year under the No Project Alternative in 2020, and 24.5 million barrels per year under the Modal Alternative. Both the No Project and Modal Alternatives would continue California's dependency on automobiles and airplanes for intercity travel, and the Modal Alternative would potentially increase the use of this non-renewable resource for intercity trips over No Project energy consumption by 6.8 to 7.0 million barrels of oil per year. The HST Alternative would consume an estimated 19.1 million barrels of oil per year. The proposed HST Alternative would consume an estimated 2.0 to 5.2 million fewer barrels of oil per year (a 22% difference) than the 2020 No Project baseline.

Operation of the proposed HST Alternative would potentially increase the load on the statewide electric power system by an estimated 480 megawatts (MW) during the peak period in 2020. Overall, the HST electricity demand would represent about 0.6% of an estimated 77,000 MW statewide demand in 2020. During construction, energy consumption for the Modal Alternative is estimated to be about 241 million British thermal units (MMBTUs) compared to an estimated 152 MMBTUs for construction of the proposed HST system (37% less than the Modal Alternative).

7.1.2 Biological Resources and Wetlands, Agricultural Land, Section 4(f) and 6(f) Resources, Cultural and Paleontological Resources, and Visual Resources

The Modal and HST Alternatives would each commit the use of land and natural resources to a transportation right-of-way. Some potentially significant unavoidable impacts on biological resources (habitat for threatened and endangered species, and wetlands) might occur where the land required for right-of-way for highway expansion or for a proposed HST alignment contains wetlands or wildlife habitat for special-status species. Some potentially significant unavoidable impacts on agricultural land may occur where the land required for right-of-way is in agricultural use. Similarly, potential unavoidable impacts on Section 4(f) and 6(f), cultural, and visual (scenic landscapes) resources could occur where alignment options (tunnels, elevated alignments, or right-of-way adjustments) would not be feasible or practicable. Both interstate highways and the proposed HST alignments would require relatively straight, flat, long linear features; moving or curving the alignment to avoid resources might not always be feasible, and could result in impacts on other resources. Similar effects would occur from property acquisition and land use along the width and length of the modal and proposed HST corridors.

Only general statements of potential impacts can be made at this program level of review because field studies were not conducted and the buffer area used for the analysis was many times larger than the actual right-of-way for the alternatives under consideration in most instances. Potential impacts would need to be further studied and clarified in the next stage of project design and environmental review, when more specific information would be available on the right-of-way needed for proposed alignments and station locations, and on the specific properties potentially affected. The objective at the project-specific stage of analysis would be to identify design options (plans and profiles) that would avoid these sensitive resources to the extent feasible.

7.1.3 Construction Impacts

Construction of either the Modal or HST Alternative would result in the irreversible commitment of resources. Fossil fuels, labor, and construction materials would be expended in the construction of the Modal and HST Alternatives. Further, labor and natural resources would be used in the fabrication and preparation of construction materials. Once used or expended, these materials are generally not retrievable. However, these materials are not in short supply and their use would not have an adverse effect on the continued availability of resources. Any construction of the proposed alternatives would also require the expenditure and allocation of local, state, and federal funds, which are not retrievable. Once used, these funds could not be used for other projects.

Short-term construction impacts related to earthwork (cut and fill and grading) that would result in dust (PM10) and localized emissions and noise from construction equipment would occur under either the Modal or HST Alternative. These impacts would be in addition to the construction impacts associated with already planned projects included in the No Project Alternative. Because the construction period would last at least 10 years and the miles of corridor under construction at one time would extend across the state, these physical impacts would potentially be significant. The potential impacts of this construction activity would be addressed in more detail during project-level analysis. This same construction activity would also have potential benefits to employment and to the California economy from construction jobs and contracts for the services and materials. The California High Speed Rail Authority's final business plan (Business Plan) (California High Speed Rail Authority 2000) describes an estimated 300,000 job-years of employment during HST construction that would generate an estimated $11 billion in personal income, $28 billion in industrial output, and $871 million in tax revenue.

7.2 RELATIONSHIP BETWEEN SHORT-TERM USES OF ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Any change to the statewide transportation system of the magnitude needed to meet the projected intercity travel demand in California by the year 2020 would have short-term effects on the human and physical environment, and enhance long-term productivity and reduce risks to health and safety. Implementation of the proposed alternatives would result in short-term population changes from relocations associated with potential property acquisitions, and potential relocation of wildlife from habitat disturbance during construction and operation. These factors would be considered in more detail during project-level review. While some relocations associated with property acquisition are likely if a decision is made to proceed with the proposed HST system, long-term benefits would also result, including enhanced long-term productivity related to increased mobility and safety, and the reduced travel time, air pollutant emissions, and energy use that an improved intercity transportation system would provide.

Short-term benefits of the Modal and HST Alternatives include employment opportunities during construction (spread over 12 years) and locally purchased materials and services.

As indicated in Chapter 1, Purpose and Need and Objectives, the existing and programmed transportation improvements in California will not keep up with the currently projected rate of future population growth and the increased intercity travel demand projected for California. As described in Chapter 5, Economic Growth and Related Impacts, the proposed HST system would provide user benefits (travel time savings, cost reductions, and accident reductions) and accessibility improvements for California's citizens. The HST system would improve accessibility to labor and customer markets, thereby improving the competitiveness of the state's industries and the overall economy. With this second effect, businesses that chose to locate in proximity to an HST station could operate more efficiently than businesses that locate elsewhere. The analysis shows that the HST Alternative would be the most efficient in terms of the land consumed per new job and resident, and could provide an incremental development density that is 4.0% more efficient than the No Project Alternative, while the Modal Alternative would be 2.3% less efficient than the HST Alternative.

7.3 CALIFORNIA ENVIRONMENTAL QUALITY ACT SIGNIFICANCE

This section describes those environmental effects identified in Chapter 3 that would be considered significant under CEQA. The potential for the proposed project and alternatives to stimulate unplanned growth is considered in Chapter 5, Economic Growth and Related Impacts. Cumulative impacts are discussed in Section 3.17, Cumulative Impacts Evaluation.

Use of the term "significant" differs under NEPA and CEQA. While CEQA requires that the significance of impacts be discussed in an EIR, NEPA does not require such discussion in an EIS. Under NEPA, significance is used to determine whether an EIS or some other level of documentation is required, and once a decision to prepare an EIS is made, the EIS reports all impacts and discusses feasible mitigation. Under CEQA, significance is used to determine whether to prepare an EIR, and then to evaluate the severity of potential adverse environmental impacts in the EIR. The EIR must also discuss feasible mitigation measures that could reduce potentially significant effects. For this reason, CEQA significance criteria and the determination of significant impacts under CEQA have been addressed separately in this section.

NEPA anticipates that mitigation will be considered where feasible for the potential impacts of a project. Therefore, while consideration of some mitigation strategies described in this EIR/EIS and in this section is appropriate under NEPA, the potential impacts they address may not be considered significant under CEQA.

7.3.1 California Environmental Quality Act Significance Thresholds

CEQA requires that an EIR identify the potentially significant environmental effects of the project (CEQA Guidelines Section 15126), but does not promulgate specific thresholds for significance. Instead, CEQA Guidelines Section 15064(b) states that "the determination…calls for careful judgment on the part of the public agency involved…" and that "an ironclad definition of significant effect is not possible because the significance of an activity may vary with the setting." The fundamental definition of significant effect under CEQA is "a substantial adverse change in physical conditions." This criterion underlies the evaluation of environmental impacts for most of the impact issues identified in the CEQA Environmental

Checklist Form (Guidelines Appendix G). CEQA encourages lead agencies to develop and publish their own thresholds of significance for the purpose of determining the significant effects of their projects. Given the planning-level impact analysis considered in this Program EIR/EIS, the Authority has not developed project-specific significance thresholds.

Some impact categories lend themselves to scientific or mathematical analysis, and therefore to quantification. Some categories have significance thresholds established by regulatory agencies, such as noise criteria or regional air pollutant criteria. For other impact categories that are more qualitative or are entirely dependent on the immediate setting, a hard-and-fast threshold is not generally feasible, and the "substantial adverse change in physical conditions" is applied as the significance criterion. In the current analysis, the CEQA checklist thresholds have been used to evaluate the significance of effects of the HST Alternative.

CEQA states that economic and social changes resulting from a project shall not be treated as significant effects on the environment (CEQA Guidelines, 15064[e]). Economic or social changes may be used, however, to determine that a physical change should be regarded as a significant effect on the environment. Where a physical change is caused by economic or social effects of a project, it may be regarded as a significant effect in the same manner as any other physical change resulting from the project. If it causes adverse economic or social effects on people, those adverse effects may be used as a factor in determining whether the physical change is a significant effect on the environment. Where the Modal or HST Alternative would involve widening or expanding existing transportation rights-of-way, the potential for adverse environmental impacts and for potential economic or social effects is limited, since the transportation corridor and its associated impacts are already well established. Where the Modal or HST Alternative would involve new transportation facilities on new right-of-way (e.g., stations or alignment), or would bring large numbers of people to new station areas, however, there is greater potential for significant effect.

7.3.2 Significant Unavoidable Adverse Effects

This section identifies those environmental categories that, given their potential for impact, would be those most likely to experience potentially significant unavoidable adverse effects at some locations along the alignments being considered for the proposed HST system. The planning level of environmental review presented in this Program EIR/EIS does not seek to quantify impacts as would typically be done at a project level. Instead, this Program EIR/EIS evaluates the potential for significant effects for each alternative based on the density of resources and/or sensitive receptors within the project vicinity and ranks the potential for impact as high, medium, or low. This is an appropriate assessment of potential impacts at this stage of such a large, statewide undertaking. The Program EIR/EIS considers alternatives and options, identifies the lesser-impact approaches in each corridor or segment, and provides a basis for identifying mitigation strategies that is relevant to the decisions at hand.

Based on this planning level of analysis, potentially significant unavoidable impacts are only identified generally. With the statewide scope of the project, and the size and diversity of the geographic areas traversed by the potential HST alignment, station options, and project alternatives, it is likely not feasible to avoid or reduce all of the potentially significant impacts of the proposed HST system at every location under consideration through project modifications, or to mitigate all these potential impacts to a less-than-significant level. Table 7.3-1 provides a summary list of the environmental categories, general mitigation strategies, potentially significant impacts, and potential levels of significance after mitigation. Depending on the alignment options that may ultimately be selected, potentially significant unavoidable effects can be expected at some locations within the proposed HST system in the general environmental categories of agricultural lands, biological resources and wetlands, hydrology and water resources, and cultural resources. However, neither the extent of such potential impacts, nor the potential locations for such impacts, can be determined at this level of analysis. For several of the environmental categories listed in the table below (including agricultural lands, wetlands, hydrology, and cultural resources), the quantities presented represent areas within which potential impacts might occur by including all the potentially affected resources or acreage in the study area for the resource topic listed. For example, the area of floodplains includes all floodplains within 100 feet (ft) (30 meters [m]) of either side of the centerline of the alignment being considered, whereas the right-of-way needed (e.g., 25 ft [8 m] on either side of centerline for the proposed HST system) for the improvements considered and the area that would be used for the improvements (e.g., the footprint for the proposed HST system) would be much less, so the potential for impacts would likewise be less. Therefore, the determination of significance is potential rather than absolute. The determination of a potentially significant or unavoidable impact would be used to focus attention at the next phase of planning and environmental review (project-specific, detailed analysis).

7.3.3 California Environmental Quality Act Environmentally Superior Alternative

The CEQA Guidelines state that, where the No Project Alternative is the environmentally superior alternative, the EIR shall also identify the environmentally superior alternative from among the other alternatives (CEQA Guidelines 15126.6[e][2]). Based on the evaluations documented in Chapter 3 of this Program EIR/EIS, the HST Alternative has been identified as the environmentally superior alternative.

Table 7.3-1
Summary of Key Environmental Impact/Benefits of Alternatives

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Traffic and Circulation	Capacity is insufficient to accommodate projected growth. Over half of 68 intercity highway segments considered would operate at unacceptable levels of service with increased congestion, travel delays, and accidents compared to existing conditions. Congestion would increase.	Congestion reduction on intercity highways compared to the No Project and HST Alternatives. However, the analysis could not account for potential use of the excess capacity by non-intercity (commuter and short-distance) trips. Congestion and travel delays on surface streets leading to and from highways/ airports.	Congestion reduction on intercity highways compared to the No Project Alternative. However, the analysis could not account for potential use of excess capacity by non-intercity (commuter and short-distance) trips. 34 million fewer long-distance automobile passengers on highways. Localized traffic conditions around stations impacted.	Encourage use of transit to stations. Work with transit providers to improve station connections.	Potentially significant	Potentially less than significant/ potentially significant/ unavoidable
Travel Conditions (travel time, reliability, safety, connectivity, sustainable capacity, passenger cost)	Longer travel times, more delay. Lower reliability due to dependence on the automobile. Increase in injuries and fatalities due to increase in highway travel. No net improvement to connectivity options. No significant increase in capacity for highway or air	Travel time reduction compared to the No Project Alternative. Improved reliability over No Project due to increased capacity. Increase in injuries and fatalities due to more highway travel. No new modes introduced; additional air frequency. Modal improvements would provide sufficient capacity to	Travel time reduction compared to the No Project Alternative. Greatest improvement in reliability due to high reliability of HST mode; significant levels of diversion to HST from auto and air result in reduced congestion; and additional modal option improves reliability for overall transportation system. Decrease in injuries and fatalities due to diversion of trips from highways.	N/A	Beneficial	N/A

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
	infrastructure, and significant worsening of congestion due to increased demand.	meet representative demand, but would have little or no capacity beyond that level. Passenger costs approximately the same as the No Project Alternative.	Highest level of connectivity. New mode would add a variety of connections to existing modes, additional frequencies, and greater flexibility. HST system would provide sufficient capacity to meet representative demand and would provide substantial additional capacity with minimal additional infrastructure. HST system would provide a release valve for the existing intercity modes. Overall savings in passenger costs of 8% to 44% compared to No Project, depending on the origin and destination of travel. HST passenger costs are competitive with the automobile travel and less expensive than air travel.			
Air Quality (Conformity Rule; tons of pollutants)	Emissions predicted to decrease in 2020 due to low emission vehicles; PM10 to increase statewide. Estimated CO 806,304 tons/year, NO_x 187,972 tons/year, TOG 121,222 tons/year; CO_2 374 million tons/year.	Vehicle miles traveled increase by 1.1% over 2020 No Project. CO 812,801 tons/year; NO_x189,238 tons/year; TOG 122,049 tons/year; CO_2 374 million tons/year.	Air quality benefit. Decrease in pollutants compared to No Project: CO 799,204 to 803,140 tons/year; NO_x 185,232 to 186,384 tons/year; TOG 120,510 to 120,895 tons/year; CO_2 368 to 372 million tons/year (0.45% to 1.4% less than No Project). (Range based on low- to high-end ridership forecasts.)	Control of construction-related emissions.	Beneficial	N/A

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Energy Use	24.3 million barrels of oil consumed annually in 2020; 6.8 million over existing conditions.	Higher total energy consumption–24.5 million barrels of oil in 2020. Higher construction energy consumption 241 MMBtus.	Energy benefit. Lower total energy consumption: 19.1 million (high-end ridership) and 22.3 million (low-end) barrels of oil in 2020; overall decrease of 2.0 to 5.2 million barrels of oil compared to No Project. Increase in electric power demand/use of natural gas. Lower construction energy consumption: 152 MMBtus (high-end ridership) and 127 MMBtus (low-end ridership).	Develop and implement energy conservation plan for construction.	Beneficial	N/A
Land Use (compatibility and property impacts)	Expansion of urban sprawl as population grows and congestion increases; development on open space and agricultural lands.	Improved access to outlying areas and communities; sprawl; incompatible with transit–first policies. High property acquisition impacts along constrained existing rights-of-way in heavily urbanized areas; 309 mi (497 km) (20% of corridor) would affect high-impact land uses.	Controlled growth around stations, urban in-fill; compatible with transit-first policies. Majority of property acquisition along existing rights of way, some acquisition along new rights of way in undeveloped areas; between 53 and 88 mi (85 and 142 km) of HST would affect high impact land uses. (Range based on alignment options selected to comprise the HST system.)	Continued coordination with local agencies. Explore opportunities for joint and mixed-use development at stations. Relocation assistance during future project-level review.	Potentially significant	Potentially less than significant

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Visual Quality	No predictable change to existing landscape.	Low to moderate contrasts along existing highways and airports; high contrasts through mountain crossings and natural open space landscapes.	Moderate to high visual contrasts for elevated structures; high sensitivity in scenic open space and mountain crossings.	Design strategies to minimize bulk and shading of bridges and elevated guideways. Use neutral colors and materials to blend with surrounding landscape features.	Potentially significant	Potentially less than significant/ potentially significant/ unavoidable
Noise	More traffic and more air operations from growth in the intercity demand generate more noise.	210 mi (338 km) or 14% of total highway corridor miles improved would have high impacts on noise-sensitive land use/populations. The Modal Alternative would include five additional runways statewide in heavily urbanized areas. Noise is one of the most prominent factors in the environmental acceptability of airport improvement expansion and is often the limiting factor in approval of such improvements.	21 to 107 mi (34 to 172 km) or 3% to 14% of alignment length statewide would have high impacts on noise-sensitive land use/populations; with mitigation, 0% of alignment would have high impacts. Noise increase due to additional high-speed train frequencies. Noise reduction from existing conditions due to elimination of horn and crossing gate noise resulting from grade separation of existing grade crossings. (Range based on alignment options selected to comprise the HST system.)	Consider sound barriers along noise-sensitive corridors; track treatment for vibration.	Potentially significant	Potentially less than significant

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	**Modal**	**HST**		**Before Mitigation**	**After Mitigation**
Farmland (includes area within 50 ft [15 m] on each side of alignment centerline [100 ft or 30 m total])	No predictable change from existing conditions as a result from the No Project transportation improvements. Continued loss of farmland in California at rate of 49,700 ac (20,113 ha) per year from population growth and urbanization (845,000 ac [341,960 ha] by 2020).	Right-of-way needs of the improvements could potentially impact a total of 1,118 ac (452 ha) of farmlands.	Right-of-way needs of the HST could potentially impact a total of 2,445–3860 ac (989–1,562 ha) of farmlands. New corridor alignments through farmlands could have potential severance impacts. (Range based on alignment options selected to comprise the HST system.)	Avoid or reduce impacts by sharing existing rail rights-of-way to the maximum extent possible and avoiding alignment options in established farmlands. Consider farmland preservation strategies.	Potentially significant	Potentially significant/ unavoidable
Biological Resources and Wetlands (Includes area within 50 ft [15 m] on each side of alignment centerline; 100 ft or 30 m total])	No predictable change from existing conditions.	1,476 ac (597 ha) of sensitive habitat; 100ac (40 ha) of wetland; 90 special-status species.	1,201 to 1,568 ac (486 to 635 ha) of sensitive habitat; 30 to 89 ac (12 to 36 ha) of wetland; 67 to 84 special-status species. (Range based on alignment options selected to comprise the HST system.)	Work with resource agencies to develop site-specific mitigation and impact avoidance strategies for project-level review in coordination with local and regional plans and policies.	Potentially significant	Potentially significant/ unavoidable

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Hydrology and Water Resources (floodplains include area within 100 ft [30 m] on each side of alignment centerline [200 ft or 61 km total]; streams and lakes include area within 50 ft [15 m] on each side of centerline [100 ft or 30 m total])	No predictable change from existing conditions.	5,540 ac (2,242 ha) of floodplains, 39,520 linear ft (12,045 m) of streams, 25 ac lakes (10 ha) within 50 ft (15 m).	1,865 to 3,873 ac (755 to 1,567 ha) of floodplains; 22,600 to 32,400 linear ft. (6,888 to 9,875 m) of streams; 7 to 27 ac (3 to 11 ha) of lakes within 50 ft (15 m). (Range based on alignment options selected to comprise the HST system.)	Avoid or minimize footprint in floodplains; conduct project-level analysis of surface hydrology and coastal lagoons; BMPs for construction as part of Storm Water Pollution Prevention Plan.	Potentially significant	Potentially less than significant / potentially significant/ unavoidable
Section 4(f) and 6(f) (Public Parks and Recreation) (includes area within 900 ft [274 m] on each side of alignment centerline [1,800 ft or 549 m total])	No predictable change from existing conditions.	132 Section 4(f) properties potentially affected; 8 wildlife refuges.	54–89 Section 4(f) properties potentially affected; 1–6 wildlife refuges. (Range based on alignment options selected to comprise the HST system.)	Consider design options to avoid parkland and wildlife refuges; identify potential site-specific mitigation measures.	Potentially significant	Potentially less than significant / potentially significant/ unavoidable

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Cultural Resources (including Section 4(f) historical resources)	Low ranking for impacts on archaeological resources and historic property.	Medium ranking for potential impacts on archaeological resources and historic properties.	Medium to high ranking for potential impacts on archaeological resources and historic properties (HST would use existing rail corridors and some stations and nearby resources developed in historic period).	Develop procedures for fieldwork, identification, evaluation, and determination of effects for cultural resources in consultation with State Historic Preservation Office and Native American Tribes.	Potentially significant	Potentially significant/ unavoidable

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Growth Potential	Statewide population is expected to grow by about 54%, statewide employment is expected to increase by 46%, and urbanized areas are expected to increase by 48% between 2002 and 2035.	Statewide population is expected to grow by 55% between 2002 and 2035 (360,000 more than No Project), statewide employment is expected to increase by 47% (250,000 jobs more than the No Project), and urbanized areas are expected to increase by 50% (65,500 ac [26,507 ha] more than the No Project) between 2002 and 2035. Increased development at major interchanges along highways and around airports; sprawl, particularly in Central Valley region.	Statewide population is expected to grow by 56% between 2002 and 2035 (700,000 more than No Project), statewide employment is expected to increase by 48% (450,000 jobs more than the No Project), and urbanized areas are expected to increase by 48% (2,600 ac [1,052 ha] less than the No Project). Transit-oriented development around stations; planned growth consistent with RTPs; growth around Merced.	Work with local communities to encourage higher density development around stations.	Potentially beneficial	N/A
Public Utilities	No impact.	Potential conflicts with 831 utilities.	Potential conflicts with 545 to 812 utilities, depending on alignments.	Relocate, reconstruct, or restore utility; consolidate several utilities underground into one conduit during relocation.	Potentially significant	Potentially less than significant

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation
Geology	Potentially susceptible to seismic hazards.	Potentially susceptible to seismic hazards, liquefaction.	Potential seismic hazards, slope stability in cut sections.	Use of ground motion data and instruments; routine maintenance of track; slope reinforcement.	Potentially significant	Potentially less than significant
Electromagnetic Fields (EMF) and Electromagnetic Interference (EMI)	General EMF levels may be increased from low-level radiofrequency and infrared for radar and radar-like purposes, and from wireless data transfer and advanced technologies; not likely to cause significant changes in EMF or EMI levels.	Not likely to cause significant changes in EMF levels or human exposure to EMF or EMI.	Various components of HST infrastructure and trains would be sources of extremely low frequency magnetic fields, and radiofrequency EMFs; overall, HST would introduce additional EMF exposures or EMI at levels for which there are not established adverse impacts.	Design features that reduce fields at the source (overhead catenary system, substations, transmission lines; some shielding with metal panels or screens).	No significant impact	Less than significant
Hazardous Materials	Disposal, clean-up or remediation of exposure to hazardous materials during construction	Estimated 33 additional Superfund, SPL, or solid waste landfill (SWLF) sites potentially impacted	Estimated 31 to 72 additional Superfund, SPL, or SWLF sites potentially affected by construction.	Detailed Initial Site Assessment, avoid sites where practicable, sub-surface investigation where needed to characterize sites and identify remediation.	Potentially Significant	Potentially less than significant

Key Environmental Issues	Alternative			Mitigation Strategy for HST	Potential Significance for HST	
	No Project	Modal	HST		Before Mitigation	After Mitigation

ac = acres
CO = carbon monoxide
CO_2 = carbon dioxide
ha = hectares
MMBtus = million British thermal units
N/A = not available.
NO_x = oxides of nitrogen
PM10 = particulate matter 10 microns in diameter or less
RTPs = regional transportation plans
TOG = total organic gases

8 PUBLIC AND AGENCY INVOLVEMENT

Pursuant to the requirements of CEQA and NEPA, the Authority and the FRA as lead agencies have conducted a public and agency involvement program as part of the program environmental review process. This chapter describes the public and agency involvement efforts conducted in the preparation of this Program EIR/EIS. The public and agency involvement program included the following efforts.

- Public involvement and outreach—informational materials, including region-specific fact sheets; information and scoping meetings including town hall meetings; public and agency scoping meetings, meetings with individuals and groups, presentations and briefings.
- Agency involvement—agency scoping meetings, interagency working group, other agency consultation.
- Notification and circulation of the Program EIR/EIS.

8.1 PUBLIC INVOLVEMENT AND OUTREACH BEFORE DRAFT PROGRAM EIR/EIS RELEASE

8.1.1 Public Information

A. MAILING LIST

A mailing list database was developed and used to provide information and announcements concerning the preparation of the Program EIR/EIS to the public. The database was based on an existing Authority contact list and includes more than 15,500 entries of federal, state, and local agency representatives; elected officials; property owners; interested persons; and interested organizations. The mailing list was updated to include public meeting participants and others who asked to be added. This list was used to provide notification of scoping events. The mailing list does not represent the distribution list for the Program EIR/EIS, which is presented in Chapter 11.

B. PUBLICATIONS AND MATERIALS

During the scoping phase, fact sheets were developed on various topics. The general fact sheet regarding scoping meetings was translated into Spanish and Chinese. Individual fact sheets covering the following general topics were compiled.

- Dates and agendas of scoping meetings.
- Role and responsibilities of the California High Speed Rail Authority.
- Project description.
- Project purpose and need and objectives, and project alternatives.
- Preliminary alignment and station options in the five regions.
- Types of high-speed trains being considered.
- Typical cross sections of high-speed train alternatives.
- Environmental review process.
- Environmental issues and technical studies.
- Visual and aesthetic resources potentially affected by the project.
- Noise and vibration, resources potentially affected by the project.

C. CALIFORNIA HIGH SPEED RAIL AUTHORITY WEB SITE

During the program environmental review process, project information and announcements have been posted on the Authority's Web site (www.cahighspeedrail.ca.gov). The Authority uses the Web site to make public documents widely available. The site includes information on high–speed trains, a proposed route map from the Authority's final business plan (California High Speed Rail Authority 2002), newsletters, press releases, board of director meeting information, recent developments and new information regarding status of the environmental review process ("What's new?"), information to contact the Authority, and related links. The scoping reports and the alternatives screening reports and public materials, in addition to other reports, have also been made available on the Web site. The Web site is generally updated monthly.

8.1.2 Public Meetings

The Authority and the FRA held both informal and formal public meetings during the EIR/EIS preparation process. Various meeting formats (e.g., open house, formal presentation, and question and comment session) were used to present information and provide opportunities for input by participants. Numerous briefings, presentations, and small group meetings were included in the process. (See Chapter 9, Organization, Agency, and Business Outreach, for a list of meetings in addition to those noted here.) There were four general categories of public meetings: town hall meetings, public and agency scoping meetings, Authority governing board meetings, and presentations and briefings to interested groups.

A. TOWN HALL MEETINGS

Fifteen informal town hall meetings were held between February 5, 2001 and March 29, 2001, to inform the public about the EIR/EIS preparation process and the subsequent more formal public and agency scoping process. The town hall meetings included a presentation on the proposed HST system and alternatives, the environmental review process, and ways to participate in the Program EIR/EIS preparation process, along with a question-and-answer session with Authority staff and consultants. Meetings were announced through direct mail, a press release, and an announcement posted on the Authority's Web site. Approximately 538 people attended the town hall meetings. A summary of the meetings and input received is presented in Outcome Report: Town Hall Meetings—August 1, 2001. The places and dates of the town hall meetings are listed below.

- California State University, Sacramento—February 5, 2001.
- California Pubic Utilities Commission—February 5, 2001.
- California State University, Hayward—February 8, 2001.
- California State University, Stanislaus—February 12, 2001.
- California Sate University, Fresno—February 15, 2001.
- San Jose State University—February 15, 2001.
- California State University, Bakersfield—February 26, 2001.
- Palmdale City Hall—March 1, 2001.
- California State University, Northridge—Mach 5, 2001.
- California State University, Los Angeles—March 8, 2001.
- California State University, Fullerton—March 12, 2001.
- California State Polytechnic University, Pomona—March 15, 2001.
- California Sate University, San Bernardino—March 19, 2001.

- California State University, San Marcos—March 22, 2001.
- San Diego State University—March 29, 2001.

B. PUBLIC AND AGENCY SCOPING MEETINGS

Seventeen public and agency scoping meetings were held between April 25, 2001 and May 23, 2001. In most locations, one meeting was conducted during the day and one during the evening to accommodate agency representatives and the general public. Meetings generally began with an informal open house and exhibit display followed by a presentation and comment session. Comments were documented and are summarized below by region and in the Final Statewide Scoping Report, December 14, 2001. Agendas, fact sheets, and scoping period comment sheets were provided. The federal notice of intent was published in the Federal Register on May 2, 2001, and the state notice of preparation was issued on April 6, 2001. Direct mail announcements of the public scoping meetings were sent to the 15,500 persons listed in the database, and the scoping meetings were announced on the Authority's Web site. Approximately 400 people participated in the formal scoping meetings. The places and dates of the public and agency scoping meetings are listed below.

- Sacramento: State Resources Building—April 24, 2001, 1:00 p.m. to 3:30 p.m.
- Oakland: Oakland City Hall—April 25, 2001, 11:00 a.m. & 6:00 p.m.
- Bakersfield: Kern County Administration Building—April 30, 2001, 3:00 p.m. & 6:00 p.m.
- Los Angeles: Japanese/American National Museum—May 2, 2001, 4:00 p.m. & 6:30 p.m.
- Fresno: Fresno City Hall—May 7, 2001, 3:00 p.m. & 6:00 p.m.
- Riverside: Riverside Convention Center—May 8, 2001, 6:30 p.m.
- San Diego: San Diego Association of Governments—May 10, 2001, 2:30 p.m., University Towne Centre, 6:00 p.m.
- Modesto: Modesto City/County Admin. Bldg.—May 14, 2001, 3:00 p.m. & 6:00 p.m.
- San Jose: Berger Drive Facility, Auditorium—May 15, 2001, 1:30 p.m. & 6:00 p.m.
- Irvine: Irvine Civic Center—May 23, 2001, 3:00 p.m. & 6:00 p.m.

