CALIFORNIA HIGH-SPEED TRAIN

DRAFT

Fresno to Bakersfield

Biological Assessment

June 2012

CALIFORNIA High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

California High-Speed Train Project

Biological Assessment

Prepared by:

URS/HMM/Arup Joint Venture

June 2012

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Acronyms

ARRA	American Recovery and Reinvestment Act
Authority	California High-Speed Rail Authority
BA	Biological Assessment
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railway
BO	Biological Opinion
CDFG	California Department of Fish and Game
CVRWQCB	Central Valley Regional Water Quality Control Board
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWHR	California Wildlife Habitat Relationship System
DPS	Distinct Population Segment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Ecological Reserve
ESA	Environmentally Sensitive Area
°F	Degrees Fahrenheit
FESA	Federal Endangered Species Act
FR	Federal Register
FRA	Federal Railroad Administration
GIS	Geographic Information System
GPS	Global Positioning System
HMF	Heavy Maintenance Facility

HST	High-Speed Train
ICS	Initial Construction Segment
kV	kilovolt
LAA	May Affect, Likely to Adversely Affect
Mph	miles per hour
NAIP	National Agricultural Imagery Program
NLAA	May Affect, Not Likely to Adversely Affect
NWR	National Wildlife Refuge
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NMFS	National Marine Fisheries Service
OCS	Overhead Catenary System
PCE	primary constituent element
PG&E	Pacific Gas & Electric
RSA	Resource Study Area
SR	State Route
Statewide Program EIR/EIS	Final Program Environmental Impact Report and Environmental Impact Statement for Proposed California High-Speed Train System
SWRCB	State Water Resources Control Board
Survey Plan	Central Valley Biological Resources and Wetland Survey Plan
TPSS	Traction Power Supply System
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEF	Wildlife Exclusion Fencing

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Executive Summary

E1.0 Executive Summary

This Biological Assessment (BA) has been prepared to evaluate the potential adverse effects of the proposed project on species listed as endangered, threatened, or proposed for listing as endangered or threatened, or that are candidates for listing as endangered or threatened under the Federal Endangered Species Act of 1973 (FESA) and designated, or proposed, critical habitats. Potential effects on federally listed species are evaluated in accordance with the legal requirements set forth in Section 7 of the FESA (16 United States Code [U.S.C.] §§ 1531 *et seq.*).

This BA presents the criteria used to determine which federally listed species were considered, and potential adverse effects to those species from the proposed project. In addition, this document proposes measures to avoid and minimize take to species protected under FESA. This BA discusses listed species and designated critical habitat that are regulated by the U.S. Fish and Wildlife Service (USFWS). No species or designated critical habitat under the jurisdiction of the National Marine Fisheries Service (NMFS) occurs in the action area. Therefore, the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) will not be initiating formal consultation with NMFS.

E1.1 Proposed Project

The Authority and FRA propose to construct a new High-Speed Train (HST) system that at final build would connect the major population centers of the San Francisco Bay Area with the Los Angeles metropolitan region. The HST system would be an electrically powered, steel-wheel-on-steel-rail system with state-of-the-art safety, signaling, and automated train-control systems. The trains would be capable of operating at speeds of up to 220 miles per hour over a fully grade-separated, dedicated track alignment.

The project discussed in this BA is for design, construction, and operation, including maintenance, of the section of the HST system from Fresno to Bakersfield, and it includes:

- Approximately 117 miles of track.
- Two railroad passenger stations, one each in the cities of Fresno and Bakersfield; and a potential third station near the city of Hanford.
- Approximately 185 road overcrossings and undercrossings.
- Associated railway support facilities: electrical stations, a Maintenance of Way Facility, and a potential Heavy Maintenance Facility.

E1.2 Technical Studies

E1.2.1 Literature Analysis

A desktop review was performed to identify the locations of wetlands and other waters of the U.S., federally listed plant or wildlife species, wildlife movement/migration corridors and areas, and federally designated or proposed critical habitat units recorded or potentially occurring within the Fresno to Bakersfield project alignment. Review materials included standard wildlife and aquatic resource databases including USFWS; California Natural Diversity Database (CNDDB); California Native Plant Society (CNPS); and California Wildlife Habitat Relationships (CWHR) databases; USFWS critical habitat designations, recovery plans and conservation guidelines; and various habitat linkage reports.

E1.2.2 Field Surveys

Field surveys were performed during the spring and summer of 2010. Surveys were conducted within the resource-specific study areas defined below, and in accordance with the methods described in the 2009 *Central Valley Biological Resources and Wetland Survey Plan* (Survey Plan). The Survey Plan was prepared with resource agency review and comments for the Central Valley sections of the HST, including the Fresno to Bakersfield Section (FRA and Authority 2009). Biologists conducted surveys for botanical resources, including federally listed plant species and elderberry shrubs; wetlands and other waters of the U.S., including federally listed vernal pool dependent species; and wildlife habitat assessments for federally listed wildlife species.

The field survey methods varied depending on survey type, land use, and permission to enter. Where properties within the study areas were not accessible to the survey crews due to lack of permission to enter, field crews used public roads, adjacent parcels where they had permission to enter, or other suitable means, as possible and available, to conduct visual surveys and compare background information to aerial imagery.

Four distinct terms are used to describe the areas studied for this BA and affected by the project: the project footprint, the action area, resource study areas (RSAs), and the project area. These areas are defined and distinguished as follows, from the least inclusive to the most inclusive:

- The project footprint is the area that is physically impacted by the construction activities associated with the proposed action.
- The action area includes the project footprint where direct effects to species may occur and extends 1,000 feet outward to include areas where indirect effects may occur. The extent of adverse effects within the action area differs for each federally listed species based on different sensitivities to disturbance. Depending on the species, the limit of indirect effects ranges from the project footprint plus a 100-foot buffer to the project footprint plus a 1,000-foot buffer. The limit of indirect effects within the action area is discussed on a species-by-species basis in Chapter 4 (Species/Critical Habitat Considered).
- RSAs are those areas where URS-HMM-Arup biologists performed field surveys. The RSAs include the project footprint and the surrounding action area. The RSAs are defined for the various biological resources as follows:
  - The Botanical RSA was surveyed for federally listed plants, sensitive natural communities, and elderberry shrubs. The Botanical RSA consists of the project footprint plus a 100-foot buffer.
  - The Wetland RSA was surveyed for wetlands and other waters of the U.S. and the species that are dependent on them (e.g., vernal pool species). The Wetland RSA consists of the project footprint plus a 250-foot buffer.
  - The Wildlife RSA was surveyed for wildlife habitat. The Wildlife RSA is defined as the proposed project footprint plus a 1,000-foot buffer, which includes a core Wildlife RSA and an auxiliary Wildlife RSA. A supplemental Wildlife RSA extends laterally from the project footprint up to 1.24 miles, depending on target species, and was studied via desktop analysis.
- The project area is the greater San Joaquin Valley regional area. It includes portions of Fresno, Kings, Tulare, and Kern counties, linking the cities of Fresno and Bakersfield with smaller rural communities, including Corcoran, Wasco, and Shafter.

The background review of movement corridors was ground-truthed in the Wildlife RSA. The availability and suitability of potential movement corridors were evaluated for migratory species. This evaluation was augmented by evaluating existing wildlife passages, such as culverts, washes, and bridges within the Wildlife RSA for signs of local wildlife movement. Potential migration barriers such as existing canals, railways, and roadways were also noted in the field.

E1.2.3 GIS Analysis

Information gathered in the field was organized in the office using ArcGIS software. All global positioning system (GPS) data were differentially corrected to achieve sub-meter accuracy. All hand-drawn locations of wetlands and other waters of the U.S., botanical resources, wildlife habitats, observations of federally listed species, key macro- or micro-habitat elements, and wildlife movement/migration corridors or other relevant field notes were digitally converted from the field maps.

E1.3 Study Results

E1.3.1 Wildlife Habitat Types that may Support Federally Listed Species

Wildlife habitat types were identified using CWHR system descriptions. Parcels whose agricultural use could not be determined to specific CWHR wildlife habitat types (e.g., dryland grain crops, irrigated grain crops, irrigated hayfield, irrigated row and field crops) were designated under the umbrella category of cropland. Agricultural croplands are the largest recorded habitat type within the RSA. Urban areas, including large cities such as Fresno and Bakersfield and the multiple smaller cities between, constitute the second greatest land use within the RSA. In urban areas, native vegetation is absent or highly disturbed, and typical vegetation consists of a variety of landscaped trees and other non-native vegetation. CWHR habitat types observed within the RSA included:

- Agricultural/cropland
- Alkali desert scrub
- Annual grassland
- Barren
- Fresh emergent wetland
- Lacustrine
- Pasture
- Riverine
- Urban
- Valley foothill riparian

E1.3.2 Federally Listed Plant and Wildlife Species

Based on the results of desktop and field surveys, 12 federally listed species are considered in this BA. The proposed project contains habitat for the following federally listed vascular plant and wildlife species regulated by USFWS:

• California jewelflower	*Caulanthus californicus*	Endangered
• Kern mallow	*Eremalche kernensis*	Endangered
• San Joaquin woolly threads	*Monolopia congdonii*	Endangered
• Hoover's spurge	*Chamaesyce hooveri*	Threatened
• Vernal pool tadpole shrimp	*Lepidurus packardi*	Endangered
• Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened
• Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened
• California tiger salamander	*Ambystoma californiense*	Threatened

- Blunt-nosed leopard lizard — *Gambelia (=Crotaphytus) sila* — Endangered
- Tipton kangaroo rat — *Dipodomys nitratoides nitratoides* — Endangered
- Fresno kangaroo rat — *Dipodomys nitratoides exilis* — Endangered
- San Joaquin kit fox — *Vulpes macrotis mutica* — Endangered

Designated Critical Habitat

The Fresno to Bakersfield Section of the HST system does not overlap designated critical habitat for any federally listed species. However, a critical habitat unit for the vernal pool fairy shrimp has been designated at a location approximately 250 feet from the project footprint.

E1.3.3 Summary of Findings, Conclusions, and Determinations

Throughout this BA, the range of direct effects to listed species (from minimum to maximum) is presented because the final alignment of the HST system will not be determined until after the preferred alignment for the project-specific EIR/EIS has been identified.

Of the four federally listed plants with potential to occur, none were found during floristic surveys within the Botanical RSA. While suitable habitat for these federally listed plants may exist in natural areas that were inaccessible to survey crews, adverse effects are not anticipated given the low potential for the species to occur and the avoidance and minimization measures that have been proposed to mitigate effects to federally listed plant and wildlife species. The effect determinations for federally listed plant species are listed in Table ES-1.

Table ES-1
Effects Determination for Federally Listed Plant Species within the Project Footprint

Plant Species	Effect Determination
California jewelflower	May Affect, Not Likely to Adversely Affect
Kern mallow	May Affect, Not Likely to Adversely Affect
San Joaquin woolly threads	May Affect, Not Likely to Adversely Affect
Hoover's spurge	May Affect, Not Likely to Adversely Affect

Effects to federally listed wildlife species were calculated based on a number of factors. These include species range, specific habitat requirements, known species occurrences, and the overlap of the project footprint with both range and suitable habitat. This project is likely to adversely affect seven of the eight wildlife species evaluated. However, the extent of effects, as determined by impacted suitable habitat, ranges between species. Table ES-2 provides the effects determination and summarizes the range of potential impacts to suitable habitat for each species. This range includes those potentially suitable habitat areas not accessible to surveyors, which may or may not actually support federally listed species.

Table ES-2
Effects Determination for Federally Listed Wildlife Species within the Project Footprint

Wildlife Species	Effect Determination[1]	Type of Effect	Potentially suitable habitat (acres)*	
			Min	Max
Vernal pool tadpole shrimp and Vernal pool fairy shrimp	LAA	Direct	12.05	38.14
		Indirect	34.51	80.80
Valley elderberry longhorn beetle	LAA	Direct	1 shrub	1 shrub
California tiger salamander Upland habitat	LAA	Direct	0.02	5.50
Blunt-nosed leopard lizard	LAA	Direct	27.60	98.05
Tipton kangaroo rat	LAA	Direct	362.45	445.38
Fresno kangaroo rat	NLAA	Direct	28.50	30.39
San Joaquin Kit Fox				
Southwestern Tulare County Satellite Area – Natural	LAA	Direct	86.81	153.94
Southwestern Tulare County Satellite Area – Agricultural			521.45	640.64
Metropolitan Bakersfield Satellite Area – Natural	LAA	Direct	215.96	216.85
Metropolitan Bakersfield Satellite Area – Agricultural			—	—
Metropolitan Bakersfield Satellite Area – Urban			247.17	302.70
Linkage – Natural	LAA	Direct	0.00	20.12
Linkage – Agricultural			124.56	350.58
Outside of Recovery Areas – Natural	LAA	Direct	206.80	284.47
Outside of Recovery Areas - Agricultural			1,903.06	2,906.34

[1] LAA = May Affect, Likely to Adversely Affect; NLAA = May Affect, Not Likely to Adversely Affect
* Based on species range overlapping with suitable habitat within the project footprint.

Critical Habitat Effect Determination

The project footprint does not occur within designated critical habitat for the vernal pool fairy shrimp, but it occurs approximately 250 feet from an area with this designation. The primary constituent elements (PCEs) for this designated critical habitat do not exist within the portion of this unit that is nearby the project footprint. Therefore, given that this designated critical habitat does not overlap with the project footprint and PCEs are not present within 250 feet of the project footprint, the proposed project will have no direct or indirect effect on designated critical habitat for the vernal pool fairy shrimp.

Effects from Interrelated and Interdependent Actions

The HST system is planned to be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles via the Central Valley. Phase 2, which is intended to be a long-term future build-out, would construct additional track from Merced to Sacramento and from Los Angeles to San Diego. The Fresno to Bakersfield alignment is one section of the statewide Phase 1 HST system. The individual sections of the system are separate from each other and can function on their own without further construction of an adjoining section. Each section is designed to have independent utility and logical termini and does not rely on other sections for operations to commence at a local level. Therefore, the proposed action is considered to be interrelated but not interdependent with the statewide HST system.

In addition to the project activities that will be implemented as part of the Fresno to Bakersfield action, interrelated activities that will be implemented in other sections of the HST system may affect federally listed species that are adversely affected by the action proposed in this document. Federally listed species that may occur in other Phase 1 sections include vernal pool tadpole shrimp, vernal pool fairy shrimp, valley elderberry longhorn beetle, California tiger salamander, blunt-nosed leopard lizard, and San Joaquin kit fox.

The adverse effects on the federally listed species from the interrelated sections of the HST system have not been formally studied; however, based on species' range and similarities in the project elements (e.g., infrastructure and supporting facilities), the direct and indirect effects to the species in other Phase 1 sections (San Jose to Merced, Merced to Fresno, Bakersfield to Palmdale) are anticipated to be similar in nature and magnitude to those of the Fresno to Bakersfield Section.

Cumulative Effects

The proposed project will be the largest project to be constructed in the Tulare Basin, followed by the construction and operation of portions of the Merced to Fresno and Bakersfield to Palmdale alignments of the HST. Other cumulative projects in the Tulare Basin Region include various transportation, residential, agricultural, commercial, and industrial projects, which will contribute to the overall loss or degradation of wildlife resources in the Tulare Basin. The successful implementation of the general conservation measures discussed in Section 2.7, along with the specific conservation measures discussed for each federally listed plant and wildlife species, will reduce the nature and magnitude of the project's effects on federally listed plant and wildlife species.

Chapter 1
Introduction

1.0 Introduction

This Biological Assessment (BA) is prepared and presented to initiate consultation with the U.S. Fish and Wildlife Service (USFWS) for the construction and operation of the Fresno to Bakersfield Section of the California High-Speed Train (HST) Project, in compliance with Section 7(a)(2) of the Federal Endangered Species Act of 1973, as amended (16 U.S.C. §§ 1531 *et seq.*) (FESA) and its implementing regulations (50 Code of Federal Regulations [CFR] § 402.01 *et seq.*).

1.1 Purpose of the Document

The following discussion summarizes the goal of FESA, the duties of the federal action agency under Section 7, the purpose of the formal consultation, and the informational requirements to initiate formal consultation.

1.1.1 Goal of the Endangered Species Act

In 16 U.S.C. § 1531, the FESA sets forth the goal of conserving threatened and endangered species (listed species) and the ecosystems upon which they depend. Section 7 of the FESA, entitled "interagency cooperation," establishes the process whereby federal action agencies, their designees, and the USFWS and/or the National Marine Fisheries Service (NMFS) (jointly referred to as the Services) work together to ensure that proposed actions are not likely to jeopardize the continued existence of species that are listed or proposed for listing as threatened or endangered under the FESA. The Services also work to ensure that proposed actions are not likely to adversely affect the designated critical habitats for those species.

The implementing procedures of FESA are set forth at 50 CFR § 402. A federal action agency may take action directly, through one of its own proposed projects, or indirectly, through partial or complete funding for a non-federal project or by issuing a permit for a non-federal project. These conditions can cause an action to be subject to a Section 7 consultation under the FESA.

1.1.2 Duties of Action Agency

When a federal agency takes action subject to the FESA, it must comply with Section 7(a)(2) of the FESA. Section 7(a)(2) states:

"Each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available."

This section embodies two duties for a federal action agency. Under Section 7(a)(2), a federal agency has an independent substantive duty to ensure that its proposed actions will not jeopardize the continued existence of an endangered species or result in the destruction or adverse modification of critical habitat. To meet this duty, a federal action agency must use the best scientific and commercial data available in assessing the effects of the proposed action. A federal action agency also has a duty to consult with the Services and to use their assistance regarding their mandate to not jeopardize a listed species. These are independent duties, and both must be fulfilled to comply with Section 7(a)(2).

As is noted in the preamble of the FESA rules, the purpose of Section 7(a)(2) is "to insure that any [agency] action is not likely to jeopardize the continued existence of any endangered species..." (51 Federal Register (FR) 19926 [June 3, 1986]). In short, the consultation is not an end in itself, but a process for the federal action agency to ensure it does not jeopardize the listed species (*Roosevelt Campobello International Park Comm. v. U.S. EPA,* 684 F.2d 1041, 1049 [1st Cir. 1982]).

While a federal action agency has a substantive duty to not jeopardize a listed species, Section 7(a)(2) does not give the Services veto over a proposed action or the non-jeopardy adverse effects that it may have on a listed species. As one court noted: "[O]nce an agency has had meaningful consultation with the Secretary of Interior concerning actions which affect an endangered species the final decision of whether or not to proceed with the action lies with the agency itself" (*National Wildlife Federation v. Coleman,* 529 F.2d 359, 371 [5th Cir. 1976]). "An agency's duty to consult...does not divest it of discretion to make a final decision" once it concludes it has done all it can to not jeopardize a listed species (*Roosevelt Campobello International Park Comm. v. U.S. EPA,* 684 F.2d 1041, 1049 [1st Cir. 1982]).

Under Section 9(a)(2)(B) of the FESA, the USFWS regulation of federally listed plant species is limited to "areas under Federal jurisdiction." Only listed plant populations that appear within an area of federal interest that are removed, cut, dug up, damaged or destroyed in known violation of a state law or regulation are protected under the FESA. A recent Ninth Circuit Court of Appeals decision further restricted the definition of Federal jurisdiction with the court rejecting the argument that private land identified as containing wetlands or other waters of the U.S. under Section 404 of the Clean Water Act, are areas under Federal jurisdiction. The court held that jurisdiction is limited to endangered plants that occur on federal lands or on federal property interest such as conservation easements, leasehold estates, and special management areas (*Northern California River Watch* v. *Carl Wilcox, Gene Cooley, Robert Floerke, William R Schellinger, Frank H. Schellinger, and Scott Schellinger*).

Although the regulations at 50 CFR § 402.12(c) identify the information necessary to initiate formal consultation, the regulation explicitly states that "the contents [of the BA] are at the discretion of the federal [action] agency" (50 CFR § 402.12[f]). No mandate exists about what goes into a BA or its structure. This BA is intended to satisfy all information requirements identified at 50 CFR § 402.14(c) that are necessary to initiate formal consultation and for the Services to produce a biological opinion (BO).

When Congress passed the FESA, it clearly envisioned a cooperative consultation process between federal action agencies and the Services whereby proposed federal actions do not jeopardize the continued existence of listed species. For the Fresno to Bakersfield Section of the HST system, formal consultation is being initiated only with the USFWS because no effects are anticipated on listed species under NMFS jurisdiction.

1.1.3 Purpose of Formal Consultation

Formal consultations determine whether a proposed action is likely to jeopardize the continued existence of a listed species (jeopardy) or adversely affect its critical habitat. Formal consultations also determine the amount or extent of anticipated incidental take in an incidental take statement. Formal consultations perform several other functions. They:

- Identify the nature and extent of the effects of federal actions on listed species and critical habitat.
- Identify reasonable and prudent alternatives, if any, when an action is likely to result in jeopardy or adversely affect critical habitat.

- Provide an exception for specified levels of "incidental take" otherwise prohibited under Section 9 of the FESA.
- Provide mandatory reasonable and prudent measures to minimize the impacts of incidental take to listed species.
- Identify voluntary ways the action agencies can help conserve listed species or critical habitat when they undertake an action.
- Provide an administrative record of effects on a species that can help establish the species' environmental baseline in future biological opinions.

As such, this BA focuses on identifying effects to listed species and, where appropriate, reasonable and prudent measures to avoid or minimize the take of listed species. In consulting with the USFWS, additional reasonable and prudent measures to minimize take of listed species may be required consistent with the minor change rule. That is, reasonable and prudent measures can only include actions that occur within the action area, involve only minor changes to the project, and reduce the level of take associated with project activities. These measures should minimize incidental take to the extent reasonable and prudent. Measures are considered reasonable and prudent when they are consistent with the proposed action's basic design, location, scope, duration, and timing (50 CFR § 402.14(i)(2). The test for reasonableness is whether the proposed measure would cause more than a minor change to the project.

As noted in the *Endangered Species Consultation Handbook* (USFWS and NMFS 1998), "Section 7 requires minimization of the level of take. It is not appropriate to require mitigation for the impacts of incidental take." Compensatory mitigation is defined as the restoration, enhancement, creation, and preservation of wetlands, wetland buffer areas, and other natural habitats carried out to replace or compensate for the loss of wetlands or natural habitat areas resulting from federal-aid projects. It may also be provided by the project proponent as a good faith effort to offset impacts to listed species. Compensatory mitigation for the effects to wetlands, natural habitats, or listed species may be included as part of the project description, but are expressly provided pursuant to the authorities of the Federal Railroad Administration (FRA) or other federal or state resource and regulatory agencies, or biological professional practice. Compensation is not provided pursuant to the regulations of FESA. Compensatory mitigation usually occurs in advance of or concurrent with the impacts to be mitigated, but may occur after such impacts in special circumstances.

1.1.4 Informational Requirements to Initiate Formal Consultation

Although action agencies possess considerable discretion regarding the contents of the BAs used in part to initiate Section 7(a)(2) consultation, it is the legal responsibility of these action agencies to ensure through consultation with the Services that their actions meet the legal requirements of Section 7(a)(2) of the FESA. To initiate formal consultation, action agencies must provide the six types of information identified at 50 CFR § 402.14(c):

- A description of the action to be considered.
- A description of the specific area that may be affected by the action.
- A description of any listed species or critical habitat that may be affected by the action.
- A description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects.

- Relevant reports, including any environmental impact statement, environmental assessment, or biological assessment prepared.
- Any other relevant available information on the action, the affected listed species, or critical habitat.

The BA that follows is intended to satisfy all information requirements identified at 50 CFR § 402.14(c). Using this BA and other best scientific and commercial data available, the Services can develop their BO as to the likelihood that the action agency's proposed activities jeopardize the continued existence of a listed species or adversely affect its designated critical habitat under the standards defined at 50 CFR § 402.02.

1.2 Proposed Action

The proposed action is the construction and operation (including maintenance) of the Fresno to Bakersfield Section of a HST system that would run through much of the state of California. The need for this HST system is directly related to the expected growth in population and increases in intercity travel demand in California over the next 20 years and beyond. With growth in travel demand, the number of travel delays is expected to increase because of the growing congestion on California's highways and at its airports. This growing congestion is expected to cause the transportation system to become less reliable, which would have negative effects on the economy, quality of life, and air quality in and around California's metropolitan areas. The intercity highway system, commercial airports, and conventional passenger rail serving the intercity travel market are currently operating at or near capacity and will require large public investments for maintenance and expansion to meet existing demand and future growth.

The purpose of the proposed HST system is to provide a new mode of high-speed intercity travel that would link the major metropolitan areas of the state; interface with international airports, mass transit, and highways; and provide added capacity to meet increases in intercity travel demand in California in a manner sensitive to and protective of California's unique natural resources.

The HST is to be funded in part by revenues from sales of a state bond approved by California voters and by funds from the American Recovery and Reinvestment Act (ARRA) and other federal sources. As the lead federal agency, the Federal Railroad Administration (FRA) combined with the federal funding constitutes the federal nexus that requires *Interagency Cooperation* under Section 7 of the FESA.

1.2.1 Overview

In response to the USFWS' request on March 1, 2011, FRA designated the California High-Speed Rail Authority (Authority) as the non-federal representative for this Section 7 consultation, in addition to its current role in managing the construction, operation, and maintenance of the HST system. Together, the Authority and the FRA propose to construct, operate, and maintain an electric-powered steel-wheel-on-steel-rail HST system that will be over 800 miles long and capable of speeds in excess of 220 miles per hour (mph) on dedicated, fully grade-separated tracks, with state-of-the-art safety, signaling, and automated train control systems.

The Authority's statutory mandate is to plan, build, operate, and maintain a HST system that is coordinated with California's existing transportation network, particularly intercity rail and bus lines, commuter rail lines, urban rail transit lines, highways, and airports. The Authority and the FRA prepared a Program Environmental Impact Report / Environmental Impact Statement (EIR/EIS) that evaluated the ability of a HST system to meet the existing and future capacity demands on California's intercity transportation system (FRA and Authority 2005). That

environmental analysis found that a HST system would meet the need for a safe and reliable mode of travel that would link the major metropolitan areas of the state and deliver predictable, consistent travel times sustainable over time. Although highway and air transportation improvements would reduce travel times and congestion, these alternative modal improvements would have greater potential for significant environmental impacts than the HST system, would increase energy use and dependence on petroleum, and would increase suburban sprawl.

As a result of this analysis, the Authority and FRA chose to proceed with the HST system and are preparing project-specific EIR/EISs for the individual sections of the system. These individual sections of the system are separate from each other and can function on their own without further construction of an adjoining section. Each section is designed to have independent utility and logical termini and does not rely on other sections for operations to commence at a local level. Once construction is complete, these discrete individual sections will be components of the larger HST system. The Fresno to Bakersfield Section is one of these individual sections. Each individual section (Merced to Fresno, Fresno to Bakersfield, etc.) will have different levels of adverse effects to listed species and critical habitats. The BAs prepared for each individual section will focus on the adverse effects to listed species and designated critical habitats within their respective section of the HST system. This BA will focus on the adverse effects to listed species and designated critical habitats specific to the Fresno to Bakersfield Section.

1.2.2 Purpose and Need

The purpose of the proposed California HST system is to provide a new mode of high-speed intercity travel that would link major metropolitan areas of the state; interface with international airports, mass transit, and highways; and provide added capacity to meet increases in intercity travel demand in California in a manner sensitive to and protective of California's unique natural resources. The purposes of the HST system are best summarized in the project objectives and policies adopted by the High-Speed Rail Authority. These project objectives and policies are:

- Provide intercity travel capacity to supplement critically over-used interstate highways and commercial airports.
- Meet future intercity travel demand that will be unmet by present transportation systems and increase capacity for intercity mobility.
- Maximize intermodal transportation opportunities by locating stations to connect with local transit, airports, and highways.
- Improve the intercity travel experience for Californians by providing comfortable, safe, frequent, and reliable high-speed travel.
- Provide a sustainable reduction in travel time between major urban centers.
- Increase the efficiency of the intercity transportation system.
- Preserve environmental quality and protect California's sensitive environmental resources by reducing emissions and vehicle miles traveled for intercity trips.
- Maximize the use of existing transportation corridors and rights-of-way, to the extent feasible.
- Develop a practical and economically viable transportation system that can be implemented in phases by 2020 and that would generate revenues in excess of the costs of operation and maintenance.

The Authority has noted several important aspects of need for a HST system. The capacity of California's intercity transportation system is insufficient to meet existing and future demand; the current and projected future congestion of the system will continue to result in deteriorating air quality, reduced reliability, and increased travel times. The system has not kept pace with the tremendous increase in population and tourism in the state. The interstate highway system, commercial airports, and conventional passenger rail system serving the intercity travel market are currently operating at or near capacity and will require large public investments for maintenance and expansion to meet existing demand and future growth over the next 20 years and beyond. Moreover, the ability to expand many major highways and key airports is uncertain; some needed expansions may be impractical or may be constrained by physical, political, and other factors.

The need for improvements to intercity travel within California relates to the following issues:

- Future growth in demand for intercity travel.
- Capacity constraints that will result in increasing congestion and travel delays.
- The unreliability of travel resulting from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California.
- The increasing frequency of accidents on intercity highways and passenger rail lines in congested corridors of travel.
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state.
- Poor and deteriorating air quality and pressure on natural resources as a result of expanded highways and airports.

The plan to build and operate the HST system addresses these issues, and the Fresno to Bakersfield Section is intended to address the related specific needs of its local region. The San Joaquin Valley has experienced substantial urban growth over the past two decades. As a result, the regional transportation system, particularly State Route (SR) 99, has experienced a substantial increase in congestion. In the winter, driving and air service are further hampered by frequent periods of heavy fog. With the future population growth projected for the San Joaquin Valley, travel demand is expected to exceed the capacity of the existing transportation system. As noted in the Program EIR/EIS, the population of Tulare County, a fast-growing county adjacent to the project, is projected to increase by 80.8% from 2010 to 2030. Over this same period, the populations of Fresno, Kings, and Kern counties are projected to increase by 59.2%, 75.7%, and 81.5%, respectively.

The HST system would provide a new, rapid transportation link between the major cities of the San Joaquin Valley, helping to relieve congestion on the existing transportation system. The Fresno to Bakersfield Section of the HST system would have stations in the cities of Fresno and Bakersfield, the two major cities in the San Joaquin Valley, and possibly in the vicinity of Hanford. For example, the travel time on the HST system between Fresno and Bakersfield would be less than the current travel time between these two cities by automobile or Amtrak. The HST system would also improve intermodal connections between the San Joaquin Valley and major metropolitan areas by facilitating a fast, reliable connection to Fresno, which hosts the main commercial airport in the region.

In addition to providing a new high-speed link between the major cities of the San Joaquin Valley, the Fresno to Bakersfield Section would be critical to the planned phased development of

the entire HST system. The High-Speed Passenger Train Bond Act directs that the Initial Operating Segment of the system will be San Francisco to Los Angeles, with the potential to open regional segments before construction completion along this north-south backbone of the system. The Fresno to Bakersfield Section is a key to the successful completion of the Initial Operating Segment for the following reasons.

- Due to its topography, low density of urban development, and large spans of agricultural lands, this section offers the greatest opportunity to reach maximum authorized speeds, which would allow the train to make up time from other sections with restricted speeds.
- This section provides the best conditions for the necessary testing of high-speed train rolling stock and infrastructure before operation due to fewer constraints from existing development and flatter terrain.
- This section offers a central location along the Initial Operating Segment for the Heavy Maintenance Facility needed for a statewide HST system.
- This section has the least cost per mile for construction, so construction could begin earlier in the project bonding timeframe.

1.3 Consultation History

This section summarizes the history of formal and informal consultation with the USFWS that the Authority and/or the FRA have conducted to date on the planned construction and operation of the Fresno to Bakersfield Section of the HST project. As consultation proceeds, Table 1-1 will be updated periodically to record the steps in that process and the updated table will be resubmitted to the USFWS after formal consultation with the USFWS is initiated with this BA. The table lists the dates, agencies, purpose, and outcome of meetings and correspondence that have taken place. Any relevant information from the development of the EIR/EIS and any of a number of federal and state regulatory permitting processes will also be added to the updated table.

Table 1-1
Consultation History between FRA and/or the Authority and the Services for the Fresno to Bakersfield Section of the HST Project

Date	Communication	Agencies Involved	Purpose	Outcome(s)
9/25/2009	Meeting	CDFG, CVRWQCB, EPA, NMFS, USACE, USFWS	Introduction of the HST System and to elicit agency feedback regarding HST alignment alternatives in the Central Valley.	Request for consistency and approval of the proposed biological resources and wetlands survey methods to be used for surveys in the Central Valley.
11/05/2009	Meeting	CDFG, USACE, USFWS	Discussion of Central Valley Biological Resources and Wetland Survey Plan, drafted by the FRA and Authority in October 2009.	Revisions were made to the Central Valley Biological Resources and Wetland Survey Plan based on comments received from the agencies during the meeting.
9/2010 through 10/2010	Telephone conversations and e-mails	USFWS	Discussion and request for guidance on Kern mallow (*Eremalche parryi* ssp. *kernensis*). Specifically, USFWS's jurisdiction of the species is under review.	Awaiting guidance from USFWS. No response provided.
9/23/2010	Meeting	CDFG, CVRWQCB, USACE, USFWS	Develop a Comprehensive Mitigation Strategy for the CA High-Speed Train Central Valley Sections.	Received numerous comments and suggestions from agencies that will be considered in development of project mitigation strategy.
11/10/2010	Meeting	CDFG, USFWS	Discussion of the Draft BA, Project Description, Effects to Listed Species, Avoidance & Minimization Measures, Proposed Compensation, and Schedule to initiate consultation.	Received comments and suggestions from agencies that will be considered in the Section 7 Formal Consultation process.
11/19/2010 through 12/9/2010	Telephone conversations and e-mails	USFWS	Discussion on treatment of Kern mallow in BA and request for review of species presented at November 10 meeting.	Awaiting guidance from USFWS. No response provided.
3/1/2011	Meeting	FRA, USFWS	Discussion of the basics of Section 7 consultation; requirements, process, and timelines.	USFWS requested that FRA formally designate the Authority as the non-federal lead in conducting Section 7 consultations. USFWS commits to providing a Biological Opinion within a 135-day timeline.

Table 1-1
Consultation History between FRA and/or the Authority and the Services for the Fresno to Bakersfield Section of the HST Project

Date	Communication	Agencies Involved	Purpose	Outcome(s)
3/14/2011	Formal Letter	Authority, FRA, NMFS, USFWS	The FRA formally designated the California High-Speed Rail Authority as their non-federal representative under Section 7 of the Endangered Species Act.	The Authority can communicate with USFWS and NMFS regarding the Section 7 consultation for the High-Speed Train project.
4/21/2011	Formal Letter	Authority, USFWS	Request for review of the species and critical habitats that are proposed to be discussed and included in the Biological Assessment pursuant to 50 CFR § 402.12(c).	On July 15, 2011, USFWS responded via email that the Sacramento Office website generates a species list but the USFWS does not concur with that list until the review of the Biological Assessment and evaluation of the rationale for the species that are not included in the Biological Assessment.
6/14/2011	Meeting	Authority, FRA, USFWS, NMFS, CDFG	Agency Coordination Meeting conducted with USFWS/NMFS/CDFG to discuss the proposed project and the contents of the Draft EIR/EIS.	Presentation of the methodology, affected environment, and mitigation measures that are proposed in the project-specific EIR/EIS.
6/24/2011	Formal Letter	Authority, NMFS	No Effect Determination letter written to NMFS for the Central Valley Distinct Population Segment steelhead.	The Authority, the designated non-federal representative, will continue to coordinate the consultation process under Section 7 of the FESA for species regulated by NMFS.
7/29/2011	Official Letter	Authority, FRA, USFWS	On behalf of the FRA and Authority, URS/HMM/Arup Joint Venture obtained an official species list from the USFWS Sacramento District web portal (Document Number 110729061228) for the proposed federal action.	The species list was used to evaluate the potential for each federally listed plant and wildlife species to occur in the vicinity of the project area.
11/22/2011	Meeting	Authority, FRA, CDFG, EPA, NMFS, USACE	Introduction of the Conceptual Mitigation Plan / Mitigation Strategy Implementation Plan proposal and agency feedback regarding mitigation options in the Central Valley.	Presentation of the federally listed species, their habitats, and the methods and mitigation measures that are proposed in the project compensatory mitigation plan. Received initial approval for landscape approach to mitigation site selection.

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Table 1-1
Consultation History between FRA and/or the Authority and the Services for the Fresno to Bakersfield Section of the HST Project

Date	Communication	Agencies Involved	Purpose	Outcome(s)
12/2/2011	Meeting	Authority, FRA, USFWS	Introduction of Conceptual Mitigation Plan / Mitigation Strategy Implementation Plan proposal and update.	Presentation of the federally listed species, their habitats, and the methods and mitigation measures that are proposed in the project compensatory mitigation plan.
3/2/2012	Meeting	Authority, USFWS, CDFG	Discussion of information needs for the issuance of the USFWS Biological Opinion and the CDFG ITP for the HST sections.	The Authority will provide USFWS and CDFG the information necessary to conclude the consultation process on the individual HST sections.

Authority: California High-Speed Rail Authority
CDFG: California Department of Fish and Game
CVRWQCB: Central Valley Regional Water Quality Control Board
EPA: Environmental Protection Agency
FRA: Federal Railroad Authority
NMFS: National Marine Fisheries Service
USACE: U.S. Army Corps of Engineers
USFWS: U.S. Fish and Wildlife Service

Chapter 2
Project Description

2.0 Project Description

The proposed action is to construct, operate, and maintain a rail line to support an intercity high-speed train from Fresno to Bakersfield (the project). The Fresno to Bakersfield Section of the HST system is one of nine sections that were identified in the HST program EIR/EIS (Authority and FRA 2005). In this document, the State of California proposed to build a HST system to connect the major population centers of the San Francisco Bay Area with the Los Angeles metropolitan region (Figure 2-1). The HST system is envisioned as a state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology with state-of-the-art safety, signaling, and automated train-control systems. The trains would be capable of operating at speeds of up to 220 mph over a fully grade-separated, dedicated track alignment.

This project description details the project alternatives (Section 2.1); the project elements (Section 2.2), including the trainsets, rail line, stations, electrical systems, and the operation and maintenance systems; the location of the project elements (Section 2.3); the construction methods (Section 2.4); the construction schedule (phasing and timeline) (Section 2.5); the operation and maintenance activities (Section 2.6); and the proposed conservation measures to be incorporated into the project design (Section 2.7). As with all projects of this magnitude and complexity, changes to the design are anticipated to occur throughout the development of the project.

2.1 Project Description Alternatives

The Fresno to Bakersfield Project EIR/EIS identifies alternatives in order to avoid potential impacts to societal, economic or natural resources, and evaluates a No Project Alternative (as required by the California Environmental Quality Act [CEQA] and the National Environmental Policy Act [NEPA]). The Project EIR/EIS examines several alternatives for rail alignments, stations, and associated facilities such as electrical and maintenance stations, and road and wildlife crossings. These alternatives were derived from the preferred alternative identified by the statewide program EIR/EIS (approved August 4, 2005, Record of Decision issued November 18, 2005; described in Section 1.2.1), prepared by the Authority and FRA. A preferred alternative for the Project EIR/EIS has not been identified.

Since a preferred alignment has not yet been identified for the Fresno to Bakersfield Section, the project description provided in this BA contains the multiple project alternatives currently under consideration in the Project EIR/EIS. To describe and evaluate the alternative alignments, stations, and facilities, this document presents impacts to potential habitat as a range from minimum to maximum values.

Regardless of the preferred alignment ultimately selected, the project alternatives are geographically similar and effects to listed species would generally result in disturbances of the same nature and a similar magnitude. The primary differences between alternatives will be the location and quantity of habitat disturbed, which varies by species. Additional information, including identification of the preferred alternative, may be available prior to the completion of formal consultation but is not available at this time. The Effects Analysis (Chapter 5) presents the range of effects to federally listed species which may occur based on the various alternatives discussed in this section.

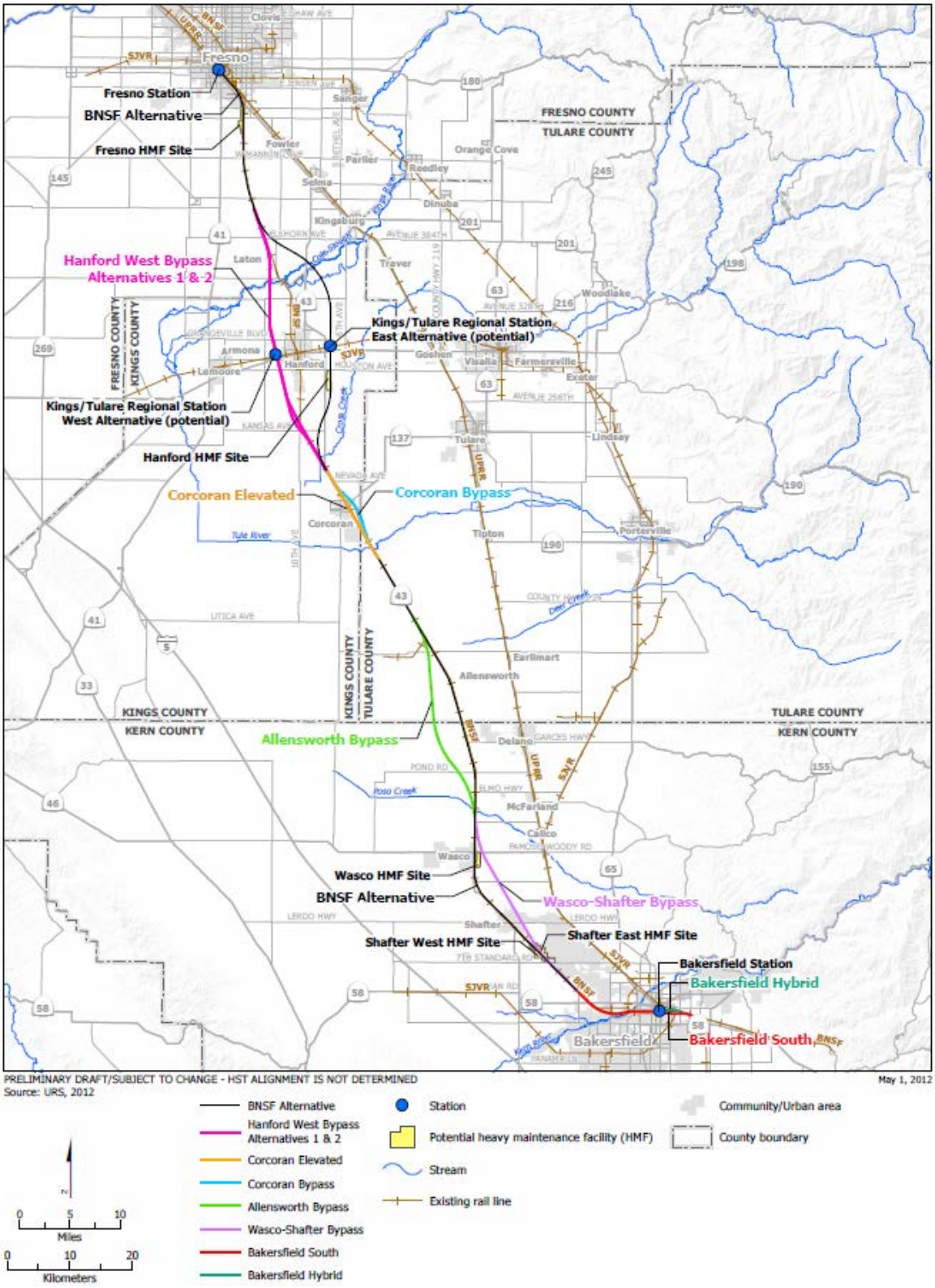

Figure 2-1
Fresno to Bakersfield project area

2.2 Project Elements

Section 2.2 discusses the physical elements of the project. These include the trainsets that may be used, at-grade track and elevated track, road crossings, stations (the Fresno Station, the potential Kings/Tulare Regional Station, and the Bakersfield Station), the electrical system and associated facilities (including substations, switching stations, and paralleling stations) that would power the train, and control and maintenance facilities (the heavy maintenance facility, the maintenance-of-way facility, and the access control systems).

2.2.1 Trainsets

The HST system would be designed for the operation of a typical train 9 to 11 feet wide, consisting of two trainsets, each approximately 660 feet long and consisting of eight cars. A train of two trainsets would seat up to 1,000 passengers and be approximately 1,320 feet long with 16 cars. The HST system is designed for a maximum operating speed of 220 mph.

2.2.2 Rail Line

The project would consist of a fully dedicated rail line, constructed from continuous welded steel rail. The rail line would be a double-track formation with one track in each direction, except at regional train stations where at least four tracks would be constructed to allow express trains to bypass local trains. Depending on the terrain and physical constraints, the HST alternatives would use four different track profiles. These track types have varying profiles: near-the-ground tracks are at-grade, higher tracks are placed on retained earth or elevated on bridge structures, and below-grade tracks are in a retained cut. The types of bridges that might be built include full channel spans, large box culverts, or, for some larger river crossings, piers within the ordinary high-water channel. The various track profiles are described below.

Drainage for elevated structures would be collected away from the tracks and cable ducts through box girders, and directed to discharge locations at the support columns (piers). Drainage would be designed to convey flow from the guideway to the adjacent drainage facilities (Authority and FRA 2009a). For both at-grade and above-grade structures, diversion ditches or drains would be situated behind retaining walls to divert runoff from adjacent properties toward stabilized drainage outfall structures. Alternatively, under-drains would be employed for drainage to avoid the use of ditches, as appropriate.

The project includes approximately 117 miles of dual track, of which between 79 to 91 miles of track would be at grade and 23 to 33 miles would be elevated. Depending on the final alignment, up to 3 miles may be below-grade. The total footprint for the HST stations and auxiliary elements would be approximately 4,700 acres, of which approximately 160 acres would be associated with elevated track.

2.2.2.1 At-Grade Profile

Where the rail line would be at-grade, the rail would be fixed by means of specially developed high-strength clips to pre-stressed concrete cross ties that would be embedded in either crushed rock ballast (Figure 2-2) or a continuous concrete slab. At-grade portions of the track bed would be built on compacted dirt embankments. The top of the rail would be constructed at a minimum of 4.5 feet above the 100-year floodplain or higher when transitioning to an elevated structure. The height of the at-grade profile may vary to accommodate slight changes in topography, provide clearance for storm water culverts and structures in order to allow water flow, and potential wildlife movement. A drainage system may be designed to include a 3-foot-wide drainage swale located on either side of the rail line, intercepted at regular intervals by culverts and open-structures to carry runoff to existing natural drainage or appropriate municipal drainage

systems. Drainage may also include paired 30-inch-wide culverts under the embankment, spaced as frequently as necessary to prevent ponding and allow drainage. Ducts would be laid alongside the HST tracks to carry low voltage power cables to power the trackside signaling and communications apparatus and fiber-optic cables that would enable continuous communications with the HST train on-board computers and train controls. The duct covers would also serve as safety walkways for detraining passengers in the event of an emergency train stop. An 8-foot-high security fence would be on the outer edge of the HST right-of-way. The overall width of the right-of-way would be approximately 120 feet where it would be at-grade.

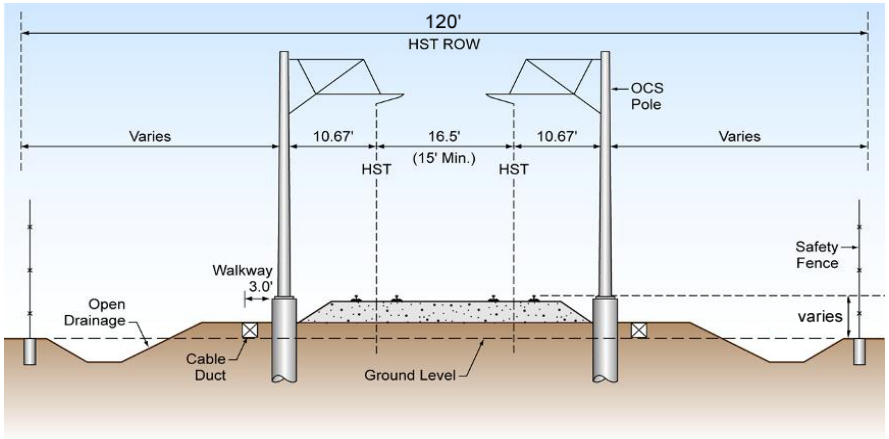

Figure 2-2
At-grade typical cross section

2.2.2.2 Retained-Fill Profile

Retained-fill profiles (Figure 2-3) are used when it is necessary to narrow the right-of-way within a constrained corridor to minimize property acquisition or to transition between an at-grade profile and an elevated profile. The guideway would be raised off the existing ground on a retained fill platform made of reinforced walls, much like a freeway ramp. Short retaining walls would have a similar effect and would protect the adjacent properties from a slope extending beyond the rail guideway.