In addition to the formal scoping meetings, other presentations, briefings, and workshops were held during the scoping process. Workshops were attended primarily by public agencies and other representative local organizations. Notification of the workshops was provided by telephone and fax to local/regional agency and organization representatives. Chapter 9, Persons and Organizations Contacted, includes a list of the additional meetings held as part of the Authority's outreach effort, both during and subsequent to scoping. Comments from these scoping workshops and meetings are summarized in the Scoping Reports, July 2001 for each of the five regions (Bay Area to Merced, Sacramento to Bakersfield, Bakersfield to Los Angeles, Los Angeles to San Diego via Inland Empire, and Los Angeles to San Diego via Orange County.

C. CALIFORNIA HIGH SPEED RAIL AUTHORITY BOARD MEETINGS

The Authority governing board typically holds monthly meetings. Board meetings are held in different locations to encourage participation from agencies and the general public in multiple areas of the state. The board meetings held during the program environmental review process regularly included status reports on the preparation of the Program EIR/EIS and provided opportunities for public comment. Authority board meetings are announced by posting on the Authority's Web site and by mailing to approximately 1,600 persons and organizations. Board meeting minutes are also posted on the Web site. The places and dates of the meetings of the Authority's board meetings are listed below.

- Oakland—April 25, 2001.
- Los Angeles—June 20, 2001.
- San Jose—August 1, 2001.
- Los Angeles—September 19, 2001.
- Burbank—October 26, 2001.
- Bakersfield—November 14, 2001.
- Sacramento—January 16, 2002.
- San Diego—February 20, 2002.
- San Francisco—March 20, 2002.
- San Bernardino—April 17, 2002.
- Oakland—May 15, 2002.
- Anaheim—June 19, 2002.
- San Jose—July 17, 2002.
- Fresno—August 21, 2002.
- Los Angeles—September 18, 2002.
- Sacramento—October 16, 2002.
- Bakersfield—November 20, 2002.
- San Francisco—January 28, 2003.
- Los Angeles—February 25, 2003.
- Irvine—May 27, 2003.
- Oakland—June 24, 2003.
- Los Angeles—July 22, 2003.

D. PRESENTATIONS, BRIEFINGS, AND OUTREACH

During the program environmental review process, presentations to conferences, forums, local and regional government agencies, interest groups and organizations, as well as agency meetings and other briefings, have been conducted to provide general information concerning the proposed HST system and the program environmental review process. Interest groups included non-governmental organizations (e.g., the Sierra Club), community planning organizations (e.g., San Francisco Planning and Urban Research Association [SPUR]), and public interest discussion/research groups (e.g., Los Angeles Town Hall). The state, regional, and local groups that participated in this aspect of the Authority and FRA outreach effort are listed in Chapter 9.

8.2 AGENCY CONSULTATION BEFORE DRAFT PROGRAM EIR/EIS RELEASE

8.2.1 Agency Scoping

In addition to the statewide scoping meeting held in Sacramento on April 24, 2001, scoping meetings and informal roundtable/workshop meetings were conducted with many public agencies. Many of the agency contacts made during the scoping process led to subsequent one-on-one and small group agency consultation meetings during the preparation of the Program EIR/EIS.

8.2.2 Interagency Consultation

The Authority and the FRA convened staff representatives from 27 interested federal and state agencies to provide input on the environmental review process. Six federal agencies (U.S. Environmental Protection Agency [EPA], U.S. Army Corps of Engineers [USACE], Federal Aviation Administration [FAA], Federal Transit Administration [FTA], Federal Highway Administration [FHWA], and U.S. Fish and Wildlife Service [USFWS]) were designated cooperating agencies under NEPA for the preparation of the Program EIR/EIS, as reflected in a memorandum of understanding among these agencies and the FRA. There were nine consultation meetings: April 24, 2001; September 26, 2001; May 8, 2002; June 26, 2002; September 12, 2002; December 17, 2002; March 12, 2003; May 28, 2003; and July 23, 2003.

The federal cooperating agencies and the lead agencies also met on six occasions: May 8, 2002; September 12, 2002; December 17, 2002; March 11, 2003; May 28, 2003; and July 23, 2003.

8.2.3 Other Agency Consultation

In addition to the scoping process and interagency staff meetings, agency consultation has taken place at the state and regional levels. For example, the Authority participated in a workshop hosted by the San Diego Area Governments (SANDAG), which a number of regional jurisdictions attended. Chapter 9, Organization, Agency, and Business Outreach, lists these additional briefings.

The Authority met with EPA and USACE for purposes of NEPA 404 consultation on July 9, 2002. The FRA also participated in meetings with the Authority, EPA, and USACE on September 12, 2002, December 16, 2002, and December 10, 2003.

The Authority met with staff of the State Historic Preservation Office on October 23, 2002 to define the area of potential effect for the archaeology and historic property evaluation and to discuss the method of analysis proposed for this Program EIR/EIS.

The FRA and the Authority also initiated consultation with the Native American Heritage Commission for a search of their Sacred Lands file and lists of Native American contacts. The contacts were sent letters providing information about the proposed project alternatives and requesting information about any traditional cultural properties that could be affected by the project. The Authority also met with tribal representatives on September 9, 2003, at Frazier Park in the Tehachapi Mountains, on September 10, 2003, at the San Luis Recreation Area in Gustine, and on October 9, 2003, at the Temecula Community Center.

8.3 SCOPING SUMMARY

The scoping process helped the lead agencies identify general environmental issues to be addressed in this Program EIR/EIS. The public and agency comments identified support for and interest in the proposed high-speed train system in the general corridors to be studied, and indicated the need for the proposed system to be connected to existing transportation systems. Providing potential freight service was also frequently mentioned. Concerns regarding environmental issues typically focused on potential noise and visual impacts, safety issues, potential impacts on air quality and sensitive habitats, and the potential for growth inducement. In addition to these issues, comments and concerns specific to each region are summarized below.

8.3.1 Bay Area to Merced

In the East Bay and Peninsula corridors, comments suggested the need to consider improving existing passenger rail services in existing corridors with compatible/consistent technologies versus adding new dedicated rights-of-way and services. Support was expressed for station locations at the proposed new Transbay Terminal in San Francisco and in downtown Oakland. The comments identified the need for the project to be sensitive to such environmental issues as noise, visual impacts, safety, impacts on wildlife refuges, and effects of induced growth. Concerns were raised regarding train speeds in urban areas. Some comments suggested including Altamont Pass in the study.

8.3.2 Sacramento to Bakersfield

Generally, the public and agency comments on an HST system in the Central Valley identified strong support for using existing rail corridors as much as possible to minimize disruption in the urban cores, as well as to minimize impacts on agricultural lands in the Central Valley. Many comments indicated a greater need for high-speed rail in the Central Valley than in other areas of the state because of limited air service into and out of the Central Valley cities. The most frequently mentioned environmental issues were preserving agricultural lands, contributing to improved air quality, and limiting potential impacts on future growth patterns.

8.3.3 Bakersfield to Los Angeles

The majority of those commenting on the HST system in this region viewed the Palmdale alignment (either through the Palmdale airport or the Transportation Center) as the preferred alignment. The I-5/Grapevine alignment was less preferred because of the extensive tunneling proposed, the seismic instability in the area, and the costs and uncertainty associated with tunnel construction. Comments expressed concern over the possible effects of the project, including adverse impacts on surrounding land uses, recreational areas, and agricultural lands, as well as general safety issues.

8.3.4 Los Angeles to San Diego via Inland Empire

In the inland corridor, two different lines of comments were presented: that the alignments should focus on corridors with the densest population, and that the alignments should focus on open land areas where greater opportunities for growth and development may exist. Comments from agencies indicated a concern that proposed stations should be located where transit-oriented land use, accessibility, and parking needs could be accommodated. Many comments suggested that this inland corridor should be connected to downtown San Diego. Comments pertaining to environmental concerns focused on visual impacts, impacts on floodplains/wetlands and sensitive habitats, noise impacts, traffic impacts, and possible growth-inducing impacts.

8.3.5 Los Angeles to San Diego via Orange County

Public and agency views on the relationship of high-speed trains and connectivity to LAX were varied and conflicting as to whether this would relieve or increase development pressures at LAX. Concerns about the existing LOSSAN rail corridor (south of Irvine) focused on the need to improve existing services rather than add new dedicated rights-of-way and services. Comments suggested the I-15 corridor would be better suited to dedicated high-speed services. Many comments from communities south of Irvine identified support for grade separation, but concerns were raised over the potential impacts of 200-mph train speeds on the existing communities along the LOSSAN corridor. Comments on environmental issues focused on potential visual, air quality, and noise impacts; compatibility with existing and planned land uses; impacts on sensitive lagoon and wetland areas; and safety. The potential impacts of an overhead catenary power supply system on views along the coast were noted. Impairment of or impacts on recreational facilities, or access to these facilities, was also raised as a concern.

8.4 NOTIFICATION AND CIRCULATION OF THE DRAFT PROGRAM EIR/EIS

Notice regarding the availability and the circulation of this Draft Program EIR/EIS were provided pursuant to CEQA and NEPA requirements. The Draft Program EIR/EIS was released for public review and comment on January 27, 2004 and noticed in the federal register on February 13, 2004. The initial public comment period was scheduled to end May 14, 2004, but due to public requests, it was extended to August 31, 2004. Responsible agency and the public oral and written comments submitted by August 31, 2004 will be addressed and responded to in the Final Program EIR/EIS.

Notification packets announcing the availability of the Draft Program EIR/EIS were mailed on February 6, 2004 to federal cooperating agencies, other affected agencies and elected officials. The federal cooperating agencies received an announcement letter from the Authority, a hard copy of the Draft Program EIR/EIS, and a CD copy of the document with appendices. 140 other affected public agencies received an announcement letter from the Authority, an Executive Summary and a CD copy of the document with appendices. 282 elected officials received an announcement letter from the Authority, a Summary Brochure and a CD copy of the document with appendices. A distribution list for the Draft Program EIR/EIS is provided in Chapter 11.

To further publicize the release of the draft environmental document, press briefings were held in San Francisco, Los Angeles and Fresno. The Authority Board Chairperson, Joseph Petrillo, provided an overview of the project and the Draft Program EIR/EIS. Public Officials from each region made remarks expressing their views on the proposed project. Several media representatives attended each briefing.

The general public was informed of the Draft Program EIR/EIS release through distribution of an announcement of the document's availability to the project mailing list. The announcement also provided the details for submitting comments by mail or fax and announced that public hearings will be held in the future. The mailing list contains approximately 10,000 statewide contacts including: federal, state, and local elected officials; federal, state and local agency representatives; chambers of commerce; environmental and transportation organizations; special interest groups; media; private entities; and members of the public. The mailing list is based on the database developed during the scoping phase. The mailing list is on file with the Authority and is available for viewing.

The Program EIR/EIS was also made available for viewing and downloading at the Authority's website, www.cahighspeedrail.ca.gov. Comments were accepted directly from the website as well. The website also provided the opportunity to request a CD ROM of the document.

The announcement and website listed the 32 statewide libraries with a hard copy of the document available for review. Participating libraries were located in the following cities: Anaheim, Bakersfield, Burbank, Escondido, Fremont, Fresno, Gilroy, Irvine, Los Angeles, Merced, Modesto, Mountain View, Norwalk, Oakland, Oceanside, Ontario, Palmdale, Palo Alto, Riverside, Sacramento, San Clemente, San Diego, San Francisco, San Gabriel, San Jose, Santa Clarita, Stockton, Sylmar, Temecula, and Tulare.

The release of the Draft Program EIR/EIS was also announced through a display ad distributed in 16 statewide newspapers. The display ads were published on Friday, February 13, 2004 in the following newspapers: Sacramento Bee, Daily Republic, Oakland Tribune, San Francisco Chronicle, San Jose Mercury, Modesto Bee, Merced Sun Star, Fresno Bee, Bakersfield Californian, Los Angeles Times, Orange County Register, Antelope Valley Press, The Press-Enterprise, North County Times, San Diego Tribune, and Stockton Record.

The Authority held a total of seven public hearings to present the Draft Program EIR/EIS and to receive public comments. Originally, five public hearings were scheduled, but with the extension of the public comment period to August 31, 2004, two more public hearings were planned. A court reporter was present at each of the public hearings to record oral comments. At each public hearing, oral comments could be made during the "public testimony" portion of the meeting or during the open house portion of the meeting to the court reporter at the "public comments" table. Oral comments on the Draft EIR/EIS were only accepted during the seven public hearings.

The public was notified of the first five public hearings through an announcement that provided the public hearing locations and schedule. The announcement was mailed on March 12, 2004 to the project mailing list (list is described in the "Document Availability" section).

The two additional public hearings were announced through a Notice Postcard mailed on May 13, 2004 to the project mailing list.

The public hearings were also announced through a second display ad distributed in 16 statewide newspapers. The display ad for the first five public hearings was published on Friday, March 19, 2004 and the ad for the two additional public hearings on May 10 and 12. The same newspapers were used as with the Notice of Availability display ad (listed in the "Document Availability" section).

Each of the five initial public hearings started at 3:00 PM and ended at 8:00 PM. The hours were selected to facilitate participation by the public. From 3:00 to 4:00 PM there was an informational open house with exhibit boards available for viewing and project staff present to answer questions and discuss issues. Formal public testimony began at 4:00 PM. Authority Board Chairperson Joseph Petrillo, facilitated the public testimony. Other Board Members, Mehdi Morshed, Executive Director of the Authority and David Valenstein, FRA Representative (at selected meetings only) were present to listen to comments. The open house resumed once all public testimony was received.

The public hearings were scheduled as follows:

Sacramento – Tuesday, March 23, 2004
Los Angeles – Tuesday, April 13 2004
San Francisco – Thursday, April 15, 2004
San Diego – Tuesday, April 20, 2004
Fresno – Wednesday, April 28, 2004

The two additional public hearings were held from 1:00 PM to 3:00 PM, all of which was public testimony. Exhibit boards were available and project staff present to answer questions and discuss issues. Chairperson Joseph Petrillo facilitated the public testimony and other Board Members and Mehdi Morshed were present to listen to comments.

The two additional public hearings were scheduled as follows:

San Jose – Wednesday, May 26, 2004
Los Angeles – Wednesday, June 23, 2004

At each public hearing, speaker cards were available for public testimony. Individuals, who wished to testify, submitted a speaker card and were then called in turn by the facilitator. Individual comments were time limited to provide equal opportunity for all to comment. A court reporter was present and recorded all the oral comments. Individuals were also able to make oral comments directly to the court reporter once the public testimony session had ended. Comment sheets were available for submitting written comments.

Public Hearing Summary

The Authority held a total of seven public hearings to present the Draft Program EIR/EIS and to receive public comments. Originally, five public hearings were scheduled, but with the extension of the public comment period to August 31, 2004, two more public hearings were planned. A court reporter was present at each of the public hearings to record oral comments. At each public hearing, oral comments could be made during the "public testimony" portion of the meeting or during the open house portion of the meeting to the court reporter at the "public comments" table. Oral comments on the Draft EIR/EIS were only accepted during the seven public hearings.

Public Hearing Notification

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Initial Five Public Hearings

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Public Hearing Overview

Sacramento - Tuesday, March 23, 2004, 3:00 - 8:00 PM

- Location: Tsakopoulos Library Galleria, East Meeting Room, 828 I Street, Sacramento
- Individuals Signed In: 75
- Oral Testimony Speakers: 26
- Comment Sheets Submitted: 8

Los Angeles - Tuesday, April 13, 2004, 3:00 - 8:00 PM

- Location: Metropolitan Transportation Authority, 1 Gateway Plaza, Los Angeles
- Individuals Signed In: 90
- Oral Testimony Speakers: 16
- Comment Sheets Submitted: 8

San Francisco - Thursday, April 15, 2004, 3:00 - 8:00 PM

- Location: State of California Building, 455 Golden Gate Avenue, San Francisco
- Individuals Signed In: 64
- Oral Testimony Speakers: 46
- Comment Sheets Submitted: 16

San Diego - Tuesday, April 20, 2004, 3:00 - 8:00 PM

- Location: San Diego Association of Governments, 401 B Street, San Diego
- Individuals Signed In: 34
- Oral Testimony Speakers: 10
- Comment Sheets Submitted: 4

Fresno - Wednesday, April 28, 2004, 3:00 - 8:00 PM

- Location: City of Fresno Council Chambers, 2600 Fresno Street, Fresno
- Individuals Signed In: 58
- Oral Testimony Speakers: 21
- Comment Sheets Submitted: 1

San Jose - Wednesday, May 26, 2004, 1:00 - 3:00 PM

- Location: County Government Center, 70 West Hedding Street, San Jose
- Individuals Signed In: 90
- Speaker Cards Submitted: 58
- Comment Sheets Submitted: 4

Los Angeles - Wednesday, June 23, 2004, 1:00 - 3:00 PM

- Location: Metropolitan Transportation Authority, 1 Gateway Plaza, Los Angeles
- Individuals Signed In: 53

- Oral Testimony Speakers: 13
- Comment Sheets Submitted: 1

In all, over 450 members of the public attended the public hearings, 190 people provided oral testimony and 42 written comments were submitted.

Written Comments Sent

Written comments were sent to the Authority in the form of letters, faxes, and postcards and were also sent through the Authority's website. The Authority has addressed comments received on the Draft Program EIR/EIS and the responses are included in Volume II. The following lists the comments (number of letters, postcards, and website comments) received. These counts represent the number of submittals received. Some of the letters received listed multiple agencies. In addition, a number of individuals and organizations also orally commented at the public hearings and/or commented both in hardcopy and electronically (through the website).

Letters (Letters/Faxes) Received: 333 total (4 from Federal Agencies, 5 from Federal Representatives, 10 from State Agencies, 4 from State Representatives, 83 from Local Agencies, 84 from Organizations, and 143 from Individuals).

Postcards: 1,411 total (both during and prior to comment period). 456 during comment period (172 of postcard #1, and 284 of postcard #2); 955 prior to comment period (all of postcard #1)

Website: 219 total (6 from local agencies, 9 from organizations, and 204 from individuals)

Overview of Comments Received

The brief summary below provides an overview of the post cards, written letters, comments submitted via the Authority's website, and oral testimony received at the public hearings during the comment period. A complete summary of comments will be included in the Final Program EIR/EIS. Many of the comments supported the concept of a statewide HST system, however disapproval of the project was also expressed in some comments. Most of the comments either favored one HST design option (alignments and/or station locations) over another or favored the inclusion or exclusion of certain design options. Concerns were raised about potential environmental impacts from the construction and operation of HST service. Many concerns about environmental impacts comments dealt with local alignment options, but some of the comments also concerned the potential for the HST system to induce growth. Several environmental organizations questioned the adequacy and detail of the Program EIR/EIS. The following bullets summarize some of the most common comments received:

- Support for a HST system linking California's major metropolitan areas.
- Opposition to HST alignment options through Henry Coe State Park.
- Support for the investigation of the Altamont Pass as an HST alignment option between the Central Valley and the Bay Area.
- Support for the Antelope Valley HST alignment (with a station at Palmdale) for crossing the Tehachapi Mountains between Central Valley and Los Angeles.
- Questions about the sufficiency of the Program EIR/EIS to meet CEQA and NEPA requirements because of a perceived lack of detail and/or design options excluded (primarily concerning the Altamont Pass).
- Support and opposition for specific alignment options between the Bay Area and Central Valley (Pacheco Pass and Diablo Range Northern Crossing option).

- Opposition to alignment options and concerns about impacts to Taylor Yards and the Cornfield site in Los Angeles. Many of the comments relating to Taylor Yards and the Cornfield site requested an extension of the comment period.
- Support for Castle Air Force Base as the HST station location and maintenance facility.
- Opposition to the CCT alignment option for HST service between Sacramento and Stockton.
- Opposition to conventional rail improvement tunneling options through Del Mar, and options with potential impacts to lagoons.
- Support and opposition for the UPRR alignment options between Fresno and Bakersfield (with a potential station at Visalia).
- Opposition to a potential HST station at Los Banos.
- Support for the Transbay Terminal as the Downtown San Francisco HST terminus.
- Concerns relating to the potential for the HST Alternative to induce growth.
- Questions about how the Program EIR/EIS address potential mitigation measures.

Additional Board Meetings

At various meetings after the issuance of the Draft Program EIR/EIS the governing board of the High Speed Rail Authority received status reports on the preparation of the Final Program EIR/EIS. At the meetings listed immediately below the Authority's governing board received, discussed, and approved with some revisions, Authority staff recommendations on identifying preferred alignment and station options for the HST alternative in the Final Program EIR/EIS. Additional information concerning the Authority Board meetings may be found on the Authority's website at www.cahighspeedrail.ca.gov.

September 22, 2004
November 10, 2004
December 15, 2004
January 26, 2005

Additional Agency Consultation and Outreach Activities

After the release of the Draft Program EIR/EIS, the FRA and Authority staff again consulted with other federal agencies, including the U.S. EPA and the U.S. Army Corps of Engineers. Additionally, the FRA consulted the President's Council on Environmental Quality (CEQ) on procedures for further study of the broad corridor identified for the northern mountain crossing of the proposed HST system (see Chapter 6, San Jose to Merced—Northern Mountain Crossing). The CEQ concurred that the proposed approach would be consistent with NEPA and would provide for compliance with Section 404 of the Clean Water Act. (CEQ (Greczmiel) letter to FRA (Yachmetz), January 24, 2005.)

In addition the co-lead agencies again consulted with the California Department of Parks and Recreation, tribal representatives, representatives of various transportation agencies and local and regional government agencies, including: the Transbay Terminal Joint Powers Authority, BART, SAMTRANS, SCRRA, SANDAG, OCTA, Riverside County Transportation Commission, the LACMTA, the Bay Area MTC, Sacramento Area COG, the Grassland Water District, the City of Palmdale, and numerous Cities and Counties in the Central Valley and elsewhere along potential alignments of the proposed HST system.

Also, following the release of the Draft Program EIR/EIS, the FRA and Authority Staff met with representatives of various groups and organizations, including the Sierra Club, the Planning and

Conservation League, the Natural Resources Defense Council, and the Train Riders Association of California (TRAC).

9 ORGANIZATIONS, AGENCY, AND BUSINESS OUTREACH BEFORE DRAFT PROGRAM EIR/EIS RELEASE

Organization	Contact	Date	Topic
22nd District Agricultural Association	Larry Baumann	January 29, 2003	Program update
AAA	Lewison Lem	July 18, 2003 September 4, 2003	Program update
	Governmental Affairs	September 4, 2003	Presentation
	John Zeigler, Southern California Division	Frequent communication	Program background information
ACREM	Jeff Atkinson	November 13, 2002	Presentation
Alameda Corridor East (ACE)	Rick Richman Sharon Neeley	February 21, 2001 October 30, 2002	Program update, ACE update, Inland Empire alignments
Alameda County Supervisors Presentation	David Kutrosky, Captiol Corridor JPA	March 22, 2002	Program update and East Bay alignment options, Transportation Committee presentation
Alstom	Todd Welty Andre Huber	Frequent communication	Program updates and technology issues
Altamont Commuter Rail Service	Stacey Mortensen	March 6, 2002	Program update
American Lung Association	N/A	June 12, 2003	Program update
American Magline Group	Neil Cummings	Frequent communication	Program updates and technology issues
American Public Transportation Association	N/A	June 20, 2001 March 10, 2003 June 9, 2003	Presentations
Amtrak	David Carol	November 20, 2002 July 24, 2003	Program updates
	Darrell Johnson Ron Scolaro	Frequent communication	Program updates and Los Angeles to San Diego via Orange County (LOSSAN) issues
Anaheim (City of)	John Lower	March 30, 2001	Alternatives and issues
	Gary Johnson John Lower	Frequent communication	Program update and Anaheim station
Antelope Valley Board of Trade, Transportation Working Group	Terry Stubbings, Palmdale	May 4, 2001	Program update, alignment and station options
Apex Strategies	Eileen Goodwin	Frequent communication	Program updates
APWA Central California Section	Various public agency staff members representing Cities of Bakersfield, Visalia, Fresno, Clovis, and Hanford	November 1, 2002	Regional alignment and station alternatives
ARTBA	N/A	April 28, 2003	Presentation

Organization	Contact	Date	Topic
ARUP	Michael Kaye John Eddy	Frequent communication	Program updates
	John Eddy	May 30, 2003	Sacramento Intermodal Transportation Facility
ASCE, Aviation Technical Group/WTS Presentation	Charles Adams, Los Angeles Intenational Airport (LAX)	April 18, 2002	Program update
ASCE, Bay Area Chapter	Thalia Anagnos	February 25, 2003	Presentation on alignment issues
Atwater City Council	Cindy Dover	October 27, 2003	Program update, alignment and station locations
Bakersfield (City of)	Mayor Harvey Hall John Stinson	March 16, 2001 November 15, 2001	Program updates, station and alignment issues
	John Flores	October 9, 2002	High-speed rail (HSR) design criteria
	Jacques LaRochelle	October 16, 2002	Alignment alternatives through Bakersfield
	City Council	October 2, 2002	Presentation
Bakersfield Chamber of Commerce	Dave Kilpatrick	March 16, 2001	Program background, jobs potential
Bakersfield Downtown Business Association	Ray Watson	February 2, 2001	Station locations, project financing
	Herman Ruddell	Frequent communication	Program updates, Bakersfield Golden State station location
BART (San Francisco Bay Area Rapid Transit District)	Tom Radulovich	Frequent communication	Program updates and alignment options
Bay Area Open Space Association	John Woodberry	July 18, 2002 October 1, 2002	Presentations
Bay Keepers Council Presentation	Members from Sierra Club, Audubon Society, & Environmental Health Coalition	May 23, 2001	Program update, alignment options, and environmental methodologies
BayRail Alliance	Presentations	September 25, 2002 January 27, 2003	Program updates, issues on alignment and station options
	Dan Krause Margaret Okuzumi	Frequent communication	Program update and alignment options
Bechtel	Tom Bordeaux	Frequent communication	Program updates and technology issues
Bell Rosenberg & Hughes Breakfast Forum	N/A	September 20, 2002	Program update
Bombardier	Matt Barkley Gary Hallman	Frequent communication	Program updates and technology issues
Booz Allen & Hamilton	Daniel Roth	February 9, 2003 December 19, 2003	Program updates
	Sandy Stadtfelt	Frequent communication	Program updates, Dutch HSR experience

Organization	Contact	Date	Topic
Burbank Area Local Agency HSR Workshop	Representatives from City of Burbank, City of Pasadena, City of Arcadia, City of Glendale	May 31, 2001	Program update, alignment and station location options, scoping issues
Burbank-Glendale-Pasadena Airport Authority	Victor Gill	March 6, 2001	Program update, airport master plan
CA Building Trades Council Presentation	Neal Struthers	May 29, 2003	Program update
CA Commonwealth Club Forum on HSR	Jim Swofford	July 17, 2003	Presentation
CA Democratic Council	Larry Trellinger	April 27, 2002	Presentation
CA Department of Interior	Sequoia/Kings Canyon National Park	June 25, 2003	Program update
CA Department of Parks and Recreation	Noah Tilghman Kay Robinson Joseph Hardcastle George Cook	August 28, 2002 September 9, 2002 October 1, 2002	Program update and alignment options
CA Department of Transportation (Caltrans)	Jeff Morales	May 8, 2002	Program update
	Brian Smith, Division of Mass Transportation Warren Weber, Division of Rail	Frequent communication	Program updates, technical studies details
	N/A	March 2002 April 22, 2003	Presentations
	Pedro Orso-Delgado	March 14, 2002	District 11 presentation
	Pat Merrill, Division of Rail	Frequent communication	Program updates, LOSSAN corridor
	Mark Leiger, District 10	Frequent communication	Merced County alignment options
	Arturo Jacobo, District 11 Charles Larwood, District 12 Jim McCarthy, District 7	Frequent communication	Program updates, alignment and station options, technical studies progress reports
CA Law Enforcement Agency Presentation	N/A	June 21, 2001	Program update
CA League of Cities	Paul Flint	February 27, 2003	Presentation
	State Convention	July 25, 2002	Presentation
	Genevieve Morelos, Transportation Committee	June 27, 2003	Presentation on alignment issues
CA State Coastal Conservancy	Sam Schuchat	January 14, 2003	Wetlands issues, alignment options, and program background
CA State Office of Historic Preservation (SHPO)	Hans Kreitzburg	October 23, 2002	Program update, cultural analysis methodology, and area of potential impact
CA Statewide Chamber of Commerce	Dave Ackerman	April 10, 2002 June 20, 2003	Program updates

Organization	Contact	Date	Topic
CA Transportation Commission	Robert Chung	December 11, 2002 June 9, 2003	Presentations
	Robert Chung	Frequent communication	Program updates
CA Transportation Foundation	Sarah West	February 26, 2003	Presentation
CA Trolley & Railroad Corp	N/A	June 3, 2002	Alignment issues
	Membership Committee	September 1, 2002 October 7, 2002	Alignment issues
CAATS	N/A	April 16, 2002	Alignment issues
California Advisory Council on Aging, Bay Area Chapter	N/A	February 3, 2003	Alignment issues
California Alliance for Transportation Choices	Christina Egan	June 28, 2002	Program update
California-Nevada Super-Speed Train Commission	Sara Katz	Frequent communication	South Orange County alignment options
Californians for Safe HW	Jim Deumas	December 11, 2002	Presentation
Caltrain JPA	Art Lloyd	Frequent communication	Program updates and Caltrain corridor
Canadian Consul General	N/A	January 29, 2003	Program update
Capitol Corridor Joint Powers Authority	David Kutrosky Eugene Skoropowski	Frequent communication	Program updates and East Bay station/alignment issues
Catellus Urban Development Corporation	Dean A. Perton David Grannis, Planning Company Associates	May 23, 2001 July 18, 2002	Program updates, alignment and station location options, scoping issues
CCSF	N/A	November 1, 2002	Coordination meeting
Central Japan Railways	Naoki Hariyama	May 30, 2003	Program update
	Naoki Hariyama Ken Ichikawa	Frequent communication	Program updates and Shinkansen information
CETAP	N/A	May 1, 2001	Presentation
China's National Railroad University	President, China's National Railroad University	August 9, 2002	Program update
City of Carlsbad	Robert T. Johnson	February 14, 2002 June 18, 2002	Alternatives and San Diego Coastal Rail Trail
	Julianne Nygard, Councilmember	Frequent communication	Program updates and LOSSAN corridor alignment options
City of Del Mar	David Scherer	November 20, 2001 December 5, 2001 May 20, 2002 June 17, 2002 June 9, 2003	Program updates, alignment and station issues, technical studies updates
	David Druker, Council Member Lauraine Brekke-Esparza, City Manager	Frequent communication	Del Mar alignment options

Organization	Contact	Date	Topic
	Linda Niles		
City of Encinitas	Richard Phillips	November 20, 2001 April 9, 2002 September 9, 2002	Discuss/refine alternatives and review proposed LOSSAN improvements
	Christy Guerin, Council Member Richard Phillips	Frequent communication	LOSSAN corridor status and alignment options
Clovis (City of)	Mayor Armstrong Jeff Witte	March 20, 2001	Alignment and station issues, farmlands issues
CMAA Northern California	Steve Perreault	October 15, 2003	Presentation
CMAA Southern California	Kelly Asper	November 13, 2003	Presentation
Community Redevelopment Agency (CRA)	Herbert Marshall Kenneth Moye	April 12, 2001	Program update, scoping issues
Compton Foundation	N/A	December 7, 2002	Program update
CSU-Stanislaus/ Transportation Futures Workshop	N/A	September 5, 2001	Presentation and workshop
Daimler Chrysler	Chris Wilson	May 5, 2003	Program update
Dana Point (City of)	Douglas C. Chotkevys	August 8, 2002 April 25, 2003	Program update and screening recommendations
	Douglas Chotkevys and other officials from surrounding cities	June 24, 2003	South Orange County alignment issues
	Douglas Chotkevys	Frequent communication	Aligment issues
DE Consult	Gerd Morhenn Wolfgang Henn	Frequent communication	Technical standards, methodologies, and analysis
Del Mar Rail Committee	N/A	January 6, 2003	Presentation
Don Breazeale & Associates	Don Breazeale Jeff Amos	Frequent communication	LOSSAN corridor alignment options
El Toro Planning Authority	Bruce Nestande	October 1, 2001	Update of HSR study
ERA	Bill Lee	May 16, 2003	Project background
Escondido	Nancy Skinner	July 11, 2001 August 22, 2001	City Council presentations
	Patrick Thomas Jonathon Brindle Lori Holt-Pfeiler, Mayor	Frequent communication	Program updates and I-15 corridor alignment options
EurailSpeed 2002 International Conference	N/A	October 25, 2002	Presentations
Farm Bureau (local chapter)	Loron Hodge Doug Carter	March 16, 2001	Alignments through farmlands, Central Valley growth
Foothill Toll Corridor Agency	James Brown	April 25, 2001 October 29, 2002	Caltrans potential joint study, foothill toll road alignment

Organization	Contact	Date	Topic
Fresno (City of)	Martin McIntyre Richard Brogan	March 20, 2001	Station and alignment issues
	Roger Monteiro	March 6, 2001	Program update, station and alignment issues
Fresno Area Residents for Rail Consolidation	John Ferdinandi, Jr. Tom Bailey	Frequent communication	Fresno-area alignments
Fresno County	Deran Koligian Roger Palomino, Fresno County Economics Opportunities Commission	March 20, 2001	Station and alignment issues, concerns about supercommuting
	Supervisors Susan Anderson, Juan Arambula, and Bob Waterson	April 19, 2001	Station and alignment issues
	Supervisor Waterson	July 3, 2002	Program update
Fresno County Council of Governments (COG)	Barbara Goodwin Clark Thompson	March 2, 2001 September 28, 2001	Station and alignment issues
	Clark Thompson	November 1, 2002	Fresno-area alignments
Fresno County Transportation Forum	Clark Thompson	November 19, 2003	Presentation
Fresno Rail Consolidation Committee	Clark Thompson	June 4, 2001 November 2, 2001 December 14, 2001	Program update, alignment issues, and rail consolidation
Friends of Light Rail	N/A	June 14, 2001	Presentation
FTA National Challenge Session AB	N/A	November 19, 2002	Presentation
Gateway Cities COG	Richard Powers	April 5, 2001 May 7, 2001 March 20, 2003	Presentations, alignment alternatives, and station issues
Granite Construction	Bill Dorey	January 15, 2003	Alignment issues
Great Valley Center	Carol Whiteside	March 26, 2001 January 3, 2002	Program updates, outreach to Central Valley
	N/A	November 21, 2002	Alignment issues
	Carol Whiteside	May 8, 2002	Presentation
	N/A	July 2002 June 6, 2003	Presentations
Greater Gardener Strong Neighborhood Initiative Group (San Jose)	Ben Tripousis	January 7, 2002	Presentation, alignment design
	Ben Tripousis	February 27, 2002	Field review
Hanford Chamber of Commerce	N/A	March 6, 2002	Presentation
Hatch Mott MacDonald	Lee Warnock	Frequent communication	Program updates

Organization	Contact	Date	Topic
High Speed Ground Transportation Association	Board Meetings	November 18, 2002 December 6, 2002 January 13, 2003	Program updates
	2002 Annual Conference	May 21, 2002 May 22, 2002	Program updates
	2003 Annual Conference	May 12, 2003–May 14, 2003	Program update and land use around stations
Huntington Beach (City of)	Ralph Bauer, Councilmember	Frequent communication	Program updates
I-5 Coalition	Ralph Webb	May 18, 2001 July 16, 2001	Alternatives and issues
Inland Empire Economic Partnership	Eric Haley	April 25, 2001	Program update
International Network for Urban Development (INTA)	N/A	October 21, 2002	Presentation
International Right-of-Way Association, Fresno Chapter	Maria Toles	March 8, 2002	Presentation
IPG Conference	SCAG	October 7, 2002	Presentation
Irvine (City of)	William Jacobs	April 2, 2001	Alternatives and issues
	Farideh Lyons Paul Glaab	Frequent communication	LOSSAN corridor status and alignment options
Italferr	Louise Hiesinger	Frequent communication	Technical standards, methodologies, and analysis
Japan Railways Technical Services (JARTS)	Hiroshi Okada Yasayuki Sakakibara Akira Nehashi	Frequent communication	Technical standards, methodologies, and analysis
	Yoshihiro Akiyama	September 19, 2002	Corridor tour and opportunities and constraints
Japanese Consulate	Makoto Tamura	Frequent communication	Program updates
Japanese Delegation	Ikuo Fujita Representatives from Central Japan Railways, Hitachi, JARTS, JTRI, Mitsubishi, MLIT, Nippon, Sharyo, Japanese Consulate	September 26, 2002	Program update and technology issues
Japanese National Chamber of Commerce leaders	N/A	September 2, 2002	Program update
Kern COG	Ron Brummett	Frequent communication	Program updates
Kern County	Dave Price	Frequent communication	Program updates
	Chuck Lackey Craig Pope Dave Price	February 2, 2001	Alignments and station locations

Organization	Contact	Date	Topic
Kern County Agencies HSR Workshop	Ron Brummett, Kern COG Jason Hade, Kern COG Gary Blackburn, KTF Dale Mills, KTF Tony Lusich, KTF Arnold Ramming, City of Bakersfield	February 2, 2001	Program update, alignment options, and station locations
Kern Economic Development Corp.	Pat Collins	March 16, 2001	Program background, jobs potential
Kern Transportation Foundation	Jason Hade	November 1, 2002	Program update
Korve Engineering	John James	Frequent communication	Program updates
Los Angeles County Federation of Labor	Miguel Contreras	March 18, 2003	Program update
LACMTA LACMTA, Agency Workshop LACMTA	NA Representatives from LACMTA, Foothill Transit, City of Burbank, Los Angeles World Airports, Los Angeles Department of Transportation (DOT), Los Angeles City Planning, Port of Los Angeles, SCRRA James de la Loza	May 1, 2001 May 1, 2001 March 15, 2001 May 2, 2001	Scoping meeting, Los Angeles County alignments and stations Program update, alignment and station issues, scoping issues Alternatives and Issues
Land Use and Transportation Task Force Presentation	N/A	August 28, 2001	Alignment issues
Leadership San Francisco	Mike Elzey	March 20, 2003	Alignment issues
League of Women Voters	Eva Brausner	March 18, 2002	Connectivity with other transportation modes
Lee Andrews Group	Donna Lee Andrews (representing Marblehead)	June 10, 2003	Potential impacts to Marblehead Development
Lincoln Seniors Group	Jerry Fritts	July 8, 2003	Presentation
Little Tokyo Redevelopment Agency	N/A	May 24, 2001	Program update, alignment and station location options, scoping issues
Los Angeles (City of)	Ruth Galanter, Councilmember Niki Tennant	August 2, 2001 August 15, 2001 February 6, 2003	Program updates and status
Los Angeles Union Station (LAUS)/Amtrak	Barbara Turnbill	July 16, 2002	Discuss LAUS run-through tracks

Organization	Contact	Date	Topic
Los Angeles World Airports (LAWA)	Carl Morgan	April 9, 2001	Palmdale Airport
	Patrick Tomcheck	April 19, 2001 May 24, 2001 August 22, 2002	Alternatives and issues, LAX Coalition meeting, and LAWA presentation on proposed LAX master plan changes
LOSSAN Board of Directors	Linda Culp, SANDAG	June 29, 2001 October 5, 2001 February 15, 2002 May 17, 2002	HSR status reports and draft staff recommendations for alignments
LOSSAN meetings with regional representatives from state and federal agencies	Regular Attendees: Teresa Henry & James Ravies, Coast. Comm. Jack Fancher & John DiGregoria, FWS Liz Varnhagen, EPA Linda Culp, SANDAG Pam Beare, CFG Susan DeSaddi, USACOE Patrick Merrill, Caltrans Rail Arturo Jacobo, CT Dist. 11 Charles Larwood, CT Dist 12	June 27, 2002 September 10, 2002 November 26, 2002 March 13, 2003 April 24, 2003 June 4, 2003 July 30, 2003	Program updates, environmental methodologies, purpose and need, alignment and station locations design options, screening recommendations, National Environmental Policy Act (NEPA) 404 issues, and preliminary environmental findings
LOSSAN Technical Advisory Committee	Linda Culp, SANDAG	August 7, 2001 January 29, 2002 August 12, 2002	Emerging recommendations Program update Program update
Lung Association	N/A	March 13, 2003	Program update
LUSK	Jim Johnson	June 10, 2003	Marblehead Development, San Clemente alignment options
Madera County	Supervisor Vern Moss	August 9, 2001	Program update
March Air Reserve Base (ARB)	Ken Delino	May 3, 2001	Design options, station locations
McArthur, Hewlett & Packard Foundations Presidents	N/A	December 16, 2002	Alignment issues
Merced (City of)	Steve Stroud Jack Lesch	March 3, 2001	Station and alignment options
Merced County	Supervisor Gloria Keene	Frequent communication	Program updates
Merced County Association of Governments	Jesse Brown	March 3, 2001	Merced station locations, alignment issues
Merced County Board of Supervisors	Kathy Simon	March 21, 2002	Presentation, program update, Merced Station options, and alignment options
	Angelo Lamas	September 16, 2003	Program update, alignment options, and station locations
Merced County Citizens Group	Lee Boesel	Frequent communication	Program updates
Merced Economic Development Corporation	Elaine Trevino	March 3, 2001	Station locations, UC Merced

Organization	Contact	Date	Topic
Metrolink	David Solow, Steve Lantz, Michael McGinley, Dedra Knox	December 17, 2001 February 5, 2002 July 10, 2002	Program updates, alignment options, and design assumptions
	Michael McGinley	Frequent communication	Alignment options and design assumptions
	Deadra Knox	Frequent communication	Program updates
Metropolitan Transit Development Board (MTDB)	Brian Sheehan	November 1, 2001	Board presentation
	Brian Sheehan	Frequent communication	Program updates, alignment and station issues
Metropolitan Transportation Commission (MTC)	Doug Kimsey	Frequent communication	Program updates and alignment options
	Steve Heminger	Frequent communcation	Program updates and alignment issues
	MTC Board	April 17, 2002 December 18, 2002 May 28, 2003	Presentations
Millenia	Ellen Warner	December 16, 2002	Sacramento Depot area development plans
Milpitas Former Councilmember J. Lawson	Councilmember J. Lawson	January 29, 2003	Program update
Miramar Air Force Base (AFB)	Colonel Thomas Cauglin	March 22, 2001	Program update, alignment options
Modesto (City of)	Mayor Carmen Sabatino	March 26, 2001	Station location
Modesto Rotary Club	George Gaekle	September 17, 2002	Alignment issues
NARP Board	George Chilson	October 18, 2002	Presentation
National Rail Ministry of India	Mr. Sereenives	May 9, 2003	Program update
National Transportation Summer Institute	N/A	July 2, 2002	Presentation
Native American Heritage Commission	Larry Meyers, Rob Wood, Debbie Pilas-Treadway	Frequent communication	Program updates, alignment and station locations, Native American outreach efforts
Native American Outreach Workshop at Frazier Park	Rob Wood, NAHC; participants included representatives from Chumash, Kitanemuk & Yowlumne, and Tejon tribes	September 9, 2003	Program update, alignment and station locations focusing on Tehachapi Mountain crossing; potential impacts to cultural resources, and level of detail of current and future studies

Organization	Contact	Date	Topic
Native American Outreach Workshop at San Luis Reservoir	Debbie Pilas-Treadway, NAHC; participants included representatives from N.V. Yokut, Ohlone, Miwuk, and Amah Musun tribes	September 10, 2003	Program update, alignment and station locations focusing on Northern California mountain crossing, South Santa Clara County and Central Valley impact; potential impacts to cultural resources, and level of detail of current and future studies
Native American Outreach Workshop at Temecula	Rob Wood, NAHC; participants included representatives from Chumash, Tataviam, Kitanemuk, Luiseno, Cahuilla, Diegueno-Kwaaymil, Gabrielino Tongva, and Cupeno tribes; and the San Fernando, Pala, Soboba, and Pechanga Bands of Mission Indians	October 9, 2003	Program update, alignment and station locations focusing on I-215/ I-15 corridor, Tehachapi Mountain crossing, potential impacts to mountains south of Temecula along I-15; potential impacts to cultural resources, and level of detail of current and future studies
The Nature Conservancy	Lloyd Wagstaff	October 1, 2002 June 12, 2003	Program updates and alignment options
	Elizabeth Gray Lloyd Wagstaff Allen Cattell	January 16, 2003	The Nature Conservancy issues and Mt. Hamilton project
Niles Canyon Railroad Group	Jim Evins	April 2, 2003	Program update
Nippon Sharyo	Masataka Nakajima	September 26, 2002	Program update
NOCRAP	Darrell Johnson, Amtrak Jerry Wilmoth, Union Pacific Railroad (UPRR) Representatives from ACE, Capitol Corridor JPA, Caltrain, Caltrans	March 6, 2002	Presentation
Nolte & Associates	William Ishmael	October 7, 2002	Sacramento station
North County Transit District (NCTD)	Leslie Blanda	Frequent communication	Program updates, alignment and station issues, technical studies updates
	Leslie Blanda	August 22, 2002 September 18, 2003 November 20, 2003	Board presentations
North Orange County Cities	Kurt Brotcke	October 3, 2001	Draft staff recommendations for alignments
Norwalk (City of)	Ernie Garcia	April 20, 2001	Alternatives and issues
Oakland (City of)	N/A	February 5, 2001	Program update
	Shanna O'Hare Dianne Tannenwald	Frequent communication	Program updates and East Bay station/alignment issues
Oakland (City of) and Capital Corridor	Eugene Skoropowski Shana O'Hare	July 2001	Coordination meeting
Oakland Airport Connector	Michele Jacobson	February 8, 2001	East Bay alignments, Coliseum BART station design

Organization	Contact	Date	Topic
Oakland Chamber of Commerce	N/A	July 3, 2003	Presentation
Oceanside (City of)	Frank Watanabe	July 5, 2001	Alternatives and issues
	Frank Watanabe	July 17, 2001	Presentation to Transportation Committee
OCTA Orange County HSR Agency Working Group meetings	Kurt Brotcke, OCTA Representatives from OCTA, Caltrans, San Juan Capistrano, Irvine, Santa Ana, TCA, Buena Park, Orange, Anaheim, San Clemente, Laguna Niguel, Cypress, Tustin, Fullerton, Mission Viejo, Huntington Beach	April 3, 2001 June 7, 2001 July 18, 2001 August 22, 2001 October 24, 2001 December 5, 2001 February 26, 2002 June 19, 2002 August 14, 2002 October 22, 2002 January 30, 2003 March 4, 2003 June 10, 2003 July 31, 2003 December 18, 2003	Alternatives, emerging recommendations, draft and approved staff alignment recommendations, upcoming outreach meetings and conceptual sketches, scoping meetings and draft no-build, program update, and environmental findings
Orange County Business Council	N/A	March 11, 2003	Briefing on HSR and program update
Orange County Transportation Authority (OCTA)	Kurt Brotcke, Michelle Bitner-Smith, Richard Marcus	Frequent communication	LOSSAN corridor updates and Orange County alignment options
Palmdale (City of)	Palmdale City officials and Public Works Administration meeting	April 19, 2001 November 12, 2003	Program updates, alignment and station location issues, scoping issues
	City officials and AV Board of Trade	May 17, 2001	Program update, alignment and station location options, scoping issues
	Terry Stubbings	December 19, 2001	Program update
	John Brooks	Frequent communication	Program updates
Pinnacle One	Marcy Szantara	November 7, 2002	Presentation
Planning Company Associates	John Barna	December 11, 2002	Program update
Porterville City Council	N/A	August 20, 2002	Presentation
PREP	Bruce Balshone	Frequent communication	San Francisco Peninsula issues
Public Policy Institute	N/A	December 12, 2002 December 13, 2002	Presentations
Rail PAC	Richard Silver	Frequent communication	Program updates
	Jim Swofford	November 25, 2002	Alignment issues
RCTC	Eric Haley	Frequent communication	Program updates, alignment and station options
RENFE	Dr. Del Rio	January 9, 2003 March 25, 2003 May 14, 2003 July 9, 2003	Program updates, Spanish HSR system, and information sharing

Organization	Contact	Date	Topic
Retired Railway Labor Union Members Association	N/A	January 3, 2002	Program update
Sacramento (City of)	Councilmember Steve Cohn, Paul Blumberg, Cam Beach	April 19, 2001 October 2, 2001 October 10, 2002	Program updates and Sacramento rail depot
	Paul Blumberg	Frequent communication	Program updates
	City Council	January 15, 2002	Presentation
	Councilmember Jones	February 22, 2002	Program update
Sacramento Chamber of Commerce	Dave Butler	April 19, 2001 January 14, 2002	Alignment and station issues
	Regional Government Forum	January 15, 2002	Alignment issues
Sacramento COG	Ken Hough Olin Woods	February 21, 2001 October 3, 2001 October 3, 2002	Program updates, alignment and station issues
	Olin Woods	Frequent communication	Program updates
Sacramento County	Supervisor Don Nottoli	April 19, 2001	Station and alignment issues
	Supervisor Muriel Johnson	April 19, 2001	Program update, alignment and station issues, Altamont Pass
Sacramento Economic Development Group	Erin Anderson	March 13, 2002	Presentation
Sacramento Transportation Authority	Brian Williams	February 21, 2001	Station locations
Samtrans	Howard Goode Darrell Maxey Ian McAvoy Corrine Goodrich	Frequent communication	Program update, San Francisco Peninsula alignment, Caltrain right-of-way, and design
San Bernardino (City of)	Mayor Judith Valles	April 27, 2001	Program update and alignment and station options
	Raymond Casey Timothy Cook	November 9, 2001	Program update and San Bernardino station/alignment issues
	N/A	January 14, 2002	Program update
	Timothy Cook	Frequent communication	San Bernardino station/alignment issues
San Clemente (City of)	James Holloway	March 27, 2001 May 16, 2001 October 2, 2001 November 19, 2001 June 10, 2003	Alternatives and issues, draft staff recommendations for alignments, alternatives with Marblehead developers and local businesses and communities
	Jim Holloway Stephanie Dorey, Mayor Susan Ritschel, Councilmember	Frequent communication	South Orange County alignment options

Organization	Contact	Date	Topic
San Diego (City of)	Jay Petrek	Frequent communication	Alignment and land use issues
	Keith Greer	May 30, 2001	Alternatives and issues
	Keith Greer Gary Halbert	August 6, 2002	Program update and review
	Scott Peters, Councilmember	June 25, 2003	Program update and alternatives
San Diego (Port of)	Genene Lehotsky	Frequent communication	Program update and alignment options
San Diego Airport Working Group	N/A	February 12, 2002	Kick-off meeting
San Diego Association of Governments (SANDAG) Agency Summit meetings	Gary Gallegos, SANDAG Linda Culp, SANDAG Brian Smith, Caltrans Pat Merrill, Caltrans	May 31, 2001 September 10, 2002 October 10, 2002 December 18, 2002 March 12, 2003	Alternatives and issues, LOSSAN study and strategic plan to discuss EIR/EIS issues and clarify positions
San Diego County	Pam Slater, Supervisor Sachiko Kohatsu	Frequent communication	LOSSAN corridor updates and Del Mar alignment options
San Diego County League of Cities	Linda Culp, SANDAG	June 11, 2001	Program update
San Diego League of Cities	N/A	June 11, 2001	Presentation
San Dieguito River Park Joint Powers Authority	N/A	January 29, 2003	Program update
San Francisco (City and County of)	Maria Ayerdi	November 2000 March 20, 2002 July 2003	Monthly meetings on Transbay Terminal
	Maria Ayerdi	Frequent communication	Program updates, station and alignment issues
San Francisco Bay Area Water Transit Forum	Liza Claremont	November 21, 2002	Alignment issues
San Francisco Bay Decision Makers	N/A	October 26, 2001	Presentation
San Francisco Chamber of Commerce	Gwyneth Borden	April 5, 2001 December 5, 2002	Presentations
	Gwyneth Borden Roberta Achtenberg	October 8, 2002	Alignment options and Altamont Pass
San Francisco County Transportation Authority	Jose Luis Moscovich	May 14, 2001	Program update and scoping meeting
San Francisco HSR Workshop Meeting	Representatives from AAA, San Francisco Municipal Railway (MUNI), Bay Area Air Quality District, San Francisco County Transportation Authority, CA PUC, City of Millbrae, City of San Francisco	May 14, 2001	Program update, alignment and station locations, scoping issues

Organization	Contact	Date	Topic
San Francisco International Airport (SFO)	Dave Monks	Frequent communication	Program updates and alignment/station issues
	Citizens Advisory Group for Runway Modernization Program	January 29, 2002	Presentation
San Francisco MUNI Executive and Management Staff	N/A	December 3, 2002	Alignment issues
San Francisco Office of Economic Development	N/A	March 28, 2003	Alignment issues
San Francisco Tomorrow HSR Advocacy Group Meetings including Sierra Club (local chapters), TRAC, and BayRail Alliance	Jane Morrison, SF Tomorrow John Holtzclaw, Sierra Club	April 4, 2001 October 30, 2001 December 5, 2001 January 24, 2002 February 28, 2002 April 25, 2002 February 27, 2003	Program updates and Northern California alignments
San Gabriel Valley COG	Representatives from Alhambra, Covina, Monrovia, Montebello, Monterey Park, San Gabriel and Walnut	May 8, 2001	Presentation, scoping, alignment and station options
	Engineers and Transportation Committees	May 21, 2001 April 5, 2001	Presentations, alignment and station options
San Gabriel Valley Economic Partnership Board	Frank Marquez, Executive Director Elaine Cullen	February 21, 2001, March 15, 2001	Program updates
San Joaquin COG	Diane Ngyuen	March 27, 2001 January 9, 2002	Program updates, station and alignment options
	N/A	February 27, 2003	Presentation
	Kim Kloeb	Frequent communication	Program updates
San Joaquin County	Supervisor Jack Sieglock	March 27, 2001	Station and alignment options
San Joaquin County Partnership	Ron Addington	March 27, 2001	Program background, station location
San Joaquin Rail Committee	Larry Miller	Frequent communication	Program updates
San Joaquin Valley Rail Authority Board Committee	N/A	July 12, 2002 August 12, 2003 May 9, 2003	Presentations and alignment issues
San Jose (City of)	Jim Webb Roxanne Miller	April 30, 2003 May 21, 2003	Program updates
	Mayor Gonzalez	March 20, 2003	Program update
	Hans Larsen Ben Tripousis Kelly Doyle	Frequent communication	Program updates and South Bay station and alignment issues
San Jose Community Forum by BayRail Alliance	Margaret Okuzumi	September 18, 2002	Program update
San Jose Rotary Club	N/A	April 30, 2003	Alignment issues

Organization	Contact	Date	Topic
San Juan Capistrano (City of)	John Gelff, Mayor George Scarborough	Frequent communication	San Juan Capistrano alignment options
	William Huber	December 17, 2001 July 21, 2002 March 4, 2003 March 21, 2003	Discuss/refine alternatives, review Purpose and need
San Mateo County Earth Day	Will Becket	April 23, 2003	Program update
San Mateo County Grand Jury, Transportation Committee	John Baker	April 25, 2002	Presentation on alignment issues
SANBAG	N/A	May 14, 2001	Alignment and station options
SANDAG	Linda Culp	Frequent communication	Program updates, alignment and station options
SANDAG Coastal Rail Agency Working Group	Linda Culp, SANDAG Leslie Blanda, NCTD Brian Sheehan, MTDB Patrick Merrill, Caltrans Rail Arturo Jacobo, Caltrans D11 Darrell Johnson, Amtrak Elizabeth O'Donoghue, Amtrak Deadra Knox, Metrolink	February 27, 2001 March 22, 2001 May 21, 2001 July 5, 2001 August 28, 2001 October 23, 2001 December 5, 2001 February 5, 2002 June 13, 2002 July 30, 2002 September 9, 2002 October 22, 2002 December 3, 2002 February 18, 2003 June 9, 2003	Alternatives, preliminary evaluation of alternatives and emerging recommendations, draft staff alignment recommendations, upcoming outreach meetings and conceptual sketches, draft no-build, and initial environmental findings
SANDAG HSR Task Force	Linda Culp, SANDAG Task Force Members Invited: Chair Lori Holt Pfeiler, Mayor of Escondido Bob Emery, Poway Art Madrid, La Mesa Joe Kellejian, Solana Beach Pam Slater, San Diego County Mickey Cafagna, Poway Ron Morrison, National City Julianne Nygaard, LOSSAN Joint Powers Board John Fowler Richard Earnest, Del Mar Christy Guerin, Encinitas Hal Sadler, CCDC Tom Golish, NCTD Brian Maienschein, MTDB Pedro Orso-Delgado, Caltrans District 11 Cmdr. Roger Natsuhara, Department of Defense	March 8, 2001 May 10, 2001 November 1, 2001 February 20, 2002 June 13, 2002 October 10, 2002 March 14, 2003 May 9, 2003 December 4, 2003	Program updates, alternatives and issues, draft staff recommendations for alignments, and potential station locations

Organization	Contact	Date	Topic
	Ed Gallo, NCTD Nick Inzunza, MTDB Ramona Finnila, Carlsbad		
Santa Clara County Economic Development	Margie Matthews	February 5, 2003	Alignment issues
Santa Clara County Open Space Council	Open Space Agencies in Santa Clara County	October 25, 2002	Coordination meeting
Santa Clarita (City of)	City officials and staff	May 21, 2001	Program update, alignment and station location options, scoping issues
Santa Clarita Chamber of Commerce, Transportation Committee		May 17, 2001	Program update, alignment and station location options, scoping issues
SCAG	Barry Samsten	February 6, 2003	Transportation Committee presentation
	Barry Samsten	Frequent communication	Program updates, inland (I-15) corridor alignment options
	N/A	February 15, 2001 March 15, 2001	Coordination with SCAG projects
SCAQMD	Barry Wallerstein Kathryn Higgins	October 17, 2001	Program update
San Francisco Peninsula (Palo Alto) HSR Workshop	Representatives from Samtrans, Caltrain JPB, City of Palo Alto, City of Redwood City, League of Women Voters	May 17, 2001	Program update, alignment and station locations, scoping issues
San Francisco Planning and Urban Research (SPUR)	Gabriel Metcalf	June 19, 2001 May 23, 2002	Presentations
	Gabriel Metcalf	April 23, 2002	Alignment issues
Siemens	Wayne Williams Frank Guzzo	Frequent communication	Program updates
Sierra Club	Jim Metropulos	February 3, 2003	Program update and alignment options
	Officers Annual Retreat in San Luis Obispo	March 8, 2003	Presentation
	Pat Moore	Frequent communication	Program updates and alignment/station options
Sierra Club (local chapters), San Francisco Bay, BayRail Alliance, and TRAC	Michael Bornstein, Sierra Club Margaret Okuzumi, BayRail Alliance Pat Moore, Sierra Club Dan McNamara, TRAC Alan Miller, TRAC	April 15, 2002	Alignment issues and Northern California mountain crossing
Sierra Club, Angeles Chapter	N/A	February 12, 2002	Presentation

Organization	Contact	Date	Topic
Silicon Valley Manufacturing Group	Laura Susinski	Frequent communication	Program updates and South Bay station and alignment issues
	Laura Susinski	February 3, 2003 April 24, 2003	Presentations
SIR's Congress	Bill Rodman	May 19, 2003	Presentation
SNCF	Jean-Pierre Mathieu Jean-Michel Gayon Pierre Louis Rochet Dennis Doute	Frequent communication	Technical standards, methodologies and analysis
Society of American Military Engineers	Wes Starratt	May 9, 2002	Presentation
Society of Military Engineers, San Diego		March 14, 2002	Presentation
Solana Beach (City of)	Joe Kellejian, Mayor	Frequent communication	LOSSAN corridor
	N/A	February 13, 2001	Coastal Rail Forum
South Alameda County (Fremont) HSR Workshop	Representatives from BART, City of Fremont, City of Union City	May 17, 2001	Program update, alignment and station locations, scoping issues
South Bay Cities COG	N/A	June 28, 2001	Alternatives and issues
South Bay Lung Association	N/A	November 14, 2002	Presentation
South Bay Medical Association Environmental Health Committee	N/A	January 8, 2003	Alignment issues
South Orange County Rail Working Group	Norm Emerson	Frequent communication	South Orange County alignment options
Southern Bay Area (Gilroy) HSR Workshop	Representatives from City of Los Banos, Los Banos Chamber of Commerce, Los Banos Commuter Alliance	May 24, 2001	Program update, alignment and station locations, scoping issues
Southern California Transit Advocates	Dana Gabbard	Frequent communication	Program update
Stanislaus County Economic Development Corporation	Charline Speck	March 26, 2001	Program background, Central Valley outreach
Stanislaus County	Supervisor Nick Blom Reagan Wilson	March 26, 2001	Pacheco Pass, alignment issues
Stanislaus County AOG	Gary Dickerson	March 26, 2001	Altamont Pass, alignment issues
State Parks Foundation	Barbara Hill	December 10, 2003	Alignment issues, parklands
Stockton (City of)	Mayor Gary Podesto	March 27, 2001	Alignment and station locations
	Roger Storey Steve Pinkerton Peggy Massey	March 27, 2001	Alignment and station locations
Stockton Chamber of Commerce	Doug Wilhoit	March 27, 2001	Central Valley transportation needs