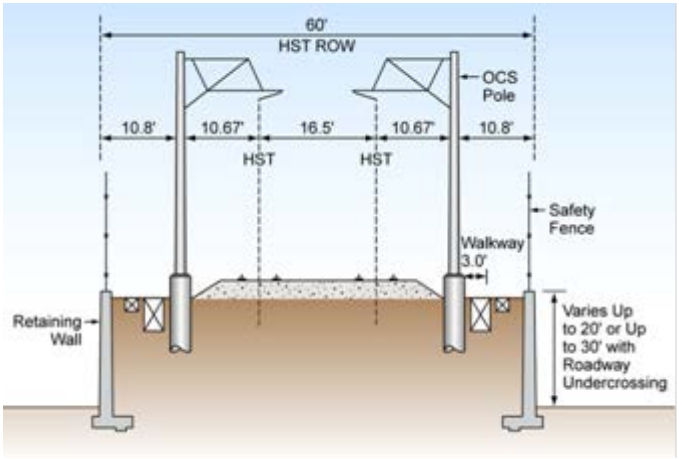

Figure 2-3
Retained-fill typical cross section

2.2.2.3 Retained-Cut Profile

Retained-cut profiles (Figure 2-4) are used when the rail alignment crosses under existing rail tracks, roads, or highways that are at-grade. This profile type is used only for short distances in highly urbanized and constrained situations. In some cases, it is less disruptive to the existing traffic network to depress the rail profile under these crossing roadways. Retaining walls would typically be needed to protect the adjacent properties from a cut slope extending beyond the rail guideway. Retained cut profiles are also used for roads or highways when it is more desirable to depress the roadway underneath an at-grade HST alignment.

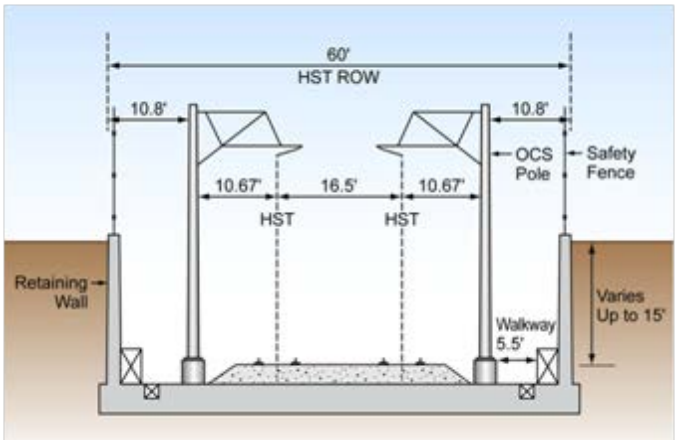

Figure 2-4
Retained-cut typical cross section

2.2.2.4 Elevated Profile

Elevated profiles (Figure 2-5) can be used in urban areas where extensive road networks must be maintained. An elevated profile must have a minimum clearance of approximately 16.5 feet over roadways and approximately 24 feet over railroads. Typical pier supports are approximately 10 feet in diameter at the ground. Such structures could also be used to cross water bodies; even though the trackway might be at-grade on either side, the width of the water channel could require a bridge at the same level, which would be built in the same way as the elevated profile.

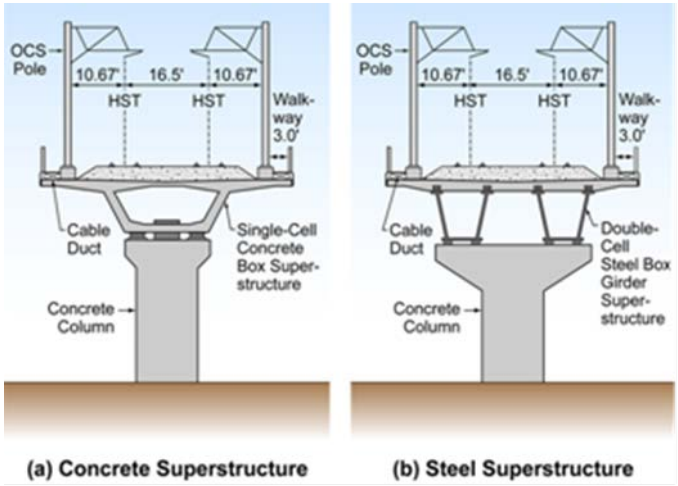

Figure 2-5
Elevated structure typical cross sections

Straddle Bents

When the HST elevated profile crosses over a roadway or railway on a very sharp skew (degree of difference from the perpendicular), a straddle bent ensures that the piers are outside of the functional/operational limit of the roadway or railway (Figure 2-6).

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

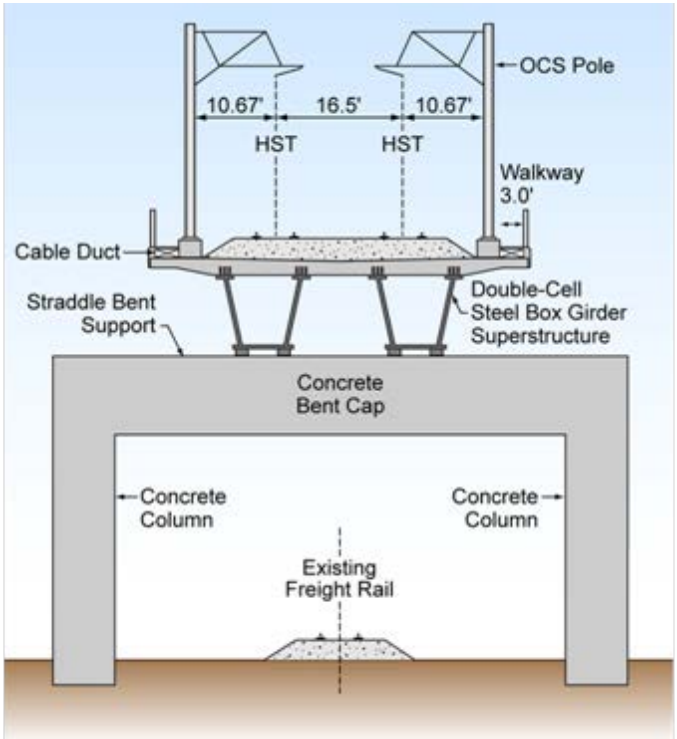

Figure 2-6
Straddle bent typical cross section

2.2.2.5 Road Crossings

To maintain local traffic and agricultural access while maintaining grade separation with the HST tracks, the project would include approximately 172 to 197 road crossings (Table 2-1). Most road crossings would be overpasses and each crossing structure would have an average footprint of 24.5 acres. Bridges may be constructed using Precast Prestressed California Wide Flange Girders with a minimum clearance of 27 feet between the HST top of rail and the structure. The slopes under the bridge up to the abutments would be 1.5:1, and the embankment slope everywhere else would be 4:1.

Table 2-1
Design Features: Maximum and Minimum

Design Feature	Minimum	Maximum
Total Length (linear miles)	114	117
At-grade profile (linear miles)	79	91
Number of major water crossings	6	7
Number of road crossings	172	197
Number of roadway overcrossings and undercrossings	48	54

- **Roadway overcrossings.** Many roadway and state route facilities currently cross with or over the BNSF Railway (BNSF) railroad tracks at-grade. Figure 2-7 illustrates how a roadway would be grade-separated over both the HST and the railroad in these situations. Similar conditions occur when an at-grade HST alignment crosses rural roads adjacent to farmland. Figure 2-8 is an example of a typical roadway overcrossing of the HST tracks; these overcrossings would generally occur approximately every 2 miles to provide continued mobility for local residents and farm operations. Overcrossings would have two lanes, each with a width of 12 feet. The shoulders would be 4 to 8 feet wide, depending on average daily traffic volumes. The paved surface for vehicles would therefore range from 32 to 40 feet wide. Minimum clearance would be 27 feet over the HST. Specifications are based on county road standards.

- **Elevated HST road crossings.** In urban areas, it may be more feasible to raise the HST, as shown on Figures 2-5 and 2-6. This type of crossing is especially relevant in downtown urban areas, where use of an elevated HST guideway would minimize impacts on the existing roadway system.

- **Roadway undercrossings**. HST alternatives may require roadway undercrossings that allow the HST to travel over roadways. Figure 2-9 illustrates how a roadway would be grade-separated below the HST guideway.

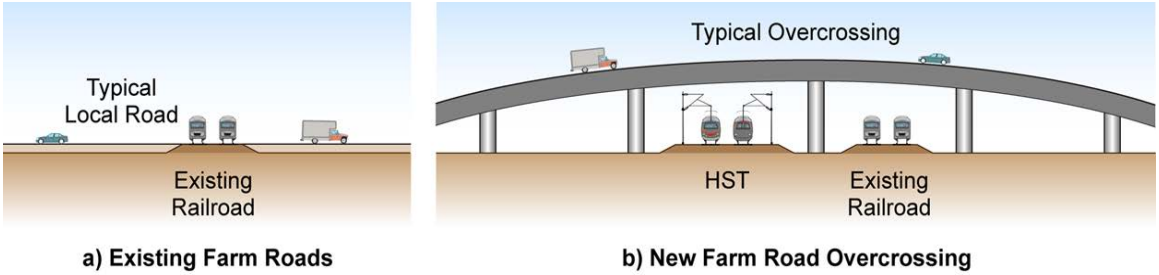

Figure 2-7
Replacing local at-grade crossings with new overcrossings above HST guideway and existing railroad trackway

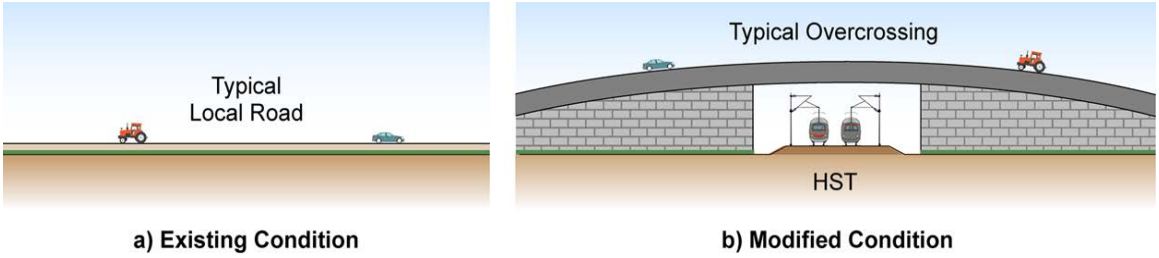

Figure 2-8
Adding local roadway overcrossings above HST guideway

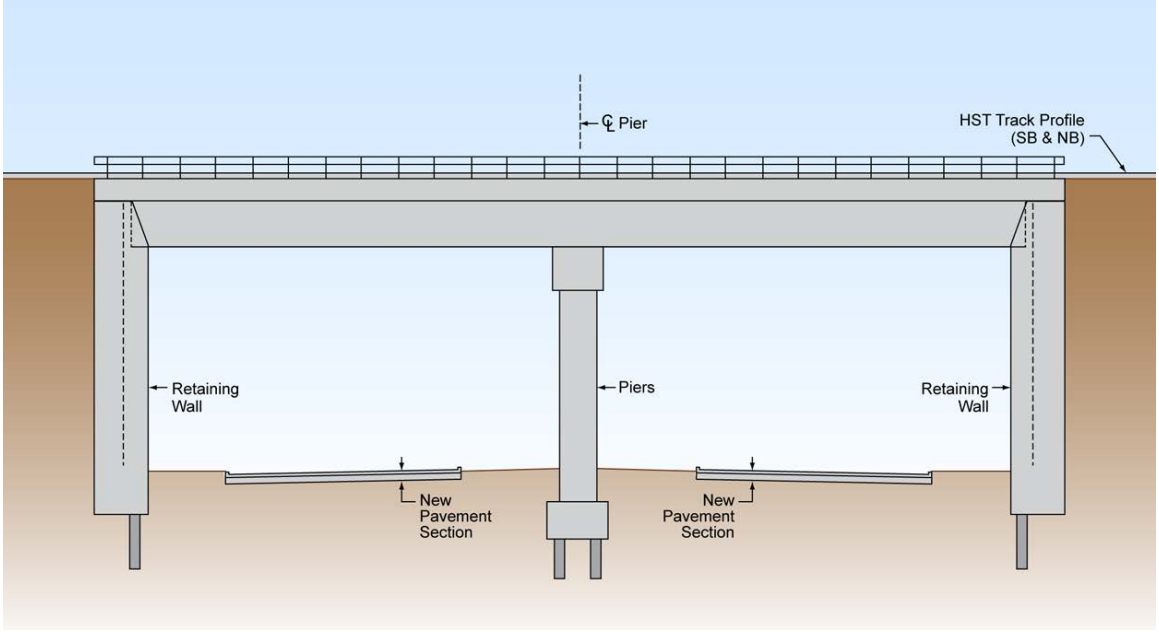

Figure 2-9
Typical cross section of roadway grade-separated beneath HST guideway

2.2.2.6 Wildlife Crossings

To maintain permeability and connectivity across the HST system, wildlife crossing opportunities will be provided through a variety of engineered structures. In addition to the dedicated wildlife crossing structures discussed below, wildlife crossing opportunities will also be available at elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage facilities (i.e. large diameter culverts (60 – 120 inches in diameter) and paired 30-inch-diameter culverts).

All sections of elevated tracks (aerial structures), as well as bridges, throughout the project will maintain habitat connectivity and wildlife crossing opportunities for federally listed species. Where the HST would be constructed on aerial structures, the elevated sections of the track will permit unobstructed wildlife passage. Where the HST is elevated on a bridge over riparian corridors, the riparian corridor will continue to provide wildlife movement opportunities under the bridge.

To facilitate the movement of state-listed and other wildlife species across the HST system, the highest density of dedicated wildlife crossing structures will be designed for the segment of the alignment between Cross Creek in Kings County and Poso Creek in Kern County. The dedicated wildlife crossing structures in this segment would be provided in at-grade portions of the railroad embankment at approximately 0.3-mile intervals. Where bridges, aerial structures, and road crossings coincide with proposed dedicated wildlife crossing structures, these features would serve the function of, and supersede the need for, dedicated wildlife crossing structures. This segment passes adjacent to the Allensworth Ecological Reserve (ER) and the Pixley National Wildlife Refuge (NWR), which contain important habitat for a number of state-listed species, including the San Joaquin kit fox. Dedicated wildlife crossing structures would also be placed to the north and south of each of the following river/creek crossings: Cole Slough, Dutch John Cut, Kings River, Cross Creek, Tule Creek, Deer Creek, Poso Creek, and Kern River. These wildlife crossing structures would be located between 100 and 500 feet from the edges of each riparian corridor.

The preliminary wildlife crossing structure design consists of modified culverts in the embankment that would support the HST tracks (Figures 2-10a and 2-10b). From end to end, the typical culvert would be 73 feet long (crossing structure length), would span a width of approximately 10 feet (crossing structure width), and provide 3 feet of vertical clearance (crossing structure height). These dimentions would yield a calculated openness factor (Bremner-Harrison et al. 2007) of 0.41.[1] To accommodate variations in the topography, the height of the at-grade profile may require that wildlife crossing structures be depressed no more than 1.5 feet (half the vertical clearance) below-grade. At locations that require the HST track to be constructed adjacent to the existing BNSF tracks, the design of the wildlife crossing structures may change, depending on site-specific conditions and engineering considerations.

At locations where storm water swales parallel the embankment, or localized flooding may occur, the approach to wildlife crossing structures would be designed in such a way as to prevent water from ponding within the structure. This would be accomplished by terminating the swales on either side of the wildlife crossing structure and engineering a high point distal to the entrance of the structure to create a micro-watershed that would limit the rainwater catchment area to a small, isolated, and discrete depression between the highpoint and the entrance to the structure.

To allow wildlife free passage through the crossing structures, the security fence along the HST right-of-way would be diverted toward the toe of the slope, up the embankment, and around the entrance of the structure. At locations that require the HST track to be constructed immediately

[1] Openness factor = (Height x Width) / Distance (i.e., [3 feet x 10 feet] / 73 feet = 0.41).

adjacent to the existing BNSF tracks, the design of the wildlife crossing structures may change depending on site-specific conditions and engineering considerations.

Additional wildlife crossing structure designs could include circular or elliptical pipe culverts, and larger (longer) culverts with crossing structure distances of up to 100 feet. However, any changes to the design of wildlife crossing structures must meet the following constraints: the design must have a minimum of 3 feet of vertical clearance (crossing structure height), depressed no more than 1.5 feet below grade (half of the vertical clearance), and must meet or exceed the minimum 0.41 openness factor.

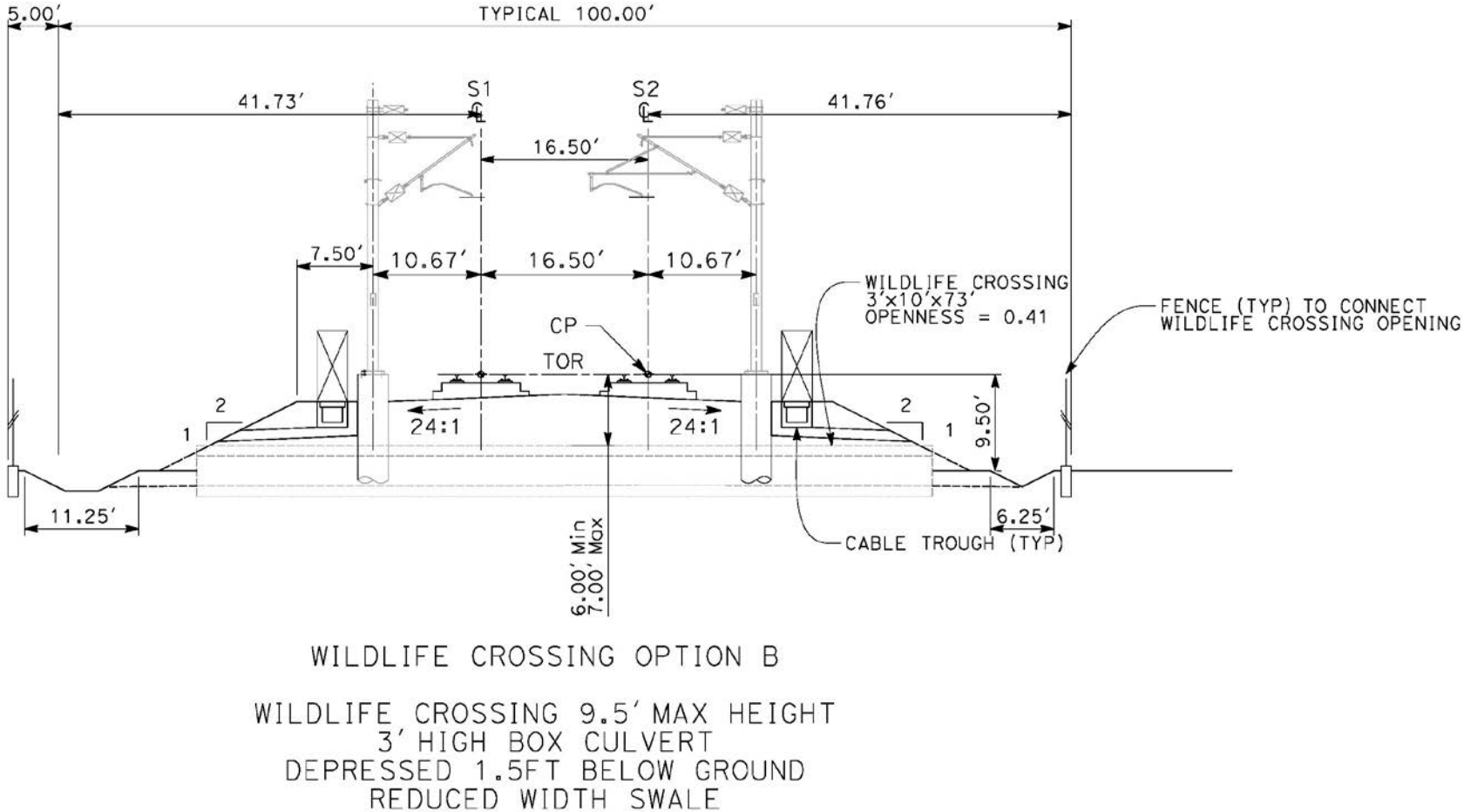

Figure 2-10a
Typical wildlife crossing structure, cross section view

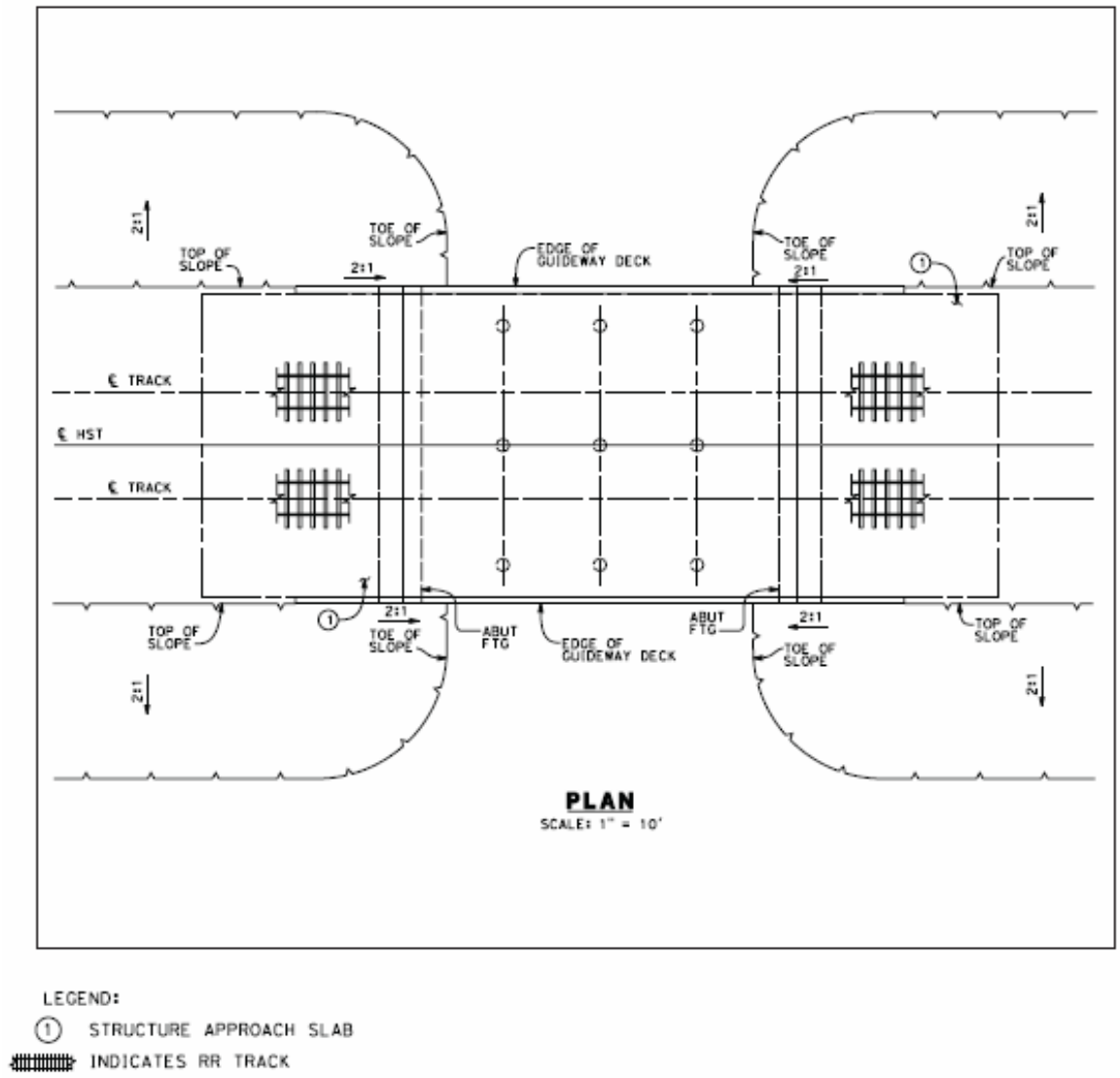

Figure 2-10b
Typical wildlife crossing structure, plan view

2.2.3 Stations

Stations would be sited and designed to allow for connection to local transit, airports, and highways; to maximize the use of existing transportation corridors and rights-of-way; and to develop a practical and economically viable transportation system. All stations would contain the following elements:

- Station buildings of 40,000 to 100,000 square feet that are two to three stories high and contain passenger boarding platforms, ticketing, waiting areas, passenger amenities, employee areas, and baggage and freight handling areas.
- Parking facilities (parking structures and surface parking lots) of 1.5 to 9 acres in Fresno and Bakersfield and 3.5 to 17.25 acres at the potential Kings/Tulare Regional Station.

- Waiting areas and queuing space for taxis and shuttle buses.
- Pedestrian connections.

This project would involve construction of up to three train stations, one in each of the cities of Fresno and Bakersfield, and a potential third station, the Kings/Tulare Regional Station, which would be situated either east or west of Hanford. Two potential locations are being considered for the Fresno Station and the potential Kings/Tulare Regional Station, and three potential locations are being considered for the Bakersfield Station. The location of the stations in Fresno, Bakersfield Bakersfield and the KingsTulare Regional Station are dependent upon a number of considerations, including which of the potential alignment alternatives is constructed. The details of the station alternatives are listed in Table 2-2 and discussed below.

Table 2-2
Details of the Station Alternatives

Station Alternative	Location	Facility Size (acres)
Fresno Station		
Fresno Station–Mariposa Alternative	Downtown Fresno, centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west	20.5
Fresno Station–Kern Alternative	Downtown Fresno, centered on Kern Street between Tulare Street and Inyo Street	18.5
Potential Kings/Tulare Regional Station		
Kings/Tulare Regional Station–East Alternative (potential)	East of SR 43 and 8th Avenue and north of the Cross Valley Rail Line	25
Kings/Tulare Regional Station–West Alternative (potential) (at-grade and below-grade options)	East of 13th Avenue and north of the San Joaquin Valley Railroad on the BNSF Alternative	48
Bakersfield Station		
Bakersfield Station–North Alternative	Corner of Truxtun and Union Avenue / SR 204	19
Bakersfield Station–South Alternative	Along Union and California avenues, just south of the Bakersfield Station–North Alternative and the BNSF right-of-way	20
Bakersfield Station–Hybrid Alternative	Corner of Truxtun and Union Avenue/SR 204, in the same location as the Bakersfield Station–North and Bakersfield Station–South alternatives.	24
SR = State Route		

2.2.3.1 Fresno Station alternatives

Two locations are under consideration for the Fresno Station: the Fresno Station-Mariposa Alternative and the Fresno Station-Kern Alternative.

The Fresno Station–Mariposa Alternative is located in Downtown Fresno, less than 0.5 mile east of SR 99 on the BNSF Alternative. The station would be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station and associated facilities would occupy approximately 20.5 acres, including 13 acres dedicated to the station, short term parking, and kiss-and-ride accommodations. Two of the three potential parking structures would each sit on 2 acres, and have a capacity of approximately 1,500 cars. The third parking structure would be slightly smaller in footprint (1.5 acres) with a capacity of approximately 1,100 cars. An additional 2 acre surface parking lot would provide approximately 300 parking spaces.

The Fresno Station–Kern Alternative is similarly situated in Downtown Fresno and would be on the BNSF Alternative, centered on Kern Street between Tulare Street and Inyo Street). The approximately 18.5 acre site would include 13 acres dedicated to the station, bus transit center, short term parking, and kiss-and-ride accommodations. Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third structure would be slightly smaller in footprint (1.5 acres) and have a capacity of approximately 1,100 cars.

2.2.3.2 Potential Kings/Tulare Regional Station alternatives

Two alternative sites are under consideration for the potential Kings/Tulare Regional Station: the Kings/Tulare Regional Station–East Alternative (potential) and the Kings/Tulare Regional Station–West Alternative (potential).

The Kings/Tulare Regional Station–East Alternative (potential) is located east of SR 43 (Avenue 8) and north of the San Joaquin Valley Railroad on the BNSF Alternative. The station building would be approximately 40,000 square feet with a maximum height of approximately 75 feet. The entire site would be approximately 27 acres, including 8 acres designated for the station, bus bays, short-term parking, and kiss-and-ride accommodations. An additional approximately 17.25 acres would support a surface parking lot with approximately 2,280 spaces.

The Kings/Tulare Regional Station–West Alternative (potential) is located east of 13th Avenue and north of the San Joaquin Valley Railroad on the Hanford West Bypass 1 and 2 alternatives. The station would be at-grade or below-grade, depending on which of the Hanford West Bypass alternatives is chosen.

The at-grade Kings/Tulare Regional Station–West Alternative (potential) would include a station building of approximately 100,000 square feet with a maximum height of approximately 36 feet. The entire site would be approximately 48 acres. Proposed facilities would include the station, bus bays, short-term parking, and kiss-and-ride accommodations; as well as, surface parking for approximately 2,800 spaces.

The below-grade Kings/Tulare Regional Station–West Alternative (potential) would include a station building of approximately the same size and height as the at-grade option. The below-grade station site would also include the same components as the at-grade station option in the same locations. However, the station platform would be located below grade instead of at ground level. Approximately 4 acres would support a surface parking lot with approximately 600 spaces, and another approximately 4 acres would support two parking structures with a combined parking capacity of 2,200 spaces.

2.2.3.3 Bakersfield Station alternatives

Three locations are under consideration for the Bakersfield Station: the Bakersfield Station–North Alternative, the Bakersfield Station–South Alternative and the Bakersfield Station–Hybrid Alternative.

The Bakersfield Station–North Alternative would be in downtown Bakersfield, at the corner of Truxtun Avenue and Union Avenue/SR 204, east of the existing Amtrak station. Surrounding land uses consist of offices, commercial, retail, industrial, and government offices. The entire site would consist of a 19-acre site, with 11.5 acres designated for the station, bus transit center, short-term parking, and kiss-and ride accommodations. The remaining 7.5 acres would be designated for two multistory parking structures, one with a planned capacity of approximately 1,500 cars, and the other with a capacity of approximately 3,000 cars.

The Bakersfield Station–South Alternative would be situated in the same general area as the Bakersfield Station–North Alternative but just south of the BNSF right-of-way. The entire site would consist of 20 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride accommodations. The remaining 5 acres would be designated for a six-level parking structure.

The Bakersfield Station–Hybrid Alternative is located in the same area as the Bakersfield Station–North and South alternatives, at the corner of Truxtun Avenue and Union Avenue/SR 204 on the Bakersfield Hybrid Alternative. The entire site would consist of approximately 24 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride accommodations; approximately 4.5 acres designated for three parking structures with a total capacity of approximately 4,500 cars (each parking structure would be seven levels; one would have a planned capacity of 1,750 cars, the second a capacity of 1,315 cars, and the third a capacity of 1,435 cars); and approximately 4.5 acres designated for an additional 480 parking spaces in surface lots.

2.2.4 Electrical SystemTraction Power Distribution

The components of electrification and power for HST are: 1) the overhead catenary system (OCS), which is the wiring system above the track that electrifies the train; 2) the traction power substations, which is the power supply system that provides power to the OCS; and 3) the electrical support facilities.

Table 2-3 summarizes the number, location, and size of the electrical electrical system component used to transmit power to the trains on the alignment.

Table 2-3
Details of Electrical System Facilities

Facility Name	Number Planned	Location	Size of Each type of Facility (acres)
Overhead catenary system poles	As needed	OCS poles spaced every 200 feet along straight portions of the track down to every 70 feet in tight-turn track areas.	N/A
Traction Power Substations	5	Spaced 30 miles apart	0.73
Switching stations	5	Every 15 miles, midway between the TPSSs	0.22
Paralleling stations	17	Every 5 miles between the supply and switching station sites	0.18

2.2.4.1 Overhead catenary System

Trains would receive power from an electrical system supplied through the OCS. The OCS would consist of a series of mast poles approximately 23.5 feet higher than the top of rail, with contact wires suspended from the mast poles between 17 to 19 feet from top of rail. The train would have an arm, called a pantograph, to maintain contact with this wire to provide power to the train. The mast poles would be spaced approximately every 200 feet along straight portions of the track and would be spaced as close as every 70 feet in tight-turn track areas. The catenary system would be connected to the traction power station substations, which would be placed at approximately 30 mile intervals. Statewide, the power supply would consist of a 2-kilovolt (kV) by 25-kV OCS for all electrified portions of the statewide system. Figure 2-11 illustrates the typical OCS cross section for aerial guideway.

2.2.4.2 Traction Power substations

The project would not include the construction of a separate power source, though the project would include the extension of power lines to a series of power substations positioned along the HST corridor. These power substations are needed to even out the power feed to the train system.

The estimated power needs of the HST system would be that each traction power substations (TPSSs) would each need to be approximately 200 feet by 160 feet (0.73 acre) and be sited approximately every 30 miles along the route.

The TPSS would have to accommodate the power supply stations and would typically have a buffer area around them for safety purposes. For the Fresno to Bakersfield Section, electrical substations would be constructed at locations where high-voltage power lines cross the HST alignment.

The TPSS could be screened from view with a wall or a fence. Each TPSS site would have a 20 foot-wide access road (or easement) from the street access point to the protective fence perimeter at each parcel location. Each site would require one 2-acre parcel. Each substation would include an approximately 450 square-foot control room (each alternative design includes these facilities, as appropriate).

Pacific Gas and Electric Company (PG&E) would supply power to the TPSSs by 115-kV or larger power lines via three supply stations (or substations) and overhead transmission lines. The substations would each consist of a control room, two autotransformers, switchgear, transformers, and related equipment. Figure 2-12 illustrates a conceptual layout of a substation.

PG&E has indicated that existing lines may need to be reconstructed to serve the project. This reconstruction could consist of reconductoring the transmission lines or new power poles may need to be installed. When electrification of the system is required, PG&E would design and implement changes to its transmission lines. This design and implementation would include the environmental review of the reconstruction of the transmission lines.

2.2.4.3 Electrical Support Facilities

Four electrical support facility types are described below: switching stations, paralleling stations, backup and emergency power supply sources, and signaling and train control elements.

<u>Switching Stations</u>

Switching stations allow adjacent power sections to be electrically connected to one another in the event of a power outage or certain operational conditions. Three switching stations would be

placed midway between, and approximately 15 miles from, the TPSSs. Each of the switching stations would be aboveground and would cover a 120 x 80 foot (0.22 acre) fenced area. Figure 2-13 illustrates a conceptual layout of a switching station.

Paralleling Stations

Paralleling stations would provide voltage stabilization and equalize current flow and would be required at approximately 5-mile intervals between the switching stations and the TPSSs. The paralleling stations would need to be approximately 100 feet by 80 feet (0.18 acre). Each station would include an approximately 450 square-foot (18 feet by 25 feet) control room. Figure 2-14 illustrates a conceptual layout of a paralleling station.

Backup and Emergency Power Supply Sources

During normal system operations, power will be provided by the local utility service and/or from the TPSS. Should the flow of power be interrupted, the system will automatically switch to a back-up power source, either through use of an emergency standby generator, an uninterruptable power supply, and/or a DC battery system.

For the Fresno to Bakersfield Section, permanent emergency standby generators are anticipated to be installed at the passenger stations and at the HMF and terminal layup/storage and maintenance facilities. These standby generators are required to be tested (typically once a month for a short duration) in accordance with National Fire Protection Association (NFPA) Standard 110/111 to ensure their readiness for back-up and emergency use. If needed, portable generators could also be transported to other trackside facilities to reduce the impact to system operations.

Signaling and Train Control Elements

Signaling and train control elements would include signal huts/bungalows within the right-of-way that house signal relay components and microprocessor components, cabling to the field hardware and track, signals, and switch machines on the track. These elements would be installed in the vicinity of track switches, and would be grouped with other power, maintenance, station, and similar HST facilities, where possible.

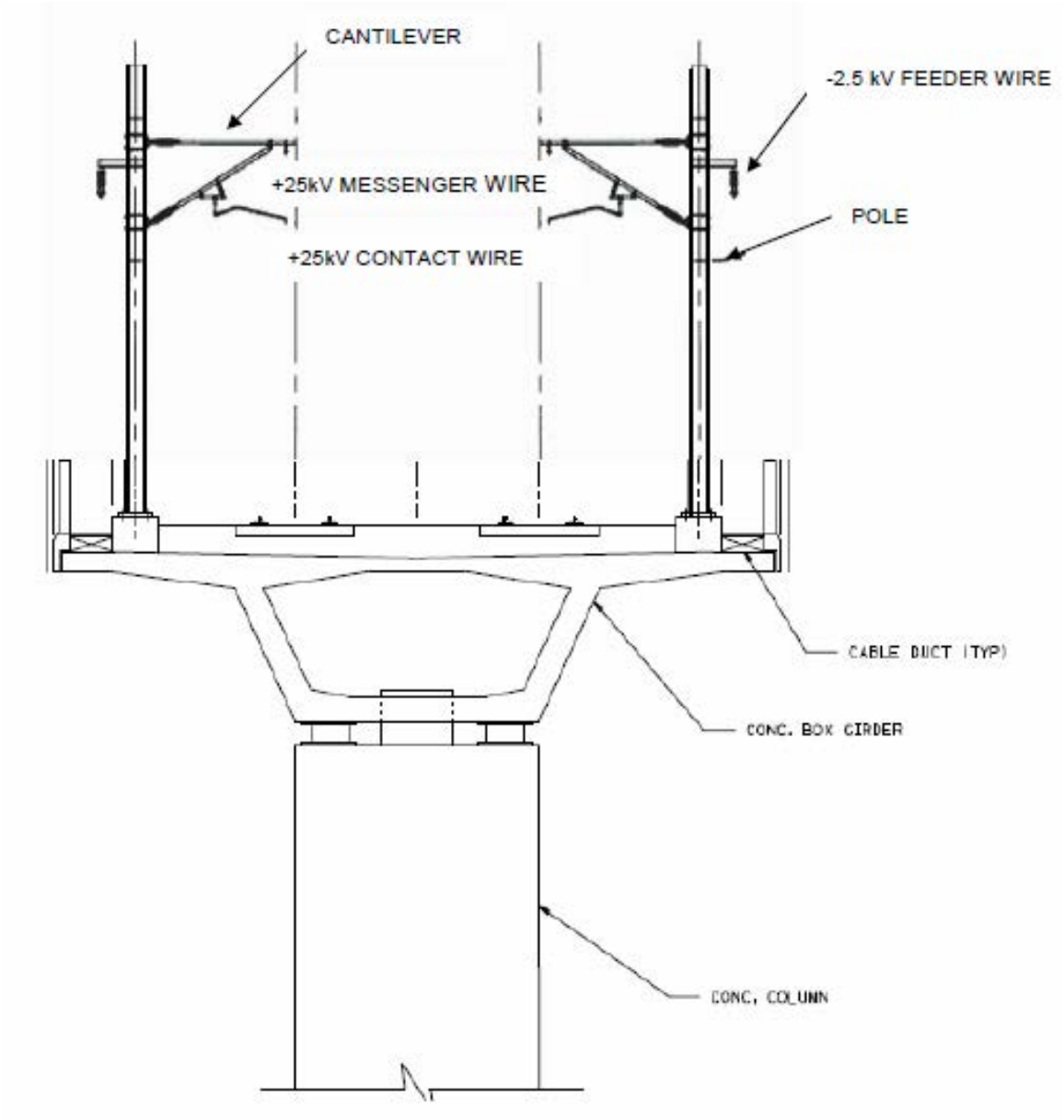

Figure 2-11
Typical overhead contact system cross section for aerial guideway

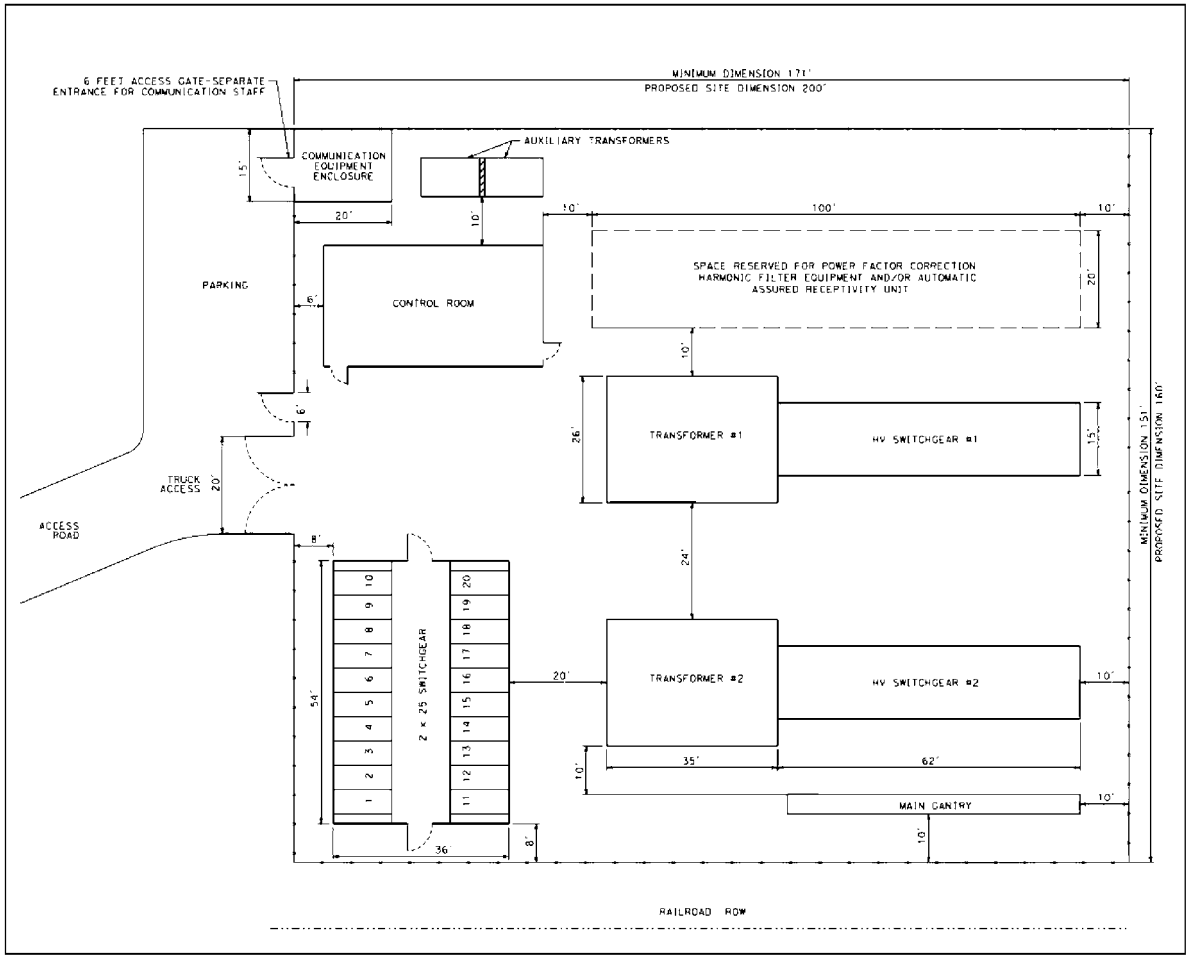

Figure 2-12
Conceptual layout of a supply station

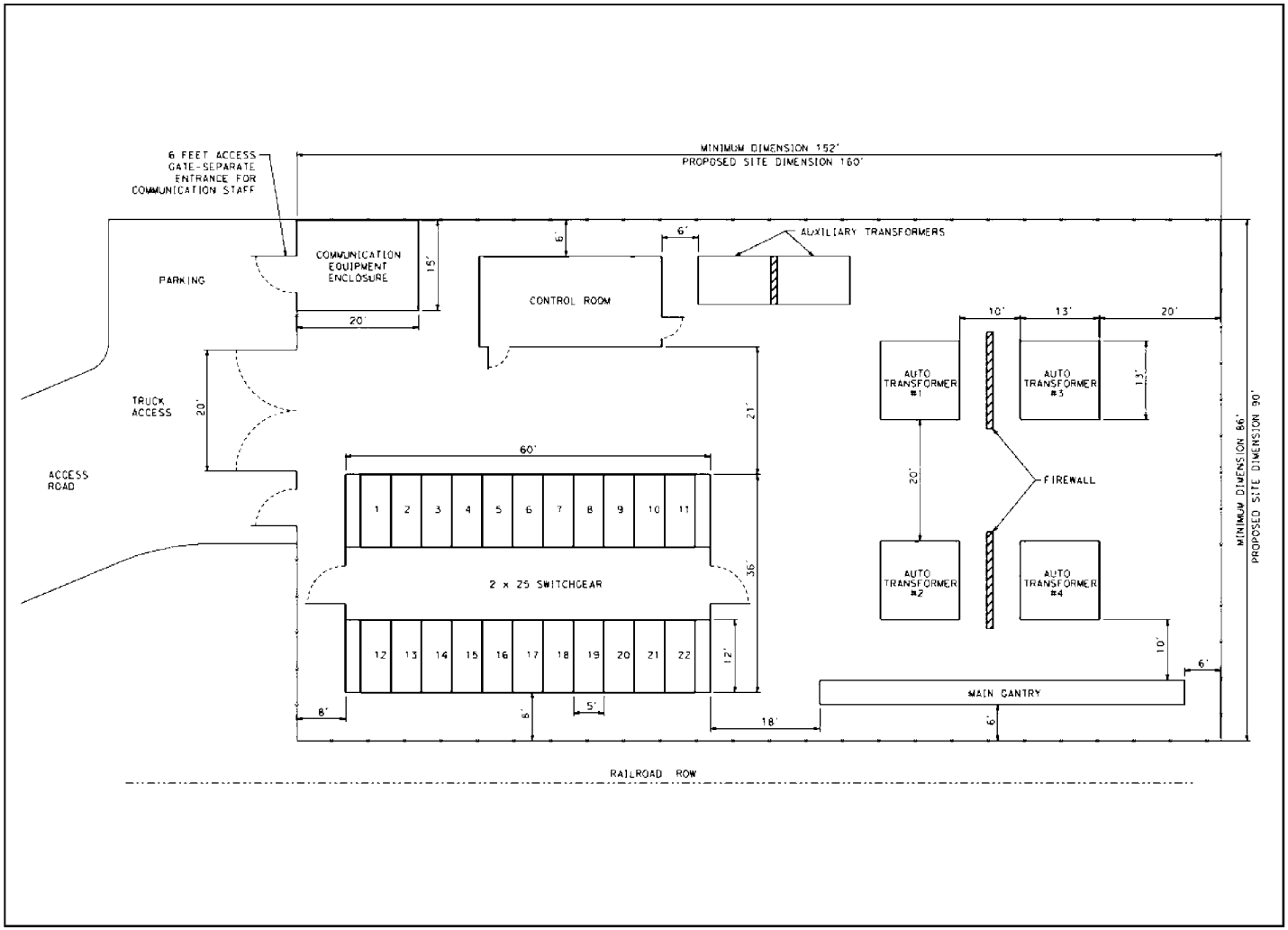

Figure 2-13
Conceptual layout of a switching station

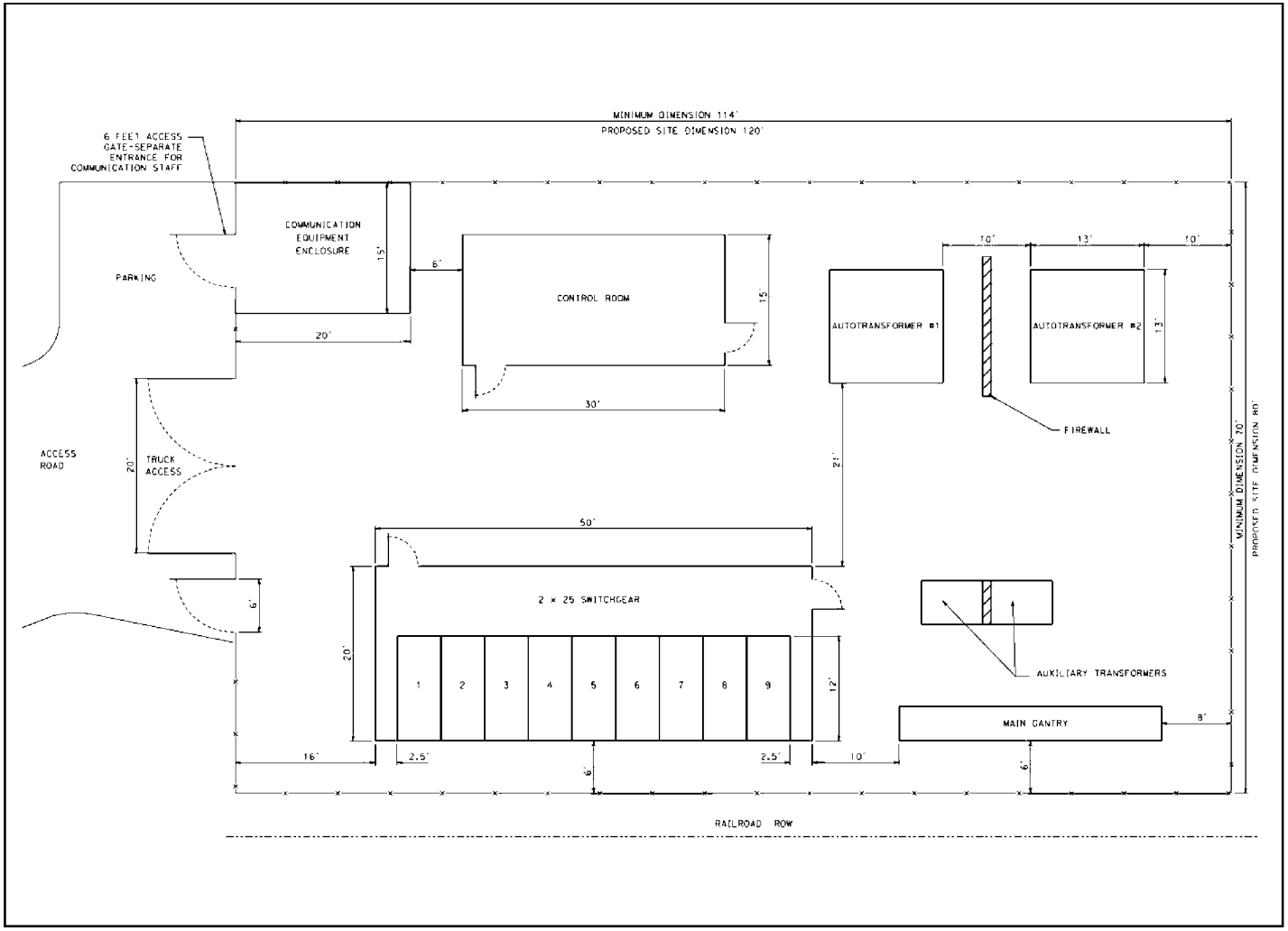

Figure 2-14
Conceptual layout of a paralleling station

2.2.5 Operation and Maintenance Systems

Facilities supporting maintenance would be required along the HST right-of-way. These facilities would consist of one maintenance-of-way facility and may also include one heavy maintenance facility (HMF) co-located with an Operations Control Center. These facilities are listed in Table 2-4 and their functions and major components are described below.