Organization	Contact	Date	Topic
STPP	John Doxey James Corless	Frequent communication	Program updates, alignment and station options
Sumitomo Corporation (JORSA)	Masao Tabuchi	March 20, 2003	Program update
	Takeshi Kato	Frequent communication	Program updates
Taiwan HSR	Jack Kwei	Frequent communication	Program updates
Talgo	Jean Pierre Ruiz	Frequent communication	Program updates
TASC	Bob Kirby	July 23, 2002	Presentation
Tejon Ranch	Joe Drew Dennis Mullins	March 13, 2003	Program update
	N/A	March 3, 2003	Alignment issues
Torrey Pines Community Association	Donald F. Billings	February 13, 2003	Program update
TRAC	Dan McNamara	February 28, 2002 July 31, 2003	Alignment options and Altamont Pass
	Adrian Brandt	Frequent communication	Program updates and Northern California mountain crossing
Transmetrics	Jack Ybarra	Frequent communication	Program updates
Transportation and Land Use Coalition (TALC)	Stuart Coen	July 16, 2003	Presentation focusing on Northern California mountain crossing alignments/issues
Tulare County Agencies HSR Workshop	Bob Stocker, TCAG Eddie Wendt, TCAG George Finney, TCAG Paul Saldana, Tulare County Econmic Development Corp. Mark Clark, Tulare County Chuck Przybylski, Tulare County	February 27, 2001	Scoping issues, alignments and station locations, outreach to Central Valley
Tustin (City of)	Lou Bone, Councilmember	October 7, 2002	Program update and LOSSAN improvements
	Lou Bone	October 21, 2002	City Council presentation
U.S. DOT Federal Secretary Director of LAX	David M. Stone	August 19, 2002	Alignment issues

Organization	Contact	Date	Topic
U.S. Environmental Protection Agency	Nova Blazej Kathleen Dadey	May 23, 2002 October 21, 2002	Alignment options, system alternatives
	Nova Blazej, Federal Activities Office Kathy Dadey, Wetlands and Sediment Nancy Levin, NEPA Review	July 9, 2002	Review of purpose and need, system alternatives, and environmental analysis methodologies
	Nova Blazej Kathleen Dadey Erin Foresman Susan DeSaddi, ACE Mark Sudol, ACE	September 12, 2002	Screening process and documentation for corridor alternatives
	Nova Blazej	Frequent communication	Alignment options, environmental methodologies
	Liz Varnhagen	Frequent communication	Program updates, screening of alternatives, environmental issues
U.S. Marine Corps	Lt. Col. Craig Meyers	February 27, 2001	Camp Pendleton
UC Davis	David Shpak Bob Johnson	Frequent communication	Program updates and research topics
UC Davis Extension	Anthony Palmere	November 7, 2001	Class presentation
UC Merced	Bob Badgley Fred Jackson	March 3, 2001	Merced station locations
Union City (City of)	N/A	June 2001	Multi-modal station plans
	Mark Leonard	May 17, 2001 December 9, 2002	Program updates and potential Union City station
Union Pacific Railroad	Jerry Wilmoth	March 6, 2002	Program update and alignment options
Universal Unitarian	Jeff Watson	September 16, 2001	Presentation
Urban Land Institute	N/A	May 14, 2002	Presentation
Valley COG Directors Meeting	N/A	October 10, 2001	Alignment issues
Valley Industry and Commerce Association (VICA)	Richard Katz	April 18, 2001	Program update, scoping issues
Visalia (City of)	Brit Fussell	Frequent communication	Program updates
	Ann Magana	November 16, 2001	Transportation roundtable
VTA	Lisa Ives Jim Lightbody Korve Engingeering	February 2001 March 2001	Gilroy alignment and design option to San Jose
	Curt Evans	May 21, 2003 June 26, 2003	Alignment issues
	Lisa Ives James Lightbody	Frequent communication	Program updates and South Bay alignment issues
VTA, City of San Jose, Caltrain JPB	Lisa Ives, VTA	November 28, 2000 February 8, 2001 February 22, 2001	Cross-section options for Gilroy to San Jose

Organization	Contact	Date	Topic
Walt Disney Imagineering/Disney Corporation	Douglas M. Moreland Edward A Chuchla Lisa Pitney	August 15, 2001 February 26, 2003 March 18, 2003	Program updates
Wilbur Smith Associates	Justin Fox	November 18, 2002	Program update
	N/A	January 6, 2003	Bakersfield stations
	Peter Martin	February 14, 2003	Bakersfield Airport station location
Women's Transportation Council	N/A	April 24, 2002	Presentation
WRCOG	Rick Bishop, Executive Director Ruth Taylor-Burger Young	March 21, 2001	Program update, alignment and station options
	Planners and Engineers Agency Coordination and City Managers Meetings	April 26, 2001 April 19, 2001	Presentations, alignment and station options
WTC	N/A	April 24, 2002	Presentation

10 LIST OF PREPARERS

California High Speed Rail Authority

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Federal Railroad Administration

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Linda Pybas, Legal Counsel (NEPA Review)

Cynthia Walters, Legal counsel (NEPA Review)

List of Consultants

Name	Title	Responsibility
Kip Field	Project Manager Parsons Brinckerhoff Quade & Douglas, Inc.	Environmental Process Management Lead Agency Coordination Discipline Co-Lead Capital Costs, Alternatives
Peter Gertler	Deputy Project Manager Parsons Brinckerhoff Quade & Douglas, Inc.	QA/QC Review Discipline Lead Transportation and Operations and Maintenance Costs Discipline Co-Lead Alternatives
Marilyn Duffey	Environmental Task Manager The Duffey Company	EIR/EIS Review and Oversight QA/QC Task Manager Discipline Lead Purpose and Need, Visual Resources, and Cumulative Impacts
Ben Strumwasser	Principal Public Affairs Management	Leader of Public Involvement
Paul Taylor	Senior Traffic Engineer Kaku Associates, Inc.	Discipline Lead Traffic and Circulation
Alice Lovegrove	Senior Environmental Engineer Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Lead Air Quality
Carl Hanson	Principal Environmental Engineer Harris Miller Miller & Hanson, Inc.	Discipline Lead Noise and Vibration

Name	Title	Responsibility
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Susan Robbins	Senior Environmental Planner Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Co-Lead Agricultural Resources
Bill Rice	Environmental Planner Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Co-Lead Agricultural Resources
Robert Malone	Environmental Planner Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Lead Public Utilities
Brian Calvert	Environmental Planner Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Lead Hazardous Material and Wastes
Roger Mason	Senior Environmental Planner Chambers Group, Inc.	Discipline Lead Cultural and Paleontological Resources
Amanda Elioff	Senior Planner Parsons Brinckerhoff Quade & Douglas, Inc.	Discipline Lead Geology and Soils
Don Mitchell	Principal Biologist Chambers Group, Inc.	Discipline Lead Biological Resources and Wetlands
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Name	Title	Responsibility
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Carol-Anne Hicks	Publications Specialist Jones & Stokes	Word Processing
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REGIONAL TEAMS		
Bay Area to Merced		
Dave Mansen	Program Director, Parsons Corporation	Regional Team Project Manager
Pat Gelb	Senior Environmental Manager, Parsons Corporation	Section 4(f) and 6(f) Technical Evaluation
Guillaume Shearin	Ph.D, Principal Planner, Parsons Corporation	Traffic, Transit, Circulation, and Parking–Technical Evaluation
Theresa Larson	Senior Project Manager, Parsons Corporation	Public Utilities–Technical Evaluation
Karla Nicholas	Senior Planner, Parsons Corporation	Local Area Growth, Development, Planning, Land Use, Socioeconomics, and Environmental Justice–Technical Evaluation
Rick Phillips, R.A.	R.A., Senior Architect, Parsons Corporation	Aesthetics and Visual Quality–Technical Evaluation
Dennis J. Brown,	Ph.D., Principal Scientist, Parsons Corporation	Hazardous Materials/ Wastes–Technical Evaluation

Name	Title	Responsibility
Allen Cattell	Ph.D., Principal Planner, Parsons Corporation	Biological Resources–Technical Evaluation Hydrology and Water Quality–Technical Evaluation
Amy J. Gilreath	Principal, Far Western Anthropological Research Group, Inc.	Cultural Resources, Archeology–Technical Evaluation
Meta Bunse	Partner / Project Manager, JRP Historical Consulting Services	Cultural Resources, Historic Architecture–Technical Evaluation
C. Bruce Hanson and Jean Durham	Paleontologic Resource Specialist & Professor of Geology (Ret.)	Paleontologic Resources–Technical Evaluation
Janine Weber Band	Ph.D., Project Geologist, Geotechnical Consultants, Inc.	Geology and Soils–Technical Evaluation
Sacramento to Bakersfield		
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Clifford Nale	Associate Scientist, EIP	Technical Lead–Paleontological Resources
Demian Ebert	Senior Scientist, EIP	Technical Lead–Biological Resources
Kimberly M. Avila, AICP	Senior Project Manager, EIP	Technical Lead–Aesthetics and Visual Quality
Barry A. Price	Division Manager, Applied Earthworks	Technical Lead–Cultural Resources
Jerry Walters	Principal, Fehr and Peers	Technical Lead–Traffic, Transit, Circulation, and Parking
Bruce R. Hilton, RG	Senior Engineering Geologist, Kleinfelder, Inc.	Technical Lead–Geology, Soils, Seismicity Technical Lead–Hazardous Materials
Richard Carman	Wilson Ihrig & Associates, Inc.	Technical Lead–Noise and Vibration
Bakersfield to Los Angeles		
Sylvia Salenius, AICP	Vice President-Project Manager P&D Environmental	Project Manager, Prepared Cumulative Impacts Section
Tin Cheung	Environmental Scientist P&D Environmental	Assistant Project Manager, Task Leader for Public Utilities Section, assisted with Hydrology Report

Name	Title	Responsibility
Garber, Lewis, P.E., T.E.	Senior Vice President P&D Environmental	Traffic, Transit, Circulation & Parking
Warren Sprague	Senior Economist P&D Environmental	Communities, Socioeconomics, and Environmental Justice Analysis
Anne Pietro	Environmental Scientist P&D Environmental	Task Leader for Aesthetics and Visual Quality Technical Analysis
Christine Huard-Spencer	Principal and Project Manager P&D Environmental	Section 4(f) and 6(F) Properties Analysis
Jennifer Hobbs	Environmental Planner P&D Environmental	Land Use, GIS, Property Impacts, Section 4(f) and 6(f) Resources
Robert Olsen	Senior Geologist P&D Environmental	Hazardous Materials and Wastes Analysis
Robert Rusby	Project Manager P&D Environmental	Agricultural Resources/Farmland Analysis
Ron Richardson	Project Engineer P&D Environmental	Analysis for Hydrology and Water Quality
Shelly Austin	Biologist P&D Environmental	Project Manager for Biological Resources and Wetlands Studies
Christopher Wornum	Principal-in-Charge Cambridge Systematics	Task Leader for estimation of benefits of HSR; Task Leader for station area impacts of induced growth
George Mazur, P.E.	Senior Associate Cambridge Systematics	Project Manager; Lead Author of technical reports of cumulative growth
J. Christopher Kopp, AICP	Associate Cambridge Systematics	Task Leader development around HSR stations and employment land consumption analysis
Dan Hodge	Associate Cambridge Systematics	Task Manager and quality control for REMI modeling and post-processing
Hugh Louch	Senior Associate Cambridge Systematics	Population and employment projections, generated monetized benefits for HSR and Modal scenarios
Glen Weisbrod	President Economic Development Research Group, Inc. (EDRG)	Economic growth model (REMI) to forecast county level business and population attraction impacts
Teresa Lynch	Senior Consultant EDRG	Construction and analysis applying economic growth model to forecast county level business and population attraction impacts
Michael Reilly	Graduate Research Associate EDRG	Technical Lead for development of residential land consumption; modified and ran CURBA model
Mark C. Robinson, RPA	Analyst, Senior Archaeologist Applied Earthworks	Project Manager, Archaeological and Historical Research

Name	Title	Responsibility
Richard A. Carman	Principal Wilson, Ihrig & Associates, Inc.	Project Manager–Noise and Vibration
Bruce R. Hilton, RG, CEG	Project Manager Kleinfelder Associates	Engineering Geology and Seismology
Los Angeles to San Diego via Inland Empire		
Linda Bohlinger	Principal-In-Charge	Oversight of Project, QA/QC
John S. Kulpa, Ph.D.	Project Manager	Regional Team Project Manager
Brian Hausknecht	Deputy Project Manager	Environmental Leader
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Los Angeles to San Diego via Orange County		
Steve Schibuola, IBI Group	Associate Director	Regional Team Project Manager
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Jack Gorzeman, HDR	Project Manager	Land Use and Planning; Hydrology and Water Quality
Walter Odening, HDR	Biological Resources Manager	Biological Resources
Wendy Worthey, HDR	Environmental Specialist	Biological Resources; 4(f) and 6(f) Resources
Jeroen Olthof, HDR	Civil Engineer	Lagoon Hydrology
Julie Wang, HDR	Environmental Specialist	Visual Resources, Hydrology
Caroline Brundage, HDR	GIS Specialist, Planner	Socioeconomics, Environmental Justice; GIS Analysis

Name	Title	Responsibility
Daniel Miller, HDR	Senior Project Manager	Geology, Soils, Seismicity; Hazardous Wastes/Materials/Public Utilities
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David Dettloff, HDR	GIS Specialist	GIS Specialist
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Mark Robinson, Applied Earthworks	Senior Archaeologist	Analyst, Cultural Resources
Nina Harris, Applied Earthworks	Staff Archaeologist	Senior Archaeologist
David Livingstone, Applied Earthworks	Architectural Historian	Analyst, Historic Resources
Kathleen Springer, San Bernardino County Museum	Senior Curator of Geological Sciences	Paleontological Resources Manager
Eric Scott, San Bernardino County Museum	Curator of Paleontology	Paleontological Resources Analyst
Gregory Maxwell, San Bernardino County Museum	Collections Assistant	Paleontological Resources Analyst
Stephanie Fluitt, San Bernardino County Museum	Project Assistant	Paleontological Resources Assistant

11 FINAL PROGRAM EIR/EIS DISTRIBUTION

The statewide distribution of the Final Program EIR/EIS emphasizes the use of electronic media to insure cost-effective, broad availability to the public and interested parties. The entire Final Program EIR/EIS, appendices, and supporting reports are available on the Internet at the Authority's Web site (www.cahighspeedrail.ca.gov). The Final Program EIR/EIS is also on display at the repositories listed below. Electronic compact disc copies of the document are available upon request at the office of the California High Speed Rail Authority, 925 L Street, Suite 1425, Sacramento, CA 95814.

All persons, agencies, and organizations listed in this chapter have been informed of the availability of and locations to obtain the Final Program EIR/EIS. Repositories and cooperating federal agencies were sent both hard and electronic copies of the Final Program EIR/EIS and appendices. Other federal agencies, state agencies, and selected interested parties listed below have received summary chapters and electronic copies of the Final Program EIR/EIS. All commenters are at a minimum receiving an electronic copy of the Final Program EIR/EIS (see index for Volume II for a complete list of commenters). Federal, state, and county elected officials, mayors of cities with possible stations, and potentially affected local agencies listed below were mailed an informational brochure and instructions about how to get a copy of the Final Program EIR/EIS. Additional local elected officials and agency representatives, along with all others on the project mailing list (approximately 10,000 contacts), have been mailed a notification that includes information about how to access the Final Program EIR/EIS.

REPOSITORY LOCATIONS

Bakersfield: Beale Memorial Library, 701 Truxton Avenue, Bakersfield, CA 93301
Phone: (661) 868-0701
Contact: N. Hughes, Acting Beale Head Librarian

Fresno: Fresno County Public Library, Central Branch, Central Reference Department, 2420 Mariposa Street, Fresno, CA 93721
Phone: (559) 488-3195
Contact: Marie Stanley, Reference Supervisor

Irvine: Irvine Heritage Park Regional Library, 14361 Yale Avenue, Irvine, CA 92604
Phone: (949) 936-4040
Contact: Barbara Brook, Branch Manager

Los Angeles: Richard J. Riordan Central Library, LA Public Library, Science, Technology, and Patents Department, 630 West Fifth Street, Los Angeles, CA 90071
Phone: (213) 228-7000
Contact: Robert Thornhill, Science, Technology, and Patents Department

Modesto: Stanislaus County Library, Government Documents Section, 1500 I Street, Modesto, CA 95354
Phone: (209) 558-7890
Contact: Charles Teval, Branch Manager

Oakland: Oakland Public Library, 125 14th Street, Oakland, CA 94612
Phone: (510) 238-3134
Contact: Pat Coffey, Government Documents Section

Riverside: Riverside Public Library, 3581 Mission Inn Avenue, Riverside, CA 92501
Phone: (909) 826-5213
Contact: Dominique McCasserty, Government Documents Librarian, (909) 826-5212

Sacramento: Sacramento Central Library, 8281 I Street, Sacramento, CA 95814
Phone: (916) 264-2795 ex. 2
Contact: James Scott, Librarian

Sacramento: California State Library, Government Publications Section, PO Box 942837, Sacramento, CA 94237-0001
Phone: (916) 651-6813
Contact: Janet Cole, Government Publications Librarian

San Diego: San Diego Public Library, Central Library, Science Industry and Government Documents, 820 E Street, San Diego, CA 92101-6478
Phone: (619) 236-5800
Contact: Gary Klockenga, Government Documents Librarian

San Francisco: San Francisco Main Library, Government Information Center, 100 Larkin Street, Civic Center, San Francisco, CA 94102
Phone: (415) 557-4500
Contact: Therese Cason, California Documents Librarian

San Jose: Dr. Martin Luther King Jr. Library, Reference Department, 150 East San Fernando Street, San Jose, CA 95112
Phone: (408) 808-2094
Contact: David Kravitz, Reference Department

Palo Alto: Palo Alto Main Library1213 Newell Road, Palo Alto, 94303
Phone: (650) 329-2641
Contact: Deborah Angel, Librarian

Mountain View: City of Mountain View General Public Library, 585 Franklin Street, Mountain View, 94040
Phone: (650) 526-7026
Contact: Alice Chu, Library Assistant

Gilroy: Gilroy Library, 7387 Rosanna Street, Gilroy, CA 95020
Phone: (408) 842-8207
Contact: Sally Leete, Adult Program Librarian

Los Banos: Merced County Las Banos Branch Library, 1312 South Seventh Street, Los Banos, CA 93635
Phone: (209) 826-5254
Attn: Lenora Costa, Library Technician

Fremont: Fremont Main Library, Reference Department, 2400 Stevenson Boulevard, Fremont, CA 94538
Phone: (510) 745-1400
Contact: Jackie Beth, Reference Librarian

Stockton: Cesar Chavez Central Library, 605 North El Dorado Street, Stockton, CA 95202
Phone: (209) 937-8221
Contact: Gretchen Louden, Government Documents Librarian

Merced: Merced County Library, 2100 O Street, Merced, CA 95340
Phone: (209) 385-7597
Contact: Victoria Mrozek, Librarian

Palmdale: Palmdale City Library, 700 East Palmdale Boulevard, Palmdale, CA 93550
Phone: (661) 267-5694
Contact: Diane Hanville, Librarian

Sylmar: Sylmar Public Library, 14561 Polk Street, Sylmar, CA 91342
Phone: (818) 367-6102
Contact: Irene Galvan, Branch Manager

Ontario: Ontario City Library, 217 South Lemon Avenue, Ontario, CA 91761
Phone: (909) 395-2204
Contact: Gloria Freel, Associate Director

Anaheim: Anaheim Public Library, 500 West Broadway, Anaheim, CA 92805
Phone: (714) 765-1880
Contact: Joyce Farris, Head of Reference

San Clemente: San Clemente Library, 242 Avenida Del Mar, San Clemente, CA 92672
Phone: (949) 492-3493
Contact: Patricia Hammond, Librarian

Escondido: Escondido Public Library, 239 South Kalmia Street, Escondido, CA 92025
Phone: (760) 839-4212
Contact: Cindi Bouvier, Reference Librarian

Burbank: Burbank Library, 110 North Glen Oaks, Burbank, CA 90502
Phone: (818) 238-5600
Contact: Nancy Tidwell, Reference Librarian

San Gabriel: City of Los Angeles San Gabriel Public Library, 500 South Del Mar Avenue, San Gabriel, CA 91776
Phone: (626) 287-0761
Contact: Janice Thornton, Library Assistant

Norwalk: Norwalk Regional Library, 12350 Imperial Highway, Norwalk, CA 90650
Phone: (562) 868-0775
Contact: Jane Hendrickson, Lead Reference Librarian

Oceanside: Oceanside Public Library, 330 North Coast Highway, 92054
Phone: (760) 435-5600
Contact: Margaret Guerrero, Cultural Services Librarian

Santa Clarita: County of Los Angeles Valencia Public Library, 23743 West Valencia Blvd, Valencia, CA 91355
Phone: (661) 259-8942
Contact: Sheri Dickey, Librarian

Temecula: Temecula Public County Library, 4100 County Center Drive, Temecula, CA 92591
Phone: (909) 600-6262
Contact: Jo Daugherty, Senior Librarian

Tulare: Tulare Public Library, 113 North F Street, Tulare, CA 93274
Phone: (559) 685-2341
Contact: Michael Stowell, Library Director

Washington DC: Federal Railroad Administration, 1120 Vermont Avenue, Washington DC, 20590
Phone: (202) 493-6368
Contact: David Valenstein, Environmental Program Manager

FEDERAL AGENCIES

Advisory Council on Historic Preservation, Executive Director, Washington DC
Bureau of Indian Affairs, Regional Director, Sacramento, CA
Bureau of Land Management, State Director, Sacramento, CA
Federal Aviation Administration, Planning and Programming Branch, Supervisor, Capacity Section, Lawndale, CA
Federal Emergency Management Agency, Region 9, Regional Director, Oakland, CA
Federal Highway Administration, Environmental Program Coordinator, Sacramento, CA
Federal Transit Administration, Office of Planning and Program Development, Director, San Francisco, CA
National Oceanic & Atmospheric Administration, National Marine Fisheries Service, Assistant Regional Administrator for Habitat Conservation, Long Beach, CA
U.S. Department of Army, Corps of Engineers, Regulatory Branch, Los Angeles, CA
U.S. Coast Guard, District 11, Chief of Staff, Alameda, CA
U.S. Department of Agriculture – National Resource Conservation Service, State Resource Conservationist, Davis, CA
U.S. Department of Agriculture – Farm Service Agency, California State Executive Director, Davis, CA
U.S. Department of the Interior, Director, Washington DC
U.S. Environmental Protection Agency, Region 9, San Francisco, CA & Washington DC
U.S. Fish & Wildlife Service, State Supervisor, Sacramento, CA
U.S. Forest Service, Regional Forester Representative, Sacramento, CA
U.S. National Park Service, Regional Director Pacific West Region & Environmental Coordinator, Oakland, CA

STATE AGENCIES

California Business, Transportation and Housing Agency, Agency Secretary, Sacramento
California Department of Transportation, Chief Deputy Director, Sacramento and District Directors from Districts 3 through 12
California Department of Housing and Community Development, Director, Sacramento
California Department of Conservation, Director, Sacramento
California Environmental Protection Agency, Secretary for Environmental Protection, Sacramento
California Integrated Waste Management Board, Executive Director, Sacramento
Office of Environmental Health Hazard Assessment, Director, Sacramento
Department of Pesticide Regulation, Director, Sacramento
Department of Toxic Substances Control, Director, Sacramento

California Air Resources Board, Planning and Technical Support Division, Technical Staff, Sacramento
State Water Resources Control Board, Water Quality Division, Regulatory Staff, Sacramento
California Geologic Survey, Supervising Geologist, Sacramento
California Health and Human Services, Secretary, Sacramento
Office of Stateside Health Planning and Development, Director, Sacramento
California Public Utilities Commission, Rail Safety & Crossing Branch, Staff, San Francisco
California State Resources Agency, Secretary, Sacramento
California Coastal Commission, Director, San Francisco
California Department of Boating and Waterways, Director, Sacramento
California Department of Fish and Game, Program Coordinator for Environmental Review and Permitting, Sacramento
California Department of Parks and Recreation, Chief of Natural Resources, Sacramento
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State Coastal Conservancy, Executive Officer, Oakland
California Transportation Commission, Executive Director, Sacramento
Governor's Office of Planning and Research-State Clearinghouse, Senior Planner, Sacramento
Native American Heritage Commission, Environmental Specialist, Sacramento
State Lands Commission, Executive Officer, Sacramento

ELECTED OFFICIALS

Federal Elected Officials

U.S. SENATORS:

The Honorable Barbara Boxer, U.S. Senate, California
The Honorable Dianne Feinstein, U.S. Senate, California

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The Honorable Joe Baca, 43rd Congressional District
The Honorable Xavier Becerra, 31st Congressional District
The Honorable Howard Berman, 28th Congressional District
The Honorable Mary Bono, 45th Congressional District
The Honorable Ken Calvert, 44th Congressional District
The Honorable Lois Capps, 23rd Congressional District
The Honorable Dennis A. Cardoza, 18th Congressional District
The Honorable Christopher Cox (vacated), 48th Congressional District
The Honorable Randy "Duke" Cunningham, 50th Congressional District
The Honorable Susan Davis, 53rd Congressional District
The Honorable Jim Costa, 20th Congressional District
The Honorable John Doolittle, 4th Congressional District
The Honorable David Dreier, 26th Congressional District
The Honorable Anna G. Eshoo, 14th Congressional District
The Honorable Sam Farr, 17th Congressional District
The Honorable Bob Filner, 51st Congressional District
The Honorable Elton Gallegly, 24th Congressional District
The Honorable Jane Harman, 36th Congressional District
The Honorable Wally Herger, 2nd Congressional District

The Honorable Michael Honda, 15th Congressional District
The Honorable Duncan Hunter, 52nd Congressional District
The Honorable Darrell Issa, 49th Congressional District
The Honorable Tom Lantos, 12th Congressional District
The Honorable Barbara Lee, 9th Congressional District
The Honorable Jerry Lewis, 41st Congressional District
The Honorable Zoe Lofgren, 16th Congressional District
The Honorable Daniel Lungren, 3rd Congressional District
The Honorable Doris O. Matsui, 5th Congressional District
The Honorable Howard P. "Buck" McKeon, 25th Congressional District
The Honorable Juanita Millender-McDonald, 37th Congressional District
The Honorable Gary Miller, 42nd Congressional District
The Honorable George Miller, 7th Congressional District
The Honorable Grace Napolitano, 38th Congressional District
The Honorable Devin Nunes, 21st Congressional District
The Honorable Nancy Pelosi, 8th Congressional District
The Honorable Richard Pombo, 11th Congressional District
The Honorable George P. Radanovich, 19th Congressional District
The Honorable Dana Rohrabacher, 46th Congressional District
The Honorable Lucille Roybal-Allard, 34th Congressional District
The Honorable Edward R. Royce, 40th Congressional District
The Honorable Linda T. Sanchez, 39th Congressional District
The Honorable Loretta Sanchez, 47th Congressional District
The Honorable Adam B. Schiff, 29th Congressional District
The Honorable Brad Sherman, 27th Congressional District
The Honorable Hilda Solis, 32nd Congressional District
The Honorable Fortney "Pete" Stark, 13th Congressional District
The Honorable Ellen Tauscher, 10th Congressional District
The Honorable Bill Thomas, 22nd Congressional District
The Honorable Mike Thompson, 1st Congressional District
The Honorable Maxine Waters, 35th Congressional District
The Honorable Diane Watson, 33rd Congressional District
The Honorable Henry Waxman, 30th Congressional District
The Honorable Lynn Woolsey, 6th Congressional District

State Elected Officials

GOVERNOR:

The Honorable Arnold Schwarzenegger, California Governor

STATE SENATE:

The Honorable Samuel M. Aanestad, 4th Senate District, Nevada City
The Honorable Richard Ackerman, 33rd Senate District, Tustin
The Honorable Richard Alarcón, 20th Senate District, Van Nuys
The Honorable Elaine Alquist, 13th Senate District, San Jose
The Honorable Roy Ashburn, 18th Senate District, Bakersfield
The Honorable Jim Battin, 37th Senate District, Palm Desert
The Honorable Debra Bowen, 28th Senate District, Redondo Beach
The Honorable John Campbell, 35th Senate District, Costa Mesa
The Honorable Gilbert Cedillo, 22nd Senate District, Los Angeles
The Honorable Wesley Chesbro, 2nd Senate District, Santa Rosa
The Honorable Dave Cox, 1st Senate District, Roseville