Table 2-4
Maintenance and Control Facilities

Facility Name	Number Planned	Location/Description	Property Characteristics	Facility Size (acres)
Maintenance-of-Way Facilities	1	Co-located with HMF if possible	—	26
Heavy Maintenance Facility (HMF)	0 or 1	—	—	154
Fresno Works–Fresno HMF Site	—	Within the southern limits of the city of Fresno and county of Fresno next to the BNSF Railway right-of-way between SR 99 and Adams Avenue (see Figure 2-17, Sheet 2) Site would serve all of the alternatives under consideration. **590 acres available to support 154-acre facility**	Economic incentives include $25 million to be used by the Authority for site acquisition, infrastructure, utilities, and/or construction Immediately accessible from HST tracks Existing roadway access 3 acres are in floodplain Close proximity to utilities Nine waterways onsite	—
Kings County–Hanford HMF Site	—	Southeast of the city of Hanford, adjacent to and east of SR 43, between Houston and Idaho avenues (Figure 2-17, Sheet 5) Site would serve all of the alternatives under consideration except the Hanford West Bypass 1 and 2 alternatives. **510 acres available to support 154-acre facility**	Economic incentives include proximity to Kings County Enterprise Zone Immediately accessible from HST tracks Convenient highway access Outside of floodplain Utilities readily available One waterway onsite	—

Table 2-4
Maintenance and Control Facilities

Facility Name	Number Planned	Location/Description	Property Characteristics	Facility Size (acres)
Kern Council of Governments–Wasco HMF Site	—	East of Wasco between SR 46 and Filburn Street (Figure 2-17, Sheet 11). Site would serve the BNSF Alternative alignment through Wasco. **420 acres available to support 154-acre facility**	One site for HMF, maintenance-of-way facility, and Operations Control Center Immediately accessible from HST tracks at both ends of the facility, with additional design features (BNSF) or at northern end only (Wasco-Shafter Bypass) Convenient highway access Outside of floodplain Close proximity to utilities Fewest acres of agricultural lands affected of all HMF sites	—
Kern Council of Governments–Shafter East HMF Site	—	In the city of Shafter on the eastern side of the BNSF Railway right-of-way between Burbank Street and 7th Standard Road (Figure 2-17, Sheet 12). Site would serve the Wasco-Shafter Bypass Alternative. **490 acres available to support 154-acre facility**	Capability of collecting daily operations data with California State University, Bakersfield, GIS lab Access is complicated by the location of the existing BNSF Railway facilities Site is not suitable for yard track turnouts from the Wasco-Shafter Bypass Alternative Existing roadway access Utilities readily available 150 acres in floodplain	—

Table 2-4
Maintenance and Control Facilities

Facility Name	Number Planned	Location/Description	Property Characteristics	Facility Size (acres)
Kern Council of Governments–Shafter West HMF Site	—	In the city of Shafter on the western side of the BNSF Railway right-of-way between Burbank Street and 7th Standard Road (Figure 2-17, Sheet 12). Site would serve the BNSF Alternative alignment through Wasco. **480 acres available to support 154-acre facility**	Capability of collecting daily operations data with California State University, Bakersfield, GIS lab Immediately accessible from HST tracks at both ends of the facility Existing roadway access Utilities readily available 175 acres in floodplain	—
Operations Control Center	0 or 1	Included as part of HMF	—	Not applicable

GIS = geographic information system
HMF = heavy maintenance facility
HST = high-speed train
SR = State Route

2.2.5.1 Heavy Maintenance Facility

An HMF is required to support start-up and maintenance of trainsets and support overall system operation. The HMF would provide a location for train assembly, testing, storage, inspection, maintenance, retrofitting, and overhaul. The facility would also have management and administrative facilities. This facility would require approximately 154 acres with space for all activities associated with train fleet assembly, disassembly, and complete rehabilitation; all onboard components of the trainsets; and overnight layover accommodations and servicing facilities. The site would include a maintenance shop, yard, Operations Control Center building, one TPSS, other support facilities, and a train interior cleaning platform. Figure 2-15 shows a typical HMF layout.

The Authority has determined that one HMF is needed between the Merced and Bakersfield stations; however, the location of this facility has not yet been identified. The final location may or may not be within the Fresno to Bakersfield Section. Five sites are under consideration for the HMF within the project alignment; however, the Kern Council of Governments–Shafter-East HMF Site would only be built if the Wasco-Shafter Bypass Alternative Alignment is used instead of the BNSF Alternative (Table 2-4). The facility would have connections to highways and utilities on a parcel zoned for heavy industrial activities.

The HMF is expected to operate 24 hours a day, 7 days a week, with up to 1,500 employees working at any given time. The HMF would have permanent lighting, described in Section 2.6.2. A conceptual layout for an HMF is presented in Figure 2-15. The property boundaries for each HMF site would be larger than the acreage needed for the actual facility, due to the unique site characteristics and constraints of each location.

2.2.5.2 Operations Control Center

Electronic devices along the rails connected to the Operations Control Center for the HST system would monitor wind speeds, rainfall, seismic movements, and land movement caused by other geologic hazards. In the event that any preset criteria are exceeded, trains would be automatically brought to an immediate stop and the power suspended. After such emergency stops, rail service would be resumed only after the precise cause to the service interruption is identified and logged, the line inspected, and the list of predetermined safety checks completed.

The Operations Control Center for monitoring and controlling HST operations would be co-located with the HMF, would provide central supervision over train and power dispatch facilities, and would serve as the hub for safety and security functions. The Operations Control Center would also manage real-time tracking of HST vehicles.

2.2.5.3 Maintenance-of-Way Facility

The HST right-of-way would require accessibility over its entire length for inspection, maintenance, repair, and emergency response. All access to rail and systems for standard maintenance-of-way would be by track-mounted equipment that runs on its own power (i.e., diesel). Maintenance-of-way equipment would be stored at a facility immediately adjacent to the HST corridor. One facility would be required for the Fresno to Bakersfield Section. This facility would include personnel facilities and areas for storage of extra parts for the track and train systems. The maintenance-of-way facilities would have access to the highway road network and to utilities. Figure 2-16 provides a conceptual plan of a typical maintenance-of-way facility. This facility would be approximately 0.75-mile long for a total size of 26 acres, including roads and parking (Authority and FRA 2009b). Access to the facility by road would be required for work crews, along with enough space to park work crew vans while working from the site. The track and access area would be within the fenced and secured area of the HST line.

If this section of the HST is chosen for the site of the HMF, the maintenance-of-way facility for the Fresno to Bakersfield Section would be co-located with the HMF. If the HMF is built outside of the Fresno to Bakersfield project area, the maintenance-of-way facility for the Fresno to Bakersfield Section would be at one of the five proposed HMF sites within this project area.

2.2.5.4 Access Control

Because the HST would be operated at high speeds (up to 220 mph), no vehicles or people would be allowed on the tracks at any time. To ensure safety and security, the HST System would be a fully grade-separated and access-controlled guideway with intrusion detection and monitoring systems where required. The HST infrastructure (e.g., mainline tracks maintenance and storage facilities) would be designed to prevent access by unauthorized vehicles, persons, animals, and objects. The entire length of the rail line will be secured by barriers (fences and walls). State-of-the-art communication, access-control, and monitoring and detection systems will be used in connection with these barriers. The fencing and intrusion protection systems will be remotely monitored and periodically inspected. Maintenance would occur as needed; however, the fencing and intrusion protection systems would not be expected to require replacement before 2035.

A single, gated entry would control access to the HMF. A two-way, 24 foot-wide circulation road would follow the interior perimeter of the facility and a 50 foot-wide asphalt apron would surround the main shop building to provide emergency vehicles access to the structure.

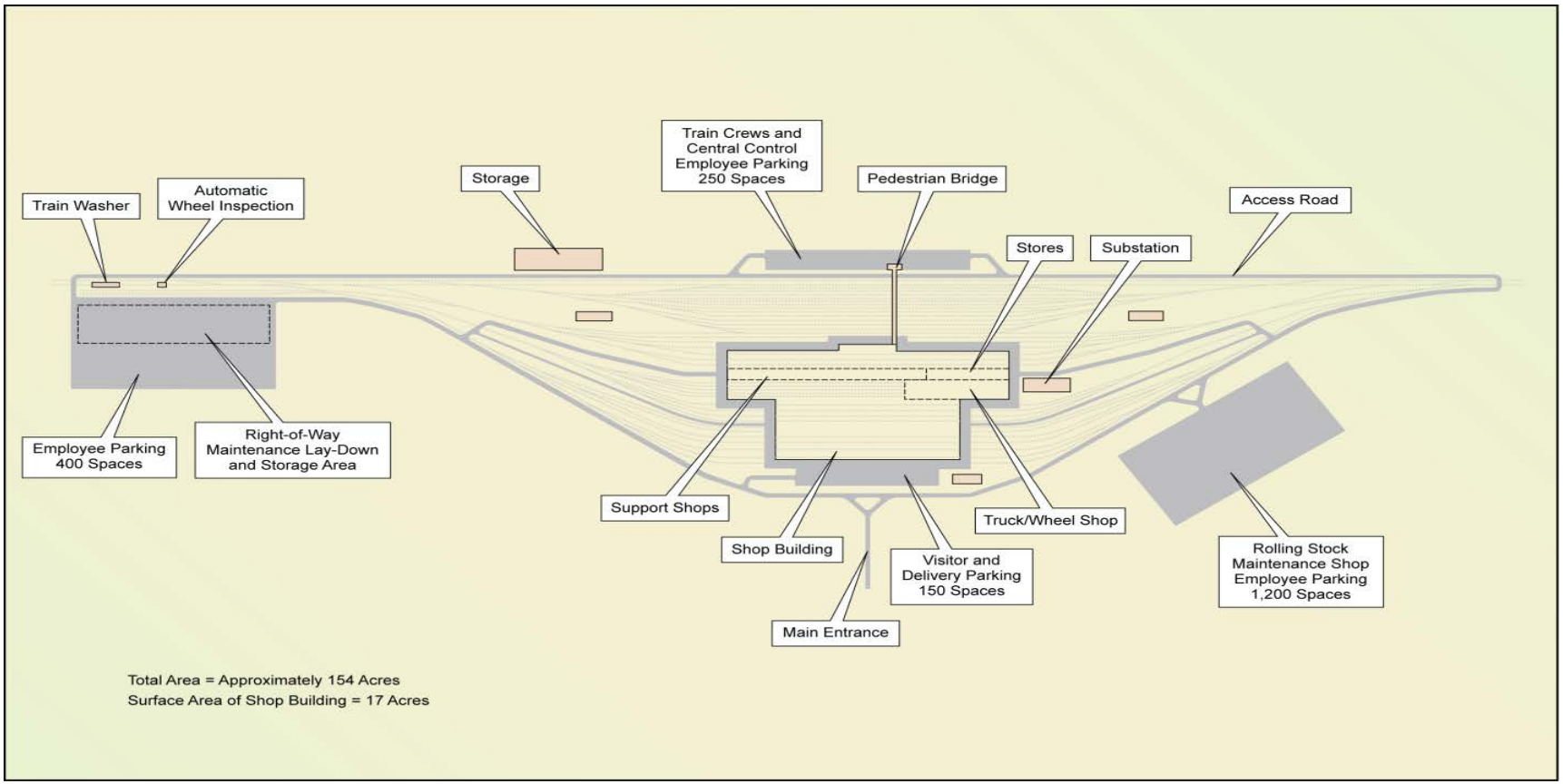

Figure 2-15
Conceptual layout of a Heavy Maintenance Facility

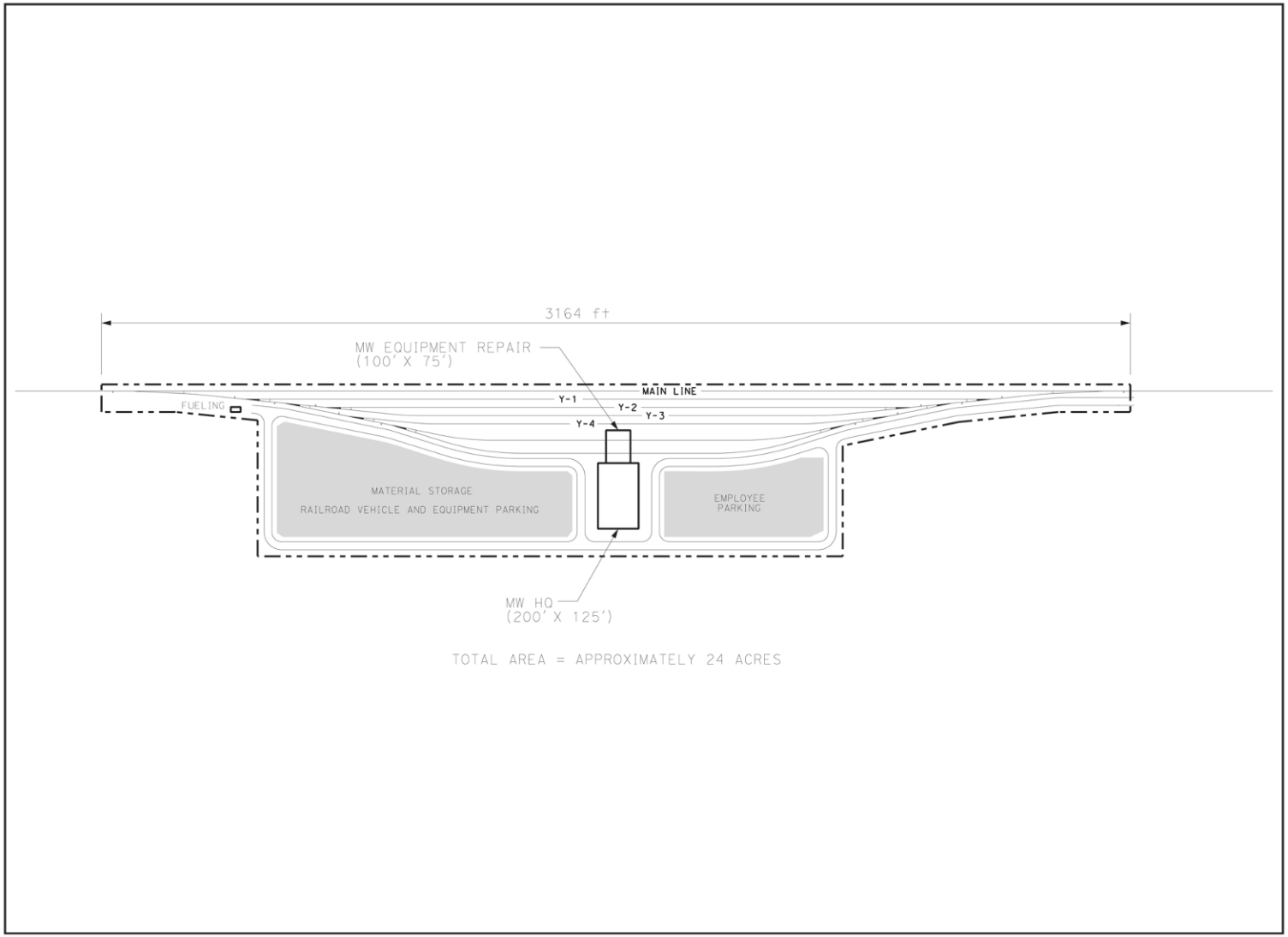

Figure 2-16
Conceptual layout of a maintenance-of-way facility

2.2.6 Additional Construction Footprint Areas

The construction footprint for the project would consist of staging, lay-down, and casting yards for fabrication of the bridge spans for the elevated portions of the HST system. Where feasible, construction staging areas for storage of equipment and materials would be set up in areas that would ultimately be occupied by permanent HST facilities, such as the station sites or the HMF site. Additional staging areas may be sited based on the contractor's needs, access to local road networks, and highway access.

If the precast segmental construction method is used for construction of concrete bridge and elevated sections, casting yards would be required. These yards would be approximately 50 acres and would be sited in areas in proximity to the longer elevated sections of the HST system such as Fresno, Wasco, and Bakersfield. To the extent feasible, casting yards may use the same footprint as permanent HST structures.

The right-of-way would be fenced and access would be controlled for safety, security, and logistical reasons. Access gates to the construction footprint would be situated within easy access to local roads and freeways. The HST right-of-way access road inside of the fenced-in area would provide access for construction activities; this road would be paved with asphalt; or, at a minimum, gravel-coated with a polymer-based binder to reduce dust. This construction access road would be approximately 24 feet wide.

Some disposal of earth unsuitable for reuse in construction (e.g., expansive clays, organic materials) is anticipated. Because the area of the project is predominantly flat and does not contain geographic barriers, extensive excavation and material removal is not anticipated. The small amounts of material unsuitable for reuse would be hauled offsite to a permitted landfill or sold as fill for another project.

2.3 Location of Project Elements

The project currently involves an HST system track alignment and stations along the Union Pacific Railroad (UPRR) corridor through the urban area of Fresno and within the general BNSF corridor from Fresno to Bakersfield. Project alignments are described as the BNSF Alternative Alignment, a single alignment from the northern to southern end of the project section, with ten limited alternative alignments. These limited alternative alignments consist of a west of Hanford alternative alignment with two variations, and each variations with an at-grade or below-grade optionn, two alternative alignments within the city of Corcoran; two relatively short alternative alignments in the rural areas between Corcoran, Allensworth, and Wasco; and two alternative alignments within the urban area of Bakersfield.

Due to engineering constraints, the track alignment cannot make relatively sudden and substantial changes in direction or vertical profile. The maximum local grade of the rail is 2.5%, with a maximum sustained grade of 1.25% over approximately 1 mile. The minimum curve radius to make a 90 degree turn at 220 mph varies from approximately 4 to 6.5 miles. To accommodate these design constraints, changes in horizontal or vertical alignment must be made over relatively long distances. As a result, and compared to other types of linear projects (e.g., highways, freight trains, transmission lines, pipelines), designs for the alignment of an HST system are less flexible with regard to curving, crossing, or orienting around or through the surrounding lands and associated resources. Where feasible, the proposed project would be adjacent to existing railways and highway facilities.

2.3.1 BNSF Alternative Alignment

The BNSF Alternative Alignment would extend from Fresno to Bakersfield and would be sited adjacent to the existing BNSF right-of-way to the extent feasible (Figure 2-17). Several minor deviations from the existing BNSF right-of-way are necessary to accommodate engineering constraints for high-speed trains. The BNSF Alternative Alignment would not follow the BNSF right-of-way within the city of Fresno; rather, the BNSF Alternative runs east of and adjacent to the UPRR right-of-way. The alignment also veers from the BNSF right-of-way near the cities of Laton and Hanford, and rejoins the BNSF right-of-way near the city of Corcoran. The alignment would generally follow the BNSF corridor through Bakersfield to the project terminus at Oswell Street. Table 2-5 presents a detailed description of the elevated sections of the BNSF Alternative Alignments and Bypasses, including the reason for aerial structures, and the general character of the lands it traverses.

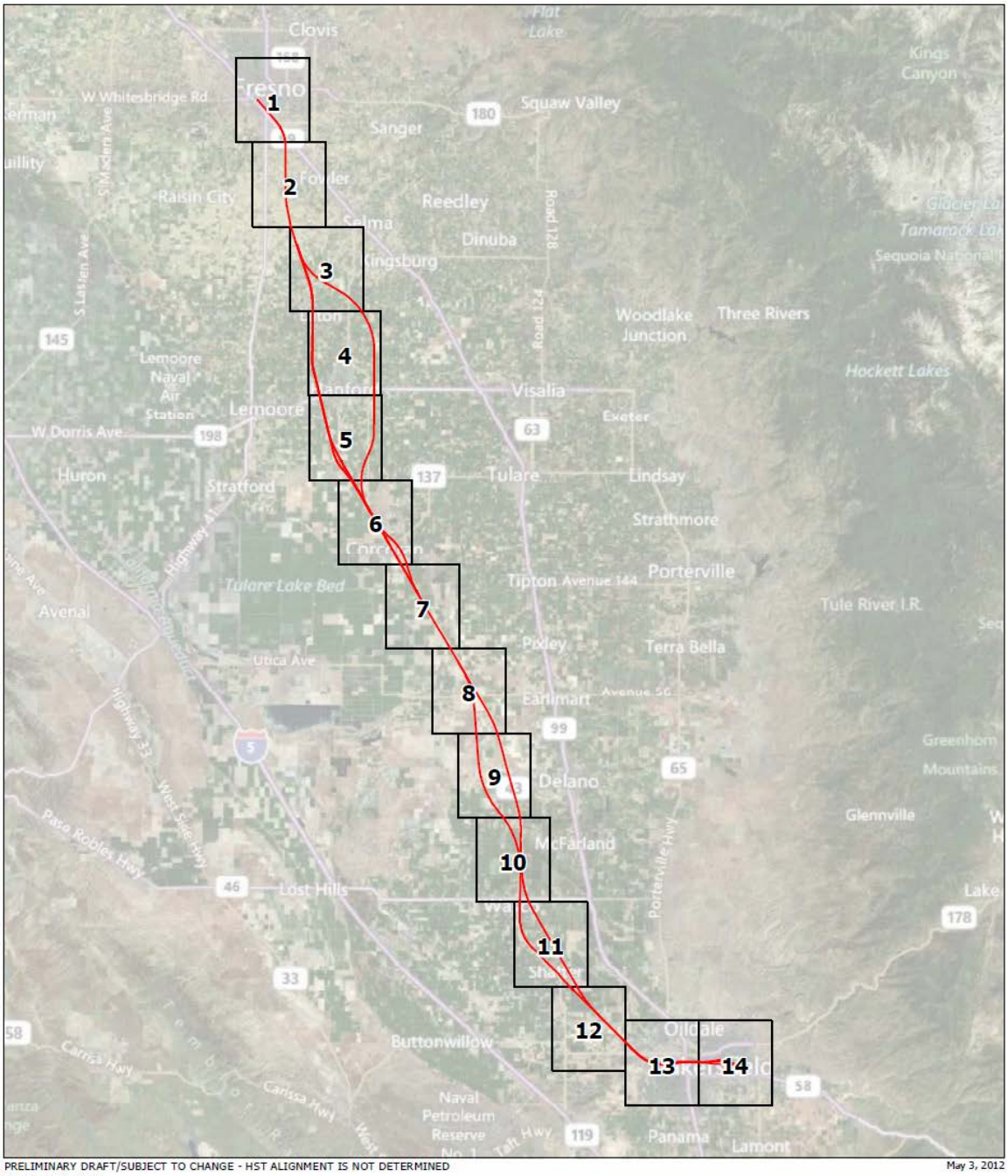

Figure 2-17
Proposed HST alignments and facility locations – Index Sheet

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

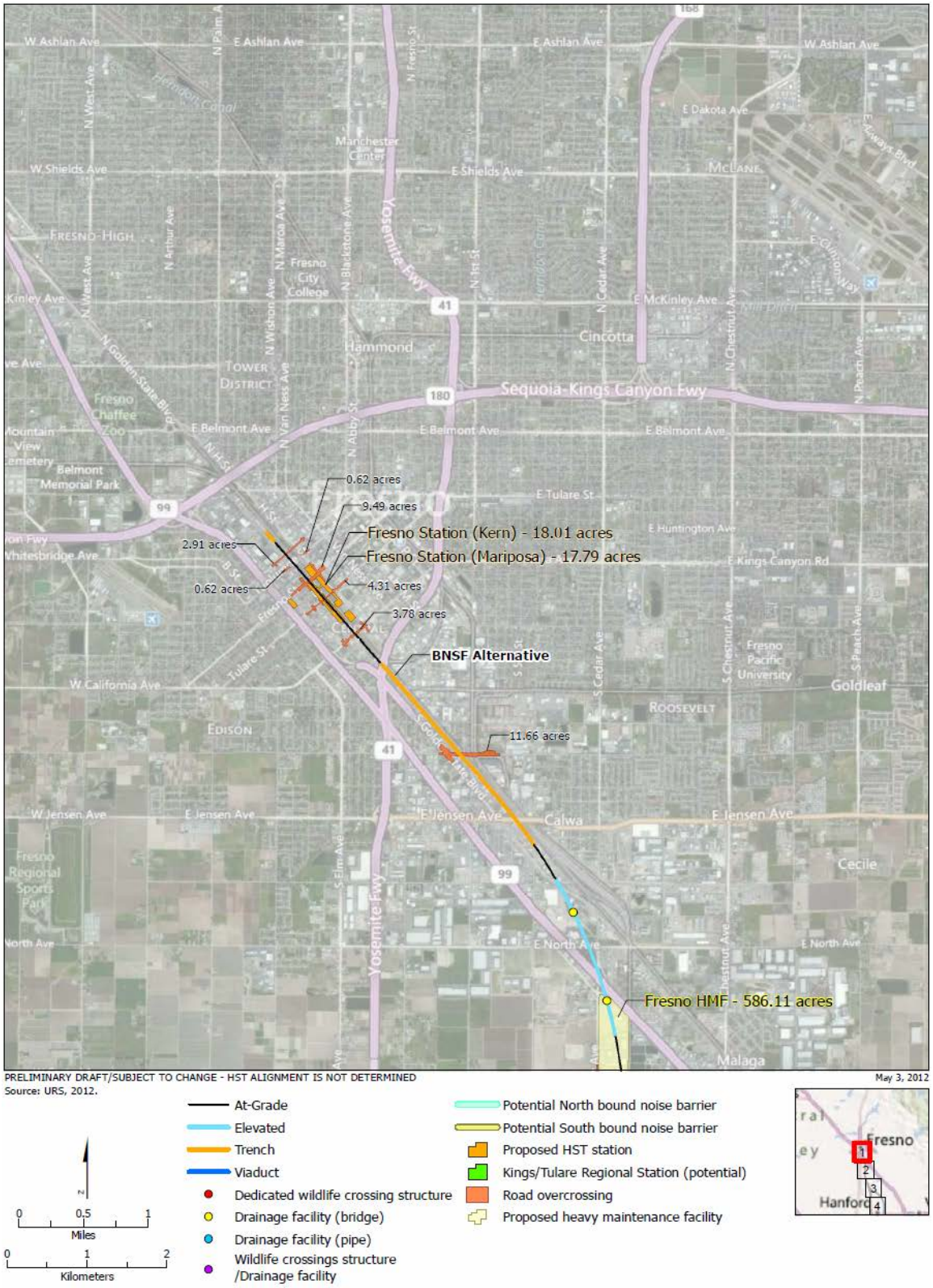

Figure 2-17
Proposed HST alignments and facility locations – Sheet 1

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

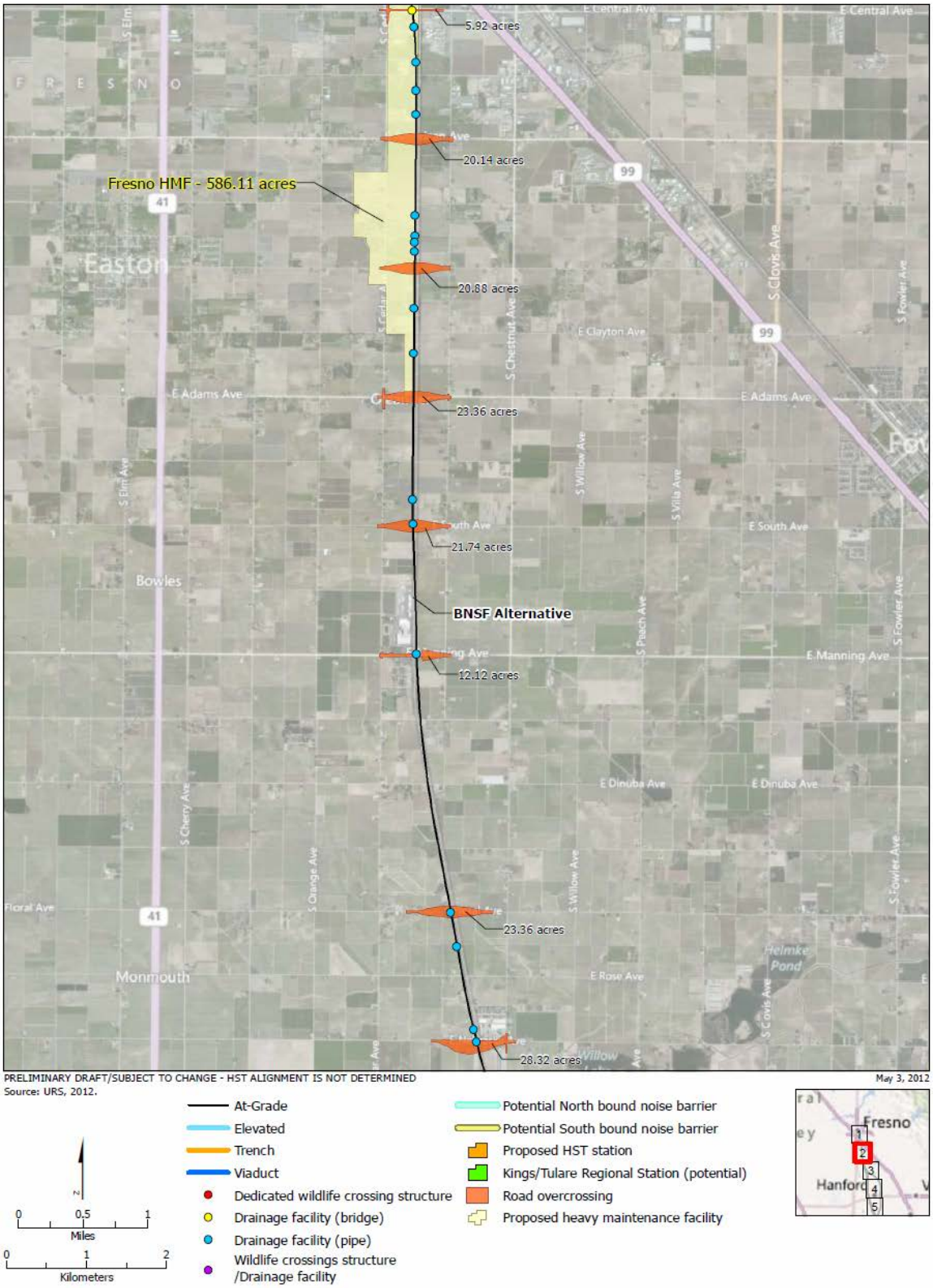

Figure 2-17
Proposed HST alignments and facility locations – Sheet 2

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

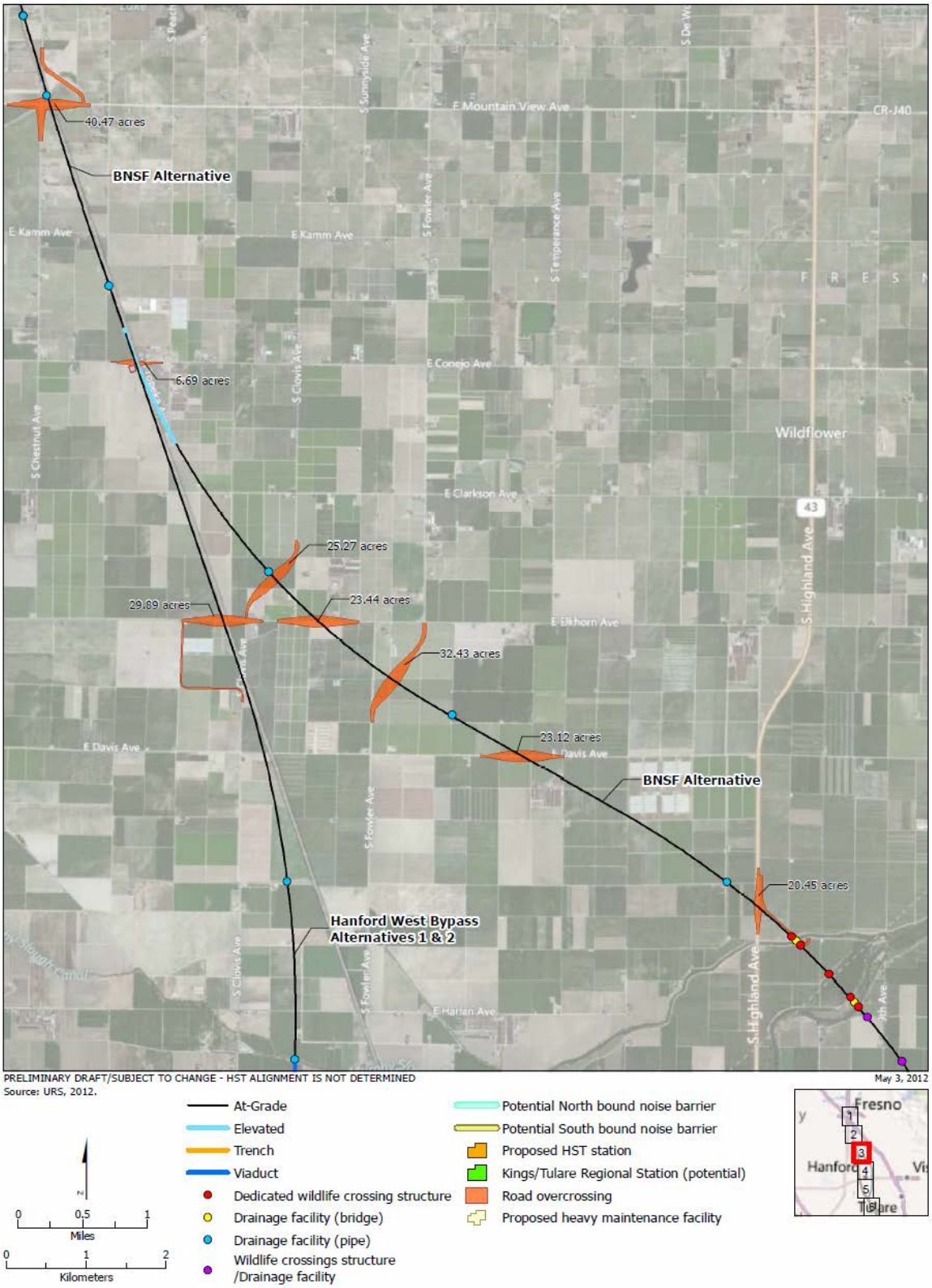

Figure 2-17
Proposed HST alignments and facility locations – Sheet 3

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

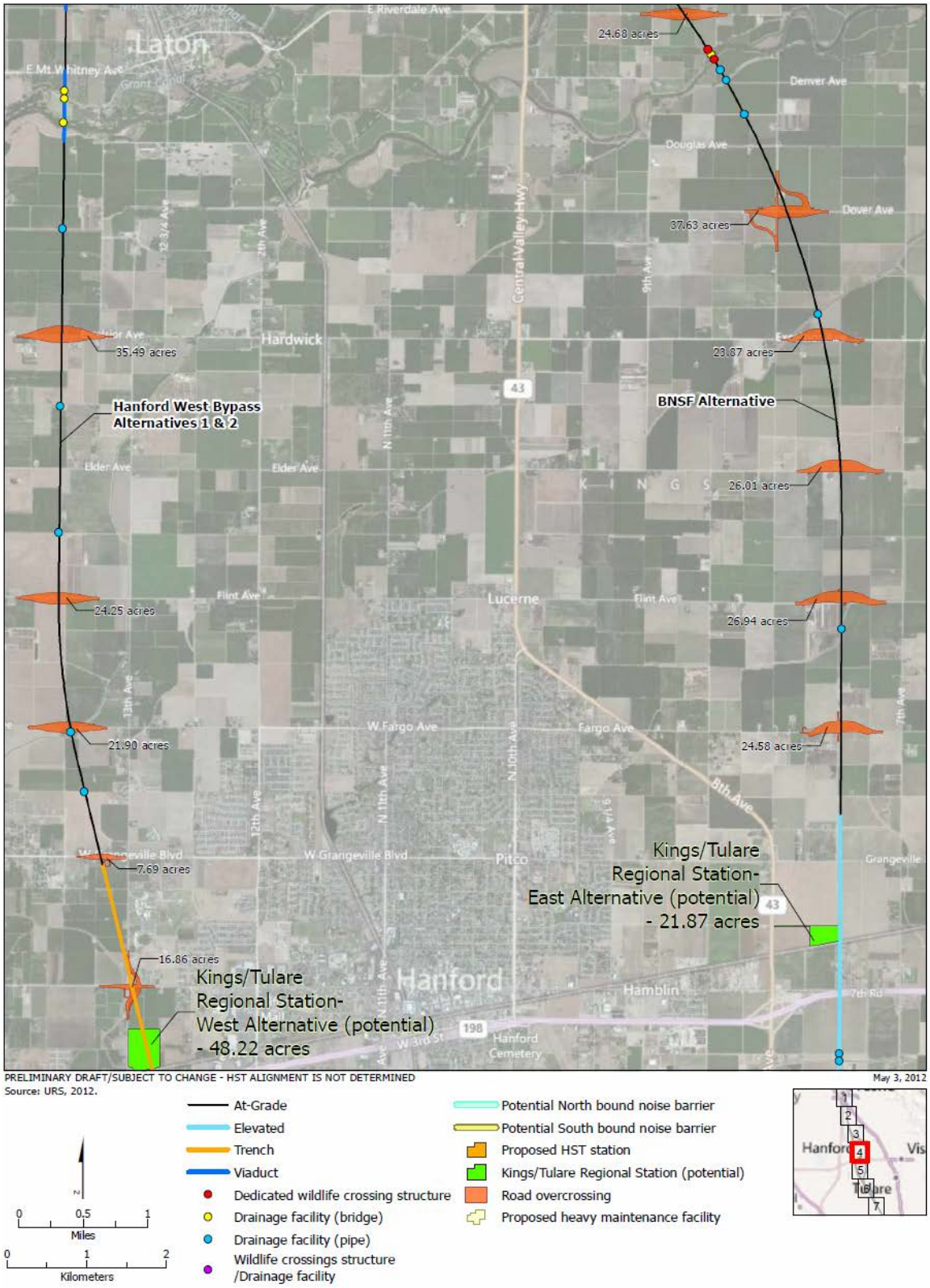

Figure 2-17
Proposed HST alignments and facility locations – Sheet 4

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

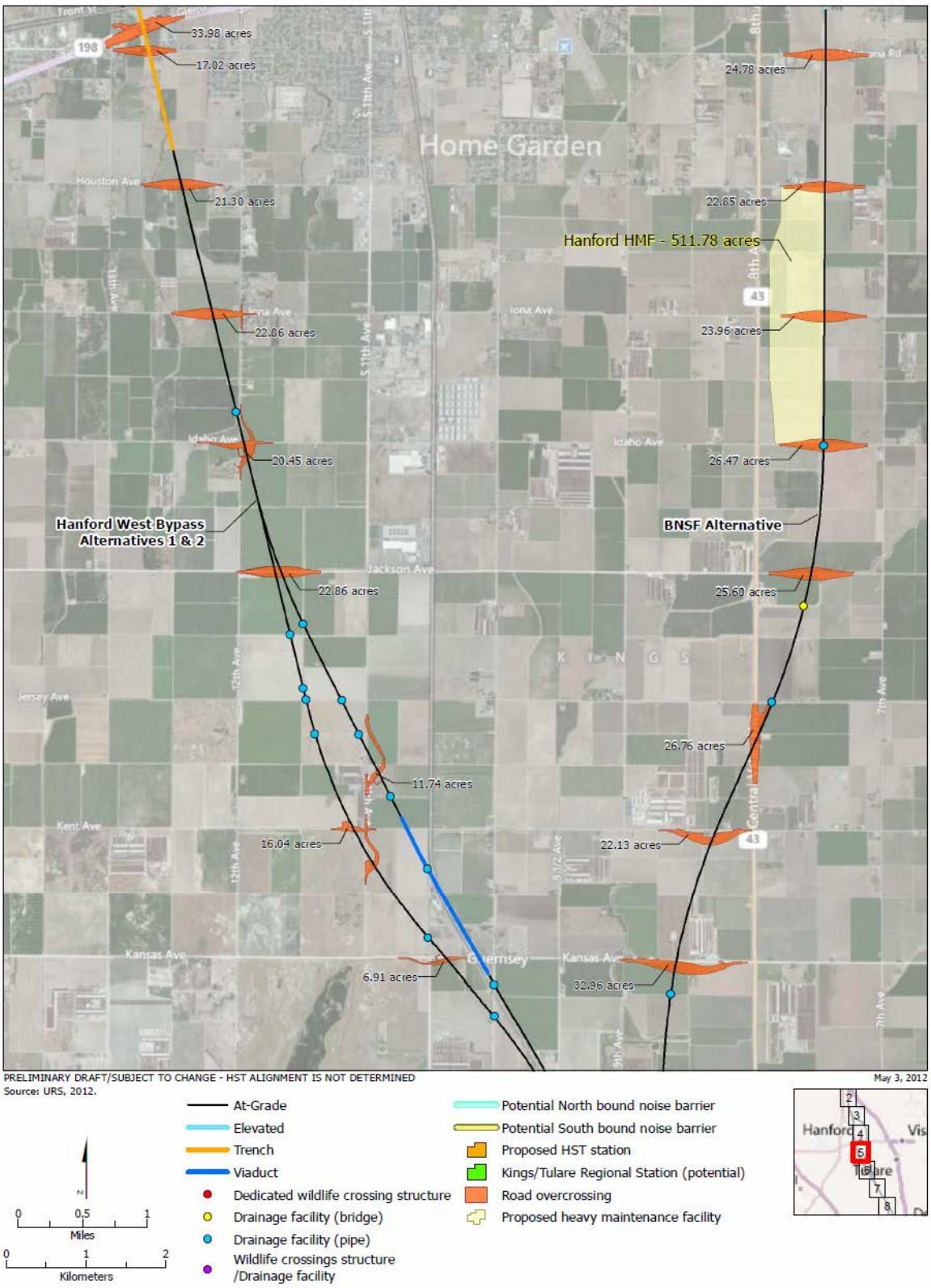

Figure 2-17
Proposed HST alignments and facility locations – Sheet 5

CALIFORNIA High-Speed Rail Authority
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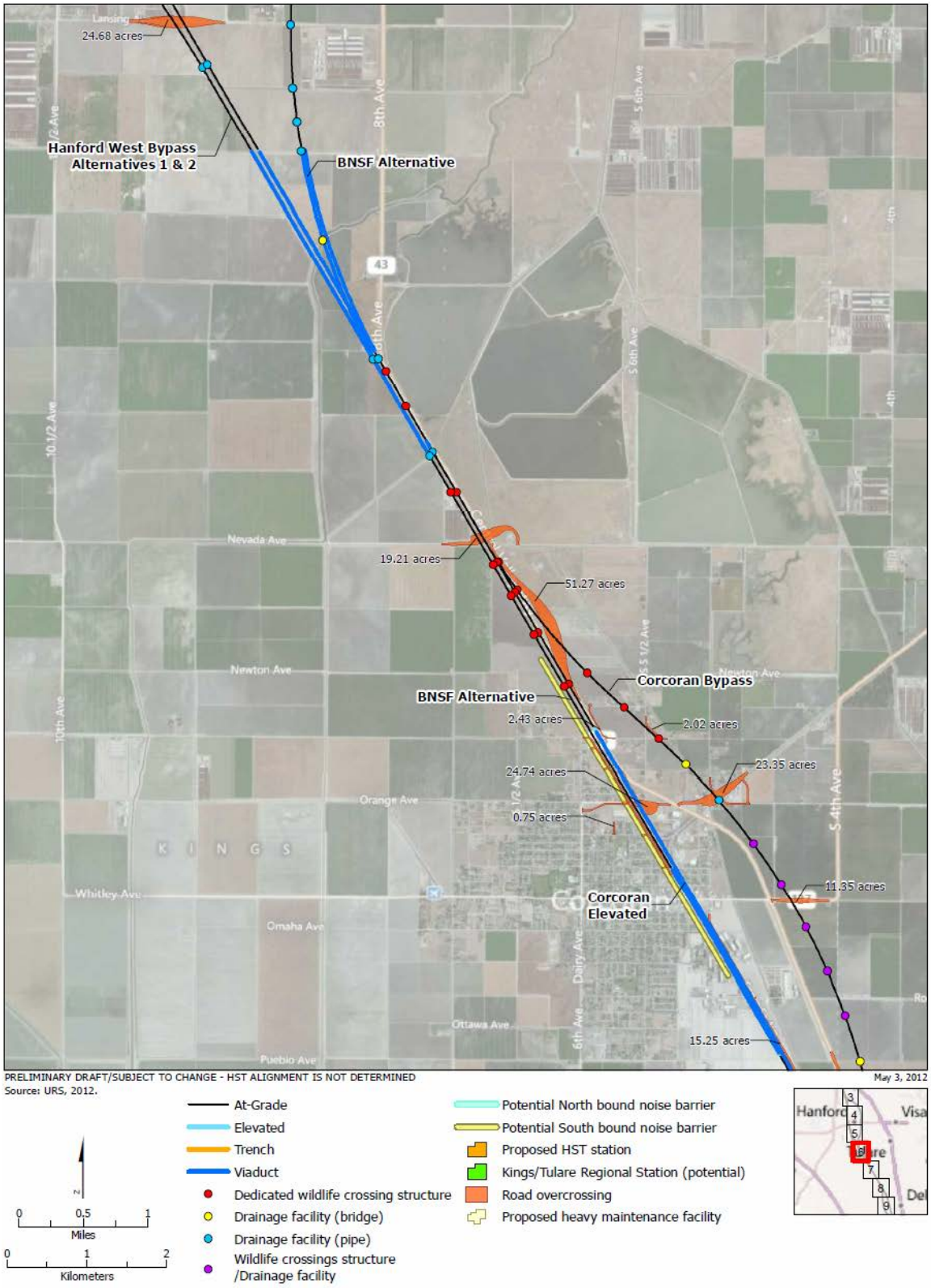