The Honorable Jeff Denham, 12th Senate District, Modesto
The Honorable Denise Moreno Ducheny, 40th Senate District, Chula Vista
The Honorable Joseph Dunn, 34th Senate District, Garden Grove
The Honorable Robert Dutton, 31st Senate District, Rancho Cucamonga
The Honorable Martha Escutia, 30th Senate District, Norwalk
The Honorable Liz Figueroa, 10th Senate District, Fremont
The Honorable Dean Florez, 16th Senate District, Fresno
The Honorable Dennis Hollingsworth, 36th Senate District, Temecula
The Honorable Christine Kehoe, 39th Senate District, San Diego
The Honorable Sheila James Kuehl, 23rd Senate District, Los Angeles
The Honorable Alan Lowenthal, 27th Senate District, Long Beach
The Honorable Michael Machado, 5th Senate District, Stockton
The Honorable Bob Margett, 29th Senate District, Diamond Bar
The Honorable Tom McClintock, 19th Senate District, Thousand Oaks
The Honorable Bruce McPherson, 15th Senate District, Santa Cruz
The Honorable Carole Migden, 3rd Senate District, San Rafael
The Honorable Bill Morrow, 38th Senate District, San Juan Capistrano
The Honorable Kevin Murray, 26th Senate District, Culver City
The Honorable Deborah Ortiz, 6th Senate District, Sacramento
The Honorable Don Perata, 9th Senate District, Oakland
The Honorable Charles Poochigian, 14th Senate District, Fresno
The Honorable Gloria Romero, 24th Senate District, Rosemead
The Honorable George Runner, 17th Senate District, Lancaster
The Honorable Jack Scott, 21st Senate District, Pasadena
The Honorable Joseph S. Simitian, 11th Senate District, Palo Alto
The Honorable Nell Soto, 32nd Senate District, Ontario
The Honorable Jackie Speier, 8th Senate District, San Mateo
The Honorable Tom Torlakson, 7th Senate District, Concord
The Honorable Edward Vincent, 25th Senate District, Inglewood

STATE ASSEMBLY:

The Honorable Greg Aghazarian, 26th Assembly District, Stockton
The Honorable Juan Arambula, 31st Assembly District, Fresno
The Honorable Joe Baca, 62nd Assembly District, San Bernardino
The Honorable Karen Bass, 47th Assembly District, Los Angeles
The Honorable John C. Benoit, 64th Assembly District, Riverside/Palm Desert (Coachella Valley)
The Honorable Patty Berg, 1st Assembly District, Santa Rosa/Ukiah/Eureka
The Honorable Rudy Bermúdez, 56th Assembly District, Norwalk
The Honorable Sam Blakeslee, 33rd Assembly District, San Luis Obispo
The Honorable Russ Bogh, 65th Assembly District, Yucaipa
The Honorable Ronald S. Calderon, 58th Assembly District, Montebello
The Honorable Joseph Canciamilla, 11th Assembly District, Martinez
The Honorable Wilma Chan, 16th Assembly District, Oakland
The Honorable Edward Chavez, 57th Assembly District, City of Industry
The Honorable Judy Chu, 49th Assembly District, Monterey Park/El Monte
The Honorable Dave Cogdill, 25th Assembly District, Modesto
The Honorable Rebecca Cohn, 24th Assembly District, Campbell
The Honorable Joe Coto, 23rd Assembly District, San Jose
The Honorable Lynn Daucher, 72nd Assembly District, La Brea
The Honorable Hector de la Torre, 50th Assembly District, Southgate
The Honorable Chuck De Vore, 70th Assembly District, Aliso Viejo/Irvine/Laguna Beach/Newport Beach/Tustin

The Honorable Mervyn M. Dymally, 52nd Assembly District, Compton
The Honorable Bill Emmerson, 63rd Assembly District, Rancho Cucamonga
The Honorable Noreen Evans, 7th Assembly District, Santa Rosa/Vallejo/Napa
The Honorable Dario Frommer, 43rd Assembly District, Glendale
The Honorable Bonnie Garcia, 80th Assembly District, El Centro/Cathedral City
The Honorable Jackie Goldberg, 45th Assembly District, Los Angeles
The Honorable Loni Hancock, 14th Assembly District, El Cerrito
The Honorable Tom Harman, 67th Assembly District, Huntington Beach
The Honorable Ray Haynes, 66th Assembly District, Temecula
The Honorable Jerome Horton, 51st Assembly District, Inglewood
The Honorable Shirley Horton, 78th Assembly District, Lemon Grove
The Honorable Guy S. Houston, 15th Assembly District, Livermore/Walnut Creek/Brentwood
The Honorable Bob Huff, 60th Assembly District, City of Industry
The Honorable Dave Jones, 9th Assembly District, Sacramento
The Honorable Betty Karnette, 54th Assembly District, Long Beach
The Honorable Rick Keene, 3rd Assembly District, Chico
The Honorable Johan Klehs, 18th Assembly District, Hayward
The Honorable Paul Koretz, 42nd Assembly District, West Hollywood
The Honorable John Laird, 27th Assembly District, Monterey
The Honorable Doug LaMalfa, 2nd Assembly District, Yuba City/Redding
The Honorable Jay LaSuer, 77th Assembly District, La Mesa
The Honorable Sally J. Lieber, 22nd Assembly District, San Jose
The Honorable Mark Leno, 13th Assembly District, San Francisco
The Honorable Tim Leslie, 4th Assembly District, Roseville
The Honorable Lloyd E. Levine, 40th Assembly District, Van Nuys
The Honorable Carol Liu, 44th Assembly District, Pasadena
The Honorable Barbara S. Matthews, 17th Assembly District, Stockton
The Honorable Bill Maze, 34th Assembly District, Visalia/Mojave
The Honorable Kevin McCarthy, 32nd Assembly District, Bakersfield
The Honorable Cindy Montañez, 39th Assembly District, Mission Hills
The Honorable Dennis Mountjoy, 59th Assembly District, Monrovia
The Honorable Gene Mullin, 19th Assembly District, San Mateo
The Honorable Alan Nakanishi, 10th Assembly District, Lodi
The Honorable Joseph Nation, 6th Assembly District, San Rafael
The Honorable Pedro Nava, 35th Assembly District, Santa Barbara
The Honorable Gloria Negrete McLeod, 61st Assembly District, Montclair
The Honorable Roger Niello, 5th Assembly District, Sacramento
The Honorable Fabian Nuñez , 46th Assembly District, Los Angeles
The Honorable Jenny Oropeza, 55th Assembly District, Carson
The Honorable Nicole Parra, 30th Assembly District, Bakersfield/Hanford
The Honorable Fran Pavley, 41st Assembly District, Woodland Hills
The Honorable George A. Plescia, 75th Assembly District, San Diego
The Honorable Keith Richman, 38th Assembly District, Granada Hills
The Honorable Mark Ridley-Thomas, 48th Assembly District, Los Angeles
The Honorable Sharon Runner, 36th Assembly District, Victorville/Lancaster
The Honorable Ira Ruskin, 21st Assembly District, Palo Alto
The Honorable Lori Saldana, 76th Assembly District, San Diego
The Honorable Simon Salinas, 28th Assembly District, Salinas
The Honorable Todd Spitzer, 71st Assembly District, Orange
The Honorable Audra Strickland, 37th Assembly District, Westlake
The Honorable Alberto Torrico, 20th Assembly District, Fremont
The Honorable Van Tran, 68th Assembly District, Costa Mesa
The Honorable Tom Umberg, 69th Assembly District, Anaheim

The Honorable Juan Vargas, 79th Assembly District, Chula Vista
The Honorable Michael N. Villines, 29th Assembly District, Fresno
The Honorable Mimi Walters, 73rd Assembly District, Laguna Niguel
The Honorable Lois Wolk, 8th Assembly District, Vacaville
The Honorable Mark Wyland, 74th Assembly District, Vista
The Honorable Leland Yee Ph.D., 12th Assembly District, San Francisco

STATEWIDE COUNTY BOARD OF SUPERVISORS CHAIRPERSON:

Ms. Blanca Alvarado, Santa Clara County
Mr. John Amaro, Glenn County
Mr. Fernando Armenta, Monterey County
Ms. Marion Ashley, Riverside County
Mr. R.J. Beeler, Butte County
Ms. Shirley Bianchi, San Luis Obispo
Mr. Frank Bigelow, Madera County
Mr. David Bradshaw, Modoc County
Mr. Mitchell Brooks, Sierra County
Mr. Harold Brown, Marin County
Mr. Bill Campbell, Orange County
Mr. Tony Campos, Santa Cruz County
Mr. Keith Carson, Alameda County
Ms. Judy Case, Fresno County
Ms. Connie Conway, Tulare County
Mr. Michael Delbar, Mendocino County
Mr. Roger Dickinson, Sacramento County
Ms. Diane Dillon, Napa County
Ms. La Vada Erickson, Siskiyou County
Ms. Victoria Erickson, Calaveras County
Mr. Richard Forster, Amador County
Mr. Howard Freeman, Trinity County
Mr. Gary Gilbert, Madera County
Mr. Richard S. Gordon, San Mateo County
Ms. Mary Jane Griego, Yuba County
Mr. Jeff Grover, Stanislaus County
Mr. Steve Gutierrez, San Joaquin County
Mr. Byng M. Hunt, Mono County
Mr. Donald Jardine, Alpine County
Mr. Michael Johnson, Solano County
Ms. Barbara Kaufman, San Francisco County
Mr. Lloyd Keefer, Lassen County
Mr. David Kehoe, Shasta County
Mr. Wally Leimbruber, Imperial County
Mr. W.B. "Butch" Lindley, Monterey County
Ms. Kathy Long, Ventura County
Mr. Paolo Maffei, Tuolumne County
Ms. Martha McClure, Del Norte County
Ms. Gloria Molina, Los Angeles County
Ms. Reb Monaco, San Benito County
Mr. Jerry O'Banion, Merced County
Mr. Ted Owens, Nevada County
Mr. Charlie Paine, El Dorado County
Mr. B.J. Pearson, Plumas County

Mr. Bob Pickard, Mariposa County
Mr. Bill Postmus, San Bernardino County
Mr. Ed Robey, Lake County
Mr. Roger Rodoni, Humboldt County
Ms. Susan Rose, Santa Barbara County
Mr. George Russell, Tehama County
Mr. Bill Santucci, Placer County
Ms. Pam Slater-Price, San Diego County
Mr. Tim Smith, Sonoma County
Ms. Alene Taylor, Kings County
Ms. Helen Thomson, Yolo County
Ms. Gayle B. Vilkema, Contra Costa County
Mr. Ray Watson, Kern County
Mr. Jim Whiteaker, Sutter County
Mr. Ted Williams, Inyo County
Mr. David Wombie, Colusa County
Ms. Kim K. Yamaguchi, Butte County

MAYORS OF CITIES WITH POTENTIAL STATIONS:

The Honorable Mayor Michael S. Amabile, Los Banos
The Honorable Mayor Alan Autry, Fresno
The Honorable Mayor David G. Ayers, Hanford
The Honorable Mayor Jerry Brown, Oakland
The Honorable Mayor Jim Burch, Palo Alto
The Honorable Mayor Edward J. Chavez, Stockton
The Honorable Mayor Jeff Comerchero, Temecula
The Honorable Mayor Roberta Cooper, Hayward
The Honorable Mayor Edward Cortez, Pomona
The Honorable Mayor Juli Costanzo, San Gabriel
The Honorable Mayor Warnie Enochs, Murrieta
The Honorable Mayor Heather Fargo, Sacramento
The Honorable Mayor Blanca M. Figueroa, South El Monte
The Honorable Mayor Ron Gonzales, San Jose
The Honorable Mayor Mark Green, Union City
The Honorable Mayor Ernest Gutierrez, El Monte
The Honorable Mayor Wyatt T. Hart, San Juan Capistrano
The Honorable Mayor Harvey Hall, Bakersfield
The Honorable Mayor Jeff Ira, Redwood City
The Honorable Mayor Joe G. Kellejian, Solana Beach
The Honorable Mayor Dennis Kennedy, Morgan Hill
The Honorable Mayor Beth Krom, Irvine
The Honorable Mayor James C. Ledford Jr., Palmdale
The Honorable Mayor Bob Link, Visalia
The Honorable Mayor Ronald O. Loveridge, Riverside
The Honorable Mayor Patricia M. Mahan, Santa Clara
The Honorable Mayor Dick Murphy, San Diego
The Honorable Mayor Shawn Nelson, Fullerton
The Honorable Mayor Gavin Newsom, San Francisco
The Honorable Mayor Gary C. Ovitt, Ontario
The Honorable Mayor David Perez, City of Industry
The Honorable Mayor Lori Holt Pfeiler, Escondido
The Honorable Mayor Al Pinheiro, Gilroy

The Honorable Mayor Curt Pringle, Anaheim
The Honorable Mayor Miguel A. Pulido, Santa Ana
The Honorable Mayor Jim Ridenour, Modesto
The Honorable Mayor David W. Smith, Newark
The Honorable Mayor Cameron Smyth, Santa Clarita
The Honorable Mayor Gordon Stefenhagen, Norwalk
The Honorable Mayor Judith Valles, San Bernardino
The Honorable Mayor Jef Vander Borght, Burbank
The Honorable Mayor Antonio Villaraigosa, Los Angeles
The Honorable Mayor Hubert Walsh, Merced
The Honorable Mayor Robert Wasserman, Fremont
The Honorable Mayor Jim Wood, Oceanside

Note: Other local elected officials not listed here have been notified regarding the availability of the Draft Program EIR/EIS.

REGIONAL/LOCAL AGENCIES BY CORRIDOR SEGMENT

Region 1—Sacramento to Bakersfield

Council of Fresno County Governments, Executive Director, Fresno
Council of San Benito County Governments, Board of Directors Chairperson, Hollister
Kern County Air Pollution Control District, Board of Directors Chairperson, Bakersfield
Kings County Association of Governments, Transportation Policy Committee Chairperson, Hanford
Merced County Association of Governments, Chairperson, Merced
Sacramento Area Council of Governments, Board of Directors Chairperson, Sacramento
Sacramento Metropolitan Air Quality Management District, Chairperson, Sacramento
Sacramento Transportation Authority, Executive Director, Sacramento
San Joaquin Council of Governments, Executive Director, Stockton
San Joaquin Regional Rail Commission, Chairperson, Stockton
San Joaquin Valley Air Pollution Control District, Governing Board Chairperson, Fresno
Stanislaus Council of Governments, Executive Director, Modesto
Tulare County Association of Governments, Governing Board Chairperson, Visalia

Region 2—Bay Area to Merced

Alameda County Transportation Improvement Authority, Executive Director, Oakland
Association of Monterey Bay Area Governments, Board of Directors President, Marina
Bay Area Air Quality Management District, Executive Officer, San Francisco
Bay Area Rapid Transit District (BART), President of the BART Board, Oakland
California Aviation Alliance, Executive Director, Vacaville
Caltrain – Peninsula Corridor Joint Powers Board, Board Secretary, San Carlos
Capitol Corridor Joint Powers Authority, Chairperson, Oakland
Metropolitan Transportation Commission, Executive Director, Oakland
Monterey Bay Unified Air Pollution Control District, Executive Officer, Monterey
San Mateo County Transportation Authority, Board of Directors Chairperson, San Carlos
San Mateo County Transit District, Board of Directors Chairperson, San Carlos
Santa Clara Valley Transportation Authority, Board of Directors Chairperson, San Jose
Solano Transportation Authority, Executive Director, Solano

Region 3—Bakersfield to Los Angeles

Antelope Valley Air Pollution Control District, Governing Board Chairperson, Lancaster
Glassel Park Association

Kern Council of Governments, Executive Director, Bakersfield
Mojave Desert Air Quality Management District, Air Pollution Control Officer, Victorville
San Bernardino Association of Governments, Executive Director, San Bernardino
San Luis Obispo Council of Governments, Executive Director, San Luis Obispo
Santa Barbara Association of Governments, Executive Director, Santa Barbara
Santa Barbara County Air pollution Control District, Director-Air Pollution Control Officer, Goleta
Southern California Air Quality Management District, Executive Officer, Diamond Bar
Southern California Association of Governments, Executive Director, Los Angeles
Ventura Council of Governments, Executive Director, Ventura
Ventura County Air Pollution Control District, Air Pollution Control Officer, Ventura
Ventura County Transportation Commission, Commission Chairperson, Ventura

Region 4—Los Angeles to Orange County to San Diego

San Diego Metropolitan Transit Development Board, Board of Directors Chairperson, San Diego
Metropolitan Transportation Authority, Executive Director, Los Angeles
North San Diego County Transit District, Board of Directors Chairperson, Oceanside
Orange County Transportation Authority, Board of Directors Chairperson, Orange
Port of Long Beach Air Quality Improvement Plan, Harbor Commission Chairperson, Long Beach
Southern California Regional Rail Authority – Metrolink, Board of Directors Chairperson, Los Angeles

Region 5—Los Angeles to Riverside to San Diego

Riverside County Transportation Commission, Commission Chairperson, Riverside
San Bernardino County Association of Governments, Board of Directors Chairperson, San Bernardino
County of San Diego - Air Pollution Control District, Director, San Diego
San Diego Association of Governments, Executive Director, San Diego
San Gabriel Valley Council of Governments, Governing Board President, Pasadena
Western Riverside Council of Governments, Executive Director, Riverside

ORGANIZATIONS AND BUSINESSES

Amtrak, Mayors Advisory Council, Bakersfield
Amtrak, President & CEO Amtrak, Washington
Bay Area Council, President and CEO, San Francisco
Burlington Northern and Santa Fe Railway, Director of Public Affairs, Los Angeles
California Native Plant Society, Executive Director, Sacramento
California-Nevada Super Speed Train Commission
Great Valley Center, President, Modesto
Mojave Desert Ecosystem Program, MPED Coordinator, Barstow
Natural Resources Defense Council, Regional Director, San Francisco
Planning and Conservation League, Executive Director, Sacramento
Rail Passenger Association of California, Executive Director, San Francisco
San Francisco Planning and Urban Research Association, President, San Francisco
Sierra Club California, Executive Committee Chair, Sacramento
Silicon Valley Manufacturing Group, Associate Director, Transportation & Land Use, San Jose
The Nature Conservancy, Regional Director, San Francisco
Train Riders Association of California, Executive Director, Sacramento
Union Pacific Railroad, Special Representative, Sacramento

12 SOURCES USED IN DOCUMENT PREPARATION

This chapter lists the sources used in the preparation of this document. The sources are listed by chapter, and by section in the case of Chapter 3. The sources include printed material, Web-based material, and personal communications.

12.1 CHAPTER 1 PURPOSE AND NEED AND OBJECTIVES

Amtrak. June 2000. Final business plan, ridership and revenue. Washington D.C.: Government Printing Office.

———. 2001. California passenger rail system, 20-year improvement plan technical report. Washington D.C.: Government Printing Office.

California Department of Highway Safety and Motor Vehicles-Annual Report. 1999. Annual summary of accident data for state highways. Sacramento, CA.

California High Speed Rail Authority. 2000. Final business plan, ridership and revenue. Sacramento CA.

Federal Aviation Administration. 2001. Terminal Area Forecast. Washington D.C.: Government Printing Office.

Kaku Associates. 2001. Unpublished data used in Table 1.2-1. Los Angeles, CA.

Los Angeles Airport Authority. 2001. LAX master plan draft EIS/EIR.

National Transportation Safety Board. 2001. Website NTSB home page, NTSB aviation page, aviation statistics, Table 1 Accidents, Fatalities, and Rates, 1999 preliminary statistics, U.S. aviation.

Office of the Inspector General. 2000. Audit Report No. CR-2000-112, Air carrier flight delays and cancellations. July 25. Washington, D.C.

Southern California Association of Governments. 2001. 2001 regional transportation plan update. Los Angles, CA.

U.S. Department of Transportation. 1999. Air travel consumer report. Washington D.C.: Government Printing Office.

12.2 CHAPTER 2 ALTERNATIVES

Amtrak. 2000. California passenger rail system five-year improvement plan summary report.

California High Speed Rail Authority. 1999. California high-speed rail corridor evaluation. Prepared by Parsons Brinckerhoff. December.

———. 1999. Revised staff recommendations for VHS route adoption. July.

———. 1999. Staff recommendations for route adoption. Approved at the July 21, 1999 Authority board meeting.

———. 2000. Final business plan. Sacramento, CA.

———. 2001. Bakersfield to Los Angeles high-speed train alignments/stations screening evaluation. August 21.

———. 2001. Bay Area to Merced high-speed train alignments/stations screening evaluation. September.

———. 2001. California high-speed train screening report.

———. 2001. Los Angeles to San Diego via Inland Empire corridor high-speed train alignments/stations screening evaluation. August.

———. 2001. Los Angeles to San Diego via Orange County high-speed train alignments/stations screening evaluation. August.

———. 2001. Sacramento to Bakersfield high-speed train alignments/stations screening evaluation. September 19.

———. 2002. Alignment refinement/optimization and evaluation of the Quantm system. April 30.

———. 2004. Engineering Criteria. January. Prepared by Parsons Brinckerhoff, Inc.

California High-Speed Rail Authority and Federal Railroad Administration. 2000. Screening evaluation.

California High-Speed Rail Commission. 1996. High speed rail summary report and action plan. December.

———. 1996. High-speed rail decision issues. January 7.

———. 1996. High-speed rail decisions issues. January 26.

California Intercity High Speed Rail Commission. 1996. Corridor evaluation and environmental constraints analysis.

Charles River Associates. 1995. Preliminary forecasts. December 5.

———. 1996. Independent ridership and passenger revenue projections for high-speed rail alternatives in California. July.

———. 2000. Independent ridership and passenger revenue projections for high speed rail alternatives in California, draft final report. Prepared for the California High Speed Rail Authority.

———. 2000. Sensitivity analysis.

———. Undated. Intercity travel demand forecasts.

CPG. 1996. Public Participation Program Summary Report.

Metropolitan Transportation Commission. 2000. Regional airport system plan, update 2000, final report. September.

———. 2002. San Francisco Bay crossing study. June 20.

Parsons Brinckerhoff. 1995. Draft technology evaluation report. September.

———. 1995. High speed rail environmental constraints and impacts analysis. December.

———. 1999. California high-speed rail corridor evaluation. Prepared for California High Speed Rail Authority. December.

San Diego Association of Governments. 2000. 2020 regional transportation plan. April.

San Francisco Metropolitan Transportation Commission. 2002. San Francisco Bay crossing study. June.

Southern California Area Governments. 2001. Regional aviation plan for the 2001 regional transportation plan. August.

Southern California Association of Governments. 2004. 2004 Regional Transportation Plan.

12.3 SECTION 3.1 TRAFFIC AND CIRCULATION

California Department of Transportation. 2003. CEQA checklist. Available: Caltrans District 4 website www.caltrans.gov. Accessed: November 10, 2003.

CH2Mhill. 2004. Los Angeles to San Diego via inland empire, traffic, transit circulation and parking technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield Region, traffic, transit circulation and parking technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, traffic, transit circulation and parking technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Metropolitan Transportation Commission. 1998 (amended 1999). 1998 regional transportation plan. Oakland, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, traffic, transit circulation and parking technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region, traffic, transit circulation and parking technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Road Information Program Website 2003. Available: <http://www.tripnet.org/>.

Southern California Association of Governments. 2001 regional transportation plan. 2001. Los Angeles, CA.

Texas Transportation Institute. 2002. Urban mobility study. College Station, TX.

Tondreau. California Highway Patrol Officer. Fort Tejon, CA. November 17, 2003—telephone conversation.

Transportation Research Board of the National Academies. 1980. Transportation research circular no. 212, interim on highway capacity. Washington, D.C.

———. 2000. 2000 highway capacity manual. Washington, D.C.

12.3.1 Bay Area to Merced

Caltrain and BART – Information regarding their parking facilities.

MTC and SACOG models were the source of traffic data. Traffic data from City of Oakland was used for a street at the Oakland City Center.

Reports and figures on High-Speed Rail Project from the Project Solve website.

12.3.2 Sacramento to Bakersfield

A. REGIONAL TRANSPORTATION PLANS

Council of Fresno County Governments. 2001. Regional transportation plan. Adopted November 29, 2001. Fresno, CA.

Kern County Council of Governments. 2000. Executive summary, regional transportation plan. September 2000. Bakersfield, CA.

Kings County. 2001. Kings County regional transportation plan. December 2001. Hanford, CA.

Merced County Association of Governments. 2001. Regional transportation plan. July 2001. Merced, CA.

Sacramento Council of Governments. 2001. A bold first step for mobility in the Sacramento region: Metropolitan transportation plan for 2025. (SACOG-02-019). Sacramento, CA.

———. 2002. Final draft, metropolitan transportation plan for 2025. May 15, 2002. (SACOG-02-009) Sacramento, CA.

San Joaquin Council of Governments. 2001. Destination 2025: 2001 regional transportation plan. Stockton, CA.

Stanislaus Council of Governments. 2002. Regional transportation plan: Investment strategies for the future, 2000 - 2025. Adopted February 13, 2002.

Tulare County Association of Governments. 2001. 2001/2002 regional transportation plan. July 16, 2001. 14th Edition. Tulare, CA.

B. GENERAL PLANS

Bakersfield, City of. 2002. Metropolitan Bakersfield general plan update environmental impact report. June. Bakersfield, CA.

Fresno, City of. Prepared by URS Corporation. 2002. Draft master environmental impact report for the 2025 Fresno general plan. Fresno, CA

Fresno, City of, Planning and Development Department-Advanced Planning. 2002. 2025 Fresno general plan. Fresno, CA.

Hanford, City of. Prepared by Valley Planning Consultants, Inc. 2002. General plan update 2002. Adopted June 18. Hanford, CA.

Merced, City of. 1997. Merced vision 2015 final program environmental impact report. April. Merced, CA.

Modesto, City of, Community and Economic Development Department. 2002. Draft environmental impact report update for the urban area general plan and related amendments to the urban area general plan.

Sacramento, City of. Undated. City of Sacramento general plan, circulation element. Sacramento, CA.

Sacramento, City of, Economic Development Department. 2002. City 2005 downtown Sacramento redevelopment strategy. February. Sacramento, CA.

Stockton, City of. Prepared by Michael Paoli and Associates. 1992. Draft environmental impact report, City of Stockton 1992 general plan revision. August. Stockton, CA.

———. 2001. Downtown strategic action plan. October. Stockton, CA.

Visalia, City of. 2001. Circulation element update. April. Visalia, CA.

C. REGIONAL TRANSPORTATION PLAN TRAVEL DEMAND MODELS

Fresno County Council of Governments (Fresno COG) 1998/2025 Model.

Kern County 1998/2025 Model.

Merced County Association of Governments (MCAG) 2000/2025 Model.

Sacramento Metropolitan Area Council of Governments (Sac Met) 2000/2025 Model.

San Joaquin County Council of Governments (SJCOG) 1999/2025 Model.

Stanislaus County Council of Governments (STANCOG) 2000/2025 Model.

Tulare County Association of Governments (TCAG) 1998/2020 Model.

D. AIRPORT MASTER PLANS

Merced, City of. Prepared by Hodges & Shutt. 1990. Merced municipal airport master plan report. December 1990. Merced, CA.

Modesto City-County Airport. Prepared by Coffman Associates. 2002. Airport master plan. Modesto, CA.

Visalia, City of. Prepared by Shutt Moen Associates. 2001. Visalia municipal airport master plan. March 26, 2001. Visalia, CA.

E. WEBSITES (ALL WEBSITES LAST ACCESSED ON FEBRUARY 13, 2003.)

City Information (Alphabetized by City Name)

<http://www.ci.bakersfield.ca.us/>.

<http://www.ci.fresno.ca.us/>.

<http://www.ci.fresno.ca.us/map/parking/index.html>.

<http://www.ci.fresno.ca.us/news%26info/release%5F120502.html>.

<http://www.ci.hanford.ca.us/>.

<http://ci.merced.ca.us/>.

<http://www.ci.modesto.ca.us/>.

<http://www.modestogov.com/gis/mapIndex.cfm?x=b>.

<http://www.cityofsacramento.org/>.

<http://www.downtownsac.org/view_map.html>.

<http://www.sacsites.com/online_library/pdfs/implmnt_dtsac_2005_full.pdf>.

<http://www.stocktongov.com/>.

<http://www.downtownstockton.org/docs/pdf/cpd_lots.pdf>.

<http://www.ci.visalia.ca.us/>.

County Information (Alphabetized by County Name)
<http://www.co.fresno.ca.us/portal/>.

<http://www.co.kern.ca.us/>.

<http://www.countyofkings.com/>.

<http://www.co.merced.ca.us/>.

<http://www.saccounty.net/>.

<http://www.sacog.org>.

<http://www.co.san-joaquin.ca.us/>.

<http://www.co.stanislaus.ca.us/>.

<http://www.co.tulare.ca.us/>.

Airport Information
<http://www.flyfresno.org/ground.asp>.

<http://www.flyvisalia.com/customamenities.htm>.

<http://www.meadowsfield.com/GroundTransportation.htm (Bakersfield Airport) >.

<http://www.mercedrides.com/Airport/MercedMunicipal.htm>.

<http://www.modairport.com/default.asp>.

<http://www.modairport.com/pass.htm#public%20parking>.

<http://www.sacairports.org/beac1102.htm#one>.

<http://www.sacairports.org/Passenger%20Service/Parking.html>.

Transit Agencies
<http://www.acerail.com/>. (Altamont Commuter Express).

<http://www.amtrak.com/destinations/california.html>.

<http://www.ci.fresno.ca.us/fax/index.html>.

<http://www.ci.visalia.ca.us/busroute.htm>.

<http://www.countyofkings.com/main/KART2.pdf>. (Hanford).

<http://www.getbus.org>. (Bakersfield).

<http://www.greyhound.com>.

<http://www.mercedrides.com/>. (Merced).

<http://www.modestoareaexpress.com/>.

<http://www.orangebelt.com>. (Orange Belt Stages).

<http://www.sacrt.com>. (Sacramento).

<http://www.sj-smart.com>. (San Joaquin County/Stockton).

<http://www.srt.org/index.html>. (Stanislaus Regional Transit).

Traffic Data from Caltrans
<http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2001all.htm>.

12.3.3 Bakersfield to Los Angeles

Burbank, City of. 1994. General plan transportation element. Burbank, CA.

Los Angeles, City of. 1999. General plan transportation element. Los Angles, CA.

Metropolitan Transportation Authority. 2002. 2002 congestion management program for Los Angeles County. Los Angles, CA.

P&D Consultants and DMJM+HARRIS. 2002. Plans and profiles. Prepared for the California High Speed Rail Authority. November. Sacramento, CA.

Palmdale, City of. 1993. General plan circulation element. Palmdale, CA. Adopted January 25. Palmdale, CA.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

Southern California Association of Governments. 1997 model validating and summary regional transportation model.

Thomas Brothers Guide. 2002. Los Angeles and Orange Counties.

12.3.4 Los Angeles to San Diego via Orange County

A. PERSONS CONTACTED

Byrne, Tim. Modeling Department. Orange County Transportation Authority.

Campbell, Glen. Master Plan of Arterial Highways. Orange County Transportation Authority.

Culp, Linda. Senior Planner. San Diego Association of Governments.

Oyang, Zyang. Modeling Department. San Diego Association of Governments.

Steffenson, Jason. Planning Department. Amtrak.