Figure 2-17
Proposed HST alignments and facility locations – Sheet 6

CALIFORNIA High-Speed Rail Authority
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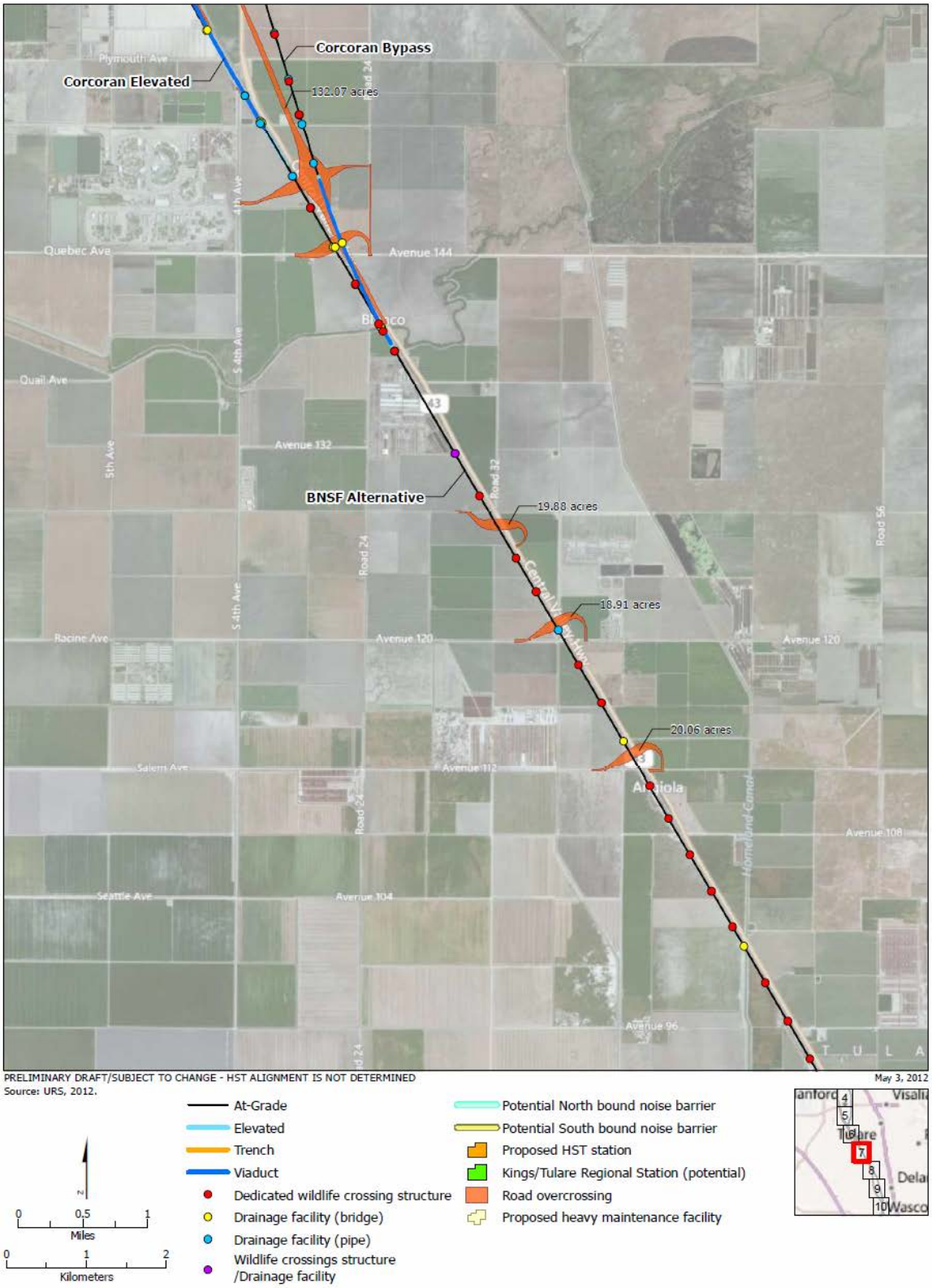

Figure 2-17
Proposed HST alignments and facility locations – Sheet 7

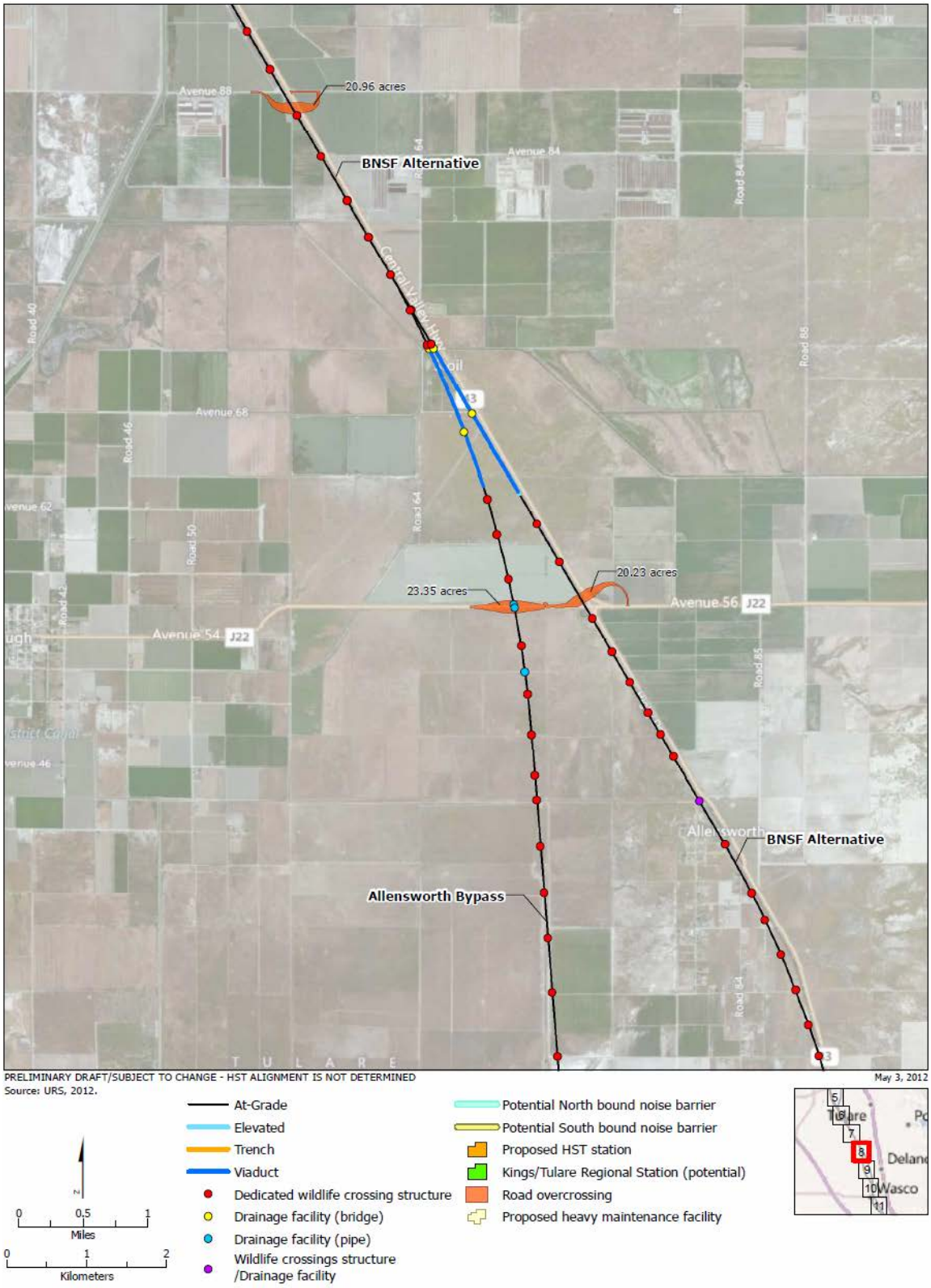

Figure 2-17
Proposed HST alignments and facility locations – Sheet 8

CALIFORNIA High-Speed Rail Authority
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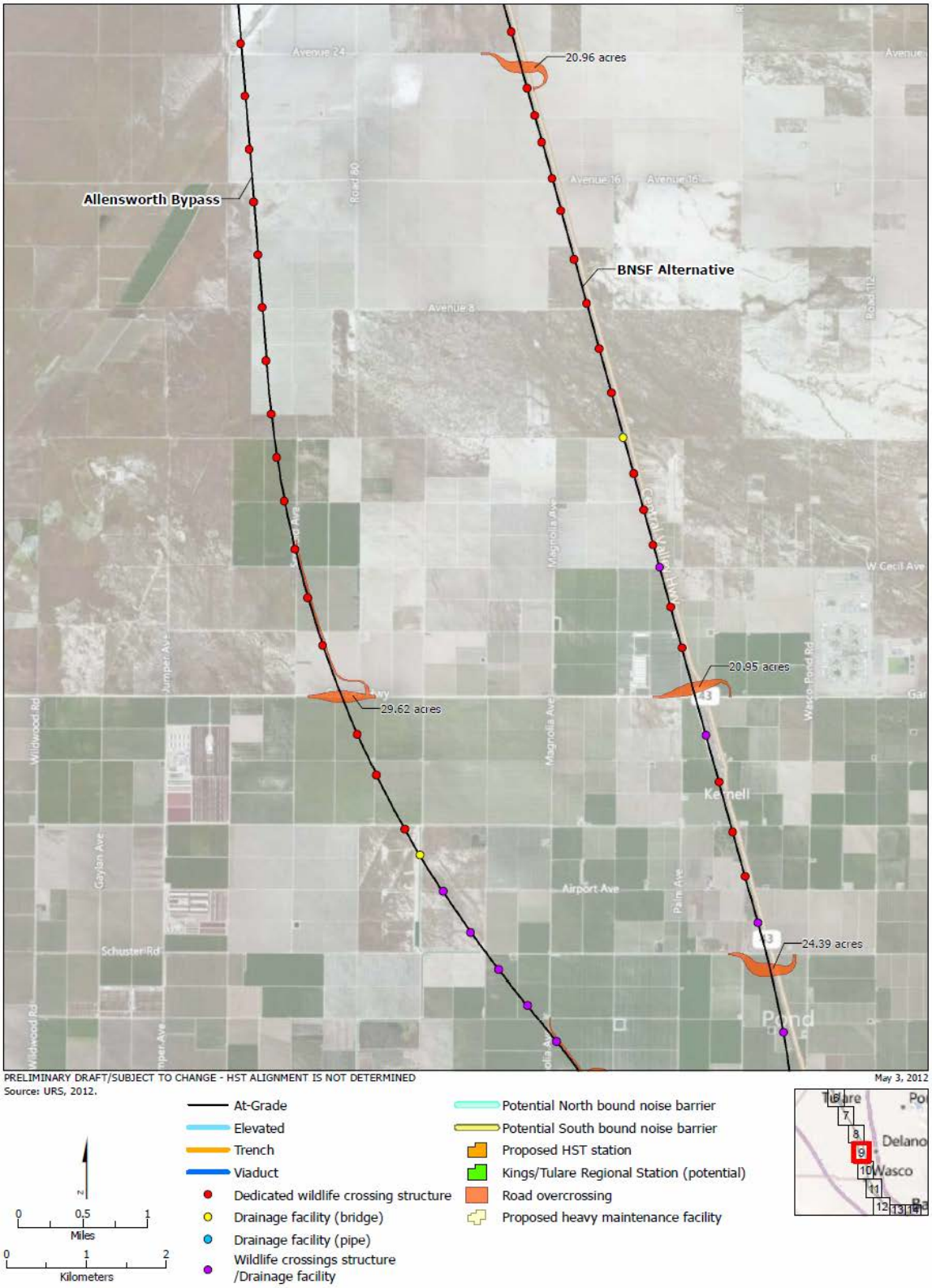

Figure 2-17
Proposed HST alignments and facility locations – Sheet 9

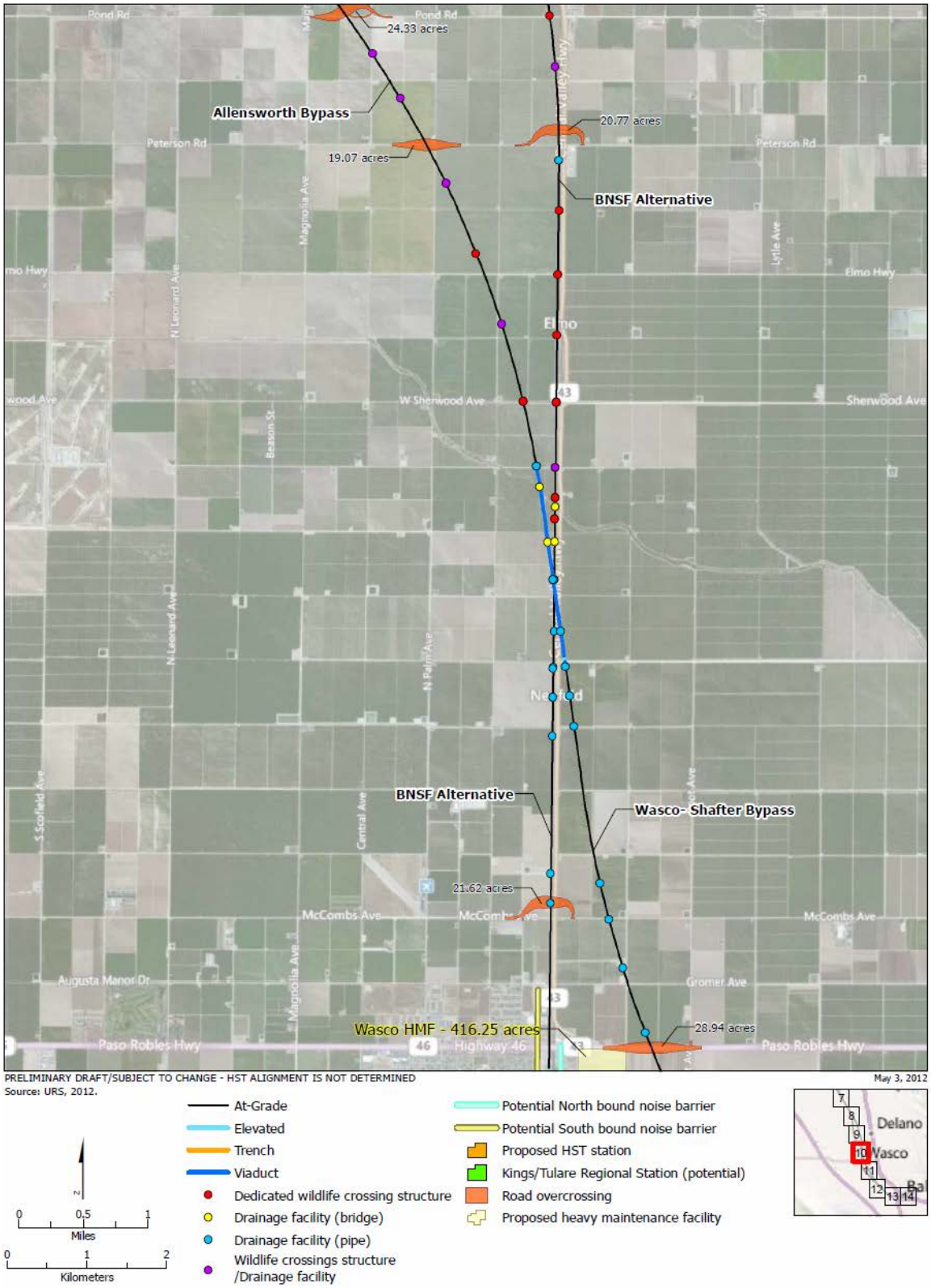

Figure 2-17
Proposed HST alignments and facility locations – Sheet 10

CALIFORNIA High-Speed Rail Authority
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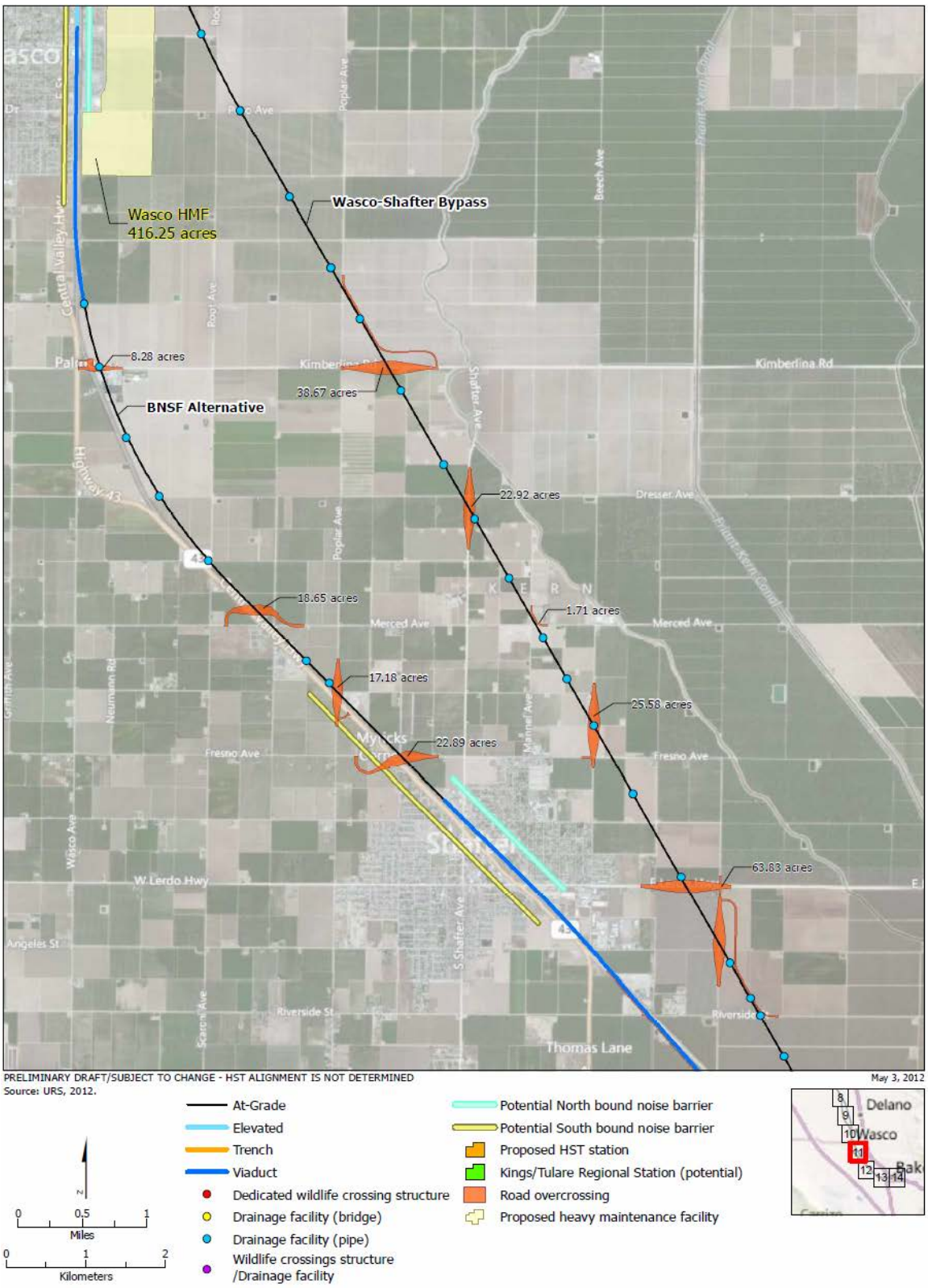

Figure 2-17
Proposed HST alignments and facility locations – Sheet 11

CALIFORNIA High-Speed Rail Authority
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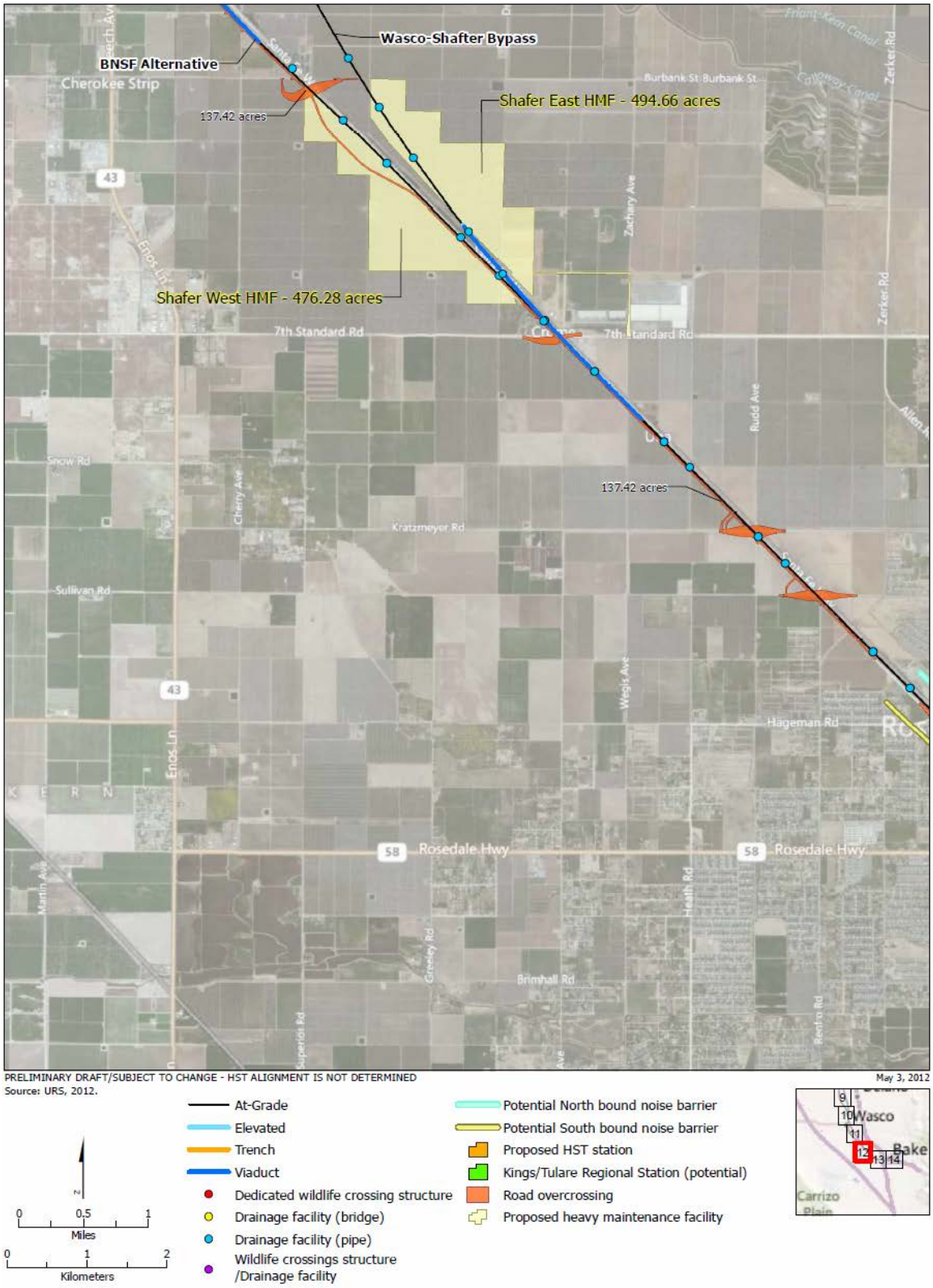

Figure 2-17
Proposed HST alignments and facility locations – Sheet 12

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

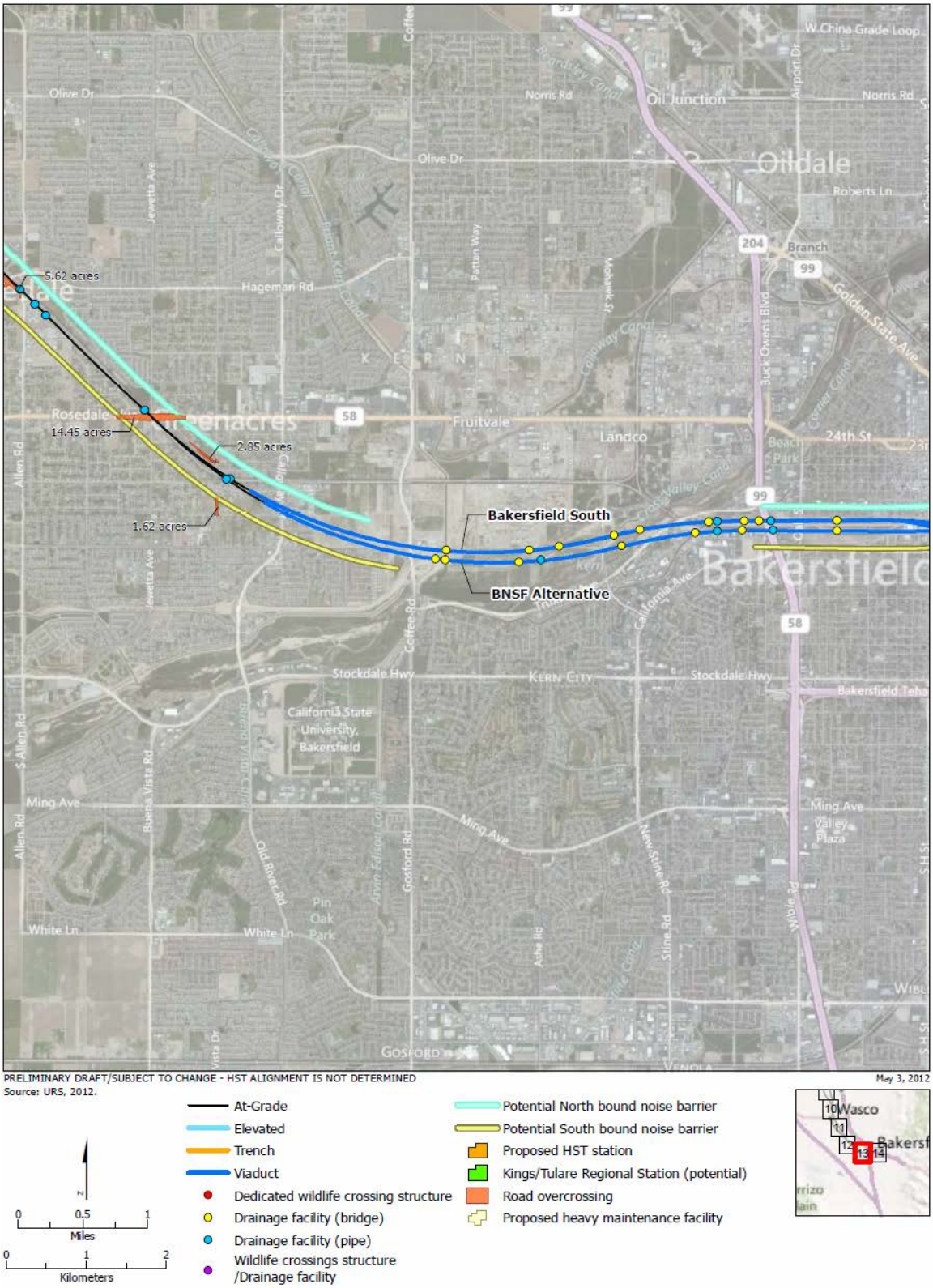

Figure 2-17
Proposed HST alignments and facility locations – Sheet 13

CALIFORNIA High-Speed Rail Authority
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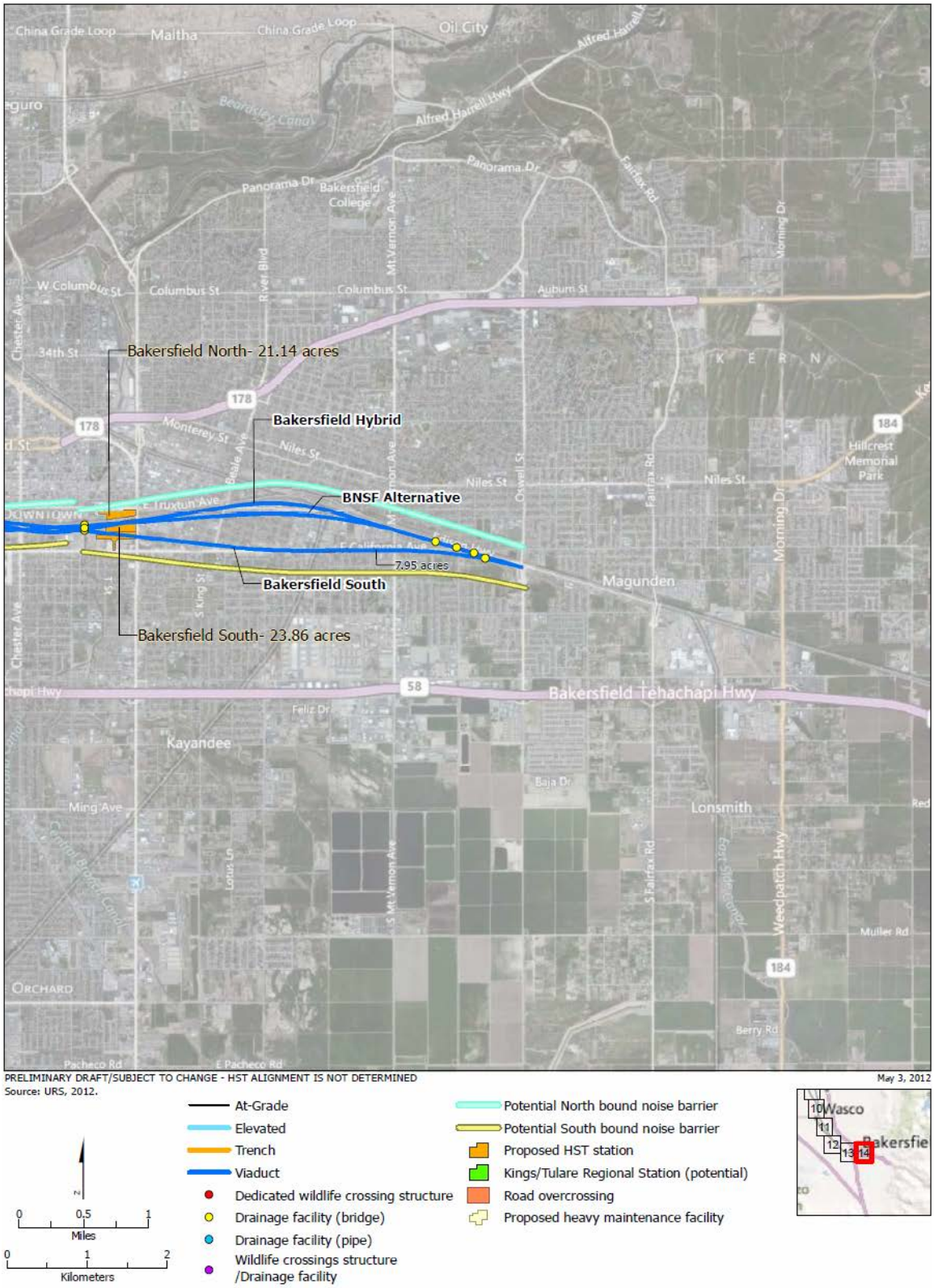

Figure 2-17
Proposed HST alignments and facility locations – Sheet 14

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

Fresno County

The BNSF Alternative Alignment would begin at the north end of the Fresno station tracks adjacent to the western side of the UPRR right-of-way in the vicinity of Amador Street. The alignment would be below grade for approximately 140 yards as it crosses the Fresno Bee railroad spur, rendering it unusable. The alignment would return to grade and continue southeast through Fresno on the western side of the UPRR until reaching East Jensen Avenue. An intrusion protection barrier approximately 1 mile in length would be required from approximately Stanislaus Street to Ventura Avenue due to the proximity of the UPRR and HST rights-of-way. The alignment would again be below grade in a shallow trench as it travels underneath East Jensen Avenue, then curve to the south and be elevated over Golden State Boulevard and SR 99. The elevated structure would span just over 1 mile and would reach a maximum height of approximately 55 feet. The alignment would return to grade and join the BNSF corridor on its western side at East Malaga Avenue south of Fresno. The BNSF Alternative would continue through Fresno County along the BNSF right-of-way in an area composed mostly of agricultural land.

Approximately 24 miles of track would be in Fresno County. Nearly all of the alignment, roughly 22 of the 24 miles, would be at-grade. The HST alignment would be elevated where it crosses from the western side to the eastern side of the BNSF tracks near East Conejo Avenue. The elevated structure would span approximately 1 mile and would reach a maximum height of approximately 42 feet as it crosses over the BNSF tracks. A total of approximately 5.5 miles of BNSF tracks would be realigned from approximately East Sumner Avenue to East Huntsman Avenue and approximately East Rose Avenue to East Kamm Avenue to accommodate the HST alignment. Another 0.5 miles of BNSF tracks would be realigned in the vicinity of South Peach Avenue. The alignment would be at-grade with bridges where it crosses Cole Slough and the Kings River into Kings County. These bridges would clear the Cole Slough and Kings River levees by approximately 3 feet. Dedicated wildlife crossing structures would be placed between 100 and 500 feet to the north and south of Cole Slough and the Kings River.

Kings County

Approximately 28 miles of the BNSF Alternative would be in Kings County. The alternative would pass east of the city of Hanford, parallel to and approximately 0.5 mile east of SR 43 (Avenue 8). South of Hanford in the vicinity of Idaho Avenue, the BNSF Alternative would curve to the west and then south toward the BNSF right-of way. The alignment was refined in this area to avoid special aquatic features north of Corcoran and east of the BNSF tracks. The alignment would rejoin the BNSF right-of-way on its western side just north of Corcoran and travel through the eastern edge of the city of Corcoran. The majority of this part of the alignment would pass through agricultural land except where it travels through the city of Corcoran. The alignment in Corcoran encompasses a number of land uses, including residential, commercial, and industrial. A total of approximately 8 miles of track within Kings County would be elevated. The first elevated portion would just east of the city of Hanford, and would span a length of 2.5 miles, beginning just south of Fargo Avenue and ending just north of Hanford Armona Road. This portion of the alignment would pass over the San Joaquin Valley Railroad and SR 198. The structure would reach a height of approximately 50 feet aboveground. The potential Kings/Tulare Regional Station would be located along this structure near the SR 43 and SR 198 interchange.

The alignment would continue at-grade south of Hanford Armona Road for approximately 10 miles, and then ascend onto an elevated structure over Cross Creek and the BNSF right-of-way. The structure would span a length of approximately 2.5 miles, beginning just before Cross Creek and returning to grade just before Nevada Avenue. The elevated structure would reach a maximum height above ground of 40 feet. The alignment would then continue at-grade and require an intrusion protection barrier from approximately Nevada Avenue to approximately North

Avenue. The barrier would be approximately 2 miles in length. At Patterson Avenue, the alignment would again ascend onto an elevated structure over Brokaw Avenue, Whitley Avenue, a BNSF Railway spur, and agricultural facilities at the southern end of the city of Corcoran. The elevated structure would span approximately 1.7 miles. The alignment would be constructed on a retained embankment as it crosses into Tulare County, from north of 4th Avenue to Avenue 136. Approximately 0.3 miles of BNSF tracks would be realigned at Oregon Avenue, south of Corcoran.

Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to the Tulare County line in at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative would also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of each of the following river/creek crossings: Dutch John Cut (Slough), Kings River, and Cross Creek.

Tulare County

The BNSF Alternative crosses approximately 22 miles of Tulare County. The alignment travels through the county adjacent to the western side of the BNSF right-of-way. The majority of the alignment would be at-grade, with only a combined total of 4 miles elevated where the alignment crosses the Tule River and then both Deer Creek and the Stoil railroad spur from the BNSF Railway. The elevated structure would reach a height of approximately 50 feet. This alignment would cross over Lakeland Canal.

Dedicated wildlife crossing structures would be provided throughout at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative would also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of each of the following river/creek crossings: Tule River and Deer Creek.

Kern County

The Kern County portion of the BNSF Alternative is approximately 44 miles long and would pass through the cities of Wasco and Shafter on its way to Bakersfield. The alignment would closely follow the western side of the BNSF corridor until just south of Wasco, where it would cross over to the eastern side of the BNSF tracks. Approximately 4 miles of BNSF tracks would be realigned in the vicinity of 4th Street, from 8th Street to Poso Avenue, and from Jackson Avenue to Merced Avenue to accommodate the HST alignment. The alignment would continue on the eastern side of the BNSF right-of-way through Shafter and then cross over once more to the western side of the BNSF right-of-way. Approximately 8 miles of Santa Fe Way would be shifted west of the proposed alignment to accommodate the HST right-of-way, from north of Riverside Street to south of Renfro Road. Approximately 1.5 miles of the BNSF's Lone Star Rail Spur would be realigned from Riverside Street to south of Burbank Street. The alignment would generally follow the BNSF corridor through Bakersfield to the project terminus at Oswell Street. Approximately 2.5 miles of BNSF tracks would be realigned in Bakersfield from Jomani Drive to Glenn Street and from Oak Street to C Street to accommodate the alignment. Within this portion of the alignment, approximately 27 miles would be at-grade, and the remainder of the alignment would be elevated. Specifically, three elevated sections would occur along this segment of the BNSF Alternative in the cities of Wasco, Shafter, and Bakersfield. The alignment would be at-grade with a bridge where it crosses Poso Creek.

The first elevated structure would begin at 1st Street, pass through Wasco for about 3 miles and return to grade north of Kimberlina Road. This structure would reach a height of approximately 45 feet to the top of the rail. From approximately Kimberlina Road, the alignment would continue at-grade for approximately 5 miles to just north of Shafter Avenue where it would again ascend onto an elevated structure.

The second elevated structure would run through Shafter for a distance of about 3.5 miles, between Shafter Avenue and Cherry Avenue. This structure would pass over a BNSF Railway yard within the city, and reach a maximum height of approximately 45 feet to the top of the rail. After returning to grade just south of Cherry Avenue, the alignment would travel approximately 10 miles to Country Breeze Place where it would ascend onto another elevated structure through Bakersfield.

The third elevated structure would run from Country Breeze Place through the Bakersfield Station to the terminus of the BNSF Alternative at Oswell Street. The elevated structure through Bakersfield would pass over the transportation corridor improvement projects, SR 99, the Kern River, and a BNSF Railway yard. The structure would range in height from 50 to 90 feet to the top of the rail. The highest elevations in the city of Bakersfield would be reached between Rosedale Highway and SR 99. From SR 99 to the terminus of the BNSF Alternative, the structure would range in height from 50 to 70 feet to the top of the rail.

Dedicated wildlife crossing structures would be provided in at-grade portions of the railroad embankment at intervals of approximately 0.3 miles. The BNSF Alternative would also include dedicated wildlife crossing structures placed between 100 and 500 feet to the north and south of the Poso Creek crossing. Dedicated wildlife crossing structures would not be installed between 100 and 500 feet to the north and south of the Kern River, because the BNSF Alternative would be elevated.

2.3.2 Alternative Alignments and Bypasses

In addition to the BNSF Alternative, the Authority and FRA are considering seven other alternative alignments for portions of the Fresno to Bakersfield Section. The Authority developed these alternatives to avoid environmental, land use, or community impacts identified for portions of the BNSF Alternative. These seven alternatives are discussed in the following paragraphs and depicted in Figure 2-17, Sheets 1-14.

Hanford West Bypass 1 Alternative. The Hanford West Bypass 1 Alternative Alignment would parallel the BNSF Alternative from East Kamm Avenue to approximately East Elkhorn Avenue in Fresno County. At East Conejo Avenue where the BNSF Alternative crosses to the eastern side of the BNSF tracks to pass the city of Hanford to the east, the Hanford West Bypass 1 Alternative continues south on the western side of the BNSF tracks. The Hanford West Bypass 1 would diverge from the BNSF corridor just south of East Elkhorn Avenue and ascend onto an elevated structure just south of East Harlan Avenue, cross over the Kings River complex and Murphy Slough, and passing the community of Laton to the west. The elevated structure would be approximately 0.8 miles in length and reach a maximum height of approximately 40 feet to the top of the rail. The Hanford West Bypass 1 Alternative would return to grade just north of Dover Avenue. The alignment would continue at-grade, curve gently to the east, and travel between the community of Armona to the west and the city of Hanford to the east. The Hanford West Bypass 1 Alternative rejoins the BNSF corridor on its western side at about Lansing Avenue. The alignment would then ascend onto another elevated structure, and travel over Cross Creek and the special aquatic features that exist north of the city of Corcoran. The elevated structure would span approximately 3 miles and reach a maximum height of approximately 20 feet to the top of the rail. This alignment would return to grade just north of Nevada Avenue and would connect to the BNSF Alternative traveling through Corcoran at-grade, on the western side of the BNSF corridor. The total length of the Hanford West Bypass 1 Alternative would be approximately 28 miles.

The Hanford West Bypass 1 Alternative includes a design option where the alignment would be below-grade between Grangeville Boulevard and Houston Avenue. The alignment would travel below-grade in an open cut with side slopes as it transitions to a retained-cut profile,

approximately 40 feet below ground level. As the alignment transitions back to grade just north of Houston Avenue, the open cut profile would be used once more. The alignment would cross SR 198 and several local roads. South Peach Avenue, East Clarkson Avenue, East Barrett Avenue, Elder Avenue, and South Tenth Avenue would be closed at the HST right-of-way, while the other roads would be realigned and/or grade-separated from the HST with overcrossings or undercrossings. Grade separations at Grangeville Boulevard, 13th Avenue, and West Lacy Boulevard would be determined based on the alignment design option selected (at-grade or below-grade).

The potential Kings/Tulare Regional Station–West Alternative would be sited along this alignment east of 13th Avenue, between Lacey Boulevard and the San Joaquin Valley Railroad spur. This potential station includes at-grade and below-grade design options as well.

Hanford West Bypass 2 Alternative. The Hanford West Bypass 2 Alternative Alignment would be the same as the Hanford West Bypass 1 Alternative from East Kamm Avenue to just north of Jackson Avenue, but at this point the Hanford West Bypass 2 Alternative would curve away to the east from the Hanford West Bypass 1 alignment. The Hanford West Bypass 2 Alternative would then travel over Kent Avenue, the BNSF right-of-way, and Kansas Avenue on an elevated structure approximately 1.5 miles in length. The structure would reach a maximum height of 55 feet to the top of the rail before returning to grade north of Lansing Avenue and continuing along the BNSF corridor. Similar to the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative would travel over Cross Creek and the special aquatic features north of Corcoran and return to grade north of Nevada Avenue; however, the Hanford West Bypass 2 Alternative would be on the eastern side of the BNSF tracks to connect to either the Corcoran Elevated Alternative or the Corcoran Bypass Alternative. Like the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative would have a total length of approximately 28 miles.

The Hanford West Bypass 2 Alternative includes the same below-grade design option as the Hanford West Bypass 1 Alternative between Grangeville Boulevard and Houston Avenue as well as both at-grade and below-grade options at the potential Kings/Tulare Regional Station–West Alternative. Similar to the Hanford West Bypass 1 Alternative, the Hanford West Bypass 2 Alternative would cross SR 198 and several local roads. Road closures would be the same as those for the Hanford West Bypass 1 Alternative, and roadway modifications at Grangeville Boulevard, 13th Avenue, and West Lacey Boulevard would depend on the alignment design option selected.

Corcoran Elevated Alternative. The Corcoran Elevated Alternative Alignment would be the same as the corresponding section of the BNSF Alternative from approximately Nevada Avenue south of Hanford to Avenue 136, except that it would pass through the city of Corcoran on the eastern side of the BNSF right-of-way on an aerial structure. The aerial structure begins at Niles Avenue and returns to grade south of 4th Avenue. It would reach a maximum height of approximately 51 feet to the top of the rail. The total length of the Corcoran Elevated Alternative would be approximately 10 miles. An intrusion protection barrier would be required in the at-grade portion of the alignment from north of Nevada Avenue to just north of Niles Avenue due to the proximity of the BNSF and HST rights-of-way. This barrier would be approximately 2 miles in length. Approximately 0.2 miles of BNSF tracks would be realigned at Patterson Avenue.

Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43 and pass over several local roads on an elevated aerial structure. Santa Fe Avenue would be closed at the HST right-of-way.

Corcoran Bypass Alternative. The Corcoran Bypass Alternative Alignment would diverge from the BNSF Alternative at Nevada Avenue and swing east of Corcoran, rejoining the BNSF Railway route at Avenue 136. The total length of the Corcoran Bypass would be approximately 10 miles. An intrusion protection barrier would be required in the vicinity of Nevada Avenue due to the proximity of BNSF and HST rights-of-way. Similar to the corresponding section of the BNSF Alternative, the majority of the Corcoran Bypass Alternative would be at-grade. However, one elevated structure would carry the HST over SR 43, the BNSF tracks, and the Tule River. The structure would reach a maximum height of approximately 45 feet to the top of the rail.

Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in the at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43, Whitley Avenue/SR 137, and several local roads. SR 43, Waukena Avenue, and Whitley Avenue would be grade-separated from the HST with an overcrossing or undercrossing; other roads, including Niles Avenue, Orange Avenue, and Avenue 152, would be closed at the HST right-of-way.

Allensworth Bypass Alternative. The Allensworth Bypass Alternative Alignment would pass west of the BNSF Alternative to avoid the Allensworth ER and the Colonel Allensworth State Historic Park. This alignment was refined over the course of environmental studies to reduce impacts to wetlands and orchards. The total length of the Allensworth Bypass Alternative Alignment would be approximately 21 miles; the alternative would begin at Avenue 84 and rejoin the BNSF Alternative at Elmo Highway. The Allensworth Bypass Alternative would be constructed on an elevated structure only where the alignment crosses Deer Creek and the Stoil railroad spur. The majority of the alignment would pass through Tulare County at-grade.

Dedicated wildlife crossing structures would be provided from approximately Avenue 84 to Poso Creek at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Deer Creek and the Poso Creek crossings.

The Allensworth Bypass would cross several roads, including County Road J22, Avenue 24, Garces Highway, Woollomes Avenue, Magnolia Avenue, Pond Road, and Elmo Highway. Avenue 24, Woollomes Avenue, and Elmo Highway would be closed at the HST right-of-way, and the other roads would be realigned and/or grade-separated from the HST with overcrossings.

Wasco-Shafter Bypass Alternative. The Wasco-Shafter Bypass Alternative Alignment would diverge from the BNSF Alternative between Taussig Avenue and Zachary Avenue, cross over to the eastern side of the BNSF tracks and bypassing Wasco and Shafter to the east. The Wasco-Shafter Bypass Alternative would be at-grade except where it travels over 7th Standard Road and the BNSF tracks to rejoin the BNSF Alternative. This aerial structure would reach a maximum height of 75 feet to the top of the rail. Approximately 4 miles of Santa Fe Way would be shifted to the west of the proposed alignment from approximately Galpin Street to south of Renfro Road to accommodate the HST right-of-way. The total length of the alternative alignment would be 21 miles.

The Wasco-Shafter Bypass was refined to avoid the Occidental Petroleum tank farm and a historic property potentially eligible for listing on the National Register of Historic Places. The Wasco-Shafter Bypass would cross SR 43, SR 46, East Lerdo Highway and several local roads. Some roads, such as SR 46, Kimberlina Road, Shafter Avenue, Beech Avenue, Cherry Avenue,

and Kratzmeyer Road would be grade-separated from the HST with overcrossings/undercrossings; other roads would be closed at the HST right-of-way.

Bakersfield South Alternative. From the Rosedale Highway (SR 58) in Bakersfield, the Bakersfield South Alternative alignment parallels the BNSF Alternative at varying distances to the north. At Chester Avenue, the Bakersfield South Alternative curves south and parallels California Avenue. As with the BNSF Alternative, the Bakersfield South Alternative would begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to its terminus at Oswell Street. The elevated section would range in height from 50 to 90 feet to the top of the rail. The realignment of the BNSF tracks from Jomani Drive to Glenn Street in Bakersfield would be required, as it is for the BNSF Alternative. Dedicated wildlife crossing structures would not be installed between 100 and 500 feet to the north and south of the Kern River, because the Bakersfield South Alternative would be elevated.

The Bakersfield South Alternative would be approximately 12 miles and would cross the same roads as the corresponding portion of the BNSF Alternative. This alternative includes the Bakersfield Station–South Alternative.

Bakersfield Hybrid Alternative. From Rosedale Highway (SR 58) in Bakersfield, the Bakersfield Hybrid Alternative follows the Bakersfield South Alternative as it parallels the BNSF Alternative at varying distances to the north. At approximately A Street, the Bakersfield Hybrid Alternative diverges from the Bakersfield South Alternative, crosses over Chester Avenue and the BNSF right-of-way in a southeasterly direction, and then curves back to the northeast to parallel the BNSF tracks toward Kern Junction. After crossing Truxtun Avenue, the alignment curves to the southeast to parallel the UPRR tracks and Edison Highway to its terminus at Oswell Street. As with the BNSF and Bakersfield South alternatives, the Bakersfield Hybrid Alternative would begin at-grade and become elevated starting at Country Breeze Place through Bakersfield to Oswell Street. The elevated section would range in height from 30 to 90 feet to the top of the rail. The realignment of the BNSF tracks from Jomani Drive to Glenn Street in Bakersfield would be required, as it is for both the BNSF and the Bakersfield South alternatives. Dedicated wildlife crossing structures would not be installed between 100 and 500 feet to the north and south of the Kern River, because the Bakersfield Hybrid Alternative would be elevated.

The Bakersfield Hybrid Alternative would be approximately 12 miles long and would cross many of the same roads as the BNSF and Bakersfield South alternatives. This alternative includes the Bakersfield Station–Hybrid Alternative.