B. AGENCIES CONTACTED

Culver City Transit.

Los Angeles County Metropolitan Transportation Authority.

Los Angeles Department of Transportation.

Metropolitan Transit Development Board (San Diego).

North County Transit District (San Diego).

Norwalk Transit.

Orange County Transportation Authority.

Santa Monica Big Blue Bus.

Torrance Transit.

C. DOCUMENTS REFERENCED

Amtrak. California passenger rail system 20-year improvement plan technical report. December. Oakland, CA.

Meyer, Mohaddes Associates, Inc. 2002. Orange County Transportation Authority strategic plan technical report for the master plan of arterial highways. April. Orange, CA.

Parsons Brinckerhoff. 2001. California High Speed Rail Authority purpose and need. March. Sacramento, CA.

Southern California Association of Governments. 2001. 2001 regional transportation plan update. April. Los Angeles, CA.

San Diego Association of Governments. 2000. 2020 regional transportation plan. April. San Diego, CA.

12.4 SECTION 3.2 TRAVEL CONDITIONS

California Department of Highway Safety and Motor Vehicles. 2001. 2000 annual report of fatal and injury motor vehicle collisions. Sacramento, CA.

California Department of Transportation. 2001. California aviation system plan. Sacramento, CA.

———. 2002. LOSSAN corridor draft strategic plan. April. Sacramento, CA.

California Department of Transportation, Division of Aeronautics. 2002. Aviation in California fact sheet. Sacramento, CA.

California High Speed Rail Authority. 2000. Final business plan. Sacramento, CA.

———. 2000a. Economic growth effects of the system alternatives for the program environmental impact report/environmental impact statement. Sacramento, CA.

———. 2003. Economic growth effects of the system alternatives for the program environmental impact report/environmental impact statement. Sacramento, CA.

California Transportation Commission. 2001. 2000 annual report to the California legislature, volume 1. Sacramento, CA.

Capitol Corridor Joint Powers Authority. 2002. The capitol corridor 2002 performance report. San Carlos, CA.

Charles River Associates, Inc. 2000. Independent ridership and passenger revenue projections for high speed rail alternatives in California. Prepared for the California High Speed Rail Authority, Sacramento, CA.

Commission Working Paper #3. 1996. Cost comparison of mode alternatives. June 20.

Federal Highway Administration Office of Freight Management and Operations. 2003. Aviation in California: Benefits to our economy and way of life. Washington, D.C.: Federal Highway Administration Office of Freight Management and Operations.

Hansen Mark, Geoffrey Gosling, Tarja Kettunen, and Erik Wilkins. 2002. The California aviation system: Current status and report trends. Berkeley, CA: University of California Berkeley Institute of Transportation Studies.

Metropolitan Transportation Commission. 2003. San Francisco Bay Area demographic and travel characteristics: 1970 to 2020. Oakland, CA.

Meunier, Jacob. 2001. On the fast track: French railway modernization and the origins of the TGV, 1944–1983. Westport, CT and London: Praeger Publishers.

Nash, Andrew. 2003. Best practices in shared-use high-speed rail systems. San Jose, CA: San Jose State University Minneta Transportation Institute.

National Center of Aviation Operations and Research. 2002. Aviation trends in California after September 11, 2001. NEXscape 5, (August 2002). College Park, MD.

National Highway Traffic Safety Administration. 2001. Traffic safety facts 2000. Washington, D.C.: U.S. Department of Transportation.

San Diego Airport Economic Analysis and Public Information Program. 2001. January 5.

San Francisco International Airport. 2002. Available: www.flysfo.com: Building the future. Accessed: December 2003.

San Joaquin Council of Governments. 2002. Environmental impact report for the 2001 regional transportation plan. Stockton, CA.

Shrank, David, and Tim Lomax. 2002. The 2002 urban mobility report. College Station, TX: Texas Transportation Institute.

Sivak, Michael, and Michael Flannagan. 2002. Flying and driving after the September 11 attacks. University of Michigan Transportation Research Institute Research Review July – September.

Southern California Association of Governments. 2001. Regional aviation plan for the 2001 regional transportation plan. Los Angles, CA.

Texas Transportation Institute and Cambridge Systematics, Inc. 2003. Monitoring urban roadways in 2001: Using archived operations data for reliability and mobility measurement. April. College Station, TX.

U.S. Department of Transportation. 1999. Air travel consumer report. Washington, D.C.

12.5 SECTION 3.3 AIR QUALITY

California Air Resources Board. Available: <www.arb.ca.gov/app/emsinv/emssumcat>.

California Air Resources Board, Planning and Technical Support Division. 2002. The 2002 California almanac of emissions and air quality.

———. 2002. Forecast emissions by summary categories report.

California Department of Transportation. 1997. Transportation project-level carbon monoxide protocol. UCD-ITS-RR-97-21. Revised December. Sacramento, CA.

———. 2001. California motor vehicle stock, travel and fuel forecast.

Cambridge Systematics. 2002. Travel demand estimation for modal alternative – internal draft.

Federal Aviation Administration. Undated. Emission and dispersion modeling system, version 3.23.

Parsons Brinckerhoff. 1999. California high-speed rail corridor evaluation. Prepared for California High Speed Rail Authority. Sacramento, CA.

Shapiro, Hassett, and Arnold. 2002. Conserving energy and preserving the environment: The role of public transportation. Prepared for the American Public Transportation Association.

U.S. Department of Energy. 2002. Transportation energy data book, edition 22.

12.5.1 Persons and Agencies Contacted

Benjamin, Michael. California Air Resources Board. February 27, 2003—telephone conversation with Alice Lovegrove, Parsons Brinckerhoff.

Honcoop, Gary. California Air Resources Board. February 28, 2003—email to Alice Lovegrove, Parsons Brinckerhoff.

Long, Jeff. California Air Resources Board. January 30, 2003—telephone conversation with Alice Lovegrove, Parsons Brinckerhoff.

Thompson, Doug. California Air Resources Board. July 9, 2003—email to Marilyn Duffy, The Duffy Company.

Weir, Jeff. California Air Resources Board. June 26, 2003—telephone conversation with Alice Lovegrove, Parsons Brinckerhoff.

12.6 SECTION 3.4 NOISE AND VIBRATION

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, noise and vibration technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, noise and vibration technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, noise and vibration technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, noise and vibration technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region noise and vibration technical evaluation. Prepared for California High Speed Rail Authority. Sacramento, CA.

U.S. Department of Transportation, Federal Railroad Administration. 1998. High speed ground transportation noise and vibration impact assessment. Washington, D.C.

U.S. Department of Transportation, Federal Transit Administration. 1995. Transit noise and vibration impact assessment. DOT-T-95-16. Washington, D.C.

12.7 SECTION 3.5 ENERGY

California Department of Finance. 1998. County populations with age, sex and race/ethnic detail July 1, 1990–2040 in 10-year increments. Sacramento, CA.

California Department of Transportation. 1983. Energy and transportation systems. Prepared for Federal Highway Administration. Sacramento, CA.

California Energy Commission. 1990. Energy efficiency report. Sacramento, CA.

———. 1999. Fuels report (commission final—P300-99-001). July. Sacramento, CA.

———. 2000. California energy demand 2000 – 2010 (staff report–technical report to California energy outlook 2000 docket #99-CEO-1). Sacramento, CA.

———. 2001. California Energy Demand 2002 – 2012 Forecast, Attachment A, Committee Workshop. Available: <http://www.energy.ca/energyoutlook/documents/2001-10-04_DEMAND_FORECAST.PDF>. Accessed: February 3, 2003.

———. 2002a. California energy demand 2002 – 2012 forecast, attachment A, committee workshop. Available: <http://www.energy.ca/energyoutlook/documents/2001-10-04_DEMAND_FORECAST. PDF>. Accessed: February 3, 2003.

———. 2002b. 2002–2012 electricity outlook report (commission final—P700-01-004F). Sacramento, CA.

———. 2002c. California energy facts. Available: <http://www.energy.ca.gov/html/calif_energy_facts.html>. Accessed: November 21, 2002.

———. 2002d. California electricity consumption by sector. Available: <http://www.energy.ca.gov./electricity/consumption_by_sector.html>. Accessed: February 13, 2003.

———. 2003a. California's major sources of energy. Available: <www.energy.ca.gov/htm/energysources.html>. Accessed: June 14, 2003.

———. 2003b. Glossary of terms. Available: <http://www.energy.ca.gov/glossary/glossary-m.html>. Accessed: March 3, 2003.

———. 2003c. California's electricity supply and demand balance over the next five years (staff report). Available: <http://www.energy.ca.gov/electricity/2003-01-28_OUTLOOK.PDF>. Accessed: March 2003.

California Energy Commission/California Public Utility Commission. 2003. Natural gas market prices. Sacramento, CA.

California Energy Commission, Media & Public Communications Office. 2003. Energy commission predicts promising electricity supply and demand for next five years. Sacramento, CA.

California High Speed Rail Authority. 2000. Independent ridership and revenue projections for high-speed rail alternatives in California. Prepared by Charles Rivers Associates. Boston, MA.

———. 2001. Final business plan. Sacramento, CA.

———. 2003. Economic growth effects of the system alternatives for the program environmental impact report/environmental impact statement. Sacramento, CA.

California Independent System Operator. 2002a. Scope of the Cal-ISO. Last revised: 2002. Available: <http://www.caiso.com/docs/2002/05/20/2002052008073426642.html>. Accessed: January 22, 2003.

———. 2002b. 2002 summer assessment (version 1.1). Sacramento, CA.

———. 2003. The grid. Available: <http://www.caiso.com/aboutus/infokit/PowerGrid.html>. Accessed: February 12, 2003.

Competitive Enterprise Institute. 1996. CAFE standards. Washington, D.C.

Consumer Power and Conservation Financing Authority/Energy Resources Conservation and Development Commission/CPUC (California Public Utilities Commission). 2003 Draft energy action plan. Sacramento, CA.

California Public Utilities Commission (CPUC). 1998. CEQA electric restructuring. Available: <http://www.cpuc.ca.gov/static/industry/environment/historical+information/ceqa+electric+restructuring/index.htm>. Accessed: January 23, 2003.

California State Department of Transportation. 1983. Congressional Budget Office in energy and transportation systems. Prepared for the Federal Highway Administration. Sacramento, CA.

Competitive Enterprise Institute. 1996. CAFE standards. Washington, D.C.

DE Consult. 2000. German peer review, report, phase I. Frankfurt am Main, Germany.

DeLeuw, Cather, and Company. 1976. Indirect Energy consumption for transportation projects. Prepared for California Department of Transportation Projects.

Federal Transit Administration, Office of Planning. 1999. Technical guidance on Section 5309 new starts criteria. Washington, D.C.

Fels, Margaret F. 1975. Comparative energy costs of urban transportation systems. Transportation Research, Vol. 9, pp. 297-308.

Oak Ridge National Laboratory. 2002. Transportation energy book: edition 22. Center for Transportation Analysis: Oak Ridge, TN.

Taylor, Paul. Vice President. Kaku Associates. June 2002—email in form of spreadsheet Santa Monica, CA.

U.S. Congress, Budget Office. 1977. Urban transportation and energy: The potential savings of different modes. Washington D.C.

———. 1982. Energy use in freight transportation. Staff working paper. Washington D.C.

U.S. Department of Energy, Energy Information Administration. 2003. Annual energy outlook 2003 with projections to 2025. Last revised: July 21. Available: <www.eia.doe.gov/oiaf/tbl22.html>. Accessed: 2003.

U.S. Department of Transportation. 2002a. Docket number NHTSA 11048. Available: <http://www.dot.gov/affairs/nhtsa2002.htm>. Accessed: June 7, 2002.

———. 2002b. Transportation Efficiency Act for the 21st Century. Available: <http://www.fhwa.dot.gov/tea21/h240subb.htm#1203>. Accessed: June 2002.

Western Area Power Administration. 2002. Path 15 update. Last revised: 8/2/02. Available: <http://www.wapa.gov/sn/pdf/path15frnfact.pdf>. Accessed: February 3, 2003.

12.8 SECTION 3.6 ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

Adair, R. K. 1991. Are biological effects of weak ELF fields impossible? Health Physics Society Newsletter 19(10):18-20.

American Conference of Governmental Industrial Hygienists. 1991. Documentation of the threshold limit values and biological exposure indices. Sixth edition. Cincinnati, OH.

American National Standards Institute (ANSI C63.12). 1987. American national standard for electromagnetic compatibility limits: recommended practice. New York: American National Standards Institute.

———(ANSI C63.4). 2000. Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz. New York: American National Standards Institute.

American Public Transit Association. 1999. Standard for the development of an electromagnetic compatibility plan. (APTA SS-E-010-98). Washington, D.C.

Bhachu, D. S., and E. Kanal. 2000. Implantable pulse generators (pacemakers) and electrodes: safety in the magnetic resonance imaging scanner environment. J Magn Reson Imaging 12(1):201-204

Bousquet, P, A. Brecher, K. Brian, et al. 2001. Maglev deployment program final programmatic environmental impact statement, Vol. I. No. DOT/FRA/RDV-00/02; DOT-VNTSC-FRA-00-04. Federal Railroad Administration, U.S. Department of Transportation. 424 p.

Dawson, T. W., K. Caputa, M. A. Stuchly, R. B. Shepard, R. Kavet, and A. Sastre. 2002. Pacemaker interference by magnetic fields at power line frequencies. IEEE Trans Biomed Eng 49(3):254-262

de Graaff, R, A. H. van Deursen, H. Smulders, and G. van Alphen. Undated. Measurements on 25 kV Traction Power Supply Systems.
Available: http://emc2.ohm.york.ac.uk/cost261/techmeetings/deGraaff.pdf.

Dietrich, F. M. and W. L. Jacobs. 1999. Survey and assessment of electric and magnetic field (emf) public exposure in the transportation environment. No. PB 99-130908, 242 p.

Enertech Consultants. 1985. AC field exposure study: human exposure to 60 Hz electric fields. No. EA3993. Palo Alto, CA: EPRI.

Federal Communications Commission. 1996. Report and order: In the matter of guidelines for evaluating the environmental effects of radiofrequency radiation. ET Docket No. FCC 96-62. Washington, D.C.: Federal Communications Commission.

———. 2002. Federal Communications Commission Spectrum Policy Task Force: Report of the interference protection working group. Available: <www.fcc.gov, document OET - IPWGFinalReport.pdf>. November. Washington, D.C.

Fossett, D. A. J. 2003. Technical data - 500 series. Available: <www.h2.dion.ne.jp/~dajf/byunbyun/tech/500.htm>.

Hayes, D. L., P. J. Wang, D. W. Reynolds, N. A. M. Estes, 3rd, J. L. Griffith, R. A. Steffens, G. L. Carlo, G. K. Findlay, C. M. Johnson. 1997. Interference with cardiac pacemakers by cellular telephones. N Engl J Med 336(21):1473-1479

Institute of Electrical and Electronic Engineers. 1999. IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. New York, NY.

International Agency for Research on Cancer (IARC), IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. 2002. IARC monographs on the evaluation of carcinogenic risks to humans. Lyon, France: IARC Press, 429 p.

International Commission on Non-Ionizing Radiation Protection. 1998. Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics 74(4):494-522.

Institute of Electrical and Electronic Engineers C95.1, IEEE Standards Coordinating Committee. 1999. IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. New York: Institute of Electrical and Electronics Engineers, Inc.

Institute of Electrical and Electronic Engineers Standards Coordinating Committee 28, IEEE International Committee on Electromagnetic Safety on Non-Ionizing Radiation. 2002. IEEE Standard for safety levels with respect to human exposure to electromagnetic fields, 0-3 kHz (C95.6). No. IEEE Std C95.6-2002. New York: Institute of Electrical and Electronics Engineers, Inc 43 p.

Jackson, J. D. 1992. Are the stray 60-Hz electromagnetic fields associated with the distribution and use of electric power a significant cause of cancer? Proc Natl Acad Sci USA 89(8):3508-3510.

Kirschvink, J. L. 1992. Childhood leukemia and electric power consumption (letter). Health Physics Society Newsletter 20(5):5-6.

Kraut, A, R. Tate, N. Tran. 1994. Residential electric consumption and childhood cancer in Canada (1971-1986). Archives of Environmental Health 49(3):156-159.

National Council on Radiation Protection and Measurements (eds.). 1986. Biological effects and exposure criteria for radiofrequency electromagnetic fields. Bethesda, MD: National Council on Radiation Protection and Measurements.

National Institute for Environmental Health Sciences. Edited by C. J. Portier and M. S. Wolfe. 1998. Assessment of health effects from exposure to power-line frequency electric and magnetic fields. Research Triangle Park, NC: National Institute of Environmental Health Sciences.

———. 1999. Health effects from exposure to power-line frequency electric and magnetic fields: prepared in response to the 1992 energy policy at (PL 102-486, section 2118). NIH Publication No. 99-4493. Research Triangle Park, NC: National Institute of Environmental Health Sciences.

National Radiological Protection Board, Chilton, Didcot, Oxon OX11 0RQ, UK. 2001. ELF electromagnetic fields and the risk of cancer. A report of an advisory group on non-ionising radiation. Documents of the National Radiation Protection Board 12(1):1-179.

Neutra, R. R., V. Delpizzo, and G. M. Lee. 2002. An evaluation of the possible risks from electric and magnetic fields (EMFs) from power lines, internal wiring, electrical occupations and appliances. Oakland, CA: California EMF Program, California Department of Health Services, 401 p.

Sandström, M, K. H. Mild, M. Sandström, A. Berglund. 1993. External power frequency magnetic field-induced jitter on computer monitors. Behaviour & Information Technology 12(6):359-363.

Savitz, D. A. 1993. Health effects of low-frequency electric and magnetic fields. Environ Sci Technol 27(1):52-54.

Scholten, A., and J. Silny. 2001a. The interference threshold of cardiac pacemakers in electric 50 Hz fields. J Med Eng Technol 25(1):1-11.

———. 2001b. The interference threshold of unipolar cardiac pacemakers in extremely low frequency magnetic fields. J Med Eng Technol 25(5):185-194.

Severson R. K., R. G. Stevens, W. T. Kaune, D. B. Thomas, L. Heuser, S. Davis, and L. E. Sever. 1988. Acute nonlymphocytic leukemia and residential exposure to power frequency magnetic fields. American Journal of Epidemiology 128(1):10–20.

Silva, J. M. et al. 1988. Power frequency magnetic fields in the home. No. 88 WM 101–8. Piscataway, NJ: Institute of Electrical and Electronics Engineers.

Swanson, J. 1996. Long-term variations in the exposure of the population of England and Wales to power-frequency magnetic fields. Journal of Radiologic Protection 16(4):287–301.

Tri, J. L., D. L. Hayes, T. T. Smith, R. P. Severson. 2001. Cellular phone interference with external cardiopulmonary monitoring devices. Mayo Clinic Proceedings 76(1):11-15.

Walter, S. D. 1996. Childhood cancer rates in Canada (letter). Archives of Environmental Health 51(6):467-468.

Wertheimer, N., and E. Leeper. 1992. Comments on EMF and cancer. Health Physics Society Newsletter 20(12):6

Zaffanella, L. 1993. Survey of residential magnetic field sources. Volume 1: Goals, results and conclusions (Final Report). No. TR-102759-V1, Palo Alto, CA: EPRI.

12.9 SECTION 3.7 LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

12.9.1 Bay Area to Merced Region

Association of Bay Area Governments. Forecasts for the San Francisco Bay Area to the year 2025. December 2001.

Dyett and Bhatia. 2001. 2001 regional transportation plan draft/final environmental impact report. December. Prepared for Metropolitan Transportation Commission.

Fremont, City of. 1991. General plan. Adopted May 7.

Gilroy, City of. 2002. General plan. June.

Los Banos, City of. 1999. General plan. May 19.

Madera, County of. 2003. Available: <www.madera-county.com>.

Merced, County of. 1990. Year 2000 general plan. Adopted December 4.

Merced County Association of Governments. 2003. Available: <www.mcag.cog.ca.us>.

Millbrae, City of. 1998. General plan 1998–2015. Adopted November 24.

———. 1998. Millbrae Station area, specific plan. Adopted November 24.

Milpitas, City of. 1994. General plan. Amended.

Morgan Hill, City of. 2001. General plan. July.

Oakland, City of. 1998. Envision Oakland, general plan/land use and transportation element. March.

Palo Alto, City of. 1998. Palo Alto 1998–2010 comprehensive plan.

Parsons Corporation. 2004. Bay Area to Merced Region, land use and planning, communities and neighborhoods, property, and environmental justice technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

———. 2003. Bay Area-to-Merced. Local area growth, development, planning, land use, socioeconomics and environmental justice technical evaluation. Draft. May. Sacramento, CA.

Redwood City, City of. 1990. Strategic general plan. Adopted January 22.

Sacramento Area Council of Governments. 2003. Available: <www.sacog.org>.

San Benito County. 2003. Available: <www.san-benito.ca.us>.

San Francisco, City and County of. 1998. General plan. Adopted between August 1997 and June 1998.

San Joaquin Council of Governments. 2003. Available: <www.sjcog.org>.

San Jose, City of. 1994. 2020 general plan. Adopted August 16.

San Mateo, City of. 1986. General plan. November 18.

Santa Clara, City of. 1992. General plan 1990–2005. July.

Stanislaus County. 2003. Available: <www.co.stanislaus.ca.us>.

Union City, City of. 2003. 2002 general plan policy document. February.

United States Census Bureau. 2003. Available: <www.census.gov>.

12.9.2 Sacramento to Bakersfield Region

Applied Earthworks. 2003. Sacramento to Bakersfield cultural resources technical evaluation. Prepared for California High Speed Rail Authority. March.

Bakersfield, City of. 2002. Metropolitan Bakersfield general plan update. December. Page II-17.

California State Automobile Association maps for:

Bakersfield Area
Fresno and Kings Counties
Fresno-Clovis
Madera, Mariposa, and Merced Counties
Merced and Vicinity
Merced/Atwater and Merced County
Modesto-Ceres
Oakdale-Riverbank-Escalon
Sacramento Northern Area,
Sacramento Southern Area
San Joaquin and Stanislaus Counties
Stockton
Tulare County
Turlock and Vicinity

DMJM Harris. 2004. Sacramento to Bakersfield region, land use and planning, communities and neighborhoods, property, and environmental justice technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

EIP Associates in association with DMJM+Harris. 2003. Sacramento to Bakersfield. Local area growth, development, planning, land use, socioeconomics and environmental justice technical evaluation. Draft. April.

Fresno, City of. 1989. Central area community plan. July. Page 14.

———. 2002. 2025 Fresno general plan. Land use and circulation map. February.

Hanford, City of. 2002. 2002 general plan update. June 18. Page. LU-9.

Marshall, James G. City Manager. City of Merced. December 20, 2002—personal communication.

Meissner, Gregg. Development Services Manager. City of Stockton. January 3, 2003—personal communication.

Merced, City of. 1997. Merced vision 2015 general plan. 1997. Pages 3-29.

———. 1998. Merced vision 2015—general plan map. June 2.

Merced County. 2003. Available: <http://www.co.merced.ca.us/castleairportrfq/index.html>. Accessed: January 24, 2003.

———. 2003. Available: <http://www.co.merced.ca.us/planning/ genplan.html>. Accessed: January 24, 2003.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High-Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

Smith, Dianne Keil. Senior Planner. City of Stockton. January 3, 2003—personal communication.

Stagnaro, David. Senior Planner. City of Stockton. January 3, 2003—personal communication.

Stockton, City of. 1989. Central Stockton plan – final plan. September. Page 14.

———. 1998. General plan policy document. Last amended November 3, 1998. Page II-3.

———. 2001. Downtown Stockton projects map.

———. 2003. Available: http://www.ci.stockton.ca.us/CD/pages/genplan-map.pdf. Accessed: January 24, 2003.

Visalia, City of. 1996. Visalia general plan land use element. Revised June 1996. Page 1-15.

A. GIS REFERENCES

Existing land use files

Fresno, City of (parcel-level). Date unknown, but acquired in April 2001.

Fresno, County of (parcel-level). Date unknown, but acquired in November 2002.

Merced, County of (parcel-level). 2000. June.

Sacramento, City of (parcel-level). Date unknown, but acquired in April 2001.

Tulare, County of (parcel-level). 2001. May.

California Dept. of Water Resources existing land use data:

Fresno. 1994.

Kern. 1998.

Kings. 1996.

Madera. 1995.

Merced. 1995.

Sacramento. 2000.

San Joaquin. 1996.

Stanislaus. 1996.

Tulare. 1999.

Zoning
Bakersfield, City of (Kern Council of Governments). 1998.

Kern County (Kern Council of Governments). 1998.

General Plan (used only where data above was not available).

B. GENERAL PLAN LAND USE

Bakersfield. 2000.

Fresno, City of. Date unknown, but acquired in April 2001.

Sacramento Council of Governments. 2000. December.

Sacramento County. 1999.

San Joaquin Valley. General plan land use for San Joaquin Valley (compiled by Cal State Stanislaus based on data from 1979–1999).

12.9.3 Bakersfield to Los Angeles Region

California Department of Finance, Demographic Research Unit. 2001. Interim county population projections. Estimated July 1, 2000 and projections for 2005, 2010, 2015, and 2020. June.

California Resources Agency Legacy Project. 2002. Public and conservation land. The California Spatial Information Library. November 8.

Castaneda & Associates. 1987. City of San Fernando revised general plan. Prepared for the City of San Fernando. Adopted in 1987.

CBA, Inc. 2000. City of San Fernando 2000-2005 housing element. Prepared for the City of San Fernando. Adopted November 6.

Bakersfield, City of. 1990. City of Bakersfield general plan. Adopted March.

Burbank, City of. 1989. City of Burbank general plan land use element. Adopted 1989.

Community Redevelopment Agency of the City of Los Angeles. 1970. Little Tokyo redevelopment project, the redevelopment plan. February 24.

———. 2000. Little Tokyo redevelopment project five year implementation plan FY 2000–FY 2004. October 5.

Envicom Corporation. 2002. Amended Little Tokyo redevelopment plan final environmental impact report. Prepared for the Community Redevelopment Agency of the City of Los Angeles. June.

ESRI. 2001. ESRI data & maps CD 2, United States Parks.

ESRI. 2001. ESRI data & maps CD 3, Geographic Names Information System Cultural Points Golf Locales.

Glendale, City of Planning Division. 1986. Land use element. Adopted October 25, 1977 and revised October 23, 1986.

Kern County Council of Governments. SJV TPA Director's Association. Kern GEONET. 1999. City of Bakersfield General Plan—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Bakersfield Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Tehachapi General Plan Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Tehachapi Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. County of Kern Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. County of Kern - General Plan Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19, 1999.

Kern County. 1994. The land use, open space, and conservation element of the Kern County general plan. Adopted March 1, 1982 and revised March 1994.

———. 2002. Kern County zoning ordinance Title 19 of the Kern County ordinance code. May.

Lancaster, City of. 1997. City of Lancaster general plan. Adopted October 28, 1997.

Lexis Nexis. Zoning ordinance. Prepared for the City of Bakersfield. Available: <http://bpc.iserver.net/codes/bakersfld/_DATA/TITLE17/index.html>.

Los Angeles, City of. 1991. Silver Lake Echo Park plan. Adopted February 17, 1984. Last revision March 27, 1991.

———. 1996. Alameda district specific plan. June 18.

———. 1996. Arleta-Pacoima community plan. Adopted November 6.

———. 1996. Central city north community plan. Adopted February 5, 1985. Last Amended April 17, 1996.

———. 1997. Sylmar community plan. Adopted August 8.

———. 1998. Boyle Heights community plan. Adopted November 10.

Los Angeles, County of. 1986. Antelope Valley area-wide general plan. Adopted December 4.

———. 1990. Santa Clarita Valley area plan. 1990. Adopted February 16, 1984 and updated December 6, 1990.

———. 1990. Streamlined general plan land use element. Adopted November 25, 1980 and revised January 9, 1990.

Michael Brandman Associates. 1991. City of Santa Clarita general plan. Prepared for the City of Santa Clarita.

Michael Brandman Associates Cordoba Corporation. 1988. East Los Angeles community plan. Prepared for the County Board of Supervisors County of Los Angeles. Adopted June 23.

P&D Consultants. 2004. Bakersfield to Los Angeles region, land use and planning, communities and neighborhoods, property, and environmental justice technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

P&D Consultants and DMJM+Harris. 2002. Plans and profiles. Prepared for the California High Speed Rail Authority. November.

P&D Environmental Services. 2003. Bakersfield-to-Los Angeles Region. Local area growth, development, planning, land use, socioeconomics and environmental justice technical evaluation. Draft. March.

Palmdale, City of. 1993. City of Palmdale general plan. Adopted January 25.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High-Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. Screening report. 2002. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

Santa Clarita, City of. 2000. City of Santa Clarita zoning map. Last updated December 12.

Southern California Association of Governments. 1993. 1993 existing land use for Los Angeles County.

———. 2001 RTP city projections. Available at: <www.scag.ca.gov/forecast/rtpgf.htm>.

Tehachapi, City of Planning Department. 1999. Tehachapi general plan update. Adopted December.

———. 2003. Tehachapi general plan housing element. Adopted January 6.

Thomas Brothers Guide. 1994. Kern County.

———. 2002. Los Angeles and Orange Counties.

U.S. Bureau of the Census. No date. 2000 United States census.

U.S. Department of Transportation, Federal Aviation Administration. 1995. Final environmental impacts statement for the Burbank-Glendale-Pasadena airport land acquisition and replacement terminal project volume 1: Documentation. September.

Vernon, City of. 1992. Vernon general plan. Adopted April 18, 1989 and revised June 16, 1992.

12.9.4 Los Angeles to San Diego via Inland Empire Region

California Department of Finance. 2003. Demographic information: Reports and research papers. Revised historical county population estimates and interim county population projections. Financial and economic data: California county profiles; California statistical abstract, total population, California and counties. City/county population and housing estimates. 2002 revised 2001, with 2000 census counts. Available: <http://www.dof.ca.gov/html>. Accessed: January 2003.

California Employment Development Department. 2001. Annual average labor force data for counties. Available: <http://www.calmis.ca.gov>. Accessed: January 2003.

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, land use and planning, communities and neighborhoods, property, and environmental justice technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Clinton, William J., President of the United States. Executive Order 12898. 1994. Federal actions to address environmental justice in minority populations and low-income populations. Federal Register, Vol. 59, No. 32, Wednesday, February 16, 1994, 7629-7633. Washington D.C. February 11.