Table 2-5
Aerial Structures

County	Alternative	Miles[1]	Orientation and Reason for Aerial Structure
Fresno	BNSF Alternative	0.02	Crossing over Fresno Street
Fresno	BNSF Alternative	1.24	Crossing over E. North Avenue and Highway 99
Fresno	BNSF Alternative	0.03	Crossing over S. Highland Avenue
Fresno	BNSF Alternative	0.06	Crossing over Cole Slough
Fresno	BNSF Alternative	0.01	Crossing over local road
Fresno	BNSF Alternative	0.92	Crossing over E. Conejo, railroad tracks, and S. Peach Avenue
Fresno	Hanford West Bypass 1 Alternative	0.8	Crossing over the Kings River complex and Murphy Slough

Table 2-5
Aerial Structures

County	Alternative	Miles[1]	Orientation and Reason for Aerial Structure
Fresno	Hanford West Bypass 2 Alternative	1.5	Crossing over Kent Avenue, the BNSF Railway right-of-way and Kansas Avenue
Kings	Hanford West Bypass 1 Alternative	3	Crossing over Cross Creek and special aquatic features that exist north of the city of Corcoran
Kings	Hanford West Bypass 2 Alternative	3	Crossing over Cross Creek and special aquatic features that exist north of the city of Corcoran
Kings	Through Corcoran - East BNSF	3.69	Running parallel to train tracks
Kings	Corcoran Bypass	0.06	Crossing over Central Valley Highway
Kings	Corcoran Bypass	0.02	Crossing Whitely Ave
Kings	Corcoran Bypass	1.65	Crossing over train tracks and Cross Creek
Kings	BNSF Alternative	0.06	Crossing over Central Valley Highway
Kings	BNSF Alternative	1.87	Crossing over train tracks and Cross Creek
Kings	BNSF Alternative	0.59	Running parallel to train tracks
Kings	BNSF Alternative	0.12	Crossing over Dutch John Cut
Kings	BNSF Alternative	0.12	Crossing over Kings Creek
Kings	BNSF Alternative	1.97	Crossing over Grangeville Boulevard, train tracks and Highway 198
Tulare	Allensworth Bypass	1.28	Crossing Deer Creek, Spa Avenue and Avenue 68
Tulare	BNSF Alternative	1.30	Crossing over Deer Creek and running parallel to train tracks
Tulare	Corcoran Bypass	1.21	Crossing over Avenue 44, SR 43, train tracks and Tule River
Tulare	BNSF Alternative	0.06	Crossing over Tule River
Kern	Allensworth Bypass	0.03	Crossing over Poso Creek
Kern	BNSF Alternative	1.17	Running parallel to train tracks crossing over Poso Creek and Taussing Avenue
Kern	BNSF Alternative	6.71	Crossing over Calloway Drive, Coffee Road, Friant-Kern Canal, Cross Valley Canal, Kern River, Truxton Avenue, Highway 99, Oak Street, Chester Avenue, Union Avenue and Eureka Street
Kern	Bakersfield South	6.86	Crossing over Calloway Drive, Coffee Road, Friant-Kern Canal, Cross Valley Canal, Kern River, Truxton Avenue, Highway 99, Oak Street, Chester Avenue, Union Avenue and Butte Street
Kern	Bakersfield Hybrid	6.86	Crossing over Calloway Drive, Coffee Road, Friant-Kern Canal, Cross Valley Canal, Kern River, Truxton Avenue, Highway 99, Oak Street, Chester Avenue, Union Avenue and Butte Street
Kern	BNSF Alternative	2.63	Crossing over Highway 46 running parallel to train tracks till crossing over the tracks at Jackson Avenue/Wasco Avenue

Table 2-5
Aerial Structures

County	Alternative	Miles[1]	Orientation and Reason for Aerial Structure
Kern	BNSF Alternative	3.18	Running parallel to train tracks and S Central Valley Highway then crossing the tracks and running parallel to Santa Fe Way
Kern	BNSF Alternative	0.01	Crossing Kimberlina Road
Kern	Wasco-Shafter Bypass	2.42	Running parallel to Santa Fe Way and train tracks, crossing tracks and running parallel on to Santa Fe Way on the other side
Kern	Wasco-Shafter Bypass	0.69	Crossing over Central Valley Highway
[1] Miles of aerial structures shown in table are for all possible alignments. At final build, only one alignment will be constructed.			

2.4 Construction Methods

The Authority may begin construction activities at any point along the initial construction segment (ICS) of the statewide HST alignment. The ICS is approximately 130 miles long. It mostly overlaps with the Fresno to Bakersfield segment, but a 25-mile portion of it is in the Merced to Fresno Section. Currently, the ICS is divided into four distinct construction packages. Ground disturbance may occur concurrently within any of the construction packages and in more than one location at a time. This discussion of construction methods includes pre-construction activities, major construction activities, construction utility requirements and waste disposal, and construction materials and equipment.

2.4.1 Pre-Construction Activities

During final design, the Authority and its contractor would conduct a number of pre-construction activities to determine how best to stage and manage the actual construction. These activities would include the following:

- Conducting geotechnical investigations which would focus on defining precise geology, groundwater, seismic, and environmental conditions along the alignment. The results of this work would guide final design and construction methods for foundations, underground structures, tunnels, stations, grade crossings, aerial structures, systems, and substations.
- Identifying staging areas and precasting yards which would be needed for the casting, storage, and preparation of precast concrete segments, temporary spoil storage, workshops, and the temporary storage of delivered construction materials. Field offices and/or temporary jobsite trailers would also be set up at the staging areas.
- Initiating site preparation and demolition, such as clearing, grubbing, and grading, followed by the mobilization of equipment and materials. Demolition would require strict controls to ensure that adjacent buildings or infrastructure are not damaged or otherwise affected by the demolition efforts.
- Relocating utilities, where the contractor would work with the utility companies to relocate or protect in place such high-risk utilities as overhead tension wires, pressurized transmission mains, oil lines, fiber optics, and communications prior to construction.

- Implementing temporary, long-term, and permanent road closures to re-route or detour traffic away from construction activities. Handrails, fences, and walkways would be provided for the safety of pedestrians and bicyclists.

- Siting the temporary batch plants that would be required to produce the Portland cement concrete or asphaltic concrete needed for roads, bridges, elevated structures, retaining walls, and other large structures. These plants generally consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; aboveground storage tanks; and designated areas for sand gravel truck unloading, concrete truck loading, and concrete truck washout. The contractor would be responsible for implementing procedures for reducing air emissions, mitigating noise impacts, and reducing the discharge of potential pollutants into storage drains or watercourses from the use of equipment, materials, and waste products.

- Conducting other studies and investigations, as needed, such as local business surveys to identify business usage, delivery, shipping patterns, and critical times of the day or year for business activities. This information would help develop construction requirements and worksite traffic control plans, and will identify potential alternative routes, cultural resource investigations, and historic property surveys.

2.4.2 Major Construction Activities

Four major types of construction activities (earthwork; construction of bridges, aerial structures, and road crossings; construction of railroad systems; and construction of stations) are briefly described below. No tunnel construction is proposed for the Fresno to Bakersfield HST Section, so this construction element is not discussed.

2.4.2.1 Earthwork

Earth support is an important factor in constructing the deep excavations that would be encountered on several alignment sections. It is anticipated that the following excavation support systems may be used along the route. The three general excavation support categories are described below.

- Open Cut Slope. Open cut slope is used in areas where sufficient room is available to open-cut the area and slope the sides back to meet the adjacent existing ground. The slopes are designed similar to any cut slope (i.e., the natural repose angle of adjacent ground material and global stability are taken into account).

- Temporary. Temporary excavation support structures are designed and installed to support vertical or near vertical excavation faces in areas where room to open-cut does not exist. These structures do not contribute to the final load carrying capacity of the trench structure and they are either abandoned in place or dismantled as the excavation is being backfilled. Generally, a temporary excavation support structure consists of soldier piles and lagging, sheet pile walls, slurry walls, secant piles, or tangent piles.

- Permanent. Permanent structures are designed and installed to support vertical or near vertical excavation faces in areas where room to open-cut does not exist. These structures form part of the permanent final structure. Generally permanent structures consist of slurry walls, secant piles, or tangent pile walls.

2.4.2.2 Construction of Bridge, Aerial Structure and Road Crossing

Each bridge or aerial structure would contain two tracks (one in each direction). All of the stations in the Fresno to Bakersfield Section would be elevated, and a station would be four

tracks (two for local trains that would stop at the station and two for express trains that would pass through). Station tracks would be 6,000 feet long with the station at the center. Of the four tracks passing through the station, the two express tracks (for trains that do not stop at the station) would be separated from those that stop at the station and platforms. In constructing the station tracks, more than one dual track aerial structure may be necessary.

Similar to existing high-speed rail systems around the world, it is anticipated that the bridges and aerial structures will be designed and built as single box segmental girder. Where needed, other structural types will be considered and used, including steel girders, steel truss, and cable-supported structures.

- Foundations. A typical aerial structure foundation pile cap is supported by an average of 4 large diameter bored piles with diameters ranging from 5 to 9 feet. The depth of the piles depends on geotechnical site conditions. Pile construction can be achieved by using rotary drilling rigs, and either bentonite slurry or temporary casings may be used to stabilize pile shaft excavation. The estimated pile production rate is 4 days per pile installation. Additional pile installation methods available to the contractor include bored piles, rotary drilling cast-in-place piles, driven piles, and a combination of pile jetting and driving.

  On completing the piles, pile caps can be constructed using conventional methods. For pile caps constructed near existing structures (e.g., the railway, bridges, underground drainage culverts), temporary sheet piling can be used to minimize disturbances to adjacent structures. It is anticipated that sheet piling installation and extraction is achieved using hydraulic sheet piling machines.

- Substructure. Aerial structures with pier heights ranging from 20 to 90 feet may be constructed using conventional jump form and scaffolding methods. A self-climbing formwork system may be used to construct piers and portal beams over 90 feet high. The self-climbing formwork system is equipped with a winched lifting device, which is raised up along the column by hydraulic means with a structural frame mounted on top of the previous pour. In general, a 3-day cycle for each 12-foot pour height can be achieved. The final size and spacing of the piers depends on the type of superstructure and spans they are supporting.

- Superstructure. It will be necessary to consider the loadings, stresses, and deflections encountered during the various intermediate construction stages, including changes in static scheme, sequence of tendon installation, maturity of concrete at loading, and load effects from erection equipment. As a result, the final design will depend on the contractor's means and methods of construction and can include several different methods, such as a span-by-span, incrementally launched, progressive cantilever, and balanced cantilever.

The spans between piers for aerial structures would generally be on the order of 100 to 130 feet. In addition to the track structure, the aerial structure would also support the power system, cable ducts for low-voltage power cables and fiber-optic cables, a service walkway running the length of the structure, and a low parapet wall to protect the walkway and prohibit access. The permanent right-of-way required to support the system would be 60 feet wide for elevated structures.

Long aerial structures may include staircases to the ground. These stairs would provide access to the guideway for HST staff to undertake routine inspection and maintenance, usually during the nighttime, when normal HST service is suspended. These stairs would also provide an emergency evacuation route for passengers.

Road crossings of existing railroads, roads, and the HST would be constructed on the line of the existing road or offline at some locations. When constructed online, the existing road would be

closed or temporarily diverted. When constructed offline, the existing road would be maintained in use until the new crossing is completed.

Construction of foundations and substructure would be similar to that for the aerial structures, but reduced in size. The superstructure would likely be constructed using precast, prestressed, concrete girders and cast-in-place deck. Approaches to the over bridges would be earthwork embankments, mechanically stabilized earth wall, or other retaining structures.

2.4.2.3 Construction of Railroad Systems

The railroad systems are to include trackwork, traction electrification, signaling, and communications. After completion of earthwork and structures, trackwork is the first rail system to be constructed, and it must be in place to start traction electrification and railroad signalizing installation.

Trackwork construction generally requires the welding of transportable lengths of steel running onto longer lengths (approximately 0.25 mile), which are placed in position on crossties or track slabs and field-welded into continuous lengths.

Both tie and ballast as well as slab track construction would be used. Tie and ballast construction, which would be used for at-grade and minor structures, typically uses cross ties and ballasts that are distributed along the trackbed by truck or tractor. In sensitive areas, such as where the HST is parallel to or near streams, rivers, or wetlands, and in areas of limited accessibility, this operation may be accomplished by using the established right-of-way with material delivery via the constructed rail line. For major civil structures, slab track construction would be used. Slab track construction is a non-ballasted track form employing precast track supports.

The traction electrification equipment to be installed would include traction power substations and the OCS. Traction power substations are typically fabricated and tested in a factory, then delivered by tractor-trailer to a prepared site adjacent to the alignment. It is assumed that substations are to be sited every 30 miles along the alignment. The OCS would be assembled in place over each track and would include poles, brackets, insulators, conductors, and other hardware.

The signaling equipment to be installed includes wayside cabinets and bungalows, wayside signals (at interlocking), switch machines, insulated joints, impedance bounds, and connecting cables. The equipment will support automatic train protection, automatic train control, and positive train control to control train separation, routing at interlocking, and speed.

2.4.2.4 Construction of Stations

The HST stations for the Fresno to Bakersfield Section would be newly constructed. HST stations require significant coordination and planning to accommodate safe and convenient access to existing businesses and residences and traffic control during construction periods. The typical construction sequence would be:

- Demolition and Site Preparation. The contractor would be required to construct detour roadways, new station entrances, construction fences and barriers, and other elements required because the existing facilities on the worksite are taken out of service. The contractor would be required to perform street improvement work, site clearing and earthwork, drainage work, and utility relocations. Substations and maintenance facilities are assumed to be newly constructed structures. For platform improvements or additional platform construction, the contractor may be required to realign existing track.

- Structural Shell and Mechanical/Electrical Rough-Ins. For these activities, the contractor would construct foundations and erect the structural frame for the new station, enclose the new building, and/or construct new platforms and connect the structure to site utilities. The contractor would also 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, communications and security equipment, finishes, and signage. The contractor may also install other tenant improvements, if requested.

2.4.3 Construction Utility Requirements and Waste Disposal

The contractors for the HST system would need to use water for construction activities, such as demolition of surface and subsurface features, dust control, soil compaction, landscape restoration, concrete work, general cleanup, hygiene, and drinking. If no water sources exist near a construction site, then the contractors would use tanker trucks, storage tanks, and water towers to provide water to the site.

Contractors would temporarily store excavated materials produced by construction activities in designated areas at or near the construction site. Wherever possible, they would return excavated soil to its original location to be used as backfill and would dispose of waste materials associated with construction in local landfills permitted to take those types of materials. Material unsuitable for reuse would be hauled offsite to a permitted location in conformance with FESA.

2.4.4 Construction Materials and Equipment

The materials required for construction would include steel rails, building materials for the The materials required for construction would include steel rails; building materials for the maintenance facilities, control buildings, and power supply facilities; concrete; reinforcing steel; ballast; cement; aggregates; specialized train system components; fuel; and water. The materials would be delivered and stored at the project site for use.

Fill material would be excavated from local borrow sites and hauled by truck to the preferred alignment. Railroad ballast would be drawn from existing, permitted quarries in various locations, from the Bay Area to Southern California. Ballast would be delivered by a combination of rail and trucks. All materials would be suitable for construction purposes and free from toxic pollutants in toxic amounts in accordance with Section 307 of the Clean Water Act. In procuring fill materials to build the grade-separated alignment, the contractor will source the materials in conformance with the FESA.

Various types of construction equipment will be used in the different phases of the project. The types of equipment associated with the different construction phases are listed in Appendix A.

2.5 Construction Schedule

This section describes the construction staging and schedule.

2.5.1 Construction Staging

As much as practical, construction staging will utilize the same areas that will ultimately be occupied by permanent HST facilities. For example, staging areas will be placed at the future locations of the HST maintenance yards in Fresno and Bakersfield.

Five additional staging areas will be set up at various points along the HST right-of-way. These staging areas will be spaced roughly evenly between Fresno and Bakersfield, and will be chosen for their easy access to the local road network and highways.

2.5.2 Construction Schedule

Project construction would generally occur in 8-hour shifts between 7 a.m. and 7 p.m., 6 days per week. Occasionally, double shifts may also be required and would be subject to local regulations regarding construction hours..

The specific construction phases and durations are presented in Table 2-6.

Table 2-6
Construction Schedule

Phase	Tasks	Duration
Right-of-Way Acquisition	Per Assembly Bill 3034, proceed with right-of-way acquisitions once State Legislature appropriates funds in annual budget	TBD
Survey and Preconstruction	Locate utilities, establish right-of-way and project control points and centerlines, and establish or relocate survey monuments	TBD
Mobilization	Mobilize safety devices and special construction equipment	March–October 2013
Site Preparation	Relocate utilities; clear/grub right-of-way; establish detours and haul routes; prepare construction equipment yards, stockpile materials, and establish precast concrete segment casting yard	April–August 2013
Earth Moving	Prepare excavations and earth support structures	August 2013–August 2015
Construction of Road Crossings	Prepare surface street modifications and grade separations	June 2013–December 2017
Construction of Aerial Structures	Construct aerial structures and bridge foundations, substructures, and superstructures	June 2013–December 2017
Track Laying	Lay tracks, including backfilling operations and drainage facilities	January 2014–August 2017
Systems	Prepare train control systems, overhead contact system, communication system, signaling equipment	July 2016–November 2018
Demobilization	Demobilize, including site cleanup	August 2017–December 2019
HMF Phase 1 [a]	Assemble test track and prepare storage	August–November 2017
Maintenance-of-Way Facility	Potentially co-located with HMF[a]	January–December 2018
HMF Phase 2 [a]	Assemble test track	June–December 2018
HMF Phase 3 [a]	Assemble HMF	January–July 2021
HST Stations	Prepare/conduct demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Fresno: December 2014–October 2019 Kings/Tulare Regional: TBD[b] Bakersfield: January 2015–November 2019

Notes:
[a] HMF would be sited in either the Merced to Fresno Section or the Fresno to Bakersfield Section.
[b] Right-of-way would be acquired for the Kings/Tulare Regional Station once it is decided that it will be constructed; however, the station itself would not be part of initial construction.

HMF = heavy maintenance facility
HST = high-speed train
TBD = to be determined

2.6 Operations and Maintenance

This section describes the train schedule, lighting, and maintenance and inspection activities.

2.6.1 Train Service

Three categories of trains would be operated: express, limited-stop, and all-stop trains (Authority and FRA 2008). Express trains would run between major stations (e.g., San Francisco, Los Angeles, San Diego). An express train could make the trip between San Francisco and Los Angeles in 2 hours and 40 minutes. Limited-stop trains would skip selected stops along the route to provide faster service between stations. All-stop trains would focus on regional service.

2.6.2 Lighting

In general, the right-of-way would not be lighted except at stations and associated maintenance and electrical facilities. Station lighting would be designed to provide safety for arriving and departing passengers within urban areas. Maintenance and electrical facilities would have permanent lighting for both interior and exterior areas, as needed to support operations, including those operations that require lighting 24 hours per day. Typically, exterior lights would be mounted on tall masts, towers, or poles and illuminate the area with sodium- or mercury-vapor light. The lights would be angled toward the ground to limit reflectance on the surrounding community.

2.6.3 Maintenance and Inspection Activities

During operation of the HST system, programmed inspection and maintenance would be performed to verify that the project components are functioning as required. The Authority would regularly perform maintenance along the track and railroad right-of-way as well as the power systems, train control, signalizing, communications, and other vital systems required for the safe operation of the HST system. Maintenance for the HST will include the following activities:

- Inspection and repair of the rail line, the power supply system, structures, signaling/control components, stations and the maintenance facilities.
- Drain cleaning, vegetation control, and litter removal along the right-of-way, aerial structures, and bridge sections.

Long-term maintenance may include intermittent activities, such as replacing short lengths of rail or ballast. A maintenance-of-way program will be instituted to schedule inspection and maintenance activities.

2.7 Conservation Measures to Be Incorporated into Project Design

To avoid and minimize the effects of the project on federally listed species, a number of conservation measures will be implemented. These measures are intended to reduce direct and indirect effects from project construction and operation (including maintenance activities) to listed species.

Compliance with applicable environmental regulations will further mitigate potential impacts, and the BO issued at the end of this formal consultation process will result in additional project-specific avoidance and minimization measures.

The FRA and Authority will require the use of best management practices (BMPs) and avoidance and minimization measures to reduce or avoid effects to federally listed species. Compensatory mitigation will be proposed where effects to listed species and their habitats cannot be avoided. General avoidance, minimization, and compensatory mitigation measures for potential adverse effects to federally listed species are listed below. Species-specific conservation measures are described in more detail in Chapter 5.

2.7.1 Avoidance and Minimization Measures

This section describes the general avoidance and minimization measures proposed to reduce project effects on federally listed species. General measures include:

- Construction work window restrictions.
- Pre-construction surveys.
- Contractor education and environmental training.
- Biological monitoring during construction activities.
- Use of environmentally sensitive area fencing, wildlife exclusion fencing, and non-disturbance zones.
- Installation of artificial dens along wildlife exclusion fencing.
- Avoidance of entrapment of federally-listed species.
- Capture and relocation of federally listed wildlife species.
- Avoidance of species entrapment within trenches.
- Restoration of temporarily disturbed areas.
- Off-site cleaning of construction equipment before it accesses the work area.
- Dewatering/water diversion.
- Construction site speed limits.

2.7.1.1 Construction Work-Window Restrictions

Due to the number of federally listed species potentially affected by the project and the conflicting potential construction work windows for each species or their habitat, construction work window restrictions will be determined through agency consultation. Because these restrictions may not reduce effects on all federally listed wildlife species, additional measures may be required, as determined by the natural resource regulatory agencies. These measures may include provision of non-disturbance zones, additional site- or species-specific biological monitoring, or approved passive or active relocation of species. Additional measures (e.g., non-disturbance exclusion zones, resource and species monitoring) may be necessary to avoid and minimize effects to listed species when construction work window restrictions are not feasible.

Construction work window restrictions for wetlands and other waters of the U.S. will be implemented to reduce direct and indirect effects of construction activities on federally listed species within those habitats. Construction activities in wetlands and other waters of the U.S. (e.g., vernal pools, seasonal wetlands, seasonal riverine areas, and riparian areas) will be restricted during the rainy season (October 15 to June 1, or April 15 if no inundation is present) or will be conducted when the resource is dry and/or lacks flowing or standing water. In the event that construction work window restrictions cannot be conducted, dewatering, water diversions, or additional BMPs will be employed as determined through consultation with the U.S. Army Corps of Engineers (USACE), USFWS, and the State Water Resources Control Board (SWRCB). Additional avoidance and minimization measures may be necessary to avoid or minimize effects to listed species when construction work window restrictions are not feasible (e.g., non-disturbance exclusion zones, resource and species monitoring, etc.).

2.7.1.2 Pre-Construction Surveys

Prior to the start of construction and where appropriate, a qualified biologist(s) will conduct preconstruction survey(s) for federally listed species (plants and wildlife), wetlands, and other waters of the U.S. Pre-construction surveys will be conducted (1) in general accordance with the appropriate technical guidance documents approved by the USACE, USFWS, California Department of Fish and Game (CDFG), and the California Native Plant Society (CNPS) and (2) in accordance with standard professional practice.

Based on the results of the pre-construction surveys, additional avoidance and minimization measures may be implemented including those discussed below.

2.7.1.3 Contractor Education and Environmental Training

Personnel who work onsite will attend a contractor education and environmental training session. The environmental training will cover general and specific biological and legal information on federally listed species and their habitats. The training sessions will be given prior to the initiation of construction activities and repeated, as needed. Updates and synopsis of the training will be provided during the daily safety ("tailgate") meeting. HST maintenance crews will be required to attend a contractor education and environmental training class annually.

2.7.1.4 Biological Monitoring during Construction Activities

A qualified USFWS-approved biological monitor will be present onsite during key construction activities, including during ground disturbance activities and for all construction activities conducted within or adjacent to identified Environmentally Sensitive Areas (ESAs), wildlife exclusion fence zones (WEF), or non-disturbance zones to oversee permit compliance and monitoring efforts. The onsite biological monitor would advise the contractor on methods that may minimize or avoid impacts on federally listed species.

2.7.1.5 Environmentally Sensitive Areas, Wildlife Exclusion Fencing and Non-Disturbance Zones

Fencing will be used to establish non-disturbance exclusion zones to restrict construction equipment and personnel from ESAs or restrict federally listed wildlife species from entering the construction areas. ESAs will include sensitive habitats that may support federally listed species and areas within buffers for federally listed species, as identified by the regulatory agencies in their permit documents. The non-disturbance zones will be determined through consultation and permitting with the various natural resources regulatory agencies.

Two types of fencing, high visibility ESA fence and WEF, will be used for these purposes. ESA fencing will be identified and depicted on the project plans and delineated in the field by the biological monitor. The contractor will ensure that all ESA areas are off-limits to construction personnel and equipment. Species-appropriate WEF will be installed along the outer perimeter of ESA fencing.

2.7.1.6 Artificial Dens Along the Wildlife Exclusion Fencing and Non-Disturbance Zones

The installation of ESA fencing and WEF around sensitive resource areas could lead to as much as 7 miles of linear obstruction to wildlife movement and migration in natural habitat areas for 2 to 5 consecutive years. To mitigate the impacts of ESA and WEF on federally listed wildlife species and their movement/migration corridors, artificial dens will be installed along the outer perimeter of the fencing.

To further mitigate the effects of project operations on wildlife movement and migration corridors, the following measures will be implemented:

- Design plans will be further refined to identify optimal wildlife-friendly crossing locations within linkages in the Allensworth area (i.e., the SR 46/SR 155 and Deer Creek-Sand Ridge linkages). Optimal wildlife corridor locations will be sited to coincide with existing natural habitats, as feasible.
- Artificial dens will be installed at dedicated wildlife crossing structures (Figures 2-10a and 2-10b) to prevent predation by larger predators at wildlife undercrossings and to provide escape cover for wildlife (e.g., San Joaquin kit fox).

2.7.1.7 Capture and Relocation of Federally listed Wildlife Species

Federally listed wildlife species detected within the project footprint during construction will be relocated by the biological monitor in accordance with agency guidance, as approved by the USFWS and appropriate natural resources agencies.

2.7.1.8 Avoidance of Entrapment of Federally Listed Species

At the end of each work day, all excavated, steep-walled holes or trenches that are more than 2 feet deep will be covered using plywood or similar materials or provided with escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. All culverts or similar enclosed structures with a diameter of 4 inches or greater that are stored at a construction site will be inspected for common and special-status wildlife species before the pipe is subsequently used or moved.

2.7.1.9 Restoration of Temporarily Disturbed Areas

Temporarily disturbed biological communities or habitats that could support federally listed species and wetlands and other waters of the U.S. will be restored to pre-project conditions. Restoration activities will include, but not be limited to: grading landform contours to approximate pre-disturbance conditions, re-vegetating temporarily disturbed areas using native plant species to the extent possible, and using certified weed-free straw and mulch.

A site restoration plan will be prepared to identify appropriate restoration activities, establish a monitoring schedule, describe the materials that should be used, identify timing of the work, identify monitoring requirements and success criteria, and recommend contingency measures.

2.7.1.10 Cleaning Of Construction Equipment

During construction, equipment will be washed and mud and plant materials will be removed from construction equipment when working in areas that could support federally listed plant or wildlife species.

2.7.1.11 Dewatering/Water Diversion

If construction occurs where open or flowing water is present, a strategy approved by the resource agencies (e.g., USFWS, USACE, SWRCB, and CDFG) will be used to dewater or divert water from the work area.

2.7.1.12 Construction Site Speed Limits

To minimize dust levels and the potential construction equipment to strike federally listed species, a speed limit of 20 mph will be enforced during project construction for all vehicles operating in construction areas.

2.7.2 Compensatory Mitigation for Effects to Federally Listed Species

Compensatory mitigation for impacts to wetlands and/or natural habitats that have the ability to support federally listed species is proposed as part of the project description for the Fresno to Bakersfield Section of the HST system. Compensatory mitigation usually occurs in advance of, or concurrent with, the impacts to be mitigated but may occur after such impacts in special circumstances.

Compensatory mitigation for direct effects to federally listed species will occur at locations determined through consultation with the appropriate regulatory agencies. Compensatory mitigation may be accomplished by creation, restoration, enhancement, or preservation of lands through a combination of the following:

- Purchase of credits from an agency-approved mitigation bank.
- Through in-lieu fee, contribution determined through negotiation and consultation with USFWS.
- Fee-title acquisition of a Service-approved property.
- Purchase or establishment of a conservation easement with an endowment for long-term management of the conservation values.
- Funding the implementation of a conservation project to restore or enhance habitat.

The amount of compensatory mitigation proposed will be based on a mitigation ratio determined by the amount of impacts to habitats associated with federally listed species. Typical compensatory mitigation ratios gathered from previous BOs and guidelines are discussed below. Specific compensatory mitigation ratios will be determined through the formal consultation process.

Compensatory mitigation for various resources may overlap. For instance, compensatory mitigation for wetlands and waters of the U.S., such as vernal pools, may overlap with compensatory mitigation for federally listed species. In some instances, compensation for one species may also compensate for effects to another species.

A compensatory mitigation plan will be prepared and implemented. This plan will identify the compensatory mitigation locations, monitoring requirements, success criteria, and reporting requirements. The plan will be submitted to the appropriate natural resource regulatory agencies for review and approval.

Compensatory mitigation ratios for federally listed wildlife species for which guidelines do not currently exist are suggested below and elaborated upon in Chapter 5. However, the actual ratios used for the project may be higher or lower, depending on the results of the agency consultation.

2.7.2.1 Vernal pool tadpole shrimp and vernal pool fairy shrimp

The compensatory mitigation ratios for these species will be based on whether the proposed mitigation is preservation or creation and on whether it occurs at an approved conservation bank or at a non-bank location. The compensatory mitigation ratios may range from 1.1:1 to 2:1 based on the guidance proposed in the 1996 U.S. Army Corps of Engineers, *Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans Within the Jurisdiction of the Sacramento Field Office, California* (USFWS 1996a).

2.7.2.2 Valley elderberry longhorn beetle

The compensatory mitigation ratios for this species may vary from 1:1 to 8:1, depending on the presence of exit holes, and may include the planting of additional associated native plants and

the transplanting of directly affected elderberry shrubs during the dormancy period, as described within the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 2000).

2.7.2.3 California tiger salamander

The compensatory mitigation ratios for California tiger salamander will be based on the amount of impacts to habitats that support the species. Impacts to upland habitat may be mitigated at a ratio of 3:1.

2.7.2.4 Blunt-nosed leopard lizard

The compensatory mitigation ratios for blunt-nosed leopard lizard will be based on the amount of impacts to natural habitats that support the species. The total number of acres to be compensated for will be determined by the amount of impacts to suitable habitat that is determined through protocol-level surveys to support the species. Impacts to potentially suitable habitat may be mitigated at a ratio of up to 4:1.

2.7.2.5 Tipton kangaroo rats

The compensatory mitigation ratios for Tipton kangaroo rats will be based on the amount of impacts to natural habitats that support the species. Impacts to potentially suitable habitat may be mitigated at a ratio of up to 3:1.

2.7.2.6 San Joaquin kit fox

The compensatory mitigation ratios for effects to the San Joaquin kit fox are based on the location of effects (i.e., recovery plan area) and the type of habitat being affected (natural or developed) by the project. Natural habitats include alkali desert scrub, annual grasslands, pasture, and barren. Developed lands include various agricultural land uses (e.g., grain fields, orchards, croplands, hayfield, vineyards, and row crops) and urban areas.

Compensation for impacts to natural habitats will be mitigated at a ratio ranging between 2:1 and 3:1, depending on whether the land is in- or outside of an identified recovery area. Mitigation for impacts to natural habitats will be established in-kind, meaning that other suitable natural lands will be preserved, enhanced, or created for the San Joaquin kit fox.

Compensation for impacts to developed habitats (e.g., agricultural or urban land uses) will be provided at a ratio ranging between 0.1:1 and 0.5:1. Mitigation for impacts to these land uses will be mitigated out-of-kind, through the preservation, enhancement, or creation of suitable natural lands for the San Joaquin kit fox.

Furthermore, impacts to agricultural lands protected under the Williamson Land Act (prime farmland, farmland of state importance, unique farmland, and farmland of local importance) are proposed for preservation at a ratio no less than 1:1 in the *Agricultural Lands* section of the EIR/EIS. Currently, the agricultural impacts, and associated mitigation, to Williamson Land Act are estimated to be approximately 1,600 acres. Preservation of agricultural lands will maintain foraging and dispersal habitat for the San Joaquin kit fox in existing agricultural production.

A summary of the compensatory mitigation for the San Joaquin kit fox is provided in Table 2-7.

Table 2-7
Compensatory Mitigation Ratios Proposed for Direct Effects to the San Joaquin kit fox

San Joaquin kit fox Area	Habitat	Mitigation Ratio
Southwestern Tulare County Satellite Areas	Natural	3:1
	Developed	0.5:1
Metropolitan Bakersfield Satellite Area	Natural	3:1
	Developed	0.1:1
Recovery Plan-Linkage	Natural	3:1
	Developed	0.5:1
Outside of Recovery Areas	Natural	2:1
	Developed	0.1:1

Note:
Natural includes lands identified as annual grasslands, alkali desert scrub, barren and pasture.
Developed lands included agricultural areas (grain fields, orchards, croplands, hayfield, vineyards, and row crops) and urban areas.

Chapter 3
Action Area

3.0 Action Area

This chapter defines the terms used in this BA, summarizes and describes the vegetation communities and wildlife habitat types, and identifies some of the common land use practices observed during field surveys. This chapter establishes the environmental baseline by detailing the existing physical and biological conditions found within the study area. The vegetation communities and wildlife habitat types are described below.

3.1 Definitions

Four distinct terms are used within this BA to describe the areas studied and affected by the project: the project footprint, the action area, the resource study area, and the project area. These areas are defined and distinguished as follows, from the least inclusive to the most inclusive:

- The project footprint is the area that is physically impacted by the construction activities associated with the proposed action (including temporary disturbance) and the location of permanent project components. The footprint consists of the limits of cut and fill plus all access roads and areas required for operating, storing, and refueling construction equipment. More details regarding the project footprint and project activities are explained in Chapter 2 (Project Description).

- The action area is the area directly or indirectly affected by the proposed action. It encompasses the project footprint and all areas where direct, indirect, and other effects from activities that are interrelated and interdependent with the proposed action may occur to federally listed species. As defined by the FESA, indirect effects are those effects that are caused by or will result from the proposed construction activities and are later in time or farther removed in distance, but are still reasonably certain to occur. Indirect effects include, but are not limited to, changes to downstream water quality, noise, or light disturbance, or changes in air quality. Interrelated actions are those "that are part of a larger action and depend upon the larger action for their justification," while interdependent actions are those "having no independent utility apart from the proposed action" (50 CFR § 402.02). The action area includes the project footprint and a 1,000-foot buffer around it. The extent of adverse effects within the action area differs for each federally listed species based on the sensitivity of the species to disturbance. Depending on the species, the limit of indirect effects ranges from the project footprint plus a 100-foot buffer to the project footprint plus a 1,000-foot buffer. The limit of indirect effects within the action area is discussed on a species-by-species basis in Chapter 4, Species/Critical Habitat Considered).

- The resource study areas (RSAs) for the various biological resources (plants, wetlands, and wildlife) are the areas that biologists studied in the field surveys. The RSAs extend along the entire HST alignment from Fresno to Bakersfield and encompass portions of the action area. In certain locations, the RSA was expanded far beyond the action area in order to provide a more thorough analysis of the resource. These are broken into survey-effort defined areas. The three defined RSAs are as follows:

  - Botanical RSA: The Botanical RSA is the study area for botanical resources, including federally listed plants, sensitive natural communities, and elderberry shrubs. The Botanical RSA consists of the project footprint plus a 100-foot buffer.

  - Wetland RSA: The Wetland RSA is the study area for wetlands and other waters of the U.S. and the species that are dependent on them (e.g., vernal pool species). The Wetland RSA consists of the project footprint plus a 250-foot buffer.

- Wildlife RSA: The Wildlife RSA is the study area for wildlife habitat assessments and is defined as the proposed project footprint plus a 1,000-foot buffer. The Wildlife RSA is divided into three areas: a core, an auxiliary, and a supplemental RSA. The supplemental RSA is identified for select species that require further analysis based on agency or protocol-recommended species-specific buffers.

The three Wildlife RSAs are as follows:

- The core Wildlife RSA consists of the proposed project footprint plus a 250-foot buffer. These areas were physically surveyed, where permission to enter was granted.
- The auxiliary Wildlife RSA (which is measured laterally 750 feet from the edge of the core Wildlife RSA for a total buffer of 1,000 feet) was surveyed based on extrapolation of observations made from within the core Wildlife RSA, aerial photograph interpretation, and windshield surveys. In total, the auxiliary Wildlife RSA is approximately 65,000 acres.
- The supplemental Wildlife RSA extends laterally from the project footprint up to 1.24 miles, depending on target species, and identifies species-specific habitats based on aerial photograph interpretation, documented occurrences of the species, and field observations of federally listed species and their habitats.

- The project area is the greater regional area from Fresno and Bakersfield, inclusive, locally known as the southern San Joaquin Valley. It crosses portions of Fresno, Kings, Tulare, and Kern counties, linking the cities of Fresno and Bakersfield with smaller rural communities, including Corcoran, Wasco, and Shafter. Major land uses include urban (industrial, commercial, and residential) and rural residential development. The project area is dominated by production of a wide variety of agricultural crops. Some undeveloped natural areas occur in the vicinity of Corcoran and Allensworth (namely, the Allensworth ER and the Pixley NWR).

3.2 Environmental Setting

This section describes the general physical biological conditions in the RSA, with particular emphasis on the topography, climate, hydrology, vegetation communities, and wildlife habitats present. Wildlife habitats are identified using CWHR descriptions. The wildlife movement corridors that are crucial for wildlife migration and distribution throughout the project area are also identified.

3.2.1 Project Location

The proposed project would occur within the San Joaquin Valley, which is the southern half of the California Central Valley. The San Joaquin Valley trends northwest from the Tulare Basin at the southern end to the Sacramento–San Joaquin Delta to the north. The eastern edge of the valley meets the western slope of the Sierra Nevada, and the western edge of the valley meets the eastern slope of the Temblor and Diablo ranges that together constitute the southern interior Coast Range ecoregion. Regionally, the Tehachapi Mountains to the south of the project area create a biological and geological connection between the southern Sierra Nevada and the interior Coast Range, and define the southern limit of the San Joaquin Valley (Figure 3-1).

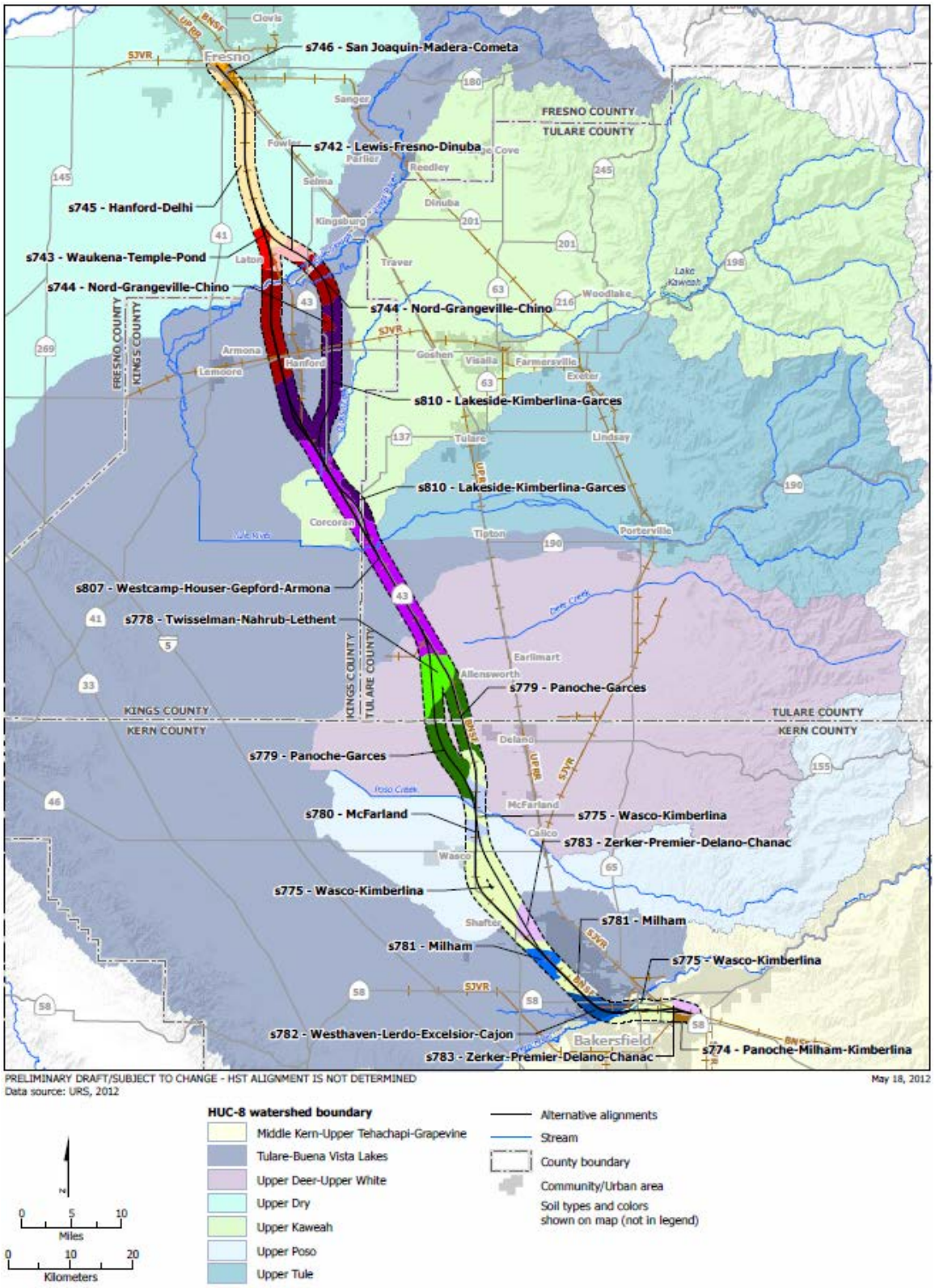

Figure 3-1
Environmental setting: Soils and watersheds

3.2.2 Topography

Elevations in the RSAs range from 203 to 430 feet above mean sea level. The topography of the project area is relatively flat. Trending from Fresno south to Bakersfield, the elevation gradually decreases from approximately 300 feet to approximately 200 feet near Allensworth. From the vicinity of Allensworth, the elevation rises gradually to Wasco and Shafter, where it plateaus briefly (circa 350 feet) and then climbs into Bakersfield (near 430 feet).

3.2.3 Climate

The San Joaquin Valley has an arid to semi-arid climate. Summers are generally hot and dry; the majority of the rainfall occurs during the mild winter months. Rainfall stations show that upwards of 80% of annual precipitation occurs between November and April. Precipitation in the San Joaquin Valley and the eastern flanks of the interior Coast Range is limited due to the rain shadow effect of the Coast Range. Generally, annual rainfall amounts decrease from north to south across the valley floor. The mean annual precipitation records for the San Joaquin Valley range from nearly 16 inches in the north to less than 5 inches in the southern reaches of the valley (U.S. Geological Survey [USGS] 1998).

During the spring and summer, snowmelt from the Sierra Nevada provides the majority of the water for the San Joaquin Valley. Warm, moisture-laden air masses generated over the Pacific Ocean condense and cool as they are pushed upward over the Sierra Nevada, resulting in heavy precipitation on the western slopes. The resulting snow pack ranges from 20 to 80 inches as elevation increases from the lower foothills to the Sierran crest.

The northern and southern portions of the San Joaquin Valley are similar with respect to daily temperatures throughout the year. Northern and southern valley temperatures were collected at the National Climate Data Center stations in Fresno and Bakersfield. The average daily temperature in the project area (as measured in the coolest and hottest months) varies annually by about 36 degrees Fahrenheit (°F) between December (average air temperature of 46°F) and July (average air temperature of 83°F). Temperature extremes in the project area have been recorded as high as 115°F and as low as 18°F (WRCC 2010).

3.2.4 Hydrology

The San Joaquin Valley has a drainage area of approximately 34,100 square miles and is roughly divided into a northern San Joaquin River Basin and a southern Tulare Lake Basin. The project is entirely within the Tulare Lake Basin. This area is generally flat and is used extensively and intensively for agriculture. The contributing rivers are normally diverted and dewatered before reaching the southern San Joaquin Valley floor (U.S. Department of Agriculture [USDA] 1982).

Most of the Tulare Lake Basin (southern San Joaquin Valley) floor is underlain by several thousand feet of sediments, including coarse-grained, water-bearing zones. Groundwater exists under both unconfined and semi-confined conditions. Groundwater levels vary with seasonal rainfall, withdrawal, and recharge. Depth to groundwater in the valley ranges from a few inches to more than 100 feet. Recharge of the groundwater occurs through percolation of applied irrigation water and leaking water from agricultural ditches and through infiltration of stream flow.

All of the streams and rivers in the RSA have been dredged, culverted, diverted, dewatered, or channelized, or have had their active floodplains severely reduced by the construction of levees or the development of agricultural lands. Pumping of groundwater for large agricultural and urban demands has resulted in groundwater subsidence in many areas of the southern San Joaquin Valley, especially the western side and southern end.

Regular flooding is now largely controlled by dams, diversions, levees, and dredging. The previous floodplain and riparian habitat have also largely been replaced by agriculture or urban development (USDA 1982; Vileisis 1997). Evaporation of the historic Tulare, Buena Vista, and Kern lakes through water diversions and climate change has resulted in a wide area of saline-sodic soils on the southern San Joaquin Valley floor. Currently, this area supports the majority of wetlands in the project area.

Alterations to both surface water and groundwater in the region have resulted in a significant decline in the historical wetland area. This decline is reflected in the high proportion of drained or partially drained hydric soils mapped in the area. Most of the water is diverted into the irrigation canals that are found throughout the south San Joaquin Valley. Therefore, most of the water present in the project area is found in irrigation canals, water detention basins, precipitation-fed wetlands, and vernal pools; water is only occasionally found in river channels. The remaining wetlands are largely unrelated to the historical floodplains or regional aquifers; primarily.

Vernal pools and seasonal wetlands have developed in mostly isolated depressions that receive water from precipitation and local surface and shallow subsurface flow or sheet flow. Water is retained in these depressions by a shallow perching layer (largely clay pans), and this water is unconnected or only partially connected to deeper groundwater layers.

3.2.5 Vegetation Communities and Wildlife Habitat Types

Habitat and natural land status in the RSA were classified using the CWHR wildlife habitat types (CDFG 2008a), as summarized in Table 3-1. Parcels whose agricultural use could not be determined to specific CWHR wildlife habitat types (e.g., dryland grain crops, irrigated grain crops, irrigated hayfield, irrigated row and field crops) were designated under the umbrella category of cropland. Agricultural croplands are the largest recorded habitat type within the RSA. Urban areas, including large cities such as Fresno and Bakersfield and the multiple smaller cities between, constitute the second greatest land use within the RSA. In urban areas, native vegetation is absent or highly disturbed, and typical vegetation consists of a variety of planted trees, such as eucalyptus (*Eucalyptus* spp.) and mulberry (*Morus* spp.), and other nonnative or ornamental vegetation. Figure 3-2 depicts the locations of habitat types along the project alignment (see Appendix B for a detailed map of habitat types).

Table 3-1
Acreage of Vegetation Communities within the RSA

Habitat Type by CWHR Vegetation Community	Acreage[a]		Percent Range[b]
	Minimum	Maximum	
Agricultural/cropland[c]	26,382.12	30,624.09	63.2 - 64.9
Urban	9,626.77	12,012.08	23.7 - 24.8
Annual grassland	2,514.80	2,960.45	6.1 - 6.2
Lacustrine	576.08	703.77	1.4 - 1.5
Pasture	468.81	570.85	1.2 - 1.2
Alkali desert scrub	304.94	563.28	0.8 - 1.2
Barren	331.53	484.93	0.8 - 1
Riverine	322.37	368.74	0.8 - 0.8
Valley foothill riparian	102.24	132.84	0.3 - 0.3
Fresh emergent wetland	16.54	22.19	<0.1 - 0.1
Valley oak woodland	8.35	8.35	<0.1
Total	40,654.55	48,451.57	—

[a] Minimum and maximum determined acreages based on the smallest and largest amount of acreage covered by any continuous combination of alternatives.

[b] Percent range based on minimum and maximum values compared with sum of all minimum and maximum values. The total acres do not match the total size of the RSA because they are based on a continuous alignment as opposed to all alternatives considered.