Colton, City of. 1987. Final preliminary general plan. May 5.

Council on Environmental Quality. 1998. Environmental justice; guidance under the National Environmental Policy Act. Executive Office of the President. Washington, D.C. December 10, 1997 [released July 1998].

El Monte, City of, and City of South El Monte. 2002. Chamber of Commerce web site, transportation section. Accessed: December 2002.

Escondido, City of. 1990. General plan. May.

Fontana, City of. 1990. General plan. May 15.

HNTB in association with CH2M Hill. 2003. Los Angeles to San Diego via Inland Empire. Local area growth, development, planning, land use, socioeconomics and environmental justice technical evaluation. Draft. March.

Los Angeles, County of. 1993. General plan. January.

March Joint Powers Authority. Land use map.

Montclair, City of, Community Development Department. 1999. General plan.

Ontario, City of. 1992. General plan. Adopted September 15.

Pomona, City of. 2002. General plan. August.

Rancho Cucamonga, City of. 1989. General plan. Amended January 4.

Rialto, City of. 1992. General plan. Approved March 31.

Riverside County. 1994. Comprehensive general plan, second reprint of fourth edition text (updated through 1992).

San Bernardino, City of. 1989. General plan. Adopted June 2.

San Bernardino County, Economic Development and Public Services Group, Land Use Services Department. 1999. General plan. Adopted July 1, 1989. Revised August 26, 1999.

San Diego Association of Governments. 1999. 2020 cities/counties forecast land use alternatives. November.

———. 2003. Demographics and other data. Long range forecasts. Population, housing, and employment by jurisdiction. Available: <http://www.sandag.org/resources>. Accessed: January 2003.

San Diego, City of. 1989. Progress guide and general plan. June.

———. 2002. General plan strategic framework element: City of villages action plan. June.

San Diego County. 1990. Progress guide and general plan. Adopted July 1, 1989. Revised February 7, 1990.

Southern California Association of Governments. 2002. Regional vision, volume 4 issue I. Spring.

Southern California Council of Governments. 2003. 2001 RTP growth forecast. Available: <http://www.scag.ca.gov/forecast>. Accessed: January 2003.

Temecula, City of. 1993. General plan.

U.S. Census Bureau. 2001. 2000 census of population. Washington, D.C. April.

———. 2002. 2000 census of population. Washington, D.C. August.

U.S. Environmental Protection Agency (EPA). 1998. Guidance for incorporating environmental justice in EPA's NEPA compliance analyses. April.

———. 2000. Draft Title VI guidance for EPA assistance recipients administering environmental permitting programs (draft recipient guidance) and draft revised guidance for investigating Title VI administrative complaints challenging permits (draft revised investigation guidance). Federal Register Volume 65, Number 124.

U.S. Department of Transportation. 2003. Implementing Title VI requirements in metropolitan and statewide planning. May 2002. Available: <http://www.fhwa.dot.gov>. Accessed: January 2003.

University of California Riverside. 1990. Long range development plan. July 1990.

12.9.5 Los Angeles to San Diego via Orange County Region

HDR for IBI Group. 2003. Los Angeles-Orange County-San Diego. Local area growth, development, planning, land use, socioeconomics and environmental justice technical evaluation. Draft. April.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, land use and planning, communities and neighborhoods, property, and environmental justice technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

A. GIS REFERENCES:

U.S. Census Bureau. 2000. Census block groups.

———. 2000. City boundaries.

San Diego Association of Governments. 2000. San Diego County existing land use.

Southern California Association of Governments, 1993. Los Angeles County existing land use.

———. 1993. Orange County existing land use.

B. GENERAL PLANS

Anaheim, City of. 1984. General plan. July.

Artesia, City of. 1993. General plan. June.

Bell, City of. 1996. General plan. October.

Bellflower, City of. 1995. General plan.

Buena Park, City of. 1997. General plan. October.

Carlsbad, City of. 1994. General plan. September.

Cerritos, City of. 1988. General plan. May.

Commerce, City of. 1987. General plan. July.

Costa Mesa, City of. 1990. General plan.

Cudahy, City of. 1992. General plan. May.

Cypress, City of. 1993. General plan. February.

Dana Point, City of. 1999. General plan. July 1991; land use, 1999.

Del Mar, City of. 1985. General plan. July.

Downey, City of. 1992. General plan. Adopted 1973, revised October 1992.

El Segundo, City of. 1992. General plan.

Encinitas, City of. 1995. General plan. May.

Fullerton, City of. 2000. General plan. November.

Garden Grove, City of. 1995. General plan. October.

Huntington Park, City of. 1991. General plan. February.

Inglewood, City of. 1990. General plan.

Irvine, City of. 1999. General plan. March.

La Mirada, City of. 1981. General plan. July.

La Palma, City of. 1999. General plan. March.

Laguna Hills, City of. 1994. General plan.

Laguna Niguel, City of General Plan, August 1992

Laguna Woods, City of. 2001. General plan. January.

Lake Forest, City of. 2000. General plan. May.

Los Angeles, City of. 2001. General plan. March.

Los Angeles County. 1992. General plan. Adopted November 1980, revised 1986 to 1992.

Maywood, City of. 1990. General plan. February.

Mission Viejo, City of. 1992. General plan. April.

Montebello, City of. 1990. General plan. October.

Norwalk, City of. 1996. General plan. February.

Oceanside, City of. 2000. General Plan.

Orange, City of. 1989. General plan. August.

Orange County. 2000. General plan.

Paramount, City of. 1990. General plan. October.

Pico Rivera, City of. 1993. General plan. August.

San Clemente, City of. 1993. General plan. May.

San Diego, City of. 1989. General plan. May.

San Diego, County of. 1997. General plan. January.

San Juan Capistrano, City of. 1999. General plan. December.

Santa Ana, City of. 1998. General plan. September 1982; land use, February 1998.

Santa Fe Springs, City of. 1994. General plan. 1991–1994.

Solana Beach, City of. 2001. General plan. 1986, amended through 2001.

South Gate, City of. 1986. General plan. November.

Stanton, City of. 1992. General plan. January.

Tustin, City of. 2001. General plan. January.

Vernon, City of. 1992. General plan. Adopted April 1989, revised June 1992.

Whittier, City of. 1992. General plan. August.

12.9.6 Other Documents Referenced

Amtrak. 2001. 20-year improvement plan. March.

California Department of Transportation. 2002. 10-year California state rail plan. March.

———. 2003. Standard environmental reference. Available: <www.dot.ca.gov/SER>. Accessed: December 5, 2003.

Pier Bowl specific plan. 1993. October.

San Diego Association of Governments. 2000. Regional transportation plan. April.

South Coast Water District. 2002. San Juan Creek property draft EIR. August.

Southern California Association of Governments. 2001. Regional transportation plan. April.

12.10 SECTION 3.8 AGRICULTURAL LANDS

American Farmland Trust, California Regional Office. 2003. AFT around the country, California region. Available: <http:\\www.farmland.org/california/index.htm>. Accessed: August 11, 2003.

California Department of Conservation. 2000. Farmland mapping and monitoring program. Sacramento, CA.

California Department of Food & Agriculture. 2002. California Department of Food & Agriculture Resource Directory 2002. pp. 28-41. Sacramento, CA: California Department of Food & Agriculture Office of Public Affairs.

California Department of Transportation. 2002. Caltrans district 6 fact sheet on State Route 99. Available: <http://www.dot.ca.gov/dist6/factsheets/sr99transinvestment.pdf>. Accessed: July 1, 2003.

Kuminoff, N. V., A. D. Sokolow, and D. A. Sumner. 2001. Farmland conversion: Perceptions and realities. Agricultural Issues Center AIC Issues Brief, May 2001: pp. 1-2. Note: The authors utilized data generated from the California State Department of Conservation Farmland Mapping and Monitoring Program to determine the average rate of urbanized acreage per year.

Parsons Brinckerhoff. 2003. System-wide alternatives definition. Orange and Los Angeles Counties. Prepared for California High Speed Rail Authority, Sacramento, CA.

12.11 SECTION 3.9 AESTHETICS AND VISUAL RESOURCES

California Department of Transportation. 2000. Officially designated state scenic highways information. July 25. Sacramento, CA.

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, aesthetics and visual resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, aesthetics and visual resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, aesthetics and visual resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region, aesthetics and visual resources technical evaluation. Prepared for California High Speed Rail Authority. Sacramento, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, aesthetics and visual resources technical evaluation. Prepared for California High Speed Rail Authority. Sacramento, CA.

PRC Services Corporation. 2000. Executive summary of the proposed Los Angeles County significant ecological areas. Prepared for Los Angeles County, Los Angeles, CA.

———. 2000. Los Angeles County significant ecological area update study 2000 background report. Los Angles, CA.

U.S. Department of Agriculture. 1984. National forest landscape management book, volume 2. April. Forest Service: Washington D.C.

U.S. Department of the Interior. Undated. Visual resources management BLM handbook-VRM manual 8400, visual resources inventory. Bureau of Land Management. Washington, D.C.

U.S. Department of Transportation, Federal Highway Administration. 1988. Visual impact assessment for highway projects. Washington D.C.

12.12 SECTION 3.10 PUBLIC UTILITIES

Ajello, Julian. Utility Safety Branch. California Public Utilities Commission. February 5, 2003—telephone conversation, (415) 703-1327.

California Energy Commission. 2003. Available: <http://www.energy.ca.gov>. Accessed: January 2003.

California Public Utilities Commission (CPUC). 2001b. California natural gas infrastructure outlook 2002–2006.

———. 2003. Available: <http://www.cpuc.ca.gov>. Accessed: January 2003.

———. 2001. California natural gas infrastructure outlook 2002 – 2006.

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, public utilities technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, public utilities technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Federal Energy Regulatory Commission. 2003. Available: <http://www.ferc.fed.us>. Accessed January 2003.

Gorham, Bob. Supervising Pipeline Engineer. Office of the State Fire Marshal. January 2003—letter and telephone conversation, (562) 497-9102.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, public utilities technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Johnson, Roger. Facilities Siting Office. California Energy Commission. February 5, 2003—telephone conversation, (916) 654-5100.

P&D Consultants. 2004. Bakersfield to Los Angeles region, public utilities technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. November. Prepared for California High Speed Rail Authority. Sacramento, CA.

———. 2002. Plans and profiles. November. Prepared for California High Speed Rail Authority. Sacramento, CA.

———. 2002. Screening report. April. Prepared for California High Speed Rail Authority. Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region, public utilities technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Pennwell MAPSearch. 2003. GIS files of electricity resources.

———. 2003. GIS files of petroleum resources.

Thomas Brothers Maps. 1999. California road atlas & driver's guide. Fort Mohave, AZ: Thomas Brothers.

Vaspoli, Dennis. Federal Energy Regulatory Commission. January 2003—letter and telephone conversation, (866) 208-3372.

12.13 SECTION 3.11 HAZARDOUS MATERIALS AND WASTES

American Society of Testing and Materials. 2000. Standard practice for environmental site assessments-Phase I environmental site assessment process (E1527-00).

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, hazardous materials and wastes technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, hazardous materials and wastes technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Environmental Data Resources, Inc. 2003. Environmental geodata. January.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, hazardous materials and wastes technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region. Hazardous materials and wastes technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, hazardous materials and wastes technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

12.14 SECTION 3.12 CULTURAL AND PALEONTOLOGICAL RESOURCES

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, cultural resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

———. 2004. Los Angeles to San Diego via Inland Empire, paleontological resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, cultural resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

———. 2004. Sacramento to Bakersfield Region, paleontological resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, cultural resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

———. 2004. Los Angeles to San Diego via LOSSAN, paleontological resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

National Park Service. Undated. Guidelines for evaluating and documenting traditional cultural properties. National Register Bulletin, 38. U.S. Department of Interior, Interagency Resources Division, Washington D.C.

P&D Consultants. 2004. Bakersfield to Los Angeles region, cultural resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

———. 2004. Bakersfield to Los Angeles region, paleontological resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region, cultural resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

———. 2004. Bay Area to Merced region, paleontological resources technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

12.15 SECTION 3.13 GEOLOGY AND SOILS

Bailey, E. H. and D. R. Harden. 1975. Map showing mineral resources of the San Francisco Bay region, California–present availability and planning for the future. USGS Miscellaneous Investigations. Map I-909.

California Department of Conservation. 2001a, 2001b. Oil, gas and geothermal fields in California: District 1 oil fields map. Division of Oil, Gas, and Geothermal Resources, Sacramento, CA.

California Department of Conservation, California Geological Survey. 2000. Map of California, principal mineral-producing localities–1990.

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, geology and soils technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, geology and soils technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Frank, David G. 1999. An arc/info point coverage of mineral resource data system (MRDS) location in eleven western states. United States Geologic Survey. Open file report 99-169.

Hart, E.W., and W. A. Bryant. 1997. Fault rupture hazard zones in California. Special Publication 42. Department of Conservation, Division of Mines and Geology. Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, geology and soils technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Jennings, C. W. 1997. Fault activity map of California and adjacent areas with locations and ages of recent volcanic eruptions. Geologic map of California. California Division of Mines and Geology, Scale 1:750,000. Sacramento, CA.

Morton, P. K., and Miller, R. V. 1981. Geologic map of Orange County showing mines and mineral deposits. California Division of Mines and Geology. Bulletin 204, Plate 1.

Norris, Robert M. and Robert W. Webb. 1990. Geology of California, 2nd ed. New York: J. Wiley and Sons, Inc.

P&D Consultants. 2004. Bakersfield to Los Angeles region, geology and soils technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced Region, geology and soils technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

State of California, Division of Mines and Geology. 1999. Seismic shaking hazard maps of California. Sacramento, CA.

Stinson, M. C., M. W. Manson, and J. J. Plappert. 1987. Mineral land classification: Aggregate materials in the San Francisco–Monterey Bay area, part II, classification of aggregate resource areas for south San Francisco Bay production-consumption region. California Division of Mines and Geology Special Report 146.

Weber, F. H., Jr. 1963. Geology and mineral resources of San Diego County, California. California Division of Mines and Geology. County Report 3, 309p.

12.16 SECTION 3.14 HYDROLOGY AND WATER RESOURCES

California Department of Transportation. 2003. Standard environmental reference, environmental handbook volume 1. Available: <http://www.dot.ca.gov/ser/vol1/vol1.htm>. Accessed: January 14, 2003.

California Department of Water Resources. 2003. Hydrologic and water supply conditions. Available: <http://watsup2.water.ca.gov/hydrologic.cfm>. Accessed: May 2003.

Environmental Protection Agency. 2002. Terminology reference system. Available: <http://www.epa.gov/trs/>. Accessed May 2003.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. November. Prepared for California High Speed Rail Authority. Sacramento, CA.

———. 2002. Plans and profiles. November. Prepared for California High Speed Rail Authority. Sacramento, CA.

———. 2002. Screening report. April. Prepared for California High Speed Rail Authority. Sacramento, CA.

12.17 SECTION 3.15 BIOLOGICAL RESOURCES AND WETLANDS

California Department of Fish and Game. 2002. Occurrence of rare, threatened, endangered and sensitive animals, plants and natural communities. California Natural Diversity Database, Sacramento, CA.

CH2Mhill. 2004. Los Angeles to San Diego via Inland Empire, biological resources and wetlands technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, biological resources and wetlands technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

HDR Inc. 2004. Los Angeles to San Diego via LOSSAN, biological resources and wetlands technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Prepared for California Department of Fish and Game, Sacramento, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, biological resources and wetlands technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced region. Biological resources and wetlands technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

California Wilderness Coalition (CWC), The Nature Conservancy (TNC), The Biological Resources Division (BRD), The Center for Reproduction of Endangered Species (CRES) and California State Parks. Missing Linkages: Restoring Connectivity to the California Landscape http://www.calwild.org/resources/pubs/linkages/index.htm Site accessed June 21, 2005.

Cabanero, Clint. GIS Analyst – South Coast Wildlands, Sent GIS data containing species linkages within southern half of California, October 7, 2004.

California State University, Stanislaus – Endangered Species Recovery Program. Proposed areas where connectivity and linkages should be promoted (1999) http://esrpweb.csustan.edu/gis/metadata/linkages.html Site accessed December 9, 2004.

California Spatial Information Library (CaSIL). National Hydrography Dataset CA SWRCB Region 1-9. http://gis.ca.gov/data_index.epl

12.18 SECTION 3.16 SECTION 4(f) AND 6(f) RESOURCES (PUBLIC PARKS AND RECREATION)

12.18.1 General Reference

CH2MHill. 2004. Los Angeles to San Diego via Inland Empire, Section 4(f) and 6(f) technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

DMJM Harris. 2004. Sacramento to Bakersfield region, Section 4(f) and 6(f) technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Federal Highway Administration. 1987. Section 4(f) policy paper. October 5. Washington D.C.

———. NEPA Federal Highway Administration, Section 4(f). Available: <http://nepa.fhwa.dot.gov/ReNepa/ReNepa.nsf/home?openform&Group=Section%204(f)%20>.

HDR Inc., 2004 Los Angeles to San Diego via LOSSAN, Section 4(f) and 6(f) Technical Evaluation, Prepared for California High Speed Rail Authority, Sacramento, CA.

P&D Consultants. 2004. Bakersfield to Los Angeles region, Section 4(f) and 6(f) technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Brinckerhoff. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

Thomas Brothers Maps. California Road Atlas & Driver's Guide. 1999. Fort Mohave, AZ: Thomas Brothers.

12.18.2 Bay Area to Merced

JRP Historical Consulting Services. 2003. Bay Area to Merced region–cultural resources technical evaluation report. February. Prepared for California High Speed Rail Authority, Sacramento, CA.

Parsons Corporation. 2004. Bay Area to Merced Region, Section 4(f) and 6(f) technical evaluation. Prepared for California High Speed Rail Authority, Sacramento, CA.

Thomas Brothers Maps. 2000. Thomas guide 2000–San Francisco, Alameda, Contra Costa and Santa Clara Counties. Fort Mohave, AZ: Thomas Brothers.

12.18.3 Sacramento to Bakersfield

Applied Earthworks. 2003. Sacramento to Bakersfield cultural resources technical evaluation. Prepared for California High Speed Rail Authority. March. Fresno, CA.

California State Automobile Association. Undated. Maps for Sacramento Northern Area; Sacramento Southern Area; San Joaquin and Stanislaus Counties; Stockton; Oakdale-Riverbank-Escalon; Modesto-Ceres; Turlock and Vicinity; Merced and Vicinity; Merced/Atwater and Merced County; Madera, Mariposa, and Merced Counties; Fresno and Kings Counties; Fresno-Clovis; Tulare County; Bakersfield Area.

Finster, Connie. Project Officer. California Department of Parks and Recreation, Office of Grants and Local Services. Communications in regards to 6(f) resources. Land and Water Conservation Fund Project List (Central Valley). January 27, 2003.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

Thomas Brothers Maps. 1999. California road atlas & driver's guide. Fort Mohave, AZ: Thomas Brothers.

12.18.4 Bakersfield to Los Angeles

California Resources Agency Legacy Project. 2002. Public and conservation land. The California Spatial Information Library. November 8. Sacramento, CA.

ESRI. 2001. ESRI Data & Maps CD 2, United States parks.

———. 2001. ESRI Data & Maps CD 3, Geographic names information system cultural points golf locales.

Kern County Council of Governments. SJV TPA Director's Association. Kern GEONET. 1999. City of Bakersfield General Plan—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Bakersfield Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Tehachapi General Plan Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. City of Tehachapi Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. 1999. County of Kern Zoning—Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19.

———. County of Kern - General Plan Valley Wide GIS Project. Lambert Conformal Conic Datum: NAD27 Zone: California V Spheroid: Clarke 1866 Units: Feet. January 19, 1999.

P&D Consultants, and DMJM+Harris. 2002. Plans and profiles. Prepared for the California High Speed Rail Authority. Sacramento, CA.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

Southern California Association of Governments. 1993. 1993 existing land use for Los Angeles County. Los Angles, CA.

Thomas Brothers Guide. 1994. Kern County. Fort Mohave, AZ: Thomas Brothers.

———. 2002. Los Angeles and Orange Counties. Fort Mohave, AZ: Thomas Brothers.

12.18.5 Los Angeles to San Diego via Inland Empire

California Department of Parks and Recreation. 2003. Unpublished data: Section 6(f) properties as listed in the DPR grant management system: Los Angeles, Riverside, San Bernardino, and San Diego Counties. Donna Arteago, CDPR, to Elizabeth Cutler, CH2M HILL. January 27.

California High Speed Rail Authority. 2003. Draft Los Angeles to San Diego via Inland Empire cultural resources technical evaluation. Prepared by CH2M HILL and HNTB Corporation. February 2003; revised March 2003a. Irvine, CA.

———. 2003b. Draft Los Angeles to San Diego via inland Empire local area growth, development, planning, land use, socioeconomics, and environmental justice technical evaluation. Prepared by CH2M HILL and HNTB Corporation. February.

Department of Transportation, Federal Highway Administration. 1989. Section 4(f) policy paper. September 24, 1987; revised June 7, 1989. Washington, D.C.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority. November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

San Diego Association of Governments. 2000. Land use GIS database. San Diego County.

Southern California Association of Governments. 1993. Land Use GIS Database. Los Angeles, San Bernardino, and Riverside Counties.

———. 2000. Land use GIS database. San Diego County.

Thomas Guide. 2003a. Street Guide, Los Angeles and Orange Counties. Fort Mohave, AZ: Thomas Brothers.

———. 2003b. Street Guide, San Bernardino and Riverside Counties. Fort Mohave, AZ: Thomas Brothers.

———. 2003c. Street Guide, San Diego County, including portions of Imperial County. Street Guide. Fort Mohave, AZ: Thomas Brothers.

12.18.6 Los Angeles to San Diego via Orange County

California High Speed Rail Authority. 2003. Los Angeles-Orange County-San Diego cultural resources technical evaluation. Prepared for the California High Speed Rail Authority, U.S. Department of Transportation, and Federal Railroad Administration. March.

———. 2003. Los Angeles-Orange County-San Diego noise and vibration technical evaluation. Prepared for the California High Speed Rail Authority, U.S. Department of Transportation, and Federal Railroad Administration. March 2003.

California Resources Agency Legacy Project. 2002. GIS data on government conservation lands. November 8.

California State Parks. Undated. Acquisition and Development Department. GIS data on state parks.

Geographic Data Technology, Inc. and Environmental Systems Research Institute, Inc. 2000. GIS data on Parks. November 1.

Parsons Brinckerhoff. 2002. Final draft environmental analysis methodologies. Prepared for California High Speed Rail Authority. November 7. Sacramento, CA.

———. 2002. Plans and profiles. Prepared for California High Speed Rail Authority, November. Sacramento, CA.

———. 2002. Screening report. Prepared for California High Speed Rail Authority. April. Sacramento, CA.

State of California Department of Parks and Recreation. 2003. Obtained lists of projects funded by the Land and Water Conservation Fund from the Office of Grants and Local Services.

12.19 SECTION 3.17 CUMULATIVE IMPACTS EVALUATION

No references for this section.

12.20 CHAPTER 4 COSTS AND OPERATIONS

DE-Consult Deutsche Eisenbahn-Consulting GmbH. 2000. California high-speed rail corridor evaluation German peer review report (Phase I). Germany. December 2000.

Engineering News Record. 2003. Engineering news record construction cost index. Available: <http://www.enr.com/features/conEco/costIndexes/constIndexHist.asp>. Accessed: September, 2003.

Parsons Brinckerhoff. 2003. Capital cost data CAHSR aviation system alternative memo. January 27.

Parsons Brinckerhoff. 2003. Operations report. January. Prepared for California High Speed Rail Authority. Sacramento, CA.

12.21 CHAPTER 5 ECONOMIC GROWTH AND RELATED IMPACTS

California High Speed Rail Authority. 2000. Final business plan. Sacramento, CA.

Cambridge Systematics, Inc. 2003. Economic growth effects of the system alternatives for the program environmental impact report/environmental impact statement–final report. Prepared for the California High Speed Rail Authority. July. Pages 3-16 to 3-18 and 7-1 to 7-3.

12.22 APPENDICES

California High Speed Rail Authority. 2004. Sacramento to Bakersfield High-Speed Train Alignment Option Segments. Sacramento, CA.

12.22.1 Appendix 3.15A

Bennett, A.F. 1990. Habitat corridors and the conservation of small mammals in a fragmented forest environment. Landscape Ecology 4:109-122.

California Department of Fish and Game. 2003. California wildlife habitat relationships system. California Interagency Wildlife Task Group.

California Natural Diversity Database. 2002. California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch, Sacramento, CA.

Farhig, L., and G. Merriam. 1985. Habitat patch connectivity and population survival. Ecology 66:1,762–1,768.

Harris, L.D., and P. B. Gallagher. 1989. New initiatives for wildlife conservation: The need for movement corridors. G. Mackintosh (ed.). Preserving Communities and Corridors. Defenders of Wildlife, Washington, D.C. 96 pp.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Non-game Heritage Program, State of California Department of Fish and Game, Sacramento, CA.

MacArthur, R. H., and E. O. Wilson. 1967. The theory of island biogeography. Princeton, NJ: Princeton University Press.

Noss, R .F. 1983. A regional landscape approach to maintain diversity. BioScience 33:700-706.

Simberloff, D., and J. Cox. 1987. Consequences and costs of conservation corridors. Conservation Biology 1:63-71.

Skinner, M. W., and B.M. Pavlik, eds. 1994. Inventory of rare and endangered vascular plants of California. California Native Plant Society Special Publication No. 1 (Fifth Edition, 1999 Electronic Inventory Update). Sacramento, CA. VI + 338 pp.

Soule, M .E. 1987. Viable populations for conservation. New York: Cambridge University Press.

12.22.2 Appendix 3.15C

Abrams, L. 1923. An illustrated flora of the Pacific states: Washington, Oregon, and California, Vol. I. Stanford, CA: Stanford University Press.

———. 1944. An illustrated flora of the Pacific states: Washington, Oregon, and California, Vol. II. Stanford, CA: Stanford University Press.

———. 1951. An illustrated flora of the Pacific states: Washington, Oregon, and California, Vol. III. Stanford, CA: Stanford University Press.

Abrams, L., and R. S. Ferris. 1960. An illustrated flora of the Pacific states: Washington, Oregon, and California, Vol. IV. Stanford, CA: Stanford University Press.

American Ornithologists' Union. 1983. Check-list of North American birds. 6th edition. American Ornithologists' Union, Washington, D.C.

———. 1998. Check-list of North American Birds. 7th edition. American Ornithologists' Union, Washington, D.C.

California Department of Fish and Game, Natural Heritage Division. 2002. Rarefind database. Sacramento, CA.

California Native Plant Society. 2001. Inventory of rare and endangered vascular plants of California. Version 1.5. Sacramento, CA.

California Wilderness Coalition. 2000. Missing linkages: Restoring connectivity to the California landscape. November. San Diego Zoo, San Diego, CA.

Committee on Standard English and Scientific Names. 2001. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Society for the Study of Amphibians and Reptiles. Herpetological Cir. No. 29.

Davis, F. W., D. M. Stoms, A. D. Hollander, K. A. Thomas, P. A. Stine, D. Odion, M. I. Borchert, J. H. Thorne, M. V. Gray, R. E. Walker, K. Warner, and J. Graae. 1998. The California gap analysis project – final report. University of California, Santa Barbara, CA.

Hickman, J. C. (ed.). 1993. The Jepson manual higher plants of California. Berkeley, CA: University of California Press.

Hitchcock et al. 1969.

Holland, R. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento, CA.

Miller, J. Y. 1992. The common names of North American butterflies. Washington, D.C.: Smithsonian Institute Press.

Munz, P. 1959. A California flora. Berkeley, CA: University of California Press.

Robins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. Common and scientific names of fishes from the United States and Canada. American Fisheries Society Special Publication 20.

Sawyer, J. O., and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento, CA.

Wilson, D. E., and F. R. Cole. 2000. Common names of mammals of the world. Washington, D.C.: Smithsonian Institute Press,

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White. 1988. A guide to wildlife habitats of California. California Department of Forestry and Fire Protection, Sacramento, CA.

———. 1990a. California's wildlife, Vol. 2: Birds. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento, CA.

———. 1990b. California's wildlife, Vol. 3: Mammals. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento, CA.

13 GLOSSARY

A

Abatement: Reduction; often used to describe mitigation of noise.

A horizon: the A horizon is soil zone immediately below surface, from which soluble material and fine-grained particles have been moved downward by water seeping into soil. Varying amounts of organic matter give the A horizon a dark color.

Accessibility: The ease with which a site or facility may be reached by passengers and others necessary to the facility's intended function. Also, the extent to which a facility is usable by persons with disabilities, including wheelchair users.

Action Alternative: An alternative that proposes some action by one or both of the co-lead agencies, as contrasted to the No Action (No Project) Alternative.

Actual Use: The amount of use that actually occurs.

Adverse: Negative or detrimental.

Affected Environment: The physical, biological, social, and economic setting potentially affected by one or more of the alternatives being considered.

Air Pollution: A general term that refers to one or more chemical substances that degrade the quality of the atmosphere.

Alignment: The horizontal and vertical route of a transportation corridor or path.

Alluvium: Sedimentary materials deposited by running water.

Alquist-Priolo Earthquake Fault Zoning Act: California law passed in 1972 to prevent construction of buildings used for human occupancy on surface traces of active faults.

Americans with Disabilities Act (ADA): Federal regulation establishing legal requirements for accessibility.

Amplitude: The magnitude of a periodic wave; also describes the strength or intensity of a signal that travels in wave form, such as a radio signal.

Aquifer: Subsurface geologic unit (rock or sediment) that contains and transmits groundwater.

Arc, Arcing: Electrical discharge is said to arc when it jumps across the space between two contacts.

At Grade: At ground surface level; used to describe roadways, river crossings, and track alignments.

Attainment: An air basin is considered to be in attainment for a particular pollutant if it meets the federal or state standards set for that pollutant. See also **Maintenance, Nonattainment**.

A-Weighted Sound Level: A measure of sound intensity that is weighted to approximate the response of the human ear, so it describes the way sound will affect people in the vicinity of a noise source.

B

Baseline: Foundation or basis to use for comparison purposes.

Bas-Relief: Sculptural element characterized by varied surface planes in low relief.