[c] "Agricultural/cropland" includes dryland grain crop, deciduous orchard, evergreen orchard, irrigated grain crop, irrigated row and field crop, irrigated hayfield, vineyard, and any other undetermined cropland.

3.2.5.1 Agricultural Lands

Seven types of agricultural land are present in the RSA: dryland grain crops, irrigated grain crops, irrigated hayfield, irrigated row and field crops, deciduous orchard, evergreen orchard, and vineyard. Undetermined agricultural land that was identified during surveys was classified as cropland. These land uses, together with urban land uses, characterize the overwhelming majority of land in the RSA.

Agricultural lands may provide marginal habitat for seasonal forage and refugia for a limited number of common species and federally listed species. Typical wildlife present on various agricultural lands include American crows (*Corvus brachyrhynchos*), red-tailed hawks (*Buteo jamaicensis*), mourning doves (*Zenaida macroura*), killdeer (*Charadrius vociferus*), garter snakes (*Thamnophis* spp.), gopher snakes (*Pituophis catenifer*), deer (*Odocoileus hemionus*), foxes (*Vulpes* spp.), and rodents such as California ground squirrels (*Spermophilus beecheyi*), voles, gophers, and rabbits.

Federally listed species potentially supported by various agricultural lands include San Joaquin kit fox (*Vulpes macrotis mutica*).

3.2.5.2 Urban

Urban areas include municipalities, industrial, residential, and agricultural structures (e.g., feedlots and poultry farms), and adjacent dedicated areas (e.g., yards, roads, highways, parking lots, stockpiles). In urban municipalities, the majority of land is covered by impervious materials.

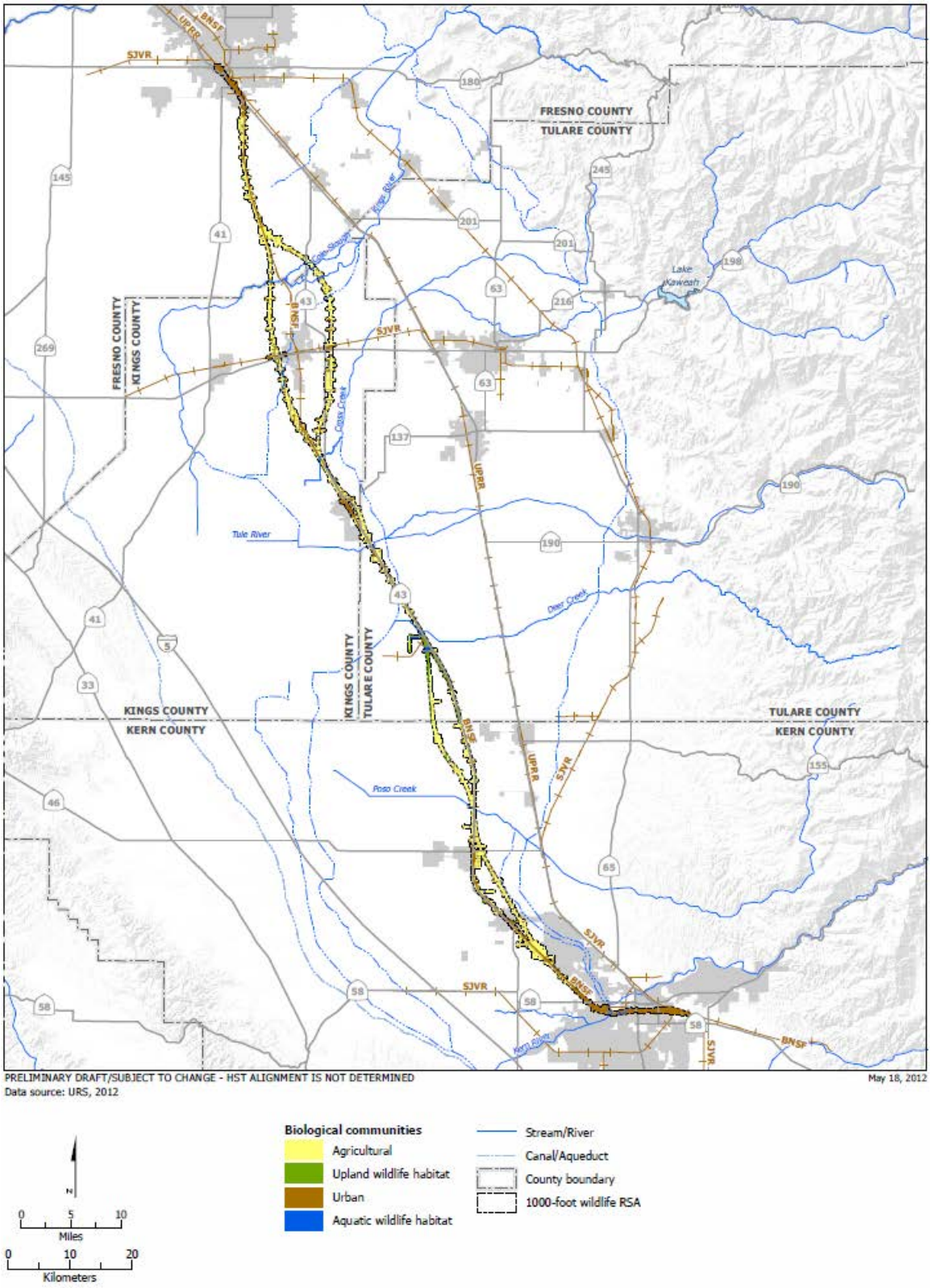

Figure 3-2
Wildlife habitat types

Vegetated areas include landscape plantings and shade trees along roads and buildings. Adaptive native and nonnative wildlife species such as the rock dove (*Columba livia*), and house sparrow (*Passer domesticus*) have acclimated to these areas (CDFG 1988). Other wildlife species that have adapted and become acclimated to urban areas include the American crow, mourning dove, western scrub jay (*Aphelocoma californica*), western fence lizard (*Sceloporus occidentalis*), California ground squirrel, Botta's pocket gopher (*Thamnomys bottae*), black-tailed jackrabbit (*Lepus californicus*), and long-tailed weasel (*Mustela frenata*).

In Bakersfield, the San Joaquin kit fox has become acclimated to developed urban areas (CDFG 2012).

3.2.5.3 Annual Grasslands

Annual grasslands are typically characterized by nonnative annual grass species. Dominant species include several species of brome (*Bromus* spp.), annual fescues (*Vulpia* spp.), oats (*Avena* spp.), and barleys *(Hordeum* spp.). Native species may be present but in lower densities, including goldfields (*Lasthenia* spp.), owl's clover (*Castilleja* spp.), tarweed (*Madia* spp.), pepperweed (*Lepidium* spp.), saltgrass *(Distichlis spicata*), fiddleneck (*Amsinckia* spp.), and popcorn flower (*Plagiobothrys* spp.). On occasion, shrub species, including saltbush (*Atriplex* spp.) may occur.

Annual grasslands in the RSA have typically experienced some level of disturbance in the past that was associated with the various agriculture practices, row cropping, or grazing. Although these areas typically have a history of disturbance, they continue to provide suitable habitat for a number of federally listed plant and wildlife species. Similar to the alkali desert scrub habitats discussed below, annual grasslands that appear to have experienced lower levels of disturbance often include vernal pool habitat.

Due to the scarcity of woody vegetation, grasslands often support a variety of burrowing animals. Typical species present in grassland habitats include savannah sparrow (*Passerculus sandwichensis*), burrowing owl (*Athene cunicularia*), turkey vulture (*Cathartes aura*), western fence lizard, northern pacific rattlesnake (*Crotalus oreganus*), black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, California vole (*Microtus californicus*), American badger (*Taxidea taxus*), and coyote (*Canis latrans*). Wildlife present in association with vernal pool features includes black-necked stilt (*Himantopus mexicanus*), great white egret (*Ardea alba*), western spadefoot (*Spea hammondii*), Pacific treefrog (*Pseudacris regilla*), tiger beetles (*Cincindela* spp.), and vernal pool branchiopods.

Federally listed species potentially supported by annual grassland habitat include Fresno kangaroo rat (*Dipodomys nitratoides exilis*), Tipton kangaroo rat (*D.n. nitratoides*), San Joaquin kit fox, giant garter snake (*Thamnophis gigas*), and blunt-nosed leopard lizard *(Gambelia sila)*. Vernal pool features within annual grassland habitat may also support California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), and vernal pool branchiopods.

3.2.5.4 Lacustrine

Lacustrine habitat is limited to human-made basins used for water storage and groundwater recharge. These basins typically have earthen berms, little or no emergent vegetation, and range in size from less than 1,000 square feet to hundreds of acres. No natural, permanent lakes occur in the RSA. Some basins may be partially bordered by willows (*Salix* spp.) and other riparian vegetation and support large colonies of nesting birds, such as cormorants (*Phalacrocorax* spp.) and great white egrets. Other small basins have little or no sign of use by wildlife. Many of the smaller basins are surrounded by fences, which limit wildlife access.

Although lacustrine habitats in the RSA are human-made and controlled, they provide important habitat for many wildlife species. The larger detention basins are used by a variety of water birds, swallows, and several species of duck. Wildlife species that use small detention basins include bullfrogs (*Rana catesbeiana*), mosquito fish (*Gambusia affinis*), egrets, mallards (*Anas platyrhynchos*), curlew (*Numenius* spp.), and red-winged blackbird (*Agelaius phoeniceus*).

Federally listed species potentially supported by lacustrine habitats include California tiger salamander, California red-legged frog, and giant garter snake.

3.2.5.5 Pasture

Pastures are actively grazed fields associated with private property. Generally, these areas are characterized by a mix of annual grasses and other herbaceous species. Typically, these areas are actively grazed by cattle and horses but not irrigated. These areas provide some habitat for federally listed wildlife species but little habitat for federally listed plant species due to the high level of disturbance. Federally listed species potentially supported by pasture habitats include the Fresno kangaroo rat, Tipton kangaroo rat, and the San Joaquin kit fox.

Common wildlife species present in this habitat type include California ground squirrel, Botta's pocket gopher, black-tailed jackrabbit, long-tailed weasel, house sparrow, American crow, American goldfinch (*Carduelis tristis*), mourning dove, western scrub jay, western skink (*Eumeces skiltonianus*), and western fence lizard.

3.2.5.6 Alkali Desert Scrub

Alkali desert scrub vegetation is dominated by shrublands with understory cover of herbs and forbs and by vernal pools (seasonally inundated or saturated areas lacking a shrub layer). Primary plant species present in these communities include saltbush, iodine bush (*Allenrolfea occidentalis*), California joint-fir (*Ephedra californica*) goldenbush *(Isocoma acradenia*), and bush seepweed (*Suaeda moquinii*).

Typical herbaceous species include alkali heath (*Frankenia salina*), goldfields, Menzie's fiddleneck *(Amsinckia menziesii*), common tarweed (*Hemizonia pungens*), and saltgrass. This habitat is concentrated in the vicinity of Allensworth in relatively undisturbed areas. Alkali desert scrub provides the best example of native habitat for federally listed species in the RSA.

Alkali desert scrub supports a wide variety of wildlife species, many of which are burrowers or burrow-dependent species, such as western burrowing owls, western spadefoot, coyote, California ground squirrel, and a variety of kangaroo rat species. Reptiles found in this habitat include the northern pacific rattlesnake, side-blotched lizards (*Uta stansburiana*), and coast horned lizards (*Phrynosoma coronatum blainvillii*). Burrowing owls breed in this vegetation community, and many raptors use these areas for foraging (CDFG 1988). Wildlife associated with vernal pool features in this habitat type include black-necked stilt, great white egret, Pacific treefrog, tiger beetles, and vernal pool branchiopods.

Alkali desert scrub communities have the potential to support federally listed species such as the blunt-nosed leopard lizard, Tipton kangaroo rat, and the San Joaquin kit fox. Vernal pool features may also support California tiger salamander, vernal pool tadpole shrimp (*Lepidurus packardi*) and vernal pool fairy shrimp (*Branchinecta lynchi*).

3.2.5.7 Barren

Barren areas are defined by the permanent absence of vegetation. Any habitat with less than 2% total vegetation cover by herbaceous or non-wildland species and less than 10% cover by tree or shrub species is defined as a barren area. Areas classified as barren include areas of bare earth

resulting from industrial activities (e.g., gravel extraction). Barren habitats support few native wildlife or plant species, though Brewer's blackbird (*Euphagus cyanocephalus*), killdeer, and western fence lizard may be present in barren habitats.

Federally listed species that may use barren habitat include blunt-nosed leopard lizard, Fresno kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox.

3.2.5.8 Riverine

Riverine habitat consists of open water areas in canals and irrigation ditches and open water areas in the flow channel of rivers (e.g., the Kings and Kern rivers) and creeks (e.g., Tule, Cross, and Poso creeks). Due to extensive water diversion for agricultural purposes, riverine habitats in the RSA do not exhibit natural flow regimes and may be dry throughout a given year. In these areas, vegetation was either absent or sparse along sandy bottoms due to water-level fluctuations, vehicle disturbance, or maintenance activities in an irrigation canal or ditch. Typical vegetation, when present, was dominated by weedy species, such as mustards (Brassicaceae), and grasses.

Wildlife species observed in riverine habitats during the various field surveys included bullfrog, mosquito fish, carp, dragonflies, red swamp crayfish (*Procambarus clarkii*), and Asian clam (*Corbicula fluminea*).

Federally listed species potentially supported by riverine habitat include California red-legged frog and giant garter snake.

3.2.5.9 Valley Foothill Riparian

Valley foothill riparian vegetation occurs along the riparian corridors and associated floodplains or terraces of the Kings River, Cross Creek, Tule River, Poso Creek, and Kern River and along their associated sloughs and side channels in the RSA. These areas are characterized by a dominance of tall trees, including Fremont cottonwood (*Populus fremontii*), western sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). Subcanopy trees include white alder (*Alnus rhombifolia*) and ash (*Fraxinus* spp.). Understory shrub and herbaceous species typically include California blackberry (*Rubus ursinus*), elderberry (*Sambucus* spp.), and willows. In the RSA, the transition from the riparian corridor to valley foothill riparian vegetation, such as cropland or orchard is generally abrupt, resulting in narrow bands of vegetation restricted by the bordering agricultural land.

Valley foothill riparian habitat provides food, water, migration and dispersal corridors, escape, nesting, and thermal cover for an abundance of wildlife. Typical wildlife species occurring in this vegetation community include western scrub jay, California quail (*Callipepla californica*), red-tailed hawk, western skink, Pacific treefrog, cottontail (*Sylvilagus* spp.), and raccoon (*Procyon lotor*).

Federally listed species potentially supported in valley foothill riparian habitat include California red-legged frog, California tiger salamander, blunt-nosed leopard lizard, giant garter snake, valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and San Joaquin kit fox.

3.2.5.10 Fresh Emergent Wetland

Fresh emergent wetland is present in small patches associated with man-made structures, including detention basins, groundwater recharge reservoirs, and irrigation and drainage ditches. Typical species in these areas include willows, rushes, bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and docks (*Rumex* spp.). A large complex of fresh emergent wetland exists in the vicinity of Cross Creek. Otherwise, fresh emergent wetland habitats outside of the Cross Creek area are

typically small vegetated areas that experience year-round ponding from irrigation water or, less frequently, seasonally during winter rain events.

Many species rely on fresh emergent wetlands for their entire life cycle or a portion of their life cycle. The federally delisted species Aleutian Canada goose (*Branta canadensis leucopareia*), bald eagle (*Haliaeetus leucocephalus*), and peregrine falcon (*Falco peregrinus*) use fresh emergent wetlands as feeding areas and roost sites (CDFG 1988). Typical species observed in association with this habitat type include red-winged blackbird, marsh wren (*Cistothorus palustris*), great white egret, great blue heron (*Ardea herodias*), bullfrog, and Pacific treefrog.

Federally listed species potentially supported by fresh emergent wetland habitat include California red-legged frog, California tiger salamander, giant garter snake, and valley elderberry longhorn beetle.

3.2.5.11 Valley Oak Woodland

Valley oak woodland occurs along the floodplain of the Kings River and associated sloughs and side channels of the Hanford West Bypass 1 and 2 Alternatives. This habitat is characterized by well-spaced stands of mature valley oak (*Quercus lobata*) with little or no sub-canopy and a well-developed herbaceous layer. Dominant herbaceous species include brome, annual fescues, oats, and barleys. Other herbaceous plants, including soap root (*Chlorogalum pomeridianum*), filaree, miner's lettuce, prickly ox-tongue (*Picris echioides*), and spiny sow thistle (*Sonchus asper*), may be present. In the RSA, valley oak woodland may intergrade with valley foothill riparian vegetation or abruptly transition to developed areas, such as cropland or orchard.

Valley oak woodland provides food, cover, nesting sites, and dispersal habitat for a wide variety of wildlife. The large oak trees present in this habitat provide nesting opportunities for many birds of prey, including Swainson's hawk (*Buteo swainsoni*). Typical wildlife species observed in this vegetation community during the wildlife habitat assessment included California ground squirrel, western fence lizard, western scrub jay, California quail, northern flicker (*Colaptes auratus*), northern mockingbird (*Mimus polyglottos*), mourning dove, American kestrel (*Falco sparverius*), and red-tailed hawk.

Federally listed species potentially supported by valley oak woodland habitat include California red-legged frog, California tiger salamander, Fresno kangaroo rat, Tipton kangaroo rat, and San Joaquin kit fox.

3.2.6 Wildlife Movement Corridors

Habitat linkages are areas of land used for a variety of purposes (any CWHR community type) that potentially serve as a corridor for movement or migration for wildlife. Habitat linkages aid in the dispersal and distribution of wildlife and are crucial for maintaining healthy populations of multiple species, including coyote, bobcat (*Lynx rufus*), and the federally listed San Joaquin kit fox. Multiple habitat linkages have been identified as part of recent state- and regional-level studies addressing connectivity and wildlife movement in California (Penrod, Hunter, and Merrifield 2001; Penrod et al. 2003; ESRP 2009; Spencer et al. 2010).

Regional plans, such as the USFWS Upland Species Recovery Plan, have also identified core, satellite, and linkage areas that roughly correspond to many of the habitat linkages identified by other sources (USFWS 1998). In addition, this plan identifies the San Joaquin kit fox as an umbrella species, which is a species that, when managed for or considered, provides an overarching level or "umbrella" of coverage for other species. The USFWS notes that "the broad distribution and requirement for relatively large areas of habitat means conservation of the kit fox will provide an umbrella of protection for many other species that require less habitat. Therefore,

the San Joaquin kit fox is an umbrella species for purposes of this recovery plan…fulfilling the fox's needs also meets those of many other species."

Consistent with these recommendations, this BA considers San Joaquin kit fox as an umbrella species and assumes that passage opportunities designed and provided for this species will also extend movement opportunities to other species within the San Joaquin Valley. As a result, wildlife movement corridors within this document are discussed primarily in terms of the San Joaquin kit fox (Section 5.13) or the additional federally listed wildlife species that may benefit from movement opportunities provided for the San Joaquin kit fox.

3.3 Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

Elements that are described in the project description for the Fresno to Bakersfield Section, including the tracks and rail bed; supporting facilities and structures such as road crossings, stations, the electrical system, and associated facilities that will power the train; and control and maintenance facilities, are considered part of the proposed action (see Section 2.2, Project Elements). As such, these elements are not considered interrelated or interdependent with the proposed action. The direct and indirect effects from each of these elements are discussed in detail in this BA to analyze how the proposed action may affect federally listed wildlife species and/or their designated critical habitats.

Other individual sections of the HST system that are adjacent to the Fresno to Bakersfield Section have similar design elements. These individual sections of the HST system are separate from each other and can function on their own without further construction of an adjoining section. Each section is designed to have independent utility and logical termini and does not rely on other sections for operations to commence at a local level. Therefore, the construction and operation of the proposed action is considered to be interrelated but not interdependent with the statewide HST system.

Due to the overlap and wide distribution of federally listed species with potential to occur on the individual Central Valley sections and the shared design elements of the HST system, the adverse effects to listed species are anticipated to be of the same nature and similar magnitude.

3.3.1 HST System Summary

At final build, the HST system will connect and serve the major metropolitan areas of California, extending from San Francisco and Sacramento in the north to Los Angeles and San Diego in the south (Figure 3-3). Following a programmatic environmental review, the Authority and the FRA approved the HST system for intercity travel in California, and selected corridors for project-level study in 2005. Building a system of such magnitude, complexity, and cost is impractical to implement as a singular project. The Authority divided the HST system into nine project sections, allowing phased system implementation.

The HST system is planned to be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles and Anaheim via the Pacheco Pass and the Central Valley. Phase 2 would connect from the Central Valley (Merced Station) to the state's capital, Sacramento, and another extension is planned from Los Angeles to San Diego. The nine individual Phase 1 and Phase 2 sections of the HST system are as follows:

Figure 3-3
Statewide HST System (Phase 1 & 2) from Programmatic EIS

Phase 1:

- San Francisco to San Jose
- San Jose to Merced
- Merced to Fresno
- Fresno to Bakersfield
- Bakersfield to Palmdale
- Palmdale to Los Angeles
- Los Angeles to Anaheim

Phase 2:

- Merced to Sacramento
- Los Angeles to San Diego

As a component of Phase 1 in the Central Valley, the Fresno to Bakersfield Section is intended to connect a Fresno station, a potential Kings/Tulare Regional station in the Hanford/Visalia/Tulare area, and a Bakersfield station. Other Phase 1 sections include the planned HST line north of the Fresno to Bakersfield Section which would extend to Merced. A planned HST line west of the Merced to Fresno section passes through the Pacheco Pass, connecting the San Francisco to San Jose HST Project to the Central Valley and the rest of the HST system. South of the Bakersfield station, the HST line would continue to Los Angeles through Palmdale.

3.3.2 Interrelated Elements

The infrastructure and supporting facilities of the Fresno to Bakersfield Section are composed of tracks, grade-separated right-of-way crossings, train stations, electrical power systems, train control, and maintenance facilities. The design includes a double-track right-of-way to accommodate planned project operational needs for uninterrupted rail movement. Additionally, the HST safety criteria preclude any at-grade intersections and, therefore, the system must be grade-separated from any other transportation system. This requires the HST system to have grade-separated overcrossings and undercrossings for roadways or roadway closures and modifications to existing systems that do not span the planned right-of-way.

These facilities are part of the construction of the Fresno to Bakersfield Section proposed in this consultation. The direct and indirect effects from each of these elements are discussed in detail in this BA to analyze how the proposed action may affect federally listed wildlife species and/or their designated critical habitats. Although other sections of the statewide HST system would be constructed and operated with much of the same project infrastructure and many of the same supporting facilities, the Fresno to Bakersfield Section has independent utility with logical termini and can function without further construction of an adjoining section. As such, this BA describes the interrelated actions of the Fresno to Bakersfield segment to the other segments in the Phase 1 HST system and their effects to federally listed species. Since the entire statewide HST system has not been designed or studied at a project-level, the effects of the interrelated actions identified in this BA relies on the current range of federally listed species and the programmatic alignments of the Phase 1 statewide HST system. In addition, the regional consultants conducting the field surveys and preparing the biological technical reports for the other HST system sections have been interviewed to discuss the types of habitat and species that have been observed within the project sections.

Information and plans to construct Phase 2 portions (e.g., Merced to Sacramento and Los Angeles to San Diego) of the HST system are not currently known and therefore excluded from the discussion in this BA. Other future federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not considered in this BA.

3.4 Ongoing Activities Affecting Species or Habitat

3.4.1 Introduction

Ongoing activities in the project area were evaluated to provide a region-level snapshot of other existing or proposed projects with the potential to affect federally listed species and their habitats. These projects and activities are not associated with the HST or other federal projects in the southern San Joaquin Valley. The Fresno to Bakersfield Section project specific EIR/EIS identified a total of 96 proposed projects that will occur within 10 miles of the HST project footprint. Of those proposed projects, approximately 15 are planned to occur within the project action area.

Wide-ranging examples of these projects include urban and industrial development such as, city redevelopment, sewer upgrade projects, housing construction, clean fuels development, and liquid natural gas facilities expansion. Other transportation related projects that are planned to occur within the action area include highway widening and interchange improvements; city road realignment, reconstruction, and surfacing; and railway improvements such as double tracking and freight rail realignment. These broad and general examples are meant to illustrate some of the existing pressures on federally listed species such as blunt nosed leopard lizard, Tipton kangaroo rat, San Joaquin kit fox and their associated habitats, independent of the proposed project.

Development in the southern San Joaquin Valley falls under the following general categories: conversion and annexation of agricultural or otherwise undeveloped lands, energy infrastructure development and improvements, state and municipal transportation projects, livestock feedlot expansion, and urban infrastructure improvements. Many of these projects are clustered in the larger urbanized metropolitan areas of Fresno and Bakersfield. However, projects such as livestock feedlot expansion or highway road widening will partially occur outside the urban boundary of smaller rural communities, or in largely undeveloped agricultural lands. These urban and agricultural development projects are not typically in close proximity to natural habitats (alkali desert scrub, barren, etc.), mostly because these natural and undisturbed lands make up such a small percentage of the overall land cover in the project area (Spencer et al 2010).

3.4.2 Ongoing Activities in the Project Area

3.4.2.1 Conversion of Agricultural Lands

Residential, mixed-development, retail, and commercial real estate development tend to be concentrated in former agricultural or formerly agricultural lands because they are relatively abundant in the project area. For example, projects reviewed for this document include the construction of small multi-store shopping centers, large scale developments consisting of hundreds or thousands of new homes and associated commercial and recreational facilities, light-industrial, warehouses and office parks, specialized facilities such as a new veterans retirement home, and apartment buildings. The majority of development projects identified in this document will occur outside existing urban boundaries.

3.4.2.2 Energy and Industrial Infrastructure

In the project area, energy and industrial infrastructure activities will be built on the edge of existing urban boundaries, or in agricultural or formerly agricultural lands that have reverted to a semi-natural state. These projects include improvements to existing energy generation and distribution lines; construction of new wastewater treatment facilities; expansion of an existing landfill; installation of a 3-mile long, 30-inch diameter pipeline to convey production water to a

groundwater recharge facility. Other projects include a proposed 125-acre solar installation near the Kern NWR, and a low-profile substation north of the Bakersfield urban limit.

3.4.2.3 Urban Infill

Other commercial, industrial, and residential projects, such as a proposed cement factory in Bakersfield, would be built in already disturbed urban locations (in this case an existing industrial lot) and would therefore have minimal disturbance to federally listed species and their habitats.

3.4.2.4 Highway and Transportation Infrastructure

Multiple highway and regional road improvements are planned for the region. These projects include highway widening, interchange improvements, bridge replacements, and rail improvements. Highway and road widening projects are planned for urban and rural regions of the project area. For example, proposed projects include improving the capacity of existing two lane county roads to four lane arterial streets, widening SR 198 to four lanes, widening SR 58 to six lanes; and construction of new roads such as a new public road connecting SR 99 at Hosking Avenue in Bakersfield.

3.4.3 Regional Impacts to Species and Habitat

Fragmentation of agricultural and semi-natural lands due to the combination of urban growth, regional infrastructure improvements, and increased roads and highways will create unavoidable impacts to federally listed species and their habitat. Cumulative impacts resulting from construction activities can be temporary or permanent, and short- or long-term. For example, temporary short- and long-term impacts may result in degraded wetland function and values due to increased impervious surfaces in the landscape. The introduction and spread of invasive plant species may also cause long-term negative consequences for native plant communities and remaining natural areas in the project area.

Permanent and long-term impacts include reduced dispersal habitat and critical linkages for wide-ranging species such as the San Joaquin kit fox, and increased edge habitat that benefits pest species like feral cats and European starlings at the expense of native wildlife. Increased traffic capacity and associated safety features, such as highway dividers, present artificial boundaries for terrestrial species, and can be a significant source of mortality for wildlife attempting to cross.

3.4.4 Cumulative Effects

Adverse effects from the proposed project included with potential effects from other proposed projects in the Tulare Basin could result in cumulatively significant impacts to federally listed wildlife species. The HST project will be the largest project to be constructed in the Tulare Basin, followed only by the construction and operation of the Merced to Fresno and Bakersfield to Palmdale alignments of the HST.

Within the California Central Valley, the Phase 1 HST sections may contribute to the overall loss or degradation of wildlife resources in the Tulare Basin. Effects from one section of the HST system will likely be similar in scope and duration on the other sections of the system.

The general avoidance and minimization measures proposed in Chapter 2.7 are intended to reduce the nature and magnitude of cumulative effects to federally listed species. Additionally, the project will comply with other federal, state, and local regulations through regulatory agency permitting processes, which will result in further development of specific avoidance and minimization measures, best management practices, and compensatory mitigation options.

Other cumulative projects in the Tulare Basin will also be required to comply with the same regulatory requirements (e.g., federal, state, and local government laws and regulations) that protect federally listed species and wildlife movement and migration corridors. The other cumulative projects that were identified to occur within the action area are largely being completed in portions of the project alignment that have already been subjected to urban or industrial development. The cumulative effects of projects within the action area combined with the effects of the proposed HST project are not anticipated to cumulatively contribute to effects on federally listed species.

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Chapter 4
Species/Critical Habitat Considered

4.0 Species/Critical Habitat Considered

This chapter presents the results of the background research that was conducted for the proposed project and presents the federally listed species that this BA will discuss. Section 4.1 details the methodology and sources used to develop the inventory of federally listed species and designated, or proposed, critical habitats that may be found within 10 miles of the project footprint. It also describes the methods used to collect data during the field surveys, the data processing, and the personnel and dates of the field surveys. Section 4.2 summarizes the results of the background review and presents the federally listed plant and wildlife species that were evaluated for their potential to occur within the action area. Finally, Section 4.3 focuses on the species that have been determined to have the potential to occur based on (1) the known distribution of the species, (2) suitable habitat appearing within the RSA, and (3) documented occurrences of the species within each species' accepted dispersal distance of the project footprint.

4.1 Study Methods

This section presents the various methods, including, background review, field surveys, and data processing and analysis, used to identify federally listed species and their suitable habitats in the project area. In addition, this section provides the names of personnel and dates of the field surveys, and describes coordination efforts with regulatory agency personnel and other professional contacts.

4.1.1 Methodology

4.1.1.1 Pre-Survey Desktop Review

Prior to conducting field surveys, existing background information was reviewed to identify the locations of wetlands and other waters of the U.S., federally listed plant or wildlife species, wildlife movement areas and migration corridors, and federally designated or proposed critical habitat units that occur within 10 miles of the Fresno to Bakersfield project footprint.

An inventory of federally listed species, designated and proposed critical habitats, and wildlife movement/migration corridors known or potentially occurring in the project area was created based on existing federal, state, and private databases, and resource agency information. Database queries included all reported occurrences within the various USGS 7.5-minute quadrangles (quads) that overlapped with the project alignment and their eight surrounding quads for the Fresno to Bakersfield Section (a nine-quad search area). Those queries were further refined down to the occurrences reported within a 10-mile buffer of the project footprint. The following data sources were reviewed:

- U.S. Fish and Wildlife Service Sacramento Field Office website: An official list of federal candidate, proposed, threatened, and endangered species and their federally designated or proposed critical habitats known or having the potential to occur within a nine-quad search area around the Fresno to Bakersfield alternative alignments was generated (USFWS 2012) (Appendix C, USFWS Species List).
- California Department of Fish and Game's California Natural Diversity Database (CNDDB) / RareFind: A list of federally listed plant and wildlife species was prepared through a two-fold inquiry consisting of a standard nine-quad search using the RareFind computer application and a geographic information system (GIS) mapping exercise of all occurrences within 10 miles of the alternative alignments. This two-fold inquiry was performed to ensure that all federally listed species, including those whose geographic location data had been suppressed, were captured in the query (CDFG 2012) (Appendix D, CNDDB Results).

- California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Plants of California: A list of federally listed plant species that may occur in the nine-quad search area was generated using the online inventory database (CNPS 2012).
- California Wildlife Habitat Relationship (CWHR) System: The list of federally listed species was augmented through a GIS exercise that overlaid the Fresno to Bakersfield project alignment with wildlife species (amphibians, reptiles, birds, and mammals) range maps available through the CWHR System (CDFG 2005). This query captured federally listed species whose known geographic range occurs within 10 miles of the alternative alignments (CDFG 2008a).
- USFWS Recovery Plans: the Recovery Plan for Upland Species of the San Joaquin Valley, California (Upland Species Recovery Plan; USFWS 1998a), and the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Vernal Pool Recovery Plan; USFWS 2005b), Valley Elderberry Longhorn Beetle Recovery Plan; USFWS 1984), Draft Recovery Plan for the Giant Garter Snake (Giant Garter Snake Recovery Plan; USFWS 1999a) and a number of Federal Register publications, public agency technical reports, survey guidelines, and other published reports.

Figures 4-1, 4-2a, and 4-2b provide the species, locations, and occurrence numbers of the federally listed species reported to the CNDDB within 10 miles of the project footprint.

4.1.1.2 Post-Survey Desktop Analysis for Fresno Kangaroo Rat Habitat

To assess where and whether Fresno kangaroo rats may persist within the project footprint, an additional desktop historical land use analysis was performed to supplement field habitat surveys. In the region north of the Kings River, land is intensely farmed and natural areas have been reduced to very small, isolated fragments. Fields are treated with chemical application and rodenticides are employed for ground squirrel control. The minimal natural habitat that is still intact has extremely limited connectivity to areas that historically were known to, or currently might, support Fresno kangaroo rat. These conditions reduce the habitat value for Fresno kangaroo rats to poor or marginal.

All parcels of potentially suitable habitat within the Wildlife RSA identified north of Kings River (20 in total) were analyzed using the Google Earth Clock tool to view historical aerial photographs. Photographs were generally available from 1998 to 2009; the best dates for this analysis were July 30, 2002, August 19, 2004, March 29, 2007, and September 24, 2009, based on the high resolution, contrast, and clarity of photos available on these dates. Each parcel's historical images were analyzed to determine the type, magnitude, frequency, and duration of disturbances, as well as parcel connectivity to nearby natural lands that could act as potential refugia habitat. Where parcels were both isolated from natural areas and regularly or intensively disturbed (regularly plowed, orchards planted and removed, etc.) for multiple years, habitat was deemed unlikely to shelter Fresno kangaroo rat. Where parcels experienced little to light use, and/or limited to moderate connectivity to natural areas existed, habitat was considered potentially suitable to shelter small, isolated populations of Fresno kangaroo rat.

Figure 4-1 contains confidential information and has therefore not been included on the website.

Figure 4-2a contains confidential information and has therefore not been included on the website.

Figure 4-2b contains confidential information and has therefore not been included on the website.

4.1.2 Field Survey Methods

Field surveys were conducted within the previously defined resource specific RSAs and in accordance with the methods described, in part, in the *Central Valley Biological Resources and Wetland Survey Plan* (Survey Plan), which was prepared for the Fresno to Bakersfield Section of the HST (Authority and FRA 2009). Biologists conducted surveys for the following biological resources:

- Botanical resources, including federally listed plant species, and elderberry shrubs.
- Wetlands and other Waters of the U.S., including federally listed vernal pool dependent species.
- Wildlife resources based on a habitat assessment for federally listed wildlife species.

The field survey methods varied depending on land use and whether the surveyors had been granted permission to enter. Descriptions of the various survey methods employed are provided in the following subsections.

4.1.2.1 Botanical Methods

Botanical surveys were conducted to identify rare plants and elderberry shrubs in the 100 foot Botanical RSA. Field surveys within the Botanical RSA were conducted as prescribed in the Survey Plan. In general, the botanical surveys were conducted in accordance with the *CNPS Botanical Survey Guidelines* (CNPS 2001), the *Protocols for Surveying and Evaluating Impacts to Special Native Plant Populations and Natural Communities* (CDFG 2009), and *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 1996b).

Prior to initiating the botanical surveys, botanical survey team leaders visited the California Academy of Sciences in San Francisco to review the key characteristics of federally listed species that were identified as having some potential to occur. In addition, reference populations were identified for the following federally listed species:

- Kern mallow (*Eremalche kernensis*).
- San Joaquin woolly threads (*Monolopia congdonii*).
- San Joaquin adobe sunburst (*Pseudobahia peirsonii*).
- Hoover's woolly-star (*Eriastrum hooveri*).
- California jewelflower (*Caulanthus californicus*).

These populations were not visited due to conflicts with the survey schedule. However, local land managers were contacted prior to the early season surveys to determine if the reference populations had begun blooming (Brian, pers. comm. 2010; Harding, pers. comm. 2010; Kearns, pers. comm. 2010; O'Dell, pers. comm. 2010; Warrick, pers. comm. 2010).

Botanical survey events were conducted in the Botanical RSA to coincide with the major bloom periods anticipated for the federally listed plants anticipated to have the potential to occur. These events occurred from March 15 through April 2, April 19 through April 30, and May 17 through May 28, 2010. A highly focused late summer botanical survey was conducted in limited areas from July 5 through July 9, 2010 to identify specific isolated plants that could not be identified to species in the earlier survey periods. During the botanical surveys all vascular plant species encountered were identified and keyed out to species level. Federally listed plant species identified were mapped using a Trimble GeoXH GPS and recorded on CNPS Rare Plant Treasure Hunt Field Survey Forms.

During the early-season surveys, urban landscapes and other large portions of the Botanical RSA were determined to contain unsuitable habitat for federally listed plant species due to active

agricultural activities, including herbicide use, controlled burns, and frequent ground disturbance. In subsequent survey periods (mid- and late-season periods) these areas were not revisited.

A vehicle survey of the Botanical RSA was conducted via public and private roads. Areas lacking potential to support federally listed plant species (e.g., urban and active agricultural areas) were eliminated from further review. In areas with habitat that may potentially support federally listed plant species, botanists walked pedestrian transects working in teams of two to six and spaced 20 to 100 feet apart or as necessary to visually assess the Botanical RSA. These physical surveys were conducted throughout the Botanical RSA in areas determined to have potential for federally listed plant species and where permission to enter had been granted. On the ground botanical surveys were not conducted in areas where permission to enter was not granted. In these off-limit areas, suitable habitat observed from public roads was recorded as natural lands that could potentially support federally listed plant species.

In addition, botanists recorded the locations of all blue elderberry (*Sambucus mexicana*) shrubs, the sole host plant for the federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). These locations were mapped during the botanical surveys, and elderberry shrubs were only identified in areas where permission to enter was granted.

4.1.2.2 Wetlands and other waters delineation Methods

A wetland delineation survey was conducted as prescribed in the Survey Plan. Teams of qualified wetland scientists conducted a detailed delineation of wetlands and other waters in the 250-foot-wide Wetland RSA. The delineation was performed with the dual intent of obtaining a Preliminary Jurisdictional Determination, as described in USACE Regulatory Guidance Letter No. 08-02 (USACE 2008a), and to document habitat that has the potential to support vernal pool dependent species. Of primary concern to the wetland scientists was the potential of the habitat to support the vernal pool fairy shrimp (*Branchinecta lynchi*) and the vernal pool tadpole shrimp (*Lepidurus packardi*). Both federally listed species are totally dependent upon seasonal vernal pools for every stage of their life cycle.

Different survey methods were used during the wetland delineation survey depending on the type of feature being delineated (e.g., wetland, other waters of the U.S., or waters of the State). Additionally, methods varied depending on land use and whether the surveyors had permission to enter a given area. Descriptions of the kinds of survey methods employed during the field survey are provided in the following subsections.

A technical report, the *Preliminary Jurisdictional Waters and Wetlands Delineation Report* (Authority and FRA 2011), and a report supplement, the *Fresno to Bakersfield Supplemental Preliminary Jurisdictional Waters and Wetlands Delineation Report* (Authority and FRA 2012) were prepared for the Fresno to Bakersfield Section and describes the delineation of wetlands and other waters in extensive detail; these reports are available upon request.

Wetlands

Wetlands in the Wetland RSA were delineated using the methods described in the *USACE Wetlands Delineation Manual* (Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008b) and, if necessary, aerial photograph interpretation. All wetlands were described using the Cowardin classification system (Cowardin et al. 1979). Vernal pool wetland habitats were evaluated for their potential to support federally listed species such as fairy shrimp and tadpole shrimp.

Other Waters of the U.S.

Other Waters of the U.S. in the Wetland RSA were delineated using the methods described in *A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States* (USACE 2008c) and USACE Regulatory Guidance Letter No. 05-05 (USACE 2005), where appropriate. Wetland biologists recorded information for each feature, by taking GPS points, field notes, and photographs.

Aerial Photograph Interpretation

Where properties within the Wetland RSA were not accessible to the wetland scientists due to lack of permission to enter, field crews used public roads, adjacent parcels where they had permission to enter, or other suitable means, where available, to conduct visual surveys and compare background information to aerial signatures identified on high resolution aerial imagery. Wetland scientists recorded the lateral extent of jurisdictional waters on GPS by digitizing the feature and by recording the extent on field maps. In the case of limited access, a GIS specialist, with the assistance of qualified wetland scientists, estimated the extent of the wetlands remotely using background information, image interpretation, and image processing. Descriptions of the methods used for manual image interpretation, and image processing (i.e., remote sensing), are provided in the *Preliminary Jurisdictional Waters and Wetlands Delineation Report* (Authority and FRA 2011), and a report supplement, the *Fresno to Bakersfield Supplemental Preliminary Jurisdictional Waters and Wetlands Delineation Report* (Authority and FRA 2012).

Field observations and visual inspection of aerial imagery revealed that some inaccessible areas in the vicinity of Cross Creek and the town of Allensworth contain vernal pool complexes. For these areas, a GIS specialist used image processing software to perform a spectral classification of 2005 and 2009 National Agricultural Imagery Program (NAIP) natural-color aerial imagery. Natural-color NAIP imagery was used rather than available color-infrared NAIP imagery because the acquisition date of the natural-color imagery provided ground conditions that were better for detection of jurisdictional waters.

To prepare the imagery for supervised classification, the GIS specialist performed a principal component analysis to simplify and reduce redundancy in the imagery (Campbell 2002). Using knowledge of the Wetland Study Area, along with known characteristics of aquatic resources, a wetland scientist helped the GIS specialist identify potentially jurisdictional waters to create spectral training data to be used for classifying the imagery. The training data were then used to classify the restricted-access areas into specific aquatic and upland cover classes. The resulting classified image was then generalized using a geospatial statistical process (specifically, neighborhood majority within a six-cell radius) to better represent the natural boundaries of ground features. The final processed image was then converted into a vector geospatial format to be used for analysis and map production. Lastly, additional refinements to the classified data were made, as appropriate, using manual image interpretation and field observations. The classification results were then reviewed by wetland scientists and confirmed by other project ecologists to be appropriately representative of ground conditions.

4.1.2.3 Wildlife Habitat Assessment Methods

The wildlife habitat assessment was conducted as prescribed in the Survey Plan. Wildlife habitat assessment field surveys were conducted throughout the Wildlife RSA to identify and map CWHR wildlife habitat types using the wildlife habitat descriptions presented in *A Guide to Wildlife Habitats of California* (CDFG 1988) and the California Wildlife Habitat Relationship System (CDFG 2008a). The wildlife habitat assessment was general in nature; it was not intended to be a substitute for protocol level surveys.

Wildlife Habitat Assessment

The wildlife habitat assessment and wildlife survey were conducted to identify habitats for, and map observations of, federally listed wildlife species present in the Wildlife RSA. Wildlife habitat assessment surveys were conducted by a combination of meandering pedestrian transect surveys of the 250 foot-wide core and 1,000 foot auxiliary RSAs and windshield surveys from existing public roads, where permitted, and from individual parcels, depending on their permission to enter status. In areas where pedestrian or windshield surveys were prohibited, the wildlife habitat field assessment was augmented with aerial photo interpretation and extrapolation of observations made on adjacent and nearby parcels.

Primary activities of the wildlife habitat assessment included the following:

- Mapping and ground-truthing wildlife habitats, movement corridors, and recovery unit areas for federally listed species at a 0.5-acre minimum mapping unit (except the Fresh Emergent Wetland CWHR wildlife habitat recorded in units smaller than the standard 0.5-acre minimum mapping unit).
- Reviewing and/or identifying wetlands and other waters.
- Mapping macro- and micro-habitat elements that may be suitable for federally listed wildlife species.
- Confirming, identifying, and describing known or previously unreported suitable wildlife habitat.
- Identifying and mapping locations of observed federally listed wildlife species.
- Mapping and describing primary constituent elements (PCE) in areas of federally designated or proposed critical habitat units.

Supplemental wildlife habitat assessments were performed for the following federally listed species:

- California red-legged frog (*Rana draytonii*).
- California tiger salamander (*Ambystoma californiense*).

The habitat assessment for the California red-legged frog and California tiger salamander included an evaluation of potential aquatic and upland habitat within 1.0 and 1.24 miles, respectively, of the alternative alignments. The assessment identified, described, and evaluated habitat conditions in accordance with agency guidelines (e.g., USFWS 2005c; USFWS and CDFG 2003). Aquatic features that could provide potential breeding habitat were mapped in the Core RSA as part of the wetland delineation surveys, and in the Auxiliary and Supplemental RSAs based on a desktop review and interpretation of aerial photographs, coupled with available wetlands and other waters databases. Those databases included the National Wetlands Inventory, the National Hydrography Dataset and Holland vernal pool dataset. Areas of upland aestivation and dispersal habitat in the Wildlife RSA were identified as part of the general wildlife habitat assessment field surveys, including micro-habitat features that could provide refugia or aestivation habitat, such as small mammal burrows. Areas of upland aestivation and dispersal habitat were not mapped in the area beyond the auxiliary RSA.

The locations of federally listed wildlife species observed in the Wildlife RSA were recorded using a Trimble GeoXH GPS unit or hand-mapped, as appropriate. Observations included those species that were directly observed and those species whose presence can be inferred based on diagnostic signs such as burrows, fresh tracks, bird songs or calls, scat, or nests. All wildlife

species observed, regardless of their listing status, were identified to the species level and recorded according to nomenclature found in *A Complete List of Amphibian, Reptile, Bird, and Mammal Species in California* (CDFG 2008b).

Wildlife Movement/Migration Corridors

Known wildlife movement/migration corridors were identified through a review of published technical reports and information available from regulatory agencies. The following data sources were obtained and used as a preliminary guide to understanding the location and species-specific requirements of the wildlife movement corridors that have been identified in the vicinity of the Fresno to Bakersfield Section:

- Wildlife movement corridors identified in *Missing Linkages*: *Restoring Connectivity to the California Landscape* (Penrod et al. 2001), which was prepared in response to the 2000 Missing Linkages conference.
- *South Coast Missing Linkage*: *A Linkage Design for the Tehachapi Connection* (Penrod et al. 2003), which provided a more in-depth analysis of the Bakersfield/Tehachapi region based on the earlier Missing Linkages report.
- Upland Species Recovery Plan (USFWS 1998a), San Joaquin Kit Fox 5-Year Review: Summary and Evaluation (USFWS 2010c), which identified core, satellite, and linkage areas, and the San Joaquin Valley Endangered Species Recovery Program (ESRP 2009), which created shapefiles of the core, satellite, and linkage areas.
- California Essential Habitat Connectivity Project (Spencer et al. 2010), which identifies natural land blocks and essential connectivity areas.

Figure 4-3 shows the locations of the movement/migration corridors in the vicinity of the project footprint that were identified by these reports.

The background review of movement corridors was ground-truthed in the Wildlife RSA to ascertain the utility of identified movement corridors on both a local- and meta-population level. This field evaluation of potential movement corridors addressed their availability and suitability for migratory species, and identified changes in corridor quality on a rough landscape level. This evaluation was further augmented through a review of existing wildlife passages, such as culverts, washes, and automobile and train bridges, in the habitat survey area for signs of local wildlife movement. Potential migration barriers such as canals and roadways were also noted in the field.

4.1.3 Data Processing and Analysis

Information gathered in the field was organized in the office using ArcGIS software and summarized in tables for future reference. All GPS data were differentially corrected to achieve sub-meter accuracy. All hand-drawn locations of wetlands and other waters, botanical resources, wildlife habitats, incidental observations of federally listed species, key macro- or micro-habitat elements, and wildlife movement/migration corridors or other relevant field notes were digitally converted from the field maps.

Where permission to enter was limited, a GIS specialist with the assistance of a qualified biologist estimated the extent or limits of the various resources remotely using background information, manual image interpretation, and image processing. This was particularly the case for wetlands and other waters. More detailed information regarding the mapping of the extent of these features can be found in the Wetlands Delineation Technical Report.

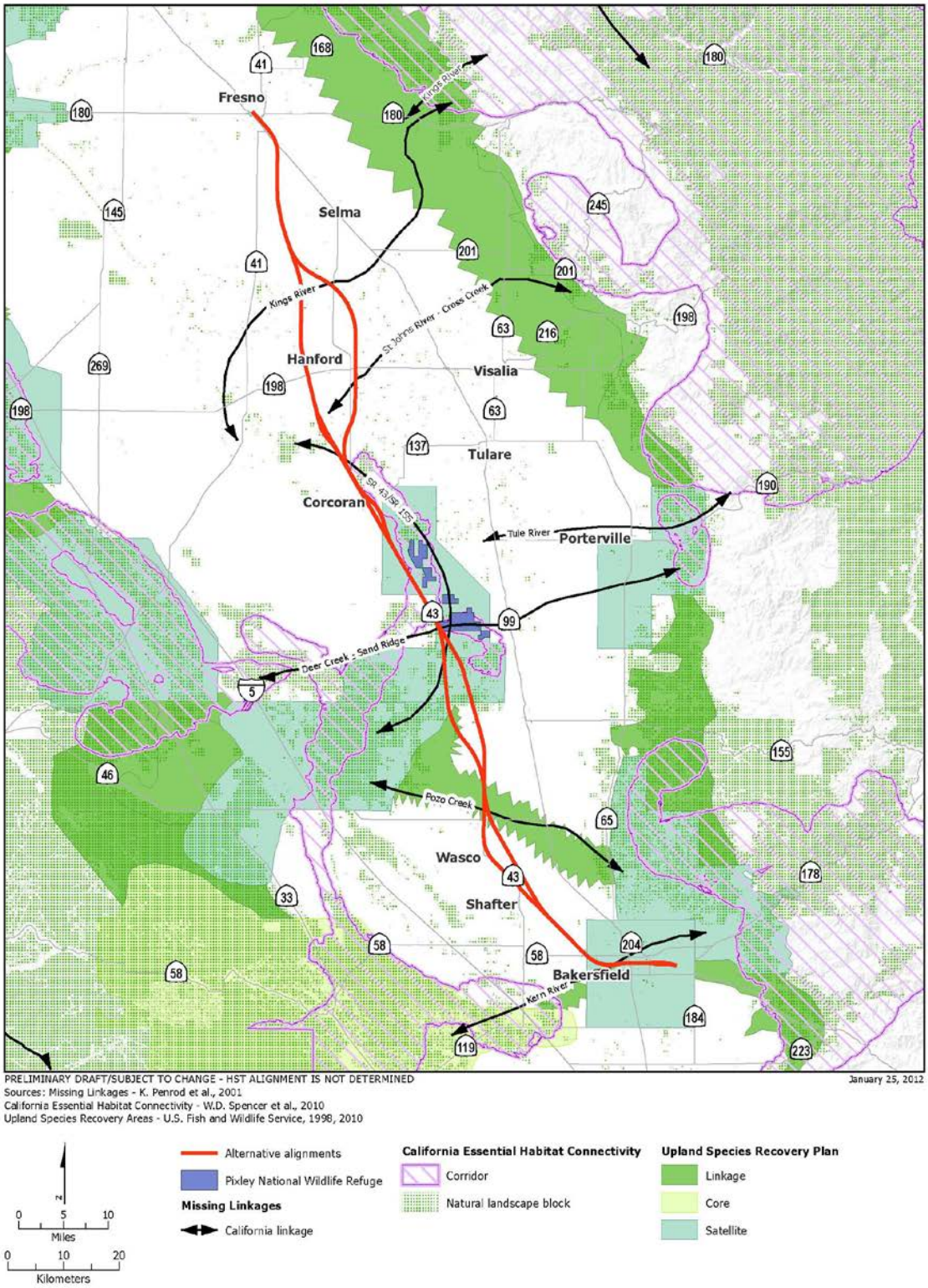

Figure 4-3
Wildlife movement corridors

CALIFORNIA High-Speed Rail Authority
U.S. Department of Transportation Federal Railroad Administration

4.1.4 Personnel and Survey Dates

This section summarizes the organization, timing, personnel, and qualifications of personnel that participated in the various survey efforts. All surveys were conducted by employees of the URS-HMM-Arup Joint Venture. Additional survey specific information, including personnel and qualifications of personnel, is provided in the *Biological Resources and Wetland Technical Report* (Authority and FRA 2011) and is available upon request.

4.1.4.1 Reconnaissance Field Trip

A reconnaissance field trip was conducted to review and obtain preliminary information for the purpose of planning the various field survey efforts and to determine health and safety hazards, resources present, and potential biological resource issues. The reconnaissance survey was conducted on February 2, 2010 by Justin Whitfield, Biology Task Lead; Jan Novak, Senior Wetland Scientist; Todd Lemein, Botanist; Matthew Bettelheim, Senior Wildlife Biologist; and Melissa Newman, Senior Wildlife Biologist.

4.1.4.2 Botanical Surveys

Surveys for federally listed plants, sensitive natural communities, elderberry shrubs, and protected trees in the Botanical RSA were conducted in the early spring, late spring, and early summer bloom periods, which corresponded to March 15 through April 2, April 19 through April 23, April 26, and May 17 through May 28, 2010. Late summer botanical surveys were conducted July 5 through July 9, 2010 to identify six annual *Atriplex* species and one *Eryngium* species that were identified during the spring and early summer survey period but could not be keyed to species because the specimens had not flowered or fruited, necessary characteristics for species identification. The botanical surveys were conducted by three teams, and in some instances all teams surveyed complex areas simultaneously. The surveys were led by Todd Lemein, Botanist. During the early spring surveys, areas lacking potential to support federally listed plant species (e.g., urban and active agricultural areas) were eliminated from future surveys. Botanical methodology meetings and preliminary field visits to calibrate team task leaders were held on March 14, March 15, April 19, and May 17, 2010. The names of the botanists, their education, years of experience and knowledge areas are outlined in Appendix E, Table E-1.

4.1.4.3 Wetland Delineation

The wetlands and other waters surveys (delineations) were conducted at the optimal period to observe and record the various wetland resources. The delineations were conducted over two 10-day periods: between March 1 and March 15, and between March 15 and March 24, 2010. The surveys were led by Jan Novak, Senior Wetland Scientist, with teams of four biologists led by designated team leaders. A wetland delineation methodology meeting was held on March 1 and March 2, 2010. Subsequently, on March 2 and March 6, 2010, a field trip was conducted with wetland delineation survey personnel to review methods in the field and to discuss problems areas. The names of the wetland scientists and their education, years of experience and knowledge areas are provided in Appendix E, Table E-2.

4.1.4.4 Wildlife Habitat Assessment

Mapping of wildlife habitat and general wildlife surveys were conducted between March 8 and March 27, 2010 excluding a four-day period between March 18 and 21. The wildlife habitat assessment was conducted by either two teams of five or three teams of three. Each team operated separately; however, in some instances all teams surveyed complex areas simultaneously. The surveys were led by Matthew Bettelheim, Melissa Newman, and Rebecca Verity, all Senior Wildlife Biologists. A wildlife methodology meeting, and preliminary field visit to

calibrate team tasks, was held on March 8, 2010. The names of the biologists, their education, years of experience, and knowledge areas are outlined in Appendix E, Table E-3.

4.1.4.5 BNSF Survey

Because access to the BNSF right-of-way was not granted until the completion of the various biological resource surveys, two multi-disciplinary survey teams were established to survey the right-of-way for botanical, wetland, and wildlife resources. The surveys were conducted by two teams (composed of three or four people) the first week (April 12-16, 2010) and one team of three the second week (April 19-25, 2010). Teams surveyed the entire BNSF right-of-way on the side of the track centerline where the train is proposed. The far side (portion of right-of-way, beyond the alternative alignment) of the BNSF right-of-way was also surveyed in the area between Corcoran and Wasco. The areas on the far side of the BNSF right-of-way, between Fresno and Corcoran and between Wasco and Bakersfield, were not surveyed. The names of the biological scientists, their education, years of experience and knowledge areas are outlined in Appendix E, Table E-4.

4.1.4.6 Engineering Considerations Surveys

The information obtained in the course of the botanical, wetland delineation, and wildlife resource surveys was used to help cite the Allensworth Bypass alignments in the vicinity of Allensworth State Historical Park and Allensworth ER. Based on the result of these surveys, which identified numerous biological resources, the Allensworth Bypass was cited to avoid adverse effects to these resources. An additional minor adjustment due to engineering considerations was made in the vicinity of Kimberlina Road (north the town of Wasco). During the week of July 12, 2010, a multidisciplinary team conducted surveys for botanical, wetlands and other waters, and wildlife resources within the Allensworth Bypass Alternative alignment and Kimberlina Road adjustments. The names of the biological scientists, their education, and years of experience are outlined in Appendix E, Table E-5.

4.1.5 Agency Coordination and Professional Contacts

This section identifies the various agency coordination and professional contacts associated with the FESA consultation and mitigation planning, botanical resources, wildlife resources and other agency communication and mitigation discussions.

4.1.5.1 Endangered Species Act

On September 25, 2009, URS-HMM-Arup Joint Venture biologists, along with representatives from CH2M HILL and ICF Jones and Stokes, held a project workshop with the resource agencies (EPA, USFWS, NMFS, USACE, CDFG, and the Central Valley Regional Water Quality Control Board) to introduce the HST project and elicit agency feedback regarding HST alignment alternatives in the Central Valley. One of the key requests from the agencies was the consistency and approval of the proposed biological resources and wetlands survey methodologies to be used for surveys in the Central Valley (San Jose to Merced, Merced to Fresno, and Fresno to Bakersfield Section of the HST system).

The Central Valley regional consultants prepared a detailed survey plan entitled *Central Valley Biological Resources and Wetland Survey Plan*. The Survey Plan was completed and transmitted to the resource agencies in October 2009.

On November 5, 2009 the FRA, along with its consultants, held a meeting with resource agencies including USFWS, USACE, and CDFG, to discuss the October 2009 Survey Plan. Revisions were made based on comments received during that meeting and subsequent written comments received from agencies not in attendance.

On September 23, 2010, a meeting with the various regulatory agencies was held regarding the Central Valley HST sections (San Jose to Merced, Merced to Fresno, and Fresno to Bakersfield) to discuss development of a comprehensive mitigation strategy.

On November 10, 2010, URS/HMM/Arup Joint Venture met with representatives of the USFWS and CDFG to discuss survey methods, impacts to special-status wildlife species, approach to impacts, permitting efforts, and avoidance, minimization and compensatory mitigation.

On March 1, 2011, URS/HMM/Arup Joint Venture met with representatives of the CAHSR, FRA, and USFWS to discuss an overview of the Section 7 process and the Authority/FRA Scope of Work – Agreement for funding a USFWS staff position.

On March 14, 2011, the FRA sent a letter to the USFWS formally designating the CAHSR as their non-federal representative under Section 7 of the Endangered Species Act.

On April 21, 2011, the Authority sent a letter to the USFWS containing a brief summary of the project, official species list, surveys conducted to dates, habitats present in the area, and list of species proposed to be included in the BA. The letter requested USFWS review and comments on the list of species proposed for inclusion in the BA.

On June 14, 2011, URS/HMM/Arup Joint Venture met with representatives of the USFWS, NMFS, CDFG, Authority, and FRA to discuss the proposed project and the contents of the Draft EIR/EIS.

On June 24, 2011, the Authority sent a No Effect Determination letter to NMFS for the Central Valley Distinct Population Segment steelhead. The letter was provided to inform NMFS that formal consultation would not be initiated for the Fresno to Bakersfield Section.

On July 15, 2011, the USFWS responded to the Authority's April 21, 2011, letter with an email from Dan Russell, who provided clarifying information regarding Section 7 process. The response stated that the official species list is indeed the list that is generated from the Sacramento USFWS web portal and deferred comments on the species to the USFWS' review of the BA.

On July 29, 2011, on behalf of the FRA and Authority, URS/HMM/Arup Joint Venture obtained an official species list from the USFWS Sacramento District web portal (Document Number 110729061228) for the proposed federal action.

On October 17, 2011, the FRA and Authority submitted a draft BA as prepared by URS/HMM/Arup Joint Venture biologists to USFWS for review and comment.

On January 25, 2012, on behalf of the FRA and Authority, URS/HMM/Arup Joint Venture obtained an official species list from the USFWS Sacramento District web portal (Document Number 1120116071828) for the proposed federal action.

On March 2, 2012, the USFWS discussed the information needs for the issuance of the USFWS Biological Opinion for the Merced to Fresno and Fresno to Bakersfield Sections of the HST.

4.1.5.2 Botanical Resources

On March 8, 2010, URS-HMM-Arup Joint Venture biologists Todd Lemein, Casey Stewman, and Ivan Parr visited the California Academy of Sciences Herbarium to research federally listed plant species with potential to occur within the Botanical RSA. The purpose of this visit was to determine diagnostic characteristics of federally listed plants for easier identification in the field (URS/HMM/Arup Joint Venture 2010).

In order to determine the bloom status of federally listed plant species in the Botanical RSA, local land managers with known occurrences of rare or endangered plant species on their property

and in the vicinity of the botanical RSA were contacted. Following is a list of the land managers, the property they manage, the resource of interest, and the dates of contact:

- Patrick Brian, Fresno Metropolitan Flood Control District. Contacted by survey personnel January, February, March, and April of 2010 about a population of San Joaquin adobe sunburst (*Psuedobahia peirsonii*) that bloomed in mid-April (Brian, pers. comm. 2010).
- Greg Warrick, Center for Natural Lands Management. Contacted by survey personnel January and March 2010 about Kern mallow (*Eremalche kernensis*). Kern mallow populations bloomed during our botanical survey effort (Warrick pers. comm. 2010).
- Dennis Kearns and Ryan O'Dell, Bureau of Land Management, Bakersfield Field Office. Contacted in February 2010 regarding reported occurrences of California jewelflower (*Caulanthus californicus*) (Kearns, pers. comm., 2010; O'Dell, pers. comm. 2010).
- Cheryl Harding, Kern Water Bank Authority. Contacted by survey personnel February and March 2010 about population of San Joaquin woolly threads (*Monolopia congdonii*) that bloomed in mid-March 2010 (Harding, pers. comm. 2010).
- From September 2010 through October 2010, URS/HMM/Arup Joint Venture held telephone conversations and communicated via e-mails with the USFWS to discuss and request guidance on Kern mallow (*Eremalche parryi ssp. kernensis),* specifically the USFWS jurisdiction of the species' under review.
- From November 19, 2010 through December 9, 2010, URS/HMM/Arup Joint Venture held telephone conversations and communicated via e-mails with the USFWS to discuss the treatment of Kern mallow in the BA and request for review of species presented during the November 10, 2010 meeting.

During the late-season botanical surveys, a population of Kern mallow (*Eremalche parryi* ssp. *kernensis*) was identified outside the Botanical RSA. This species' taxonomy is currently under review; the Jepson Manual and the USFWS guidance conflict on nomenclature and species identification. Ellen Cypher, currently a botanist with CDFG and formerly an employee of USFWS, as well as the author of the *Supplemental Survey Methodology for Kern Mallow* (Cypher 2002), was contacted on May 27, 2010 to provide guidance on reporting this population (Cypher, pers. comm. 2010). To date, correspondence with the USFWS Sacramento Field Office has not resulted in an official determination or guidance regarding regulations of the Kern mallow (*E. parryi* ssp. *kernensis)*. For the purposes of this report Kern mallow is being reported as *Eremalche parryi* ssp. *kernensis* until further guidance is provided by USFWS.

During the botanical surveys, several annual saltbush species (*Atriplex* spp.) were identified, including one species resembling a special-status species: San Jacinto Valley crownscale (*Atriplex coronata* var. *notatior*). Samples of the suspected San Jacinto Valley crownscale were sent to Elizabeth Zacharias, Ph.D., for genetic testing to confirm the identification because the taxonomy within the *Atriplex* genus is complex and identification based on physical features is often difficult. Additionally, the fact that the closest known occurrence of San Jacinto Valley crownscale is from Riverside County put the identification in question. Dr. Zacharias is currently rewriting the *Atriplex* key for the revised edition of the Jepson Manual (unreleased) (Zacharias, pers. comm. 2010; Hrusa, pers. comm. 2010). Results of genetic testing could not confirm the species identification as *A. coronata* var. *notatior*. Instead, the genetic testing and analysis of physical features (lack of dense tubercles on the fruiting bracts) led Dr. Zacharias to believe the specimens are *A. coronata* var. *coronata*, which is not a federally listed plant species.

4.1.5.3 Wildlife Resources

Since the spring of 2010, URS-HMM-Arup Joint Venture biologists Matthew Bettelheim, Justin Whitfield, and Jessie Golding have been in contact with Brian Cypher, Ph.D., biologist with the California State University, Stanislaus, Endangered Species Recovery Plan, to guide the design and placement of suitable wildlife corridor structures.

During the spring 2010 field surveys, URS-HMM-Arup Joint Venture biologist Matthew Bettelheim was contacted by CDFG biologist Annee Ferranti, manager of the Allensworth Ecological Reserve. Ms. Ferranti and CDFG biologist Krista Tomlinson later prepared an informal list detailing the biological resources known by CDFG to occur within the Allensworth Ecological Reserve (Tomlinson, pers. comm. 2010).

4.1.5.4 Mitigation Planning

On September 23, 2010, a meeting with the various regulatory agencies was held regarding the Central Valley HST sections (San Jose to Merced, Merced to Fresno, and Fresno to Bakersfield) to discuss development of a comprehensive mitigation strategy.

On April 26, 2011, URS/HMM/Arup Joint Venture met with representatives of the USFWS, CDFG, USACE, EPA, and Tulare Basin Working Group to discuss mitigation opportunities pertaining to Conceptual Area Protection Plans (CAPPs) and to solicit input on identifying and prioritizing lands for compensatory mitigation.

On December 2, 2011, on behalf of the FRA and Authority, URS/HMM/Arup Joint Venture biologists introduced the *Conceptual Mitigation Plan* proposal and requested USFWS feedback regarding compensatory mitigation options for federally listed species in the Central Valley.

4.2 Species/Critical Habitats within the Geographic Area

This section summarizes the results of the background review and presents the federally listed species that were evaluated for their potential to occur within the action area. Based upon the findings of the review and the environmental baseline conditions, some of the federally listed species are inferred to be present within the action area. This inference of species presence is substantiated by the known range of the listed species overlapping with habitat that may support the species in one or all stages of its lifecycle.

4.2.1 Federally Listed Plant and Wildlife Species

As determined by the background review of federally listed plant and wildlife species, 11 federally listed plant species were evaluated for their potential to occur within 10 miles of the project footprint. These federally listed species included four plant species that have federally designated critical habitat units within the project area.

Based on the background review, 23 federally listed wildlife species were initially evaluated for their potential to occur within the project area. These listed wildlife species were composed of four invertebrates, two fish, four amphibians, two reptiles, six birds, and five mammal species. In addition, three of the federally listed wildlife species evaluated have designated critical habitat within the project area.

4.2.1.1 Plants

Of the 11 federally listed plant species evaluated as having potential to occur within the project area, 7 species were ruled out based on the lack of suitable habitat, extensive areas converted by human development, extensive water diversions, local or regional extirpations, and/or because

the Botanical RSA lies outside of these species' known and extant geographic or elevation range. None of the federally designated critical habitat units for plant species occur within the project footprint. The potential for the remaining four federally listed plant species to be present within the Botanical RSA is further evaluated in this BA.

4.2.1.2 Wildlife

Of the 23 federally listed wildlife species initially evaluated, 15 were ruled out based on the lack of suitable habitat, extensive areas converted by human development, extensive water diversions, local or regional extirpations, and/or because the Wildlife RSA lies outside of these species' known geographic range. None of the federally designated critical habitat units for wildlife species occur within the project footprint. Additionally, two species that have recently been delisted (American peregrine falcon and bald eagle) were recorded on the list but will not be considered for formal consultation. The potential for the remaining eight federally listed wildlife species to occur in the Wildlife RSA is further evaluated in this BA (Table 4-1).

4.2.1.3 Federally Listed Wildlife Species Requiring Further Analysis

Among those special-status wildlife species that were found to have no potential to occur within the project area, two federally listed species required further analysis to warrant this determination: California red-legged frog *(Rana draytonii*) and giant garter snake (*Thamnophis gigas*), both federally listed as threatened.

California red-legged frog

A review of the CNDDB (CDFG 2012) and CWHR (CDFG 2005) databases show that the project footprint is approximately 11 miles to the east of the California red-legged frog's current known geographic range. Historically, California red-legged frog ranged throughout the San Joaquin Valley's western margins and valley floor; however, these San Joaquin Valley populations have since been extirpated and the current distribution of the species is primarily restricted to the Coast Range (Jennings and Hayes 1994). Since the project footprint and action area occur well outside of the current geographic range of the California red-legged frog, this species is not reasonably expected to occur and is not evaluated further in this BA.

Giant garter snake

The giant garter snake once ranged throughout the San Joaquin Valley as far south as the historic Tulare, Kern, and Buena Vista lakebeds, but it has been extirpated from many areas due to habitat conversion. The project area is within the San Joaquin and South Valley Recovery Unit for the giant garter snake. Within the San Joaquin Recovery Unit, existing populations are limited to the western side of the Central Valley. In addition, no extant populations of the species are known to occur within the South Valley Recovery Unit.

The Giant Garter Snake Recovery Plan (USFWS 1999a) identifies several areas of privately and publicly owned freshwater marshes where repatriation of this species is possible; in particular, wetlands associated with the Tulare basin, which are outside of the Wildlife RSA. However, extirpation of the southernmost populations in the San Joaquin Valley has since been confirmed and the southernmost range of the species is currently restricted to Burrel (Fresno County) (USFWS 1999a). Therefore, based on the best scientific and commercial data available, this species is not reasonably expected to occur within the action area and is not evaluated further in this BA.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Plants			
Caulanthus californicus CALIFORNIA JEWELFLOWER	**FE**	Chenopod scrub, valley and foothill grassland, pinyon-juniper woodland; (NL). Historically from central valley and Carrizo plain. Occurs with *Vulpia microstachys*, *Trifolium* spp., *Calandrinia ciliata,* and *Lasthenia californica*. Usually on subalkaline sandy loams; (200-3000 feet).	**Potential to Occur:** No individuals of California jewelflower were observed during 2010 field surveys. However, the project area however, is within the species' known range; habitats similar to those where this species has been observed were identified within the Botanical RSA, and seven CNDDB records have been reported within a 10-mile radius of the project footprint. This species has potential to occur where permission to enter was not granted in those portions of the action area in Kings, Tulare, and Kern Counties.
Eremalche kernensis KERN MALLOW	**FE**	Chenopod scrub, valley and foothill grassland; (NL). Dry, open sandy to clay soils, usually within valley saltbush scrub, edge of balds; (200-1700 feet).	**Potential to Occur**: No individuals of listed Kern mallow were observed during the 2010 field surveys. Limited potential exists for the white-flowered population of conservation concern, *Eremalche kernensis*, to occur within the action area, as the project action area is outside the reported range (Lokern region) of the species. However, the taxonomy of the species is under review. Pale lavender to purple flowered plants that key to Perry's mallow may occur within action area. One CNDDB record has been reported within a 10-mile radius of the project footprint.
Monolopia congdonii (=Lembertia congdonii) SAN JOAQUIN WOOLLY THREADS	**FE**	Chenopod scrub, valley and foothill grassland; (NL). Alkaline or loamy plains, sandy soils, with grasses and within chenopod scrub; (200-2500 feet).	**Potential to Occur:** No individuals of San Joaquin woolly threads were observed during the 2010 field surveys. However, in Kern County, habitat suitable to support San Joaquin woolly threads occurs in the action area, and two CNDDB records have been reported within a 10-mile radius of the project footprint**.** The species has potential to occur within the action area in high quality natural areas of Kern County mapped as alkali desert scrub and annual grassland habitats. This species is not likely to occur outside of Kern County or in alkali desert scrub or annual grassland habitats that have been degraded due to residential, agricultural, or oil development.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Opuntia treleasei BAKERSFIELD CACTUS	**FE**	Chenopod scrub, valley and foothill grassland, cismontane woodland; (NL). Coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats within grassland; (300-1800 feet).	**No Potential to Occur:** No individuals of Bakersfield cactus were observed during 2010 field surveys. Several CNDDB occurrences of Bakersfield cactus lie within a 10-mile radius of the project footprint; however, most historical occurrences are considered extirpated due to urban development. Areas of the Botanical RSA, where permission to enter was not granted, that overlap with the range of this species are heavily disturbed from urbanization and active agriculture; therefore, this species is not expected to occur.
Orcuttia pilosa HAIRY ORCUTT GRASS	**FE**	Vernal pool; (OBL). With *Eryngium vaseyi*, *Trichostema lanceolatum*, *Downingia* sp., surrounded by annual grassland. Average vernal pool size is 4.2 acres; (75-400 feet).	**No Potential to Occur:** No individuals of hairy Orcutt grass were observed during the 2010 field surveys. Habitat suitable to support the species is limited. The closest CNDDB occurrence of hairy Orcutt grass is approximately 50 miles north of the project area.
Orcuttia pilosa HAIRY ORCUTT GRASS *CRITICAL HABITAT*	**DCH**	--	**No Potential to Occur:** The project footprint lies outside of federally designated critical habitat for this species.
Pseudobahia bahiifolia HARTWEG'S GOLDEN SUNBURST	**FE**	Valley and foothill grassland, cismontane woodland; (NL). Clay soils, northern slopes of knolls, along shady creeks or near vernal pools; (50-500 feet).	**No Potential to Occur:** The HST project footprint lies outside of the species' known range and no individuals of Hartweg's golden sunburst were observed during the 2010 field surveys. The closest CNDDB occurrence of this species is approximately 40 miles north of the project area.
Tuctoria greenei GREEN'S TUCTORIA	**FE**	Vernal pools, valley and foothill grassland; (OBL). Dry bottoms of vernal pools in open grasslands. Vernal pools averaging 1.5 acres; (100-3500 feet).	**No Potential to Occur:** No individuals of Green's tuctoria were observed during the 2010 field surveys. There are no known CNDDB occurrences of Green's tuctoria within a 10-mile radius of the Botanical RSA and this species is believed to be extirpated from Kern and Tulare Counties.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Castilleja campestris ssp. *succulenta* SUCCULENT (=FLESHY) OWL'S-CLOVER	**FT**	Northern Claypan and Northern Hardpan vernal pools within annual grasslands; (OBL). Small and large vernal pools and swales; (75-2500 feet).	**No Potential to Occur:** No individuals of succulent owl's-clover were observed during the 2010 field surveys. There are no known CNDDB occurrences of succulent owl's-clover within a 10-mile radius of the project footprint and the soils where this species is known to occur are coarser and more acidic than soils found within the Botanical RSA.
Castilleja campestris ssp. succulenta SUCCULENT (=FLESHY) OWL'S-CLOVER *CRITICAL HABITAT*	**DCH**	--	**No Potential to Occur:** No federally designated critical habitat for this species is present within 10 miles of the project footprint.
Chamaesyce hooveri HOOVER'S SPURGE	**FT**	Valley and foothill grassland, vernal pools; (OBL). Vernal pools on volcanic mudflow or clay substrate; (75-500 feet)	**Potential to Occur:** No individuals of Hoover's spurge were observed during the 2010 field surveys; however, potentially suitable habitat exists within annual grassland, alkali desert scrub, and vernal pool habitats within the action area in Kings and Tulare County where permission to enter was not granted. No CNDDB records of Hoover's spurge have been reported within a 10-mile radius of the project footprint. Hoover's spurge has low potential to occur in Kings or Tulare County, and no potential to occur within the action area in Fresno or Kern County
Chamaesyce hooveri HOOVER'S SPURGE *CRITICAL HABITAT*	**DCH**	--	**No Potential to Occur:** No federally designated critical habitat for this species is present within 10 miles of the project footprint.
Orcuttia inaequalis SAN JOAQUIN VALLEY ORCUTT GRASS	**FT**	Vernal pool; (OBL). Vernal pools averaging 1.5 acres. Acidic soils with clay to sandy loam texture; (30-2500 feet).	**No Potential to Occur:** No individuals of San Joaquin Valley Orcutt grass were observed during the 2010 field surveys. CNDDB reports from 8 miles north of the project area are considered to be extirpated. The Botanical RSA lies outside of the species' current known range.
Orcuttia inaequalis SAN JOAQUIN VALLEY ORCUTT GRASS	**DCH**	--	**No Potential to Occur:** The project footprint lies outside of federally designated critical habitat for this species.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
CRITICAL HABITAT			
Pseudobahia peirsonii SAN JOAQUIN ADOBE SUNBURST	**FT**	Cismontane woodland, valley and foothill grassland; (NL). Grassy valley floors and rolling foothills in heavy clay soil; (300-2600 feet).	**No Potential to Occur:** No individuals of San Joaquin adobe sunburst were observed during the 2010 field surveys and suitable habitat for this species in the Botanical RSA is highly degraded. The project area lies outside of the species' known range, no CNDDB records of San Joaquin adobe sunburst have been reported within a 10-mile radius of the project footprint**.**
Invertebrates			
Branchinecta conservatio CONSERVANCY FAIRY SHRIMP	**FE**	Conservancy fairy shrimp are known from six disjunct populations in Tehama, Butte, Solano, Glenn, Merced, and Ventura Counties. Found in large, turbid pools in the northern 2/3 of the Central Valley; inhabit astatic pools in swales formed by old, braided alluvium, filled by winter/spring rains, which last until June.	**No Potential to Occur:** The Wildlife RSA lies outside of the species' known range; it does not overlap with any of the six identified populations. No suitable habitat to support the species is present in the project footprint. There are no CNDDB occurrences within 10 miles of the project footprint.
Lepidurus packardi VERNAL POOL TADPOLE SHRIMP	**FE**	Found in vernal pools in unplowed grassland with old alluvial soils underlain by hardpan or in sandstone depressions; water in the vernal pools has very low alkalinity and conductivity.	**Potential to Occur:** No vernal pool tadpole shrimp were observed during 2010 field surveys; however, project footprint lies within the species' known range. High-quality vernal pool complexes were identified within the Wetlands RSA, and three CNDDB records are present within a 10-mile radius.
Lepidurus packardi VERNAL POOL TADPOLE SHRIMP *CRITICAL HABITAT*	**DCH**	Primary constituent elements include: complexes of swales and pools with intermittently or continuously flowing surface water; depressional features that become inundated by winter rains and continuously hold water for a minimum of 41 days; and sources of food and habitat structure within pools.	**No Potential to Occur:** No federally designated critical habitat for this species is present within the Wildlife RSA.
Branchinecta lynchi VERNAL POOL FAIRY SHRIMP	**FT**	Found in vernal pools, particularly small, clear-water sandstone depression pools and grassy swale, earth slump, or basalt-flow depression pools.	**Potential to Occur:** *Branchinecta* sp. fairy shrimp confirmed in vernal pool complexes during 2010 field surveys but were not identified to species. The species has been reported to CNDDB within the Wildlife RSA.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Branchinecta lynchi VERNAL POOL FAIRY SHRIMP *CRITICAL HABITAT*	**DCH**	Primary constituent elements include: complexes of swales and pools with intermittently or continuously flowing surface water; depressional features that become inundated by winter rains and continuously hold water for a minimum of 18 days; and sources of food and habitat structure within pools.	**No Potential to Occur:** The project footprint lies outside federally designated critical habitat for this species. Critical habitat for vernal pool fairy shrimp is designated within 250 feet of the project footprint; however, no primary constituent elements are present. The project will have no direct or indirect effect on designated critical habitat for this species.
Desmocerus californicus dimorphus VALLEY ELDERBERRY LONGHORN BEETLE	**FT**	Blue elderberry shrubs (*Sambucus mexicana*.) with stem diameters of 2 to 8 inches. Species always found close to host plant. Larvae may remain in stems for up to 2 years.	**Potential to Occur:** No valley elderberry longhorn beetles were observed during 2010 field surveys; however, the project area is within the species' known range. The beetle's host plant, blue elderberry, was observed within the Botanical RSA along the banks of the Kern River, Dutch John Cut, and Cole Slough, and five occurrences within a 10-mile radius have been recorded within the project footprint.
Fish			
Hypomesus transpacificus DELTA SMELT	**FT**	Occur in the low-mid reaches of San Joaquin-Sacramento Delta. Found in brackish water with very low salinity. Shortly before spawning, adults migrate upstream from the brackish-water habitat and disperse widely into river channels and tidally-influenced backwater sloughs and channel edgewaters. Spawn in these shallow, fresh or slightly brackish waters upstream of the mixing zone.	**No Potential to Occur:** The project area is outside of the historic and current known geographic range of the species. Suitable habitat is not present within the Wildlife RSA due to extensive water diversions and instream obstructions which prohibit migratory movement to anadromous waters.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Oncorhynchus mykiss CENTRAL VALLEY STEELHEAD	**FT**	Anadromous. Found in Pacific Ocean and spawns in coastal streams and rivers. Requires mostly gravel-sized material for spawning, but will also use mixtures of sand-gravel and gravel-cobble.	**No Potential to Occur:** The project area is outside of the historic and current known geographic range of the species. Suitable habitat is not present within the Wildlife RSA due to extensive water diversions and instream obstructions which prohibit migratory movement to anadromous waters.
Amphibians			
Ambystoma californiense CALIFORNIA TIGER SALAMANDER	**FT**	Annual grasslands and grassy understory of valley-foothill hardwood habitats (i.e., oak-savannah). Require vernal pools or other seasonal water sources for breeding. Require mammal burrows or other underground refuges.	**Potential to Occur:** No California tiger salamanders were observed during 2010 field surveys. Five occurrences have been recorded in the CNDDB within a 10mile radius of the project footprint. The range of California tiger salamander overlaps a portion of the project footprint, from Fresno south to the city of Corcoran. The majority of this area does not contain suitable habitat for the species and California tiger salamanders are not expected to occur. Potentially suitable habitat for the species may occur within a limited (5-linear-mile) portion of the action area (the Cross Creek grassland region north of Corcoran), where permission to enter was not granted.
Ambystoma californiense CALIFORNIA TIGER SALAMANDER *CRITICAL HABITAT*	**DCH**	Primary constituent elements include: standing bodies of fresh water which become inundated during winter rains and typically remain inundated for a minimum of 12 weeks; upland habitats that contain small mammal burrows or other underground refugia; upland dispersal habitat that allows for movement between occupied habitats.	**No Potential to Occur:** No federally designated critical habitat for California tiger salamander is present within the project footprint.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Rana draytonii (*Rana aurora draytonii*) CALIFORNIA RED-LEGGED FROG	**FT**	Pools in marshes; streams; ponds with emergent vegetation, and typically without predatory fish; require adequate hibernacula, such as small mammal burrows or moist leaf litter.	**No Potential to Occur:** The project area is within the historical range of the California red-legged frog; however, this species is believed to be extirpated from the San Joaquin Valley and the current distribution of the species is primarily restricted to the Coast Range. The Wildlife RSA lies outside of the species' currently accepted range and no occurrences within a 10-mile radius of the project footprint have been recorded in the CNDDB.
Batrachoseps stebbinsi TEHACHAPI SLENDER SALAMANDER	**C(T/E)**	Restricted to scattered populations in the Caliente Creek drainage at the juncture of the southern Sierra Nevada and the Tehachapi Mountains, and in isolated canyons on the northern slopes of the Tehachapi Mountains from Tejon Canyon to Fort Tejon. Found at elevations ranging between 2,000 to 4,600 feet. Limited to moist, seasonally shaded, north-facing rocky or talus slopes and oak or mixed pine-oak woodland along canyons and ravines; found beneath heavy leaf litter and rock, talus, and woody debris refugia.	**No Potential to Occur:** The project area lies outside of the species' known range. No suitable habitat exists in the action area, and no CNDDB occurrences within a 10-mile radius of the project footprint.
Lithobates (=Rana) pipiens NORTHERN LEOPARD FROG *LIMITED TO* NATIVE POPULATIONS ONLY	**C(T)**	In California, native populations are limited in range to Modoc and Lassen counties; introduced populations are otherwise scattered throughout California. Habitat requirements include aquatic winter habitat with emergent vegetation for egg deposition, uplands dominated by grasses or forbs for foraging, and availability of moist substrate. Only native populations of this species receive consideration as California species of special concern under California Fish and Game Code.	**No Potential to Occur:** The project area lies outside of the range of species' known native populations. Population in the project area represents introduced individuals that receive no protection.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Reptiles			
Gambelia (=*Crotaphytus*) sila BLUNT-NOSED LEOPARD LIZARD	**FE**	Resident of sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief. Seek cover in mammal burrows, under shrubs or structures such as fence posts; they do not excavate their own burrows.	**Potential to Occur:** CNDDB reports confirm blunt-nosed leopard lizard within the Allensworth Ecological Reserve on parcels adjacent and contiguous to those within the Wildlife RSA. Suitable habitat in the way of sparsely vegetated alkali and desert scrub habitats are present for the species. In addition, multiple CNDDB records confirm blunt-nosed leopard lizard elsewhere in the Wildlife RSA. Based on the known distribution of the species, suitable habitat appearing within the Wildlife RSA, and documented occurrences of the species within the Wildlife RSA, the blunt-nosed leopard lizard has potential to occur within a limited portion of the action area between the towns of Allensworth and Neufeld.
Thamnophis gigas GIANT GARTER SNAKE	**FT**	Found in freshwater marshes and low-gradient streams. Prefers habitat with dense emergent vegetation, deep and shallow pools of water (which persist throughout the seasonal cycle of activity), open areas along water margins, and upland habitat with access to structures suitable for hibernation and escape from flooding. Has adapted to drainage canals and irrigation ditches.	**No Potential to Occur:** The project area is within the historical range of the giant garter snake; however, records within the San Joaquin Valley are limited to rice production zones in Sacramento, Sutter, Butte, Colusa, and Glenn counties and the Grasslands and Mendota Wildlife areas of Fresno County. In the southern San Joaquin Valley, the species has otherwise been determined extirpated, particularly in the vicinity of the historic Kern, Tulare, and Buena Vista lakebeds. The project area lies outside of the species' currently accepted range; no occurrences within a 10-mile radius of the project footprint have been recorded in the CNDDB.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Birds			
Empidonax trallii extimus SOUTHWESTERN WILLOW FLYCATCHER	**FE**	Breeds in relatively dense riparian tree and shrub communities (e.g., willow, cottonwood, tamarisk thickets, and woodland) associated with rivers, swamps, and other wetlands, including lakes and reservoirs. Most of these habitats are classified as forested wetlands or scrub-shrub wetlands. Habitat requirements for wintering are not well known, but habitats used include brushy savanna edges, second growth, shrubby clearings and pastures, and woodlands near water.	**No Potential to Occur:** The project area is near the historical range but is outside of the currently accepted range of the southwestern willow flycatcher. The current distribution of the species in the Central Valley is primarily restricted to upstream portions of the Kern River watershed. No southwestern willow flycatchers were observed during the 2010 field surveys; however, suboptimal nesting and/or foraging habitat was identified within the RSA along the Kern River. No occurrences within a 10-mile radius of the project footprint have been recorded in the CNDDB.
Gymnogyps californianus CALIFORNIA CONDOR	**FE**	Permanent resident of the semi-arid, rugged mountain ranges surrounding southern San Joaquin Valley. Nests in caves, crevices, behind rock slabs, or on large ledges on high sandstone cliffs. Condors have been reintroduced into the mountains of southern California north of the Los Angeles basin, in the Big Sur vicinity of the central California coast.	**No Potential to Occur:** The project area is outside of the species' known range; it does not overlap with any of the reintroduced populations. No occurrences within a 10-mile radius of the project footprint have been recorded in the CNDDB.
Vireo bellii pusillus LEAST BELL'S VIREO	**FE**	Summers within California range. Typically inhabits structurally diverse dense riparian woodlands/shrubs along water courses or near open water. Nests in shrub or low tree, usually 3 feet above ground, in horizontal or down-sloping twig fork, typically near edge of thicket. Obligate riparian species during breeding season. Brown-headed cowbird severe threat.	**No Potential to Occur:** Habitat suitable to support the species is limited within the project footprint. No species occurrences have been reported to the CNDDB within a 10-mile radius of the project footprint. The project area is outside of the known range of the least Bell's vireo.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Charadrius alexandrinus nivosus WESTERN SNOWY PLOVER	**FT**	Occurs year round in California range. Inhabits beaches, dry mud or salt flats, sandy shores of rivers, lakes, and ponds. Nests primarily on coastal beaches, but known to nest in the Central Valley. Breeds in loose colonies. *Federal listing applies only to the Pacific coastal population.*	**No Potential to Occur:** Three CNDDB records report western snowy plover within a 10-mile radius of the project footprint. Suitable habitat for the species is present within the project area; however, because they are not coastal inhabitants, these individuals are not considered to be part of the federally listed population.
Coccyzus americanus occidentalis WESTERN YELLOW-BILLED CUCKOO	**C**	Breeds in large blocks of riparian habitats (particularly woodlands with willow and cottonwood) along the broad lower flood bottoms of larger river systems. Dense understory foliage is important.	**No Potential to Occur:** The project area lies within the historical range of the western yellow-billed cuckoo; however, it is outside of the species' currently accepted range. Distribution of the species in the Central Valley is primarily restricted to isolated breeding populations along the Sacramento River and in the upper Kern River watershed. No western yellow-billed cuckoos were observed during 2010 field surveys; suboptimal nesting and/or foraging habitat was identified in the riparian corridor along the lower Kern River. One CNDDB occurrence is recorded within the project area.
Synthliboramphus hypoleucus XANTUS'S MURRELET	**C / BCC**	Breeds on offshore islands of Baja California and southern California; occasionally wanders north to Vancouver Island. An ocean-going species; nests in colonies on rocky sea islands, laying its eggs among boulders or in crevices off of island beaches.	**No Potential to Occur:** The nine-quad search "captures" one documented occurrence of this species. The project area is well outside of the known range of the Xantus's murrelet. No suitable habitat for the species is present.
Falco peregrinus anatum AMERICAN PEREGRINE FALCON	**Delisted**	Found year-round within California range in a variety of habitats, most with cliffs for nesting and open areas for foraging. Uses large cities and nests on buildings.	**Potential to Occur:** American peregrine falcon was observed within the Wildlife RSA during field surveys. Suitable foraging habitat in the way of open grasslands, meadows, pastures, fallow fields, and irrigated crop field observed. No prior occurrences have been reported within a 10-mile radius of the project footprint to the CNDDB.

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
Haliaeetus leucocephalus BALD EAGLE	**Delisted**	Mainly found in mountainous habitats near reservoirs, lakes, and rivers; builds nests in the upper canopy of large coniferous trees. Most nest within 1 mile of water.	**Potential to Occur:** No bald eagles were observed during 2010 field surveys; however, project area is within the species' known range, and suitable foraging habitat was identified within the Wildlife RSA. No occurrences have been reported to the CNDDB within a 10-mile radius of the project footprint.
Mammals			
Dipodomys ingens GIANT KANGAROO RAT	**FE**	Occurs in the western San Joaquin Valley; prefers annual grassland on gentle slopes (10 degrees) with friable, sandy-loam soils. Prefers open habitat areas with almost no shrub cover.	**No Potential to Occur:** The project area is outside of the species' known range and no occurrences have been reported to the CNDDB within a 10-mile radius of the project footprint.
Dipodomys nitratoides nitratoides TIPTON KANGAROO RAT	**FE**	Occurs in the Tulare Lake basin of the southern San Joaquin Valley; the population is restricted to south of the Kings River. Inhabits saltbush scrub and sink scrub communities. This species needs soft friable soils which escape seasonal flooding. Digs burrows in elevated soil mounds at bases of shrubs.	**Potential to Occur:** Although kangaroo rat sign (tail drags, burrows, tracks) were observed during 2010 field surveys, no Tipton kangaroo rats were confirmed to sub-species. A portion of the project footprint is within the species' known range and suitable scrubland habitat was identified within the Wildlife RSA. Forty-one CNDDB records have been reported within the project area. Tipton kangaroo rats have potential to occur where suitable habitat is present between the Kings River and Bakersfield.
Dipodomys nitratoides exilis FRESNO KANGAROO RAT	**FE**	Restricted to native grasslands in western Fresno County that are north of the Kings River. Preferred habitat consists of nearly flat, light, friable soils in chenopod scrub and grassland communities. The species is not known to use areas that have been cultivated or irrigated.	**Potential to Occur:** Although kangaroo rat sign (tail drags, burrows, tracks) were observed during 2010 field surveys, no Fresno kangaroo rats were confirmed to sub-species. The project footprint is on the edge of the species' historic range. Small areas of highly fragmented suitable habitat were identified within the Wildlife RSA. Two occurrences have been recorded to the CNDDB from within the project area; both are considered to be extirpated by CDFG. However, potential to occur exists in limited areas of isolated habitat north of the Kings River.
Sorex ornatus relictus *BUENA VISTA LAKE SHREW*	**FE**	Occurs in the Tulare Basin in marshlands and riparian areas; prefers moist soil and uses stumps, logs, and litter for cover.	**No Potential to Occur:** The project area is located outside of the species' known range, no suitable habitat is present, and no occurrences have been reported within the

Table 4-1
Federally Listed Plant and Wildlife Species

Scientific Name COMMON NAME	Federal Status[1]	Preferred Habitat	Potential to Occur
			action area of the project footprint.
Vulpes macrotis mutica SAN JOAQUIN KIT FOX	**FE**	Occurs in the San Joaquin Valley in annual grassland or grassy open stages with scattered shrubby vegetation; requires loose-textured sandy soils for burrowing; requires suitable prey base of small rodents, including kangaroo rats or California ground squirrels.	**Potential to Occur:** No San Joaquin kit foxes were observed during 2010 field surveys; however, the project area is within the species' current known range, and suitable habitat for foraging, breeding, denning, and/or movement was identified in various areas throughout the Wildlife RSA. More than 200 occurrences have been recorded in the CNDDB from within a 10-mile radius of the project footprint.

Notes:
[1] Federal Status
FE – Endangered
FT – Threatened
DCH – Designated Critical Habitat by the U.S. Fish and Wildlife Service
BCC – Birds of Conservation Concern
C(E) – Candidate for Endangered listing status
C(T) – Candidate for Threatened listing status
C(T/E) – Candidate for Threatened or Endangered listing status
[2] State Status
SE – Endangered
ST – Threatened
FP – Fully Protected species designated by the California Department of Fish and Game
C(E) – Candidate for Endangered listing status
C(T) – Candidate for Threatened listing status
CSC – California Species of Special Concern designated by the California Department of Fish and Game
Source:
The California Department of Fish and Game (CDFG) Natural Diversity Database (CNDDB) records and USFWS species lists for the USGS 7.5 minute quadrangles queried that surround the project area: Bear Mountain (213B), Arvin (214A), Weed patch (214B), Conner (215A), Millux (215B), Mt Adelaide (238B), Bena (238C), Rio Bravo Ranch (239A), Oil Center (239B), Lamont (239C), Edison (239D), Oildale (240A), Rosedale (240B), Stevens (240C), Gosford (240D), Rio Bravo (241A), Buttonwillow (241B), East Elk Hills (241C), Tupman (241D), Knob Hill (262C), Deepwell Ranch (263A), McFarland (263B), Famoso (263C), North of Oildale (263D), Pond (264A), Wasco NW (264B), Wasco SW (264C), Wasco (264D), Lost Hills NE (265A), Sausalito School (287B), Delano East (287C), Pixley (288A), Alpaugh (288B), Allensworth (288C), Delano West (288D), Hacienda Ranch NE (289A), Hacienda Ranch NW (289B), Hacienda Ranch (289D), Tulare (311A), Paige (311B), Taylor Weir (311C), Tipton (311D), Waukena (312A), Guernsey (312B), El Rico Ranch (312C), Corcoran (312D), Monson (334A), Traver (334B), Goshen (334C), Visalia (334D), Burris Park (335A), Laton (335B), Hanford (335C), Remnoy (335D), Riverdale (336A), Burrel (336B), Lemoore (336D), Whatoke (356B), Reedley (356C), Orange Cove South (356D), Sanger (357A), Malaga (357B), Conejo (357C), Selma (357D), Fresno South (358A), Kearney Park (358B), Raisin (358C), Caruthers (358D), Friant (378B), Clovis (378C), Round Mountain (378D), Lanes Bridge (379A), Gregg (379B), Herndon (379C), and Fresno North (379D).

4.3 Species/Critical Habitats Considered

The following species are discussed in detail based on the *Potential to Occur* determination of Table 4-1.

4.3.1 California Jewelflower

California jewelflower (*Caulanthus californicus*) was federally listed as endangered in July 1990 (Federal Register 55:29361). It was listed as state endangered under the California Endangered Species Act (CESA) in January 1987. Additionally, it is a CNPS List 1B.1 species.

California jewelflower is included in the Upland Species Recovery Plan (USFWS 1998a). No critical habitat has been designated for this species.

4.3.1.1 Species Description

California jewelflower is an annual herb in the mustard family (Brassicaceae) and ranges from 4 to 20 inches tall. The stems of this species are typically branching and feature oblong leaves at the base that transition to clasping, egg-shaped leaves near the top. The stems feature clusters of maroon buds that reveal translucent white flowers during the blooming period, generally between February and May. For individuals to successfully set seed, this species requires specific insect pollinators, sufficient rainfall, and temperatures which do not rise above average for the season. Seed dispersal mechanisms are not precisely known but likely include gravity, fruit-eating animals, wind, and water (USFWS 1998b).