Beneficial Visual Impact: Impact resulting if a project alternative eliminates a dominant feature that currently detracts from scenic qualities or blocks vistas in the landscape.

BTU: British Thermal Unit, equal to the amount of heat required to raise 1 pound of water 1 degree Fahrenheit at 1 atmosphere of pressure.

Buttressing: An action or structure that provides support or stability.

C

California Environmental Quality Act (CEQA): "Legislation enacted in 1970 to protect the quality of the environment for the people of California by requiring public agencies and decision-makers to document and consider the environmental consequences of their actions. CEQA is the state equivalent of the National Environmental Policy Act (NEPA)."

Capital Cost: The total cost of acquiring an asset or constructing a project.

Capitol Corridor: An existing intercity rail alignment approximating the I-80 corridor; carries freight traffic, long distance Amtrak service, and intrastate "Capitol" service.

Carbon Dioxide (CO_2): A colorless, odorless gas that occurs naturally in the earth's atmosphere; significant quantities are also emitted into the air by fossil fuel combustion.

Carbon Monoxide (CO): A colorless, odorless gas that is generated in the urban environment primarily by the incomplete combustion of fossil fuels in motor vehicles.

Catenary Wire: A suspended (overhead) wire system that supplies power from a central power source to an electric vehicle such as a train.

CEQA: See **California Environmental Quality Act**.

Class I Trail: A trail within a separate right-of-way designated for exclusive use by bicycles and pedestrians, with cross traffic by motorists minimized.

Class II Trail: A trail within a restricted right-of-way designated for semiexclusive use by bicycles, with traffic by motor vehicles or pedestrians at crossings.

Class III Trail: A trail located within a right-of-way designated by signs or permanent markings and shared with pedestrians and motorists.

CNEL: Community Noise Equivalent Level. A 24-hour L_{eq} that has been adjusted to add a "penalty" of 5 dBA for evening noise (between 7:00 p.m. and 10:00 p.m.) and 10 dBA for nighttime noise (between 10:00 p.m. and 7:00 a.m.).

Cofferdam: Watertight enclosure from which water is pumped to expose the bottom of a body of water and permit construction.

Community Cohesion: The degree to which residents have a sense of belonging to their neighborhood, a level of commitment to the community, or a strong attachment to neighbors, groups, and institutions, usually as a result of continued association over time.

Congestion Management Plan: A planning document that addresses strategies for reducing traffic congestion.

Connectivity: Describes the degree of "connectedness" of a transportation system such as a transit network, and the ease with which passengers can move from one point to another within the network, or points outside the network.

Conservation Easement: An easement created by transferring development rights over a property from a farmer to another entity such as the local jurisdiction or an agricultural protection organization; the land remains in private ownership and may be farmed, but may not be developed with urban uses. See also **Easement**.

Cooperating agency: Under NEPA, any agency other than the lead agency that has legal jurisdiction over, or technical expertise regarding, environmental impacts associated with a proposed action and has agreed to participate.

Construction: Any activity that directly alters the environment, excluding surveying or mapping.

Contra-flow: Refers to movement against the general direction of flow.

Corridor: A geographic belt or band that follows the general route of a transportation facility (highway, railroad, etc).

Criteria Pollutants: Refers to pollutants for which federal and state air quality standards have been established: carbon monoxide (CO), sulfur oxides (SO_x), nitrogen oxides (NO_x), ozone (O_3), particulate matter with a diameter of 10 microns or less (PM10), particulate matter with a diameter of 2.5 microns or less (PM2.5), and lead (Pb).

Cultural Resources: Resources related to the tangible and intangible aspects of cultural systems, living and dead, that are valued by a given culture or contain information about the culture. They include, but are not limited to, sites, structures, buildings, districts, and objects associated with or representative of people, cultures, and human activities and events.

Cumulative Impact: (1) As defined by CEQA, the result of two or more individual impacts which, when considered together, are considerable or which compound or increase other environmental impacts. (2) As defined by NEPA, and impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

Cut and Cover: Construction technique in which a trench is excavated, infrastructure is installed, and the trench is closed.

Cut and Fill: Construction technique involving excavation or grading followed by placement and compaction of fill material.

Cut Slope: A slope that is shaped by excavation or grading. See also **Fill slope**.

D

Decibel (dB): A logarithmic measurement of noise intensity.

Densification: The process of making an element more compact by reducing air space.

Dewatering: The process of removing water from an area or substance, such as fill material.

Disturbance: A discrete event, either natural or human induced, that causes a change in the condition of an ecological system.

E

Easement: An interest in land owned by another individual or organization that entitles its holder to a specific limited use.

Ecosystem: A system formed by the interaction of living organisms, including people, with their environment.

Electromagnetic Field (EMF): The force field that extends outward from any moving electrical current, consisting of both a magnetic field and an electric field.

Electromagnetic Interference: An electrical emission or disturbance that causes degradation in performance or results in malfunctions of electrical or electronic equipment, devices, or systems.

Emergent: (1) Arising naturally. (2) Of vegetation, rooted in periodically or continuously inundated substrate, but with a portion of the plant extending above the water.

EMF: See **Electromagnetic Field**.

EMI: See **Electromagnetic Interference**.

Eminent Domain: A jurisdiction or agency's legal right to take private property for public use in exchange for fair compensation.

Emission and Dispersion Modeling System (EDMS): Modeling system used by the Federal Aviation Administration (FAA) to estimate airplane emissions generated from a specified number of landing and take-off (LTO) cycles.

Endangered Species: Any species listed under the federal Endangered Species Act as being in danger of or threatened with extinction throughout all or most of its range.

Enplanement: The act of boarding an airplane.

Environmental Impact Report (EIR): A detailed informational document that analyzes a project's potential significant effects and identifies mitigation measures and reasonable alternatives to avoid the significant effects. This document is part of the CEQA environmental review process.

Environmental Impact Statement (EIS): A detailed informational document that analyzes a project's potential significant effects and identifies mitigation measures and reasonable alternatives to avoid the significant effects. This document is part of the NEPA environmental review process.

Environmental Justice: Identifying and addressing the potential for disproportionately high and adverse effects of programs, policies, and activities on minority populations and low-income populations.

Erosion: Process by which earth materials are worn down by the action of flowing water, ice, or wind.

Ethnicity: A grouping or category of people based on shared cultural traits such as ancestral origin, language, custom, or social attitude.

F

Farmland of Local Importance: Farmlands that are important to the local agricultural community, as determined by each county's board of supervisors and local advisory committee. See also Farmland of Statewide Importance, Prime Farmland.

Farmland of Statewide Importance: Farmlands of statewide importance are similar to prime farmlands but have been evaluated as less valuable because they have steeper slopes, less ability to retain moisture in the soil, or other characteristics that limit their use. To quality as farmland of statewide importance, a property must have been used for production of irrigated crops at some time during the previous 4 years.

Farmland Severance: Because agricultural land usually consists large parcels, the acquisition of part of a property results in the severance (disconnection) of land retained under agricultural use, and in impacts associated with construction and with occupation or use of developed areas.

Fault: A fracture in the earth's lithosphere (brittle rocky shell) along which movement has occurred.

Feasible: Capable of being implemented.

Fecundity: Fertility; potential to be fruitful in offspring or vegetation.

Feeder route: Branch routes that feed into main (arterial) routes.

Fiber Optic Cable System: A data transmission technology that relies on light rather than electricity, conveying data through a cable consisting of a central glass core surrounded by layers of plastic.

Fill Slope: A slope shaped by the placement and compaction of loose "fill" materials, which may be reused from elsewhere on the construction site, or imported.

Fiscally or Financially Constrained Plans: Plans that are limited by the foreseen availability of project funding in a region.

Flyover: A bridge that carries one road or rail alignment aerially over another.

Footprint: Area of the ground surface covered by a facility, or affected by construction activities.

Frequency: The number of times a field, such as an electromagnetic field, changes direction in space each second. Also, the number of trains, flights, or other transportation service occurring in a given time period.

G

G Force: A force whose magnitude is equal to the gravitational force acting on a body at sea level, expressed as 1.0g.

Gauss: Unit of measure describing the strength of a magnetic field. Near the surface of the earth, the earth's magnetic field measures approximately 0.5 gauss (0.1 Telsa). See also **Tesla**.

General Plan: A planning document, usually at the city or county level, that encapsulates policies for land use and development over a specified period of time. A general plan may be supplemented by specific plans that address land use and development policies for specific portions of a planning jurisdiction, such as historic districts or areas slated for redevelopment.

Geographic Information System (GIS): An information management system designed to store and analyze data referenced by spatial or geographic coordinates.

Giga: Prefix meaning 1 billion.

GIS: See **Geographic Information System.**

Grade Crossing: The intersection of a railroad and a highway at the same elevation (grade); an intersection of two or more highways; an intersection of two railroads.

Grade-Separated: At different elevations; on separate levels.

Greenhouse Gases: A class of air pollutants believed to contribute to the "greenhouse" global warming effect, including nitrogen oxides (NO_x) hydrocarbons (HC), and carbon dioxide (CO_2).

Grid: A system of interconnected power generators and power transmission lines that is managed to meet the requirements of energy users connected to the grid at various points.

Groundwater: Water contained and transmitted through open spaces within rock and sediment below the ground surface.

Growth Inducement: Contribution to the rate or extent of development in an area.

Guideway: Defined by the Orange County Transportation Authority as "a track or riding surface that supports and physically guides transit vehicles specially designed to travel exclusively on it."

H

Habitat: An environment where plants or animals naturally occur; an ecological setting used by animals for a particular purpose, such as roosting habitat, breeding habitat, etc.

Headway: The time between buses, trains, or other transit vehicles at a given point. For example, a 15-minute headway means that one bus arrives every 15 minutes.

Herbaceous: Describes plants that have little or no woody tissue. Herbaceous plants typically survive for only a single growing season.

Heritage Resources: An alternate term for cultural resources used in some planning documents. See **Cultural Resources**.

Hertz: A unit of measure describing **frequency**, equal to cycles (number of reversals) per second.

High-Speed Steel-Wheel-on-Steel-Rail Train: An improvement of traditional railroad passenger technology that has been designed to operate at speeds of 100 to 150 mph (160 to 240 kph) on existing rail infrastructure.

High-Speed Train: Refers to a train designed to operate safely and reliably at speeds near 200 mph (350 kph).

High Visual Impacts: Impacts sustained if features of a project alternative are very obvious, such that they begin to dominate the landscape and detract from the existing landscape characteristics or scenic qualities.

Hydrocarbons: A wide variety of organic compounds, including methane (CH_4), emitted principally from the storage, handling, and combustion of fossil fuels.

I

Impact: A change the condition or function or an environmental resource or environmental value as a result of human activity. Also called effect.

In Lieu of: Instead of or in place of.

Indigenous Species: A native species; any plant or animal species that occurs naturally in a wilderness area and was not introduced, deliberately or accidentally, by humans.

Infrastructure: The facilities required for a societal function or service; e.g., transportation infrastructure, utilities infrastructure.

Initial Study: An environmental study carried out in compliance with CEQA, with the goal of evaluating whether a proposed project has the potential to result in significant impacts on the environment.

Insertion Loss: The actual noise-level reduction at a specific receiver due to construction of a noise barrier or some other intervention between the noise source (e.g., traffic) and the receiver.

In-Situ: In the original or natural position.

Intermodal: Describes transportation that involves more than one means (walk, bike, auto, transit, taxi, train, bus, air, etc.) during a single journey.

Inversion: A region where atmospheric temperature increases rather than decreasing with height, suppressing atmospheric mixing and tending to trap pollutants near the ground surface, where their effects on health and materials are greater.

Investment-Grade Ridership Forecast: Ridership forecast that is sufficiently detailed and reliable to permit responsible decision-making about capital expenditures.

J

K

Kilo: Prefix meaning 1 thousand.

L

Landscape Unit: An area of distinct, but not necessarily homogenous, visual character.

Landslide: Movement of earth or rock materials downslope under the influence of gravity.

Land Use Compatibility Assessment: an assessment of the compatibility of a proposed project or land use with existing and projected land uses in nearby areas, based on the sensitivity of various land uses to change related to the alternatives and the impact of these changes on the land use.

Lead (Pb): A stable element that persists and accumulates both in the environment and in humans and animals, and can have toxic effects.

Lead Agency: The public agency that has the principal responsibility for carrying out or approving a project or action, and is thus responsible for preparing environmental review documents in compliance with CEQA and/or NEPA.

L_{eq}: A measure of the average noise level during a specified period of time.

L_{eq}(h), dBA: Equivalent or average noise level for the noisiest hour, expressed in **A-weighted decibels**.

Less than Significant: In CEQA usage, describes an impact that is not sufficiently adverse, intense, or prolonged to require **mitigation**.

Level of Service (LOS): A rating using qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers.

Liquefaction: A type of ground failure in which soils or sediments lose their internal cohesion, cease to behave as a solid, and flow like a liquid.

Logarithmic Scale: A measurement in which the ratio of successive intervals is not equal to 1 (which is typical for linear scales) but is some common factor larger than the previous interval (a typical ratio is 10, so that the marks on the scale read: 1, 10, 100, 1000, 10000, etc. Logarithmic scales are useful for graphing values that have a very large range.

Low Visual Impacts: Impacts sustained if features of a project alternative are consistent with the existing line, form, texture, and color of other elements in the landscape and do not stand out.

M

Magnetic Levitation (Maglev): A high-speed train technology that relies on attractive or repulsive magnetic forces to lift and propel the train along a guideway.

Mainline: A principal highway or railroad, exclusive of connectors, ramps, spurs, etc.

Maintenance: An air basin is considered to be in maintenance for a given pollutant if it was formerly in nonattainment but is now meeting the established standards for that pollutant. See also **Attainment, Nonattainment**.

Major Investment Study (MIS): A study that evaluates project alternatives for their ability to solve an area's transportation problems.

Master Plan: A comprehensive planning document intended to guide the long-range growth and development of a community or region, or the long-term management and use of a parkland.

Measure M: Approved by Orange County voters in November 1990, Measure M instituted a sales tax of 0.5 cent for countywide transportation improvements.

Mean High-Water Mark: The elevation reached by the water surface at the mean (average) high water level (average high tide elevation or average flood elevation), often indicated by physical characteristics such as erosion, lines of vegetation, or changes in type of vegetation.

Medium Visual Impact: Impacts sustained if features of a project alternative are readily discernable but do not dominate the landscape or detract from existing dominant features.

Mesoscale: Describes regional air quality analysis.

Microscale: Describes local air quality analysis.

Midden: Refuse accumulation associated with prehistoric use of a site or area.

Mitigation: Action or measure undertaken, minimize, reduce, eliminate, or rectify the adverse impacts of a project, practice, action, or activity.

Modal: A transportation system defined on the basis of specific rights-of-way, technologies, and operational features.

Monitoring: The collection of information to determine the effects of resource management and to identify changing resource conditions or needs.

Monoculture: The cultivation of a single product to the exclusion of other uses of land.

N

National Ambient Air Quality Standards (NAAQS): Federal standards stipulating the allowable ambient concentrations of specific criteria pollutants.

National Environmental Policy Act (NEPA): "Federal legislation requiring federal agencies to consider the environmental impacts of major federal projects or decisions, to share information with the public, to identify and assess reasonable alternatives, and to coordinate efforts with other planning and environmental reviews taking place."

Nitrogen Oxides (NO_x): A class of pollutant compounds that include nitrogen dioxide (NO_2) and nitric oxide (NO), both of which are emitted by motor vehicles. See **Criterial Pollutants**.

No Action: Under NEPA, refers to an alternative under which no action would be taken (no infrastructure would be built and no new management or operational practices would be instituted). See **No Project**.

No Project: Under CEQA, refers to an alternative under which no action would be taken (no infrastructure would be built and no new management or operational practices would be instituted). See **No Action**.

Nonattainment: An air basin is considered to be in nonattainment for a particular pollutant if it is exceeding federal or state standards for that pollutant. See also **Attainment**, **Maintenance**.

Non-Electrified Steel-Wheel-on-Steel-Rail Train: Conventional intercity diesel locomotive train equipment (e.g., Amtrak California Corridor trains).

Nonpoint Source Pollution: Pollution that cannot be traced to a single source, but collects from a wide area. Examples include pesticides or fertilizers that wash into rivers or percolate through the soil into groundwater.

Non-Water-Contact Recreation: Describes recreational activities where contact with the water is not likely, such as photography, wildlife viewing, etc.

Notice of Intent (NOI): Formal notice stating that an environmental impact statement will be prepared for a proposed project, published in the Federal Register by the federal lead agency.

Notice of Preparation (NOP): Formal notice stating that an environmental impact report will be prepared for a proposed project, issued by the state lead agency.

Noxious Weed: A plant that has been defined as a pest by law or regulation. Both the State of California and the federal government maintain lists of plants that are considered threats to the well-being of the state or the country.

NPL/Superfund List: Federal list of sites that have been identified as posing an immediate public health hazard and where an immediate response is necessary.

O

Ordinary High-Water Mark: The line on the shore of a body of water established by the fluctuation of water.

Ozone (O_3): A photochemical oxidant that is a major cause of lung and eye irritation in urban environments.

P

Paleontological: Related to the study of life in past geologic time.

Pantograph Power Pickup: A device for collecting current from an overhead wire, consisting of a hinged vertical arm operated by springs or compressed air and a wide, horizontal contact surface that slides along the wire.

Particulate Matter: Liquid and solid particles of a wide range of sizes and compositions; of particular concern for air quality are particles smaller than or equal to 10 microns and 2.5 microns in size (PM10 and PM2.5 respectively).

Point Source Pollution: Pollution that can be traced to a single source. An example is a smokestack at a factory.

Poverty Level: For example, the poverty level was defined in 1999 for a family of four as a income of $16,700 or less.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Preferred Alternative: The alternative identified as preferred by the lead agencies.

Program-Level: Refers to a CEQA or NEPA environmental review that covers the broad spectrum of a large, complex, regionally extensive effort comprised of a number of smaller, regionally focused projects or phases.

Project-Level: Refers to more detailed site-specific environmental analysis focusing on a single project that is part of a larger program.

Prime Farmland: Rural land that has the best combination of physical and soil chemistry characteristics for producing food, feed, forage, fiber, and oilseed crops, and is available for these uses.

Public Transportation: Includes bus, trolley bus, streetcar or trolley car, subway or elevated, railroad, ferryboat, and taxicab service.

Purpose and Need: The reason(s) why a project or action is undertaken, and the need(s) it is intended to meet or fulfill.

Q

Quantm System: An route selection and optimization tool that carries out automated three dimensional alignment searches and corridor screening based on client- or user-specified geometry, constraints, and cost parameters.

R

Radio Frequency: The frequency range of the electromagnetic spectrum that is used for radio communication.

Ranchette: A rural or semi-rural ranch-style residence with a comparatively small acreage.

Reactive Organic Gases (ROG): Reactive **hydrocarbon** pollutants.

Regional Transportation Improvement Plan: A listing of all transportation projects proposed over a six-year period for a given region. The regional transportation improvement program (RTIP) is prepared to implement projects and programs listed in the RTP and is developed in compliance with state and federal requirements.

Regional Transportation Plan: A long-range (20+ year) transportation plan. The regional transportation plan (RTP) identifies major challenges as well as potential opportunities associated with growth, transportation finances, the future of airports in the region, and impending transportation system deficiencies that could result from growth anticipated in the region. There are typically two components of the RTP, a financially constrained and financially unconstrained version. The financially constrained version of the RTP includes projects and programs that fit within existing and planned funding sources.

Richter Scale: A logarithmic scale measuring the severity of earthquakes, based on the magnitude of ground motion.

Ridership: The number of people who ride a transportation system.

Right-of-Way: A legal right of passage over a defined area of real property. In transit usage, refers to the corridor along a roadway or track alignment that is controlled by a transit or transportation agency/authority.

Riparian: Relating to, living, or located on the bank of a natural watercourse, lake, or tidewater.

Riprap: Armoring consisting of randomly placed rock or concrete, used to strengthen an embankment or protect it from **erosion**.

Rolling Stock: Wheeled railway vehicles.

Ruderal: Weedy vegetation, commonly including or dominated by introduced species, characteristic of areas where native vegetation has been disturbed or removed.

S

Scenic Corridor: **Corridor** with landscapes and vistas of high scenic quality.

Scoping: A process used under both CEQA and NEPA to determine the scope of issues to be addressed and for identifying the significant issues related to the proposed action or project to be addressed in an environmental impact report or environmental impact statement.

Screenline: An imaginary line across parallel roadways that defines a zone of analysts.

Section 4(f): Refers to provisions originally enacted as Section 4(f) of the U.S. Department of Transportation Act of 1966 (23 C.F.R. 771.135) and subsequently codified in 49 U.S.C., Subtitle I, Section 303(c). The "Section 4(f)" provisions address the potential for conflicts between transportation needs and the protection of lands for recreational use and resource conservation by regulating the use of publicly owned parkland, recreation areas, and historic sites. Specifically, they prohibit the Secretary of Transportation from approving any program or project that would require the use of any publicly owned land from a public park, recreation area, wildlife or waterfowl refuge, or land of an historic site of national significance as determined by the officials having jurisdiction over these lands, unless there are no feasible and prudent alternatives to the use of these lands. In addition, a proposed program or project must include all possible planning to minimize harm resulting from the proposed use.

Section 6(f): State and local governments often obtain grants through the to acquire or make improvements to parks and recreation areas (16 U.S.C. § 460-4 through 460-11, September 3, 1964, as amended 1965, 1968, 1970, 1972–1974, 1976–1981, 1983, 1986, 1987, 1990, 1991, 1993–1996). Refers to Section 6(f) of Land and Water Conservation Fund Act of 1964, which prohibits the conversion to a non-recreational purpose of property acquired or developed with funds granted through the Act without the approval of the National Park Service. Section 6(f) directs the Department of the Interior to ensure that replacement lands of equal value (monetary), location, and usefulness are provided as conditions to such conversions. Consequently, where such conversions of Section 6(f) lands are proposed for transportation projects, replacement lands must be provided.

Sedimentary Rock: Rock resulting from the consolidation of sediment.

Seiche: Oscillation or "sloshing" of water in a lake, bay, or other enclosed body as a result of landsliding or seismic groundshaking.

Senate Bill 45: Bill that instituted consolidation of various funding programs into the STIP and increased accountability for programming and delivery of STIP projects to the regions around the state and the various Caltrans' districts.

Sensitivity Analysis: An analysis that assesses how sensitive the outcomes predicted by modeling are to changes in different model inputs (assumptions or variables).

Shadow impact: shadow impact ranking would be high if a new (not existing) elevated structure were within 75 ft (23 m) of residential or open space, natural areas, or parkland.

Significant: In CEQA usage, describes an impact that is sufficiently adverse, intense, or prolonged to require **mitigation**. For NEPA useage see 40 C.F.R. 1508.27.

South Coast Air Quality Management District: The regional regulatory agency with the primary responsibility for improving air quality in the South Coast Air Basin.

State Implementation Plan: Statewide plan for complying with the federal Clean Air Act. The State Implementation Plan (SIP) consists of narrative, rules, and agreements that California will use to cleanup polluted areas.

State Transportation Improvement Program: A multi-year capital improvement program of transportation projects on and off the state highway system, funded with revenues from the State Highway Account and other funding sources. STIP programming generally occurs every two years.

Strike-Slip Fault: A fault along which the dominant direction of movement is parallel to the fault trace (the expression of the fault on the ground surface).

Stub End: A track that terminates at one end.

Subsidence: Sinking or lowering of the ground surface.

Sulfur Oxides (SO_x): Sulfur-oxygen compounds that include the important **criteria pollutants** sulfur dioxide (SO_2) and sulfur trioxide (SO_3).

T

Take: As defined in Section 3 of the federal Endangered Species Act, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Tesla: Unit of measure describing the strength of a magnetic field. See also **Gauss**.

Tiering: Refers to the practice of addressing general issues in broader environmental impact reports or statements such as **program-level** documents and providing more detailed site-specific analyses in subsequent (typically **project-level)** documents that "incorporate" the initial broad analysis by reference.

Total Organic Gases (TOG): A pollutant classification that includes all **hydrocarbons**, both reactive and non-reactive.

Trainset: A complete unit of **rolling stock** that makes up a single train.

Transit-Dependent Population: The population over the age of 16 (workers) who use **public transportation** as a means of traveling to and from work.

Transit Node: A connection, station, or terminal on a transit network.

Transportation Demand Management: The operation and coordination of various transportation system policies and programs to manage travel demand to make the most efficient and effective use of existing transportation services and facilities.

Transportation system management: actions that improve the operation and coordination transportation services and facilities to realize the most efficient use of the existing transportation system.

Travel Time: The time spent on the road, in the air, or on a train from a place of origin to a place of destination. Total travel time includes the time required to reach a station or an airport, time spent waiting for the next scheduled train or flight, time spent getting to the boarding area, time spent checking and retrieving luggage, time spent getting a rental car or taxi, as well as time spent to reach the final destination.

Tributary Watercourse: A stream feeding a larger stream or a lake.

Trinomial: An alphanumeric abbreviation for a previously identified historic or prehistoric resource, such as CA-ORA-1352, representing the state (e.g., California or CA-), the county (e.g., Orange or -ORA-), and a unique number assigned by the State Historic Preservation Office (such as -1352).

Tsunamis: Waves that travel in the open ocean and are caused by an undersea earthquake, landslide or volcanic activity.

U

Unavoidable: In CEQA and NEPA usage, describes an impact that cannot be entirely avoided, reduced, or compensated for.

Unique Farmland: Farmland with soils of lower quality than either **prime farmland** or **farmland of statewide importance**, but still used for the production of crops. Unique farmlands are usually irrigated, but may include nonirrigated orchards or vineyards in some of California's climate zones in California. To quality as unique farmlands, a property must have been in crops at some time during the previous 4 years.

Units of Measure:

Table of Metric Equivalents	
Length	
Unit	**Approximate U.S. Equivalent**
kilometer	0.62 mile
meter	39.37 inches
centimeter	0.39 inch
Area	
Unit	**Approximate U.S. Equivalent**
square kilometer	0.3861 square miles
hectare	2.47 acres
Capacity	
Unit	**Approximate U.S. Equivalent**
liter	1.057 quarts
Mass and Weight	
Unit	**Approximate U.S. Equivalent**
metric ton	1.102 short tons (2,204.6 pounds)
kilogram	2.2046 pounds
gram	0.035 ounce
Speed	
Unit	**Approximate U.S. Equivalent**
kilometer per hour	0.621 mile per hour

Uplift: The action of a portion of the earth's surface as it rises above adjacent areas. An area of higher elevation than surrounding areas; an area that has been uplifted.

V

V/C Ratio: Volume to capacity ratio; describes the relationship between the amount of traffic a roadway was designed to carry and the amount of traffic it actually carries. Related to the **level of service (LOS)** the roadway can provide.

Very High Speed Steel-Wheel-on-Steel-Rail Train: A train capable of maximum operating speeds near 220 mph (350 kph) utilizing steel-wheel-on-steel-rail technology.

Viaduct: A bridge that conveys a road or a railroad over a valley often constructed of a series of arches supported by piers.

Viewshed: Total visible area from a single observer position, or the total visible area from multiple observer positions. Viewsheds are accumulated seen-areas from highways, trails, campgrounds, towns, cities, or other viewer locations. Examples are corridor, feature, or basin viewsheds.

Visual Intactness: The aesthetic integrity of the visual environment and its freedom from encroaching elements.

Visual Resources: The natural and artificial features of a landscape that characterize its form, line, texture, and color.

Visual Unity: The visual coherence and compositional harmony of a landscape when considered as a whole.

Visual Vividness: The visual power or memorability of landscape components as they combine in patterns experienced by the viewer.

Volt: Standard unit of measure for electrical potential.

W

Water-Contact Recreation: Recreational activities in which contact with the water is intended or likely, such as swimming, water-skiing, and fishing.

Watershed: The area that contributes water to a drainage system or stream.

Watt: Standard unit of measure for electrical power.

Wayside Power: Electrical power provided from the utility grid to the electrified railroad right-of-way at convenient locations from the side of the rail tracks or corridor.

Weir: A small dam that restricts flow in a stream in order to raise water level, or diverts flow into a desired course.

Wetland: An area that is regularly saturated by surface water or groundwater and is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions.

Wildlife Corridor: A belt of habitat that is essentially free of physical barriers such as fences, walls, and development, and connects two or more larger areas of habitat, allowing wildlife to move between physically separate areas.

X

Y

Z

SOURCES USED

www.155.217.58.58/cgi-bin/atdl.dll/fm/3-34.343/gloss.htm

www.apta.com/research/stats/rail/definitions.cfm

www.bpa.gov/Corporate/KCC/defn/defnsmal/fgh.htm

www.bpa.gov/Corporate/KCC/defn/defnsmal/no.htm

www.ca.blm.gov/GoldenQueen/pub-glos.htm

http://ceg.eh.doe.gov/nepa/regs/ceq/toc_ceq.htm

www.cogsci.princeton.edu/cgi-bin/webwn

www.cogsci.princeton.edu/cgi-bin/webwn or www.windmill.co.uk/glossary.html

www.courtinfo.ca.gov/selfhelp/ glossary.htm#E

www.dot.ca.gov/ser/glossary.htm

www.envisionutah.org/glossary.htm

http://www.epa.gov/owow/wetlands/pdf/40cfrPart230.pdf

www.faa.gov/arp/app600/5054a/5054a1.htm

www.fao.org/docrep/V8350E/v8350e0f.htm

www.fcit.coedu.usf.edu/network/glossary.htm

www.geology.er.usgs.gov/paleo/glossary.shtml

www.grc.nasa.gov/WWW/pbrf/glossary.htm

www.inventors.about.com/library/inventors/blrailroad6.htm

www.members.tripod.com/AMRZ_Home/Glossary.html

www.Merriam-Webster

www.mortgage-rates-mortgage-rates.net/ glossary.htm

www.ncat.org/neaap/resources/glossary.htm

www.octa.net/center/intro/def.asp

www.projectauditors.com/Dictionary/C.html

www.techfest.com/networking/cabling/cableglos.htm

www.tfcbooks.com/mainpage/glossary.htm

www.transweb.sjsu.edu/comglos.htm.

www.ucop.edu/facil/pd/CEQA-Handbook/glossary.html

www.wave-guide.org/library/glossary.html

www.wrh.noaa.gov/Phoenix/general/glossary/

U.S. Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management. U.S. Forest Service, Agricultural Handbook No. 701, Glossary-6.

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