Habitat loss resulting from developmental pressure is the primary threat to California jewelflower. Competition with exotic species and the reduction of potential pollinators through insecticide use are also potentially threatening existing populations.

4.3.1.2 Habitat Requirements and Range

California jewelflower is typically found at elevations ranging from 240 feet to 2,950 feet in subalkaline sandy loam soils. California jewelflower is associated with desert scrub, annual or perennial grasslands, and juniper and pinyon-juniper woodland. Historically, this species may also have been associated with alkali desert scrub. Species that may co-occur with California jewelflower include annual fescues (*Vulpia sp.*), clovers (*Trifolium* spp.), red maids (*Calandrinia ciliata*), and goldfields. This species is known to occur in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture.

Historically, this species occurred in Fresno, San Luis Obispo, Santa Barbara, Kings, Tulare, and Kern counties. Currently, this species is known to occur in Fresno, San Luis Obispo, and Santa Barbara counties.

4.3.1.3 Action Area

Within the project action area, the limit of direct and indirect effects for California jewelflower includes the project footprint and an additional 100-foot buffer. This area is equivalent to the Botanical RSA as defined during the 2010 field surveys.

4.3.1.4 Documented Occurrences and Survey Results

Seven CNDDB occurrences of California jewelflower are reported within 10 miles of the Botanical RSA, three of which are within the Botanical RSA (CDFG 2012). All of the CNDDB records within 10 miles of the Botanical RSA are considered extirpated due to agricultural conversion and urban development, except for one, which is considered possibly extirpated (CDFG 2012). This

occurrence is 3.8 miles from the Botanical RSA near Bakersfield, along Caliente Creek, at the foot of the Tehachapi Grade, in Kern County.

As identified in the recovery plan, three areas with concentrated extant metapopulations of California jewelflower are known; Santa Barbara Canyon, the Carrizo Plain in San Luis Obispo County, and Kreyenhagen Hills in Fresno County (USFWS 1998a). These areas are far outside of the Botanical RSA. Other isolated populations remain, including a population near Lost Hills, which represents the nearest reported extant population (USFWS 1998a).

California jewelflower was not identified during March, April, May, or July 2010 surveys of the Botanical RSA.

4.3.1.5 Potential to Occur in the Action Area

Although the California jewelflower was not observed during floristic surveys conducted within the Botanical RSA, this species has limited potential to occur on properties where permission to enter was not granted. Suitable habitat for the species appears along the upland margins of inundated vernal pools in alkali desert scrub and annual grassland habitats within the action area. Suitable habitat for the species may occur in those portions of the action area within Kings, Tulare, and Kern Counties.

The presence of California jewelflower is inferred based on the historical distribution of the species, suitable habitat appearing within the Botanical RSA in areas where permission to enter was not available, and documented occurrences of the species near the project footprint; however, the potential for the species to occur is low.

4.3.2 Kern Mallow

Kern mallow (*Eremalche kernensis*) was federally listed as endangered in July 1990 (Federal Register 55:29361). This species is also a CNPS List 1B.1 species.

Kern mallow is included in the USFWS Upland Species Recovery Plan (USFWS 1998a). No critical habitat has been designated for this species.

4.3.2.1 Species Description

Kern mallow is an annual herb in the Malvaceae family that varies in size depending on seasonal precipitation, typically reaching 2 to 4 inches in height, but ranging up to 20 inches. Individuals of this species can exhibit a single upright stem or multiple stems with outer stems growing laterally along the ground. During the blooming period between March and May, five-petaled white to pale lavender flowers are produced, followed by fruit within a few days (strict definitions of the federally listed species include only populations with white flowers). Seeds drop to the ground from mature fruits and are likely dispersed by animals and wind.

The taxonomy of this species is currently uncertain. Neither the first nor second edition of the Jepson Manual recognizes the nomenclature *E. kernensis;* instead, they list the species as a subspecies of Parry's mallow (*E. parryi* ssp. *kernensis*) (Hickman 1993; Andreasen 2010). According to the *Supplemental Survey Methods for Kern Mallow* (Cypher 2002), the strictest definition of Kern mallow describes the species as gynodioecious, with generally white to pale lavender flowers, and found in the vicinity of Lokern in Kern County. The same document recommends that all populations west of the Sierra crest with gynodioecious or small-flowered characteristics should be reported, regardless of flower color or apparent gender. The Upland Species Recovery Plan describes the identification process based on flower color, where populations with only pinkish-purple flowers are considered Parry's mallow, whereas populations with predominantly white flowers are the "object of conservation concern" (USFWS 1998a).

As stated in the Upland Species Recovery Plan, the Kern mallow is threatened by the conversion of suitable habitat into other land uses. Petroleum interests, including oil exploration, pipeline maintenance, and utility corridor maintenance, have also been cited as leading to the fragmentation of existing populations. Conservation efforts for this species have focused on preserving its remaining habitat and on increasing the amount of research that is applied to studying its demography (USFWS 1998a).

4.3.2.2 Habitat Requirements and Range

Kern mallow is usually found in grasslands or in areas dominated by saltbush or other chenopod shrubs at elevations between 300 and 900 feet, although it has been reported as high as 3,280 feet (CNPS 2010). This species is generally found on alkaline sandy loam or clay loam soils in areas dominated by other herbaceous species (less than 25% shrub cover). Associated species typically include foxtail brome, red-stemmed filaree, woolly goldfields (*Lasthenia minor*), and white Sierran layia *(Layia pentachaeta* ssp. *albida*). Shrubs commonly associated with this species include spinescale saltbush and cattle saltbush (*Atriplex polycarpa*). This species generally occurs in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, as well as in vernal pools and pasture.

The range of Kern mallow includes western Kern County and primarily the Lokern area, which is between Buttonwillow and McKittrick. Although some define the species by this limited range (Cypher 2002), broader definitions expand the possible range as far as the known range for Parry's mallow, which extends from Alameda County to Ventura County.

The Upland Species Recovery Plan targets the Lokern area (30 miles from action area) for species habitat conservation and species recovery.

4.3.2.3 Action Area

Within the project action area, the limit of direct and indirect effects for Kern mallow includes the project footprint and an additional 100-foot buffer. This area is equivalent to the Botanical RSA as defined during the 2010 field surveys.

4.3.2.4 Documented Occurrences and Survey Results

One historical occurrence of Kern mallow was reported within 10 miles of the Botanical RSA (CDFG 2012). The exact location of this occurrence is unknown; however, the CNDDB places it within 1 mile of the project footprint. This occurrence was found in a saline valley grassland community and is presumed extant, although it was last observed in 1962.

Several occurrences of Kern mallow are reported from the Lokern area, between Buttonwillow and McKittrick, and are described as a single metapopulation (USFWS 1998a). This area is approximately 30 miles west of the Botanical RSA. If a broad concept of the species is applied, several recent and historic occurrences are reported in Kern, Kings, San Luis Obispo, Tulare, and Santa Barbara counties, including occurrences near Corcoran and Pixley, which are within the immediate vicinity of the Botanical RSA.

During the early season botanical surveys, botanists investigated the previously known occurrences for the species; no historically documented Kern mallow populations were found.

A population of mallow identified from the Jepson Manual as *Eremalche parryi* ssp. *kernensis,* was detected near the intersection of SR 155 and SR 43 in Kern County during the botanical surveys in May 2010. The species was recorded in a fallow field outside of the Botanical RSA (less than 500 feet away). The dominant cover in the field consisted of foxtail brome and pungent tarweed (*Hemizonia pungens*). The area appeared to have been heavily disturbed in the past.

However, shrub recruitment of bush seepweed indicated that the field had not been disturbed for at least one complete growing season. The observed population was gynodioecious and small-flowered, but it occurred approximately 30 miles east of Lokern and no white flowered specimens were observed. The entire population appeared to have light- to medium-purple flowers. As only populations within the Lokern area with predominantly (>90%) white flowers are the object of conservation concern (USFWS 1998a), this occurrence is not considered to represent the federally listed population of Kern mallow.

4.3.2.5 Potential to Occur in the Action Area

Based on the guidance of the Upland Species Recovery Plan (USFWS 1998a), the listed white-flowered population of Kern mallow is not currently known to occur within the action area, as the action area is outside the current range of the species (Lokern region). Only one occurrence, now 48 years old, has been reported from within the action area. However, *E. parryi* ssp. *kernensis* has been documented near the action area and potential exists for unreported populations of the species of conservation concern to occur in suitable habitat within the action area where permission to enter was not available. Therefore, the potential for the species to occur is low.

4.3.3 San Joaquin Woolly Threads

San Joaquin woolly threads (*Monolopia congdonii*) was federally listed as endangered in July 1990 (Federal Register 55:29361). It is also a CNPS List 1B.2 species. San Joaquin woolly threads is included in the Upland Species Recovery Plan (USFWS 1998a). No critical habitat has been designated for this species.

4.3.3.1 Species Description

San Joaquin woolly threads is an annual herb in the composite family (Asteraceae) that typically features many long, trailing stems. The branching stems are tipped with clusters of tiny, yellow flower heads that typically bloom between late February and early April, depending on precipitation levels. Seeds fall upon reaching maturity, and dispersal mechanisms are not precisely known but likely include wind, water, and wildlife. The number of seeds that germinate depends on precipitation levels, and seeds that do not germinate remain viable in the soil seed bank (USFWS 1998a).

The primary threat to San Joaquin woolly threads is habitat destruction resulting from agricultural and urban development. Conservation efforts have focused on preserving the remaining populations and on funding demographic studies and monitoring programs (USFWS 1998a). Oil activity, grazing by sheep, vehicle traffic, urban development, and agricultural conversion are continued threats to this species (USFWS 1998a).

4.3.3.2 Habitat Requirements and Range

This annual herb is generally found in neutral to subalkaline soils of sand to sandy loam texture, in chenopod scrub or grasslands at elevations between 200 and 2,600 feet. Species that may co-occur with San Joaquin woolly threads include red brome, red-stemmed filaree, goldfields, Mediterranean grass (*Schismus* spp.), and fescue (*Vulpia myuros*). Currently this species is known to occur in San Luis Obispo, Kern, Kings, Fresno, San Benito, and Santa Barbara counties. Historically, this species was also known to occur in Tulare County. This species generally occurs in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture.

Priority areas for recovery of this species include the Carrizo Plain Natural Area, and areas in the Lost Hills, Jacalitos Hills, Kettleman Hills, and Panoche Hills. None of these areas are within 10 miles of the action area.

4.3.3.3 Action Area

Within the project action area, the limit of direct and indirect effects for San Joaquin woolly threads includes the project footprint and an additional 100-foot buffer. This area is equivalent to the Botanical RSA as defined during the 2010 field surveys.

4.3.3.4 Documented Occurrences and Survey Results

The CNDDB reports 12 occurrences of San Joaquin woolly threads within 10 miles of the Botanical RSA (CDFG 2012). Two of these occurrences are in the Botanical RSA. Nine of the 12 recorded occurrences, including the 2 occurrences that fall within the Botanical RSA, are extirpated or possibly extirpated due to agricultural and urban development. Occurrence number 19, about 10 miles southeast of the terminal end of the Bakersfield North and South segments, is presumed extant although no plants were observed at the site during 1986 and 1987 surveys of the area. Two occurrences near the Kern River, approximately 6 miles and 7 miles southwest of the Rosedale segment, were confirmed in 2009.

As acknowledged in the Upland Species Recovery Plan, several metapopulations of San Joaquin woolly threads have been identified in the western San Joaquin Valley (USFWS 1998a). The nearest of these occurrences to the Botanical RSA include populations near Lost Hills and Bakersfield in Kern County.

San Joaquin woolly threads was not observed during floristic surveys conducted within the Botanical RSA, in Kern County.

4.3.3.5 Potential to Occur in the Action Area

The San Joaquin woolly threads was not observed within the action area; however, habitat suitable to support San Joaquin woolly threads occurs in the action area. The species has potential to occur within the action area in high quality natural areas mapped as alkali desert scrub and annual grassland habitats. While the species is known both currently and historically from Fresno, Tulare, Kings, and Kern County, documented occurrences within the project area are only known from Kern County. The majority of the populations are known from the western San Joaquin Valley. This species is not likely to occur in alkali desert scrub or annual grassland habitats that have been degraded due to residential, agricultural, or oil development. This species is not expected to occur in Fresno, Kings, or Tulare Counties.

San Joaquin woolly threads has limited potential to occur in the action area because the current range of the species is west of the action area. However, the presence of San Joaquin woolly threads is inferred in suitable habitats within Kern County based on the known distribution of the species, suitable habitat appearing within the Botanical RSA in areas where permission to enter was not granted, and documented occurrences of the species near the project footprint; however, the potential for the species to occur is low.

4.3.4 Hoover's Spurge

Hoover's spurge (*Chamaesyce hooveri*) was federally listed as threatened in March 1997 (Federal Register 62:14338). This species is also a CNPS List 1B.2 species. Critical habitat for Hoover's spurge was designated on August 6, 2003 (Federal Register 68:46683) but no designated critical habitat exists within 10 miles of the project footprint. Hoover's spurge is included in the USFWS Vernal Pool Recovery Plan (USFWS 2005b).

4.3.4.1 Species Description

Hoover's spurge is an annual herb in the spurge family (Euphorbiaceae) that grows in mats along the ground. This species ranges from 2 to 40 inches in diameter and has kidney-shaped leaves. Along each stem, between the leaves, are cyathium (flower clusters or inflorescences) composed of tiny white flowers. Depending on location and hydrologic condition, the species generally blooms between May and October. This species is an obligate wetland plant but will not grow in standing water (Alexander and Schlising 1998). Once produced, seeds likely remain dormant in the soil seed bank for several years until appropriate conditions are present because plants often reappear at pools in substantial numbers after years of absence (USFWS 2005b).

Hoover's spurge is primarily threatened by the conversion of suitable habitat to agriculture and changes in hydrology from nearby agricultural activities. Competition with invasive species and destruction from grazing cattle are also threatening this species (USFWS 2005b).

4.3.4.2 Habitat Requirements and Range

Hoover's spurge may be found at elevations from 80 feet to 130 feet in hardpan or claypan vernal pools. Occupied vernal pools range in size from 0.47 acre to 600 acres, with the species occurring along the margins of the deepest section of dried pools. This species is an obligate wetland plant but will not grow in standing water (Alexander and Schlising 1998). In the San Joaquin Valley, this species is typically found in soils that are neutral to saline-alkaline with clay to sandy loam textures. The two most common associates of Hoover's spurge are Greene's tuctoria (*Tuctoria greenei*) and hairy Orcutt grass (*Orcuttia pilosa*), although these species occur in different locations in the vernal pool habitat. This species generally occurs in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, as well as in vernal pools and pasture. Currently this species is believed to occur in Tehama, Butte, Tulare, Stanislaus, Glenn, and Merced counties; however, of the 26 occurrences that are presumed to be extant, the majority of these occurrences have not been confirmed since the late 1980s (CDFG 2012).

Recovery areas have not been identified for this species.

4.3.4.3 Action Area

Within the project action area, the limit of direct and indirect effects for Hoover's spurge includes the project footprint and an additional 100-foot buffer. This area is equivalent to the Botanical RSA as defined during the 2010 field surveys.

4.3.4.4 Documented Occurrences and Survey Results

Currently this species is believed to occur in Tehama, Butte, Tulare, Stanislaus, Glenn, and Merced counties; however, of the 26 occurrences that are presumed to be extant, the majority of these occurrences have not been confirmed since the late 1980s (CDFG 2012).

The CNDDB contains no documented occurrences of Hoover's spurge within 10 miles of the Botanical RSA (CDFG 2012). However, historical occurrences of this species in Tulare County were recorded east of the city of Visalia (USFWS 2005b).

The major extant population centers, as identified in the Vernal Pool Recovery Plan, include the Vina Plains of Tehama and Butte Counties, the Visalia-Yettem area of Tulare County, and the Hickman-La Grange area of Stanislaus County (USFWS 2005b). The Tulare County population of Hoover's spurge is not within the project area; however, the species has potential to occur when suitable habitat is found within the Botanical RSA.

Hoover's spurge was not identified during March, April, May, or July 2010 surveys of the Botanical RSA.

4.3.4.5 Potential to Occur in the Action Area

Hoover's spurge was not observed during floristic surveys in the Botanical RSA; however, this species has potential to occur within vernal pools that occur in annual grassland and alkali desert scrub habitats in a limited portion of the action area where permission to enter was not granted. Potentially suitable vernal pool habitat for the Hoover's spurge occurs within portions of the action area in Kings and Tulare Counties. Kings County has no known occurrences within the Botanical RSA, and the occurrences from Tulare County are well east of the action area and are believed to be extirpated (CDFG 2012). As such, the potential for this species to occur in Kings or Tulare Counties is low. This species is not expected to occur in the action area within Fresno or Kern Counties because the species is not known from these counties. Lands containing potentially suitable habitat are extremely limited and do not provide the appropriate hydrology required by this species.

The presence of Hoover's spurge is inferred in suitable habitat in Tulare County based on the historical distribution of the species, suitable habitat appearing within the Botanical RSA in areas where permission to enter was not granted, and documented occurrences of the species near the project footprint. Therefore, the potential for the species to occur is low.

4.3.5 Vernal Pool Tadpole Shrimp

The vernal pool tadpole shrimp (*Lepidurus packardi*) is federally listed as endangered (Federal Register 59-48136). Critical habitat was first designated for the vernal pool tadpole shrimp in 2003 (Federal Register 68-46683), with the final designation established in 2006 (Federal Register 28-7117). The vernal pool tadpole shrimp is included in the Vernal Pool Recovery Plan (USFWS 2005b).

4.3.5.1 Species Description

The vernal pool tadpole shrimp is a small crustacean, 1 to 1.5 inches long and brown in color, found in California's vernal pools. As dictated by this ephemeral habitat, fairy shrimp have short life spans; from December until the pools dry up in late spring or summer. Individuals can reach sexual maturity in 18 days and complete their life span in nine weeks. Eggs (cysts) remain dormant in the soil during the dry season and may lie dormant in the soil for many years before hatching.

The vernal pool tadpole shrimp feeds on small invertebrates, amphibian eggs, and some vegetation. Although it has not been documented, the vernal pool tadpole shrimp probably preys on fairy shrimp when they co-occur (Eriksen and Belk 1999). The vernal pool tadpole shrimp is more temperature-tolerant than the vernal pool fairy shrimp.

This species is threatened by habitat loss, primarily from development, agriculture, and encroachment of non-native grasses.

4.3.5.2 Habitat Requirements and Range

Vernal Pool tadpole shrimp exist only in vernal pools or vernal pool-like habitats. These are a unique, seasonal aquatic habitat, which form when winter rains fill shallow depressions. Lined with impervious claypan or hardpan soils, the pools persist for several months and then gradually evaporate during spring. The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools (Eng et al. 1990, Helm 1998).

Vernal pool tadpole shrimp are endemic to California's Central Valley, from Shasta County to Merced County; the majority of the populations are distributed in the northern and eastern portions of the Central Valley. This species is found in vernal pools and seasonal wetlands containing highly turbid water, often in unplowed grasslands. These seasonal pools contain old alluvial soils underlain by hardpan, or occur in sandstone depressions; water in the pools has very low alkalinity and conductivity. In general, suitable aquatic communities occur in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture.

A review of the CNDDB (CDFG 2012) and Vernal Pool Recovery Plan (USFWS 2005b) indicates that portions of the Wildlife RSA occur within the geographic range for this species. Two Core Recovery Areas identified in the Vernal Pool Recovery Plan fall within 10 miles of the action area. The Cross Creek Core Area is approximately 5 miles east of the action area, and the Pixley Core Area is adjacent to the action area.

Designated critical habitat for vernal pool tadpole shrimp does not occur within the project footprint.

4.3.5.3 Action Area

Within the project action area, the limit of direct and indirect effects for the vernal pool tadpole shrimp includes vernal pools and seasonal wetlands suitable to support this species within the project footprint and an additional 250-foot buffer. This area is equivalent to the Wetland RSA as defined during the 2010 field surveys. The 250-foot buffer is consistent with the guidance in the *1996 Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans within the Jurisdiction of the Sacramento Field Office, California* (Programmatic BO) (USFWS 1996a).

4.3.5.4 Documented Occurrences and Survey Results

High quality vernal pool areas are documented in and around the Pixley NWR and Allensworth ER (USFWS 2005a). Portions of the project footprint run parallel to the boundary of these Reserves.

According to a query of the CNDDB, five occurrences of vernal pool tadpole shrimp have been reported in Tulare County, two occurrences in Kings County, and three occurrences in Fresno County (CDFG 2012). To date, these occurrences constitute the southernmost extent of the vernal pool tadpole shrimp's known range. Three vernal pool tadpole shrimp occurrences (Numbers 129, 139, and 140) have been reported within the project area east of Hanford; however, none are within 1 mile of the project footprint (CDFG 2012). The closest occurrence (Number 139) was reported approximately 5 miles east of the project footprint (Figure 4-2a, Sheet 2) and consisted of hundreds of vernal pool tadpole shrimp observed in vernal pools in a nonnative grassland area west of Cross Creek (CDFG 2012).

The Vernal Pool Recovery plan documents that vernal pool tadpole shrimp are uncommon even within remaining vernal pools. Within the San Joaquin Vernal Pool Region, they are reported only from the Grasslands Ecological Area and private land in Merced County and from single locations in Tulare and Kings Counties.

Although other vernal pool crustaceans were observed during the spring 2010 field surveys (e.g., ostracods [seed shrimp] and fairy shrimp), the vernal pool tadpole shrimp was not observed. Protocol level habitat assessment or focused presence/absence surveys were not conducted during the 2010 field season.

4.3.5.5 Potential to Occur in the Action Area

Vernal pool tadpole shrimp habitat is present in vernal pools and seasonal wetlands that were identified in the wetland delineation. In general, suitable vernal pool areas occur in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture. Although the species was not observed during surveys conducted within the Wildlife RSA, the species has potential to occur in high quality natural areas within the action area where permission to enter was not granted.

The presence of vernal pool tadpole shrimp is inferred based on the known distribution of the species, suitable habitat appearing within the Wildlife RSA, and documented occurrences of the species near the project footprint.

4.3.6 Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Brachinecta lynchi*) was federally listed as threatened in September 1994 (Federal Register 59:48136). This species is included in the Vernal Pool Recovery Plan (USFWS 2005b).

Designated critical habitat for this species is discussed in Section 4.3.7.

4.3.6.1 Species Description

The vernal pool fairy shrimp is 1 to 1.5 inches long, translucent in appearance, and found in California's vernal pools. Due to the ephemeral nature of their habitat, fairy shrimp have short life spans; typically from December to early May. Shrimp eggs are laid by the adults each winter season. However, eggs may lie dormant (as cysts) in the soil for many years before hatching. Vernal pool fairy shrimp are filter and suspension feeders. Their diet mainly consists of unicellular algae, bacteria, and ciliates. They may also scrape algae, diatoms, and protists from the surface of rocks, sticks, and plant stems.

Threats to this species are primarily from habitat conversion due to urban and agricultural development.

4.3.6.2 Habitat Requirements and Range

The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. Vernal pools are a unique, seasonal aquatic habitat, which form when winter rains fill shallow depressions. Lined with impervious claypan or hardpan soils, the pools persist for several months, and then gradually evaporate during spring. Although the species has been collected from large vernal pools, including one that exceeds 25 acres, it tends to occur in small vernal pools or seasonal wetlands in unplowed grasslands (Eriksen and Belk 1999). It is most frequently found in seasonally aquatic pools measuring less than 0.05 acre. In general, suitable aquatic communities occur in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture.

A review of the CNDDB (CDFG 2012) and Vernal Pool Recovery Plan (USFWS 2005b) indicates that the entire Wildlife RSA occurs within the geographic range for this species. Two Core Recovery Areas identified in the Vernal Pool Recovery Plan fall within 10 miles of the action area. The Cross Creek Core area is approximately 5 miles east of the action area, and the Pixley Core Area is adjacent to the action area.

4.3.6.3 Action Area

Within the project action area, the limit of direct and indirect effects for the vernal pool fairy shrimp includes vernal pools and seasonal wetlands suitable to support this species within the project footprint and an additional 250-foot buffer. This area is equivalent to the Wetland RSA as defined during the 2010 field surveys. The 250-foot buffer is consistent with the guidance in the 1996 Programmatic BO (USFWS 1996a).

4.3.6.4 Documented Occurrences and Survey Results

The proposed project falls in the San Joaquin Valley Vernal Pool Region identified in the Vernal Pool Recovery Plan. Vernal pools were documented to occur in the Wildlife RSA, in the vicinity of the Pixley NWR and Allensworth ER (USFWS 2005a).

Nine vernal pool fairy shrimp occurrences have been reported to the CNDDB within 10 miles of the project footprint. The closest occurrence (Number 177; reported in 1998) is approximately 0.5 mile northeast of the town of Allensworth (Figure 4-2a, Sheet 3) at a seasonal wetland in the Pixley NWR (CDFG 2012). In 1993, vernal pool fairy shrimp were found in vernal pools on the Two Well Unit of Pixley NWR (USFWS 2005a), which is approximately 3 miles east of the project footprint (Figure 4-2a, Sheet 3). The Vernal Pool Recovery Plan describes the species as occurring in the Pixley NWR in Tulare County, and at isolated locations in Kings Counties.

The wetland delineation surveys identified seasonal wetlands and vernal pools that could provide habitat for vernal pool fairy shrimp. During the spring 2010 field surveys, unidentified fairy shrimp (and seed shrimp, or common ostracods) were observed near Allensworth in vernal pools and seasonal wetlands in natural habitats dominated by alkali desert scrub and annual grassland. No protocol level habitat assessment or focused presence/absence surveys were conducted during the 2010 field season.

4.3.6.5 Potential to Occur in the Action Area

Vernal pool fairy shrimp habitat is present in vernal pools and seasonal wetlands that were identified in the 2010 wetland delineation. In general, suitable aquatic habitat occurs in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and pasture. Although the species was not observed during surveys conducted within the Wildlife RSA, the species has potential to occur in vernal pool and seasonal wetland habitat within the action area where permission to enter was not granted.

The presence of vernal pool fairy shrimp is inferred in areas which may support suitable habitat throughout the entire Wildlife RSA, based on the known distribution of the species, suitable habitat appearing within the Wildlife RSA, and documented occurrences of the species near the project footprint.

4.3.7 Critical Habitat for Vernal Pool Fairy Shrimp

Critical habitat was first designated for the federally threatened vernal pool fairy shrimp in 2003 (Federal Register 68-46683), with the final designation established in 2006 (Federal Register 28-7117). The designation includes a total of 597,821 acres in California and Oregon. California holds 29 units of critical habitat in the Sacramento Valley, San Joaquin Valley, and central California coastal counties.

4.3.7.1 Defined Critical Habitat

The PCEs of designated critical habitat for vernal pool fairy shrimp include vernal pools, seasonal wetlands, and other ephemeral wetlands and depressions that become dry in the summer but

maintain inundation and moisture long enough to support the full cycle of the fairy shrimp's life. They also include vernal pool complexes, including networks of pools, swales, and other ephemeral features that are hydrologically and ecologically connected to those vernal pools, swales, and other ephemeral wetlands and depressions that are hydrologically and ecologically connected (USFWS 2003).

Multiple units of designated critical habitat for vernal pool fairy shrimp lie within 10 miles of the project footprint. However, only Unit 27B occurs within the Wetland RSA. This unit (*Pixley Unit,* [*16,706 acres*] *Tulare County*) is south of the cities of Hanford and Lemoore, north of Wasco, and east of the city of Tulare. The Pixley Unit contains the largest contiguous area of habitat for the species in the southern San Joaquin Valley (Holland 2009). Vernal pool fairy shrimp in this area occur within northern claypan vernal pools that tend to be more alkaline and larger than vernal pool fairy shrimp habitats found on the eastern margin of the San Joaquin Valley.

4.3.7.2 Presence or Absence in the Action Area

Designated critical habitat for vernal pool fairy shrimp occurs within the Wetland RSA at one location that is approximately 250 feet away from the project footprint. The 2010 habitat surveys reported that the designated critical habitat consists of approximately 54 square feet of annual grassland habitat that is separated from the rest of the Pixley Critical Habitat Unit by SR 43 and the BNSF right-of-way. The annual grassland habitat that is within the Wetland RSA is hydrologically and ecologically disconnected from the remainder of the critical habitat unit.

4.3.8 Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is an insect that was federally listed as threatened in August 1980 (Federal Register 80:23899). The Valley Elderberry Longhorn Beetle Recovery Plan (Valley Elderberry Longhorn Beetle Recovery Plan, USFWS 1984) was published in June 1984. A 5-year review of the Valley Elderberry Longhorn Beetle was undertaken in September 2006. Based on the species 5-year review and more recent scientific evidence that the species survival is more successful than previously understood, the USFWS is currently considering a proposal to delist the species.

4.3.8.1 Species Description

The valley elderberry longhorn beetle is a medium-sized beetle, about 0.75 inches long. The forewings of the female are dark metallic green with red margins, whereas those of the male are primarily red with dark green spots. Beetles remain hidden in the stems and trunks of elderberry shrubs as larvae and pupae for 1 to 2 years. Adults emerge from the shrubs mid-March through June, at about the same time that the elderberry shrub produces flowers (Barr 1991; USFWS 1984; USFWS 2006b).

The primary threats to survival of this species are considered to be loss of habitat due to agricultural conversion, stream and river channelization, removal of riparian vegetation, and recreational, industrial, and urban development.

4.3.8.2 Habitat Requirements and Range

The valley elderberry longhorn beetle has only been found in association with blue elderberry shrubs (*Sambucus mexicana*), which are often found in or close to riparian habitats along Central Valley rivers and their tributaries. Both larvae and adults feed only on this plant. Elderberry shrubs often occur in clumps that consist of several stems attached to a main trunk. Stems and trunks must be equal to or greater than 1 inch in diameter to provide suitable habitat for the valley elderberry longhorn beetle larvae (USFWS 1999b). This beetle is generally found along waterways and in floodplains in the Central Valley that support remnant stands of riparian

vegetation; however, the species may be found associated with elderberry plants that are outside of the riparian corridor. This species generally occurs in the following CWHR wildlife habitat types: riparian, or where elderberry shrubs are present.

A review of the CNDDB (CDFG 2012) and the Valley Elderberry Longhorn Beetle Recovery Plan (USFWS 1984) indicates that the entire Wildlife RSA occurs in the known geographic range of the valley elderberry longhorn beetle. However, the areas identified in the Valley Elderberry Longhorn Beetle Recovery Plan as a high priority for the recovery of this species do not occur within 10 miles of the project footprint.

4.3.8.3 Action Area

Within the project action area, the limit of direct and indirect effects for the valley elderberry longhorn beetle includes elderberry shrubs with stems with diameters greater than 1 inch at ground level within the project footprint and an additional 100-foot buffer outside of the dripline of each shrub. This area is equivalent to the Botanical RSA as defined during the 2010 field surveys. The 100-foot buffer is consistent with the guidance in the USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b).

4.3.8.4 Documented Occurrences and Survey Results

Five occurrences of this species have been reported to the CNDDB within a 10-mile radius of the project footprint; however, no occurrences are documented in CNDDB within 1 mile of the project footprint (CDFG 2012). The closest reported occurrence of this species (Number 61) is located approximately 4 miles north of Bakersfield (Figure 4-2a, Sheet 5), where many elderberry shrubs were recorded in a riparian area along the banks of the Kern River (CDFG 2012).

Elderberry shrub locations were recorded as part of the botanical surveys within the Botanical RSA. Twelve elderberry shrubs were observed within the Botanical RSA during the 2010 survey and more are expected to occur within unsurveyed lands that contain riparian habitat (Cole Slough, Dutch John Cut, etc.):

- Two shrubs were observed north of Layton, near Monmouth, outside of the riparian corridor.
- Ten shrubs were observed along the banks of the Kern River.

No focused presence/absence surveys for the valley elderberry longhorn beetle were proposed or conducted during 2010.

4.3.8.5 Potential to Occur in the Action Area

Valley elderberry longhorn beetle has been documented within a 10-mile radius of the project footprint. Based on the species-specific habitat requirements (*i.e.*, within unsurveyed riparian corridors near Cole Slough and Dutch John Cut and the presence of the host plant at locations described above), there is potential for the species to occur in the action area.

The presence of valley elderberry longhorn beetle is inferred wherever elderberry shrubs are of a suitable size to host larvae. This inference is based on the known distribution of the species, host plants appearing within the Botanical RSA, and documented occurrences of the species within the project area.

4.3.9 California Tiger Salamander

The California tiger salamander (*Ambystoma californiense*), central California distinct population segment (DPS), was federally listed as threatened in April 2004 (FR 69:47212). It was listed as

threatened within the state of California, under the CESA, in March 2010. The recovery plan for the California tiger salamander is still under development.

Critical habitat for California tiger salamander (central population) was designated in August 2005. The listing included almost 200,000 acres of critical habitat designated in 19 counties for the central population of the California tiger salamander (FR 70:49379). No designated critical habitat for California tiger salamander exists within the project footprint.

4.3.9.1 Species Description

The California tiger salamander is a large terrestrial salamander; black, with several white or pale yellow spots or bars. Adults are thought to feed mainly on a variety of invertebrates. Hatchlings feed on zooplankton and older larvae feed on tadpoles (mostly *Pseudacris* tadpoles) and aquatic invertebrates.

California tiger salamanders are nocturnal and fossorial, spending most of their time underground in animal burrows, especially those of California ground squirrels and valley pocket gophers. The adults emerge from their fossorial habitats at night with the fall rains in early winter (October – November) and migrate to aquatic breeding ponds.

Breeding usually occurs in fish-free ephemeral ponds that form during winter and dry out in summer, but some salamanders may also breed in slow streams and in some semi-permanent waters, including cattle ponds. Breeding can occur explosively all at once, or it can continue for several months, depending on rainfall levels. The peak breeding period typically occurs between December and February. Adults engage in mass migration during a few rainy nights in the wet season between November and May, and leave the breeding ponds shortly after breeding. During years with below average rainfall, breeding occurs with limited success.

Threats to the species include road construction and traffic, agricultural land conversion, urban development, and non-native predators associated with aquatic habitats.

4.3.9.2 Habitat Requirements and Range

The California tiger salamander is distributed throughout portions of the Central Valley and Central Coast ranges from Colusa County south to San Luis Obispo and Kern Counties, from sea level to 3,460 feet in elevation. This species needs both suitable upland terrestrial habitat and seasonal breeding ponds in order to survive. Terrestrially, it inhabits lowland grasslands, oak savannah, and mixed woodland habitats with a population of fossorial mammals that create appropriately sized burrows and refugia. They also require aquatic habitat, such as vernal pools, seasonal ponds, or semi-permanent calm waters that hold water for a minimum of 3 to 4 months in duration for breeding and larval maturation. This species generally occurs in the following CWHR wildlife habitat types: upland within alkali desert scrub, annual grassland, and pasture surrounding vernal pools and seasonal wetlands, and within vernal pools and seasonal wetlands.

A review of the CNDDB (CDFG 2012) and CWHR (CDFG 2005) databases indicates that within the project area, the known geographic distribution of the California tiger salamander occurs only from the city of Fresno to the city of Corcoran. This distribution roughly corresponds with the species' historical range in the Central Valley, where limited museum records and verified sightings reported in Fresno and Tulare counties suggest the species may still be extant (Jennings and Hayes 1994). In the San Joaquin Valley, the southeastern-most extent of the species' known range is near the city of Corcoran. The California tiger salamander is not expected to occur south of Corcoran.

4.3.9.3 Action Area

Within the project action area, the limit of direct and indirect effects for the California tiger salamander includes vernal pools and seasonal wetlands (aquatic habitats), as well as, annual grasslands, valley oak woodlands, and pastures (upland habitats) suitable to support the breeding cycle of this species within the portion of the project footprint and a 250-foot buffer that extends from just north of Cross Creek to approximately 1 mile north of Corcoran (the Cross Creek grassland region). This 250-foot buffer is equivalent to the Wetland RSA. The project footprint in the Cross Creek grassland area is limited to approximately 5 linear miles.

4.3.9.4 Documented Occurrences and Survey Results

Four California tiger salamander occurrences have been reported to the CNDDB within a 10-mile radius of the project footprint; of these, three have been reported within a 5-mile radius. Number 583 includes two records reported together, and is northeast of the city of Fresno. Number 612 is south of the city of Kingsburg and west of the city of Hanford, between Cole Slough and the Kings River. These historical records date back to the period between 1879 and 1936 and the occurrences have since been extirpated. The third occurrence, number 522, was reported in 1999, in vernal pools associated with Cross Creek, approximately 5 miles east of the city of Hanford. This area contains designated critical habitat (Southern San Joaquin Region – Unit 5A) for the species. The occurrence consisted of California tiger salamander egg masses observed in a complex of vernal pools surrounded by nonnative annual grasslands (CDFG 2012; Figure 4-2a, Sheet 2).

Based on the results of wildlife habitat surveys and the supplemental habitat assessment, the only potential breeding habitat within the species range in the vicinity of the project footprint are seasonal ponds (mapped as lacustrine) south of Cross Creek. This potential breeding habitat occurs outside of the project footprint. These seasonal ponds are managed, in part, for wildlife use, unlike most water features identified in the supplemental habitat assessment. While permission to enter was not granted in this area, a review of aerial photography shows that the seasonal ponds appear to be surrounded by suitable upland habitat in the form of annual grassland and pastures. California tiger salamander adults, larvae, or eggs were not identified during wildlife habitat surveys; however, protocol level surveys for the species were not performed. Suitable aquatic habitat for this species (e.g., seasonal wetlands and vernal pools) only occurs outside the construction footprint (i.e., seasonal lacustrine ponds south of Cross Creek).

North of the Cross Creek grassland region, natural areas have been reduced by intensive agriculture to very small, isolated fragments. Upland areas have little to no habitat value: agricultural fields are regularly disked, ploughed, or turned, eliminating burrows and potentially crushing or smothering fossorial species. Frequent rodenticide application directly kills both amphibian and small mammal species and reduces the availability of burrows (upland salamander refugia) in fallowed or pasture lands. Water bodies are limited to irrigation canals and detention basins built and operated for agricultural purposes. Irrigation canals provide no aquatic habitat value for California tiger salamander, and the majority of detention basins were observed to support bullfrogs, a predator of California tiger salamander.

4.3.9.5 Potential to Occur in the Action Area

The range of California tiger salamander overlaps with the northern section of the project footprint, from the northern boundary in Fresno south to the city of Corcoran. Within the RSA, detention and retention basins, irrigation ditches, and canals, (mapped as lacustrine, riverine, and fresh emergent wetlands) provide suboptimal breeding habitat for California tiger salamander's because the hydrologic regime under which these unnatural water bodies operate

would interrupt breeding activity or key aquatic life stages. In perennial waters where bullfrogs and mosquito fish (among other fish species) were observed, high levels of predation could limit California tiger salamander reproductive efforts. Aerial spraying of fertilizers and pesticides could also affect egg, larval, and adult salamanders. Similarly, water features such as seasonal wetlands in heavily urbanized areas between the cities of Fresno and Corcoran are not expected to support breeding habitat for California tiger salamanders, due to the high levels of disturbance, habitat conversion, and fragmentation associated with urbanization and agricultural development in the San Joaquin Valley. The majority of this area does not contain suitable habitat for the species. Given these conditions, California tiger salamanders are not expected to occur within the action area north of the Cross Creek grassland region.

Potentially suitable habitat for the species may occur within a limited portion of the action area near seasonal ponds identified south of Cross Creek. Potential upland habitat consists of all alkali desert scrub, annual grassland, valley oak woodland, and pasture CWHR wildlife habitat types within 1.24 miles of these seasonal ponds.

The species has specific habitat requirements that limit its potential to occur within the action area. The presence of California tiger salamanders is inferred in the annual grassland region between Cross Creek and north of Corcoran. This inference is based on the known distribution of the species, suitable upland and aquatic habitat appearing within the Wildlife RSA, and documented occurrences of the species within 5 miles of the project area.

4.3.10 Blunt-Nosed Leopard Lizard

The blunt-nosed leopard lizard (*Gambelia sila*) was federally classified as endangered on March 11, 1967 (Federal Register 32:4001). It was listed as endangered by the State of California, under CESA, in 1971. No critical habitat has been designated for this species.

The blunt-nosed leopard lizard is included in the Upland Species Recovery Plan (USFWS 1998a). A 5-year review completed in February 2010, recommended that no change be made to the blunt-nosed leopard lizard listing status (USFWS 2010a).

4.3.10.1 Species Description

The blunt-nosed leopard lizard is a large lizard with a broad, triangular-shaped head, a truncated snout, a rounded body, well-developed limbs, granular scales, and a long, rounded tail that is longer than the body. Color is grayish to brown, with cream-colored crossbands and large dark spots.

Adult blunt-nosed leopard lizards are generally active during the breeding season between April and July, and typically lay between two and six eggs in mid-June or July. Juveniles hatch from late July to August, and sometimes into September. They remain active typically through October (Montanucci 1965; Stebbins 2003). While dormant outside of the April through October period and at night, the blunt-nosed leopard lizard inhabits small mammal burrows of species such as California ground squirrels and kangaroo rats (*Dipodomys* spp.); however, in areas of low mammal burrow density they can construct their own shallow burrows (USFWS 1998a). Their diet consists of arthropods and small lizards (USFWS 1985; Germano and Williams 1992; Stebbins 2003).

Threats include habitat disturbance, destruction, and fragmentation from agriculture, water diversion, urbanization and the introduction of non-native grasses.

4.3.10.2 Habitat Requirements and Range

The blunt-nosed leopard lizard is restricted in range to portions of the San Joaquin Valley, at elevations from the Central Valley floor up to 2,600 feet in the surrounding foothills (Germano and Williams 1992; Stebbins 2003; USFWS 1985). The blunt-nosed leopard lizard occurs in alkali sink scrub, saltbush (*Atriplex* spp.) scrub, California joint-fir scrub (Ephedra scrub), and sparse grasslands, often in areas with alkaline or saline soils (Montanucci 1965; Stebbins 2003). Washes and dirt road corridors may be important in otherwise poor habitat (e.g., thick grass habitat) (Warrick et al. 1998). In general, this species is absent from areas of steep slopes, dense vegetation, and seasonal flooding (Montanucci 1965). The species may occur within the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, and barren.

A review of the CNDDB (CDFG 2012) and CWHR (CDFG 2005) databases indicates that while the geographic distribution of the blunt-nosed leopard lizard is relatively widespread in southern portions of the San Joaquin Valley, within the project footprint the geographic distribution of the species is limited from the town of Allensworth (south of Avenue 56) south to the unincorporated community of Neufeld (north of SR 43). This corresponds approximately to the area between Deer Creek in the north and Poso Creek in the south. The Pixley NWR–Allensworth ER has been identified as a core area for the recovery of the blunt-nosed leopard lizard by the USFWS (USFWS 1998a). This area has also been identified as part of the Highway 43 – Garces Highway linkage (Penrod et al. 2001) (Figure 4-3).

4.3.10.3 Action Area

Within the project action area, the limit of direct and indirect effects for the blunt-nosed leopard lizard includes alkali sink scrub, saltbush scrub, California joint-fir scrub, and grassland habitats suitable to support this species within the project footprint and an additional 500-foot buffer between the towns of Allensworth and Neufeld.

4.3.10.4 Documented Occurrences and Survey Results

Over 50 occurrences of the species have been reported within a 10-mile radius of the project footprint. Five extant occurrences (Numbers 129, 194, 203, 206, and 375) lie within the Wildlife RSA (Figure 4-2a, Sheets 3 and 4). These occurrences were reported between 1974 and 2005 in alkali desert scrub and annual grassland habitats (CDFG 2012). Blunt-nosed leopard lizards have also been reported in the Allensworth ER (CDFG 2012) and in the Deer Creek East Unit of Pixley NWR (USFWS 2005a; Uptain et al. 1985) (Figure 4-2a, Sheet 3). In addition to the sightings at Allensworth ER, USFWS documents BNLL occurrences in the Pixley NWR, near Poso Creek north of Wasco (1998a).

Although this species was not observed during the spring 2010 field surveys, extensive small mammal burrows, which provide suitable refugia habitat, were observed in the Wildlife RSA in the vicinity of the Allensworth ER. Between Deer Creek and Poso Creek, blunt-nosed leopard lizard habitat occurs in the Wildlife RSA where suitable burrows for refugia exist within appropriate habitat types. Protocol level surveys for the blunt-nosed leopard lizard were not conducted during the 2010 field season.

4.3.10.5 Potential to Occur in the Action Area

Due to the specific habitat requirements of the species, blunt-nosed leopard lizard has potential to occur within a limited portion of the action area. The presence of blunt-nosed leopard lizard is inferred in the action area between the towns of Allensworth and Neufeld based on the known distribution of the species, the presence of suitable habitat within the Wildlife RSA, and documented occurrences of the species within the Wildlife RSA.

4.3.11 Tipton Kangaroo Rat

The Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) is a federally endangered species. The USFWS listed the Tipton kangaroo rat in the Federal Register on July 8, 1998 (Federal Register 53:25608). Critical habitat has not been designated for the species. The species is included in the Upland Species Recovery Plan (USFWS 1998a) and the species 5-Year Review: Summary and Evaluation (USFWS 2010d). The 5-year review of the plan completed in February 2010, recommended that no change be made to the Tipton kangaroo rat listing status.

4.3.11.1 Species Description

The Tipton kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat, and is closely related to the two other subspecies, Fresno kangaroo rat (*Dipodomys nitratoides exilis*) and short-nosed kangaroo rat (*D.n. brevinasus*). Geographic location is used to distinguish between the three subspecies. Structural distinctions between the subspecies are only evident by dissection (USFWS 1998a).

The fur of the Tipton kangaroo rat subspecies is dark yellowish-buff dorsally and white ventrally. A white stripe extends across the hips, continuing for the length of the tufted tail. The base of the tail is circumscribed by white. The top and bottom of the tail are blackish. Dark whisker patches on each side of the nose are connected by a black band of fur. The Tipton kangaroo rat tends to have larger average measurements than the Fresno kangaroo rat: total length for males, 9.25 inches, for females, 8.70 inches; length of hind foot for males, 1.37 inches, for females, 1.32 inches. (USFWS 1998a)

Like all kangaroo rats, San Joaquin kangaroo rats, including the Tipton subspecies, are adapted to hopping on their elongated hind legs. Other adaptations include a long, tufted bi-colored tail for balance, a shortened neck and a large, flattened head, and external fur-lined check pouches. Distinguishing characteristics include large, dorsally placed eyes and small, rounded ears. Forelimbs are comparatively short with stout claws that facilitate digging burrows. Burrow systems are generally dug by themselves or predecessors, with depths typically less than 10 inches, and tend to be placed in slightly elevated, soft, loose soil with several entrances. The subspecies is nocturnal and feeds mostly on seeds, with small amounts of green herbaceous vegetation and insects when available. The San Joaquin kangaroo rat can be distinguished from other kangaroo rats within its geographic range by the presence of four toes on the hind foot; the other species found in the same area have five toes (USFWS 1998a).

Very little information has been published regarding Tipton kangaroo rat reproduction but it is believed to be similar to that of another subspecies, the Fresno kangaroo rat. Reproduction of the San Joaquin kangaroo rat begins in the winter and peaks through late March and early April, but can continue through fall. Most females seem to have one litter per year, although some have two or more. Average litter size is about two and young remain in burrows for typically 6 weeks prior to making their way aboveground (USFWS 1998a).

The principle threats to the species are habitat loss and fragmentation due to conversion to agriculture.

4.3.11.2 Habitat Requirements and Range

Historically, Tipton kangaroo rats ranged throughout much of the southern San Joaquin Valley from the southern margins of Tulare Lake in the north, to the Buena Vista Slough of the Kern River Channel in the northwest, to the edge of Kern and Buena Vista Lakes in the southwest, and to the edge of the San Joaquin Valley floor in the east and the south (USFWS 1998a). Currently, the Tipton kangaroo rat occurs in isolated and fragmented areas from the Kings River south into Kern County.

Important vegetation communities for Tipton kangaroo rat include annual grasslands and alkali desert scrub (Griggs et al. 1992). Much of the occupied habitats today have sparsely scattered woody shrubs and a groundcover of annual grasses and forbs. Although it is not uncommon for occupied habitat to become seasonally flooded, terrain not subject to flooding is important for population persistence (USFWS 1998a). Suitable habitat for Tipton kangaroo rat may occur in the Wildlife RSA between the Kings River and Bakersfield in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, barren, and pasture.

The Tipton kangaroo rat subspecies is predominantly found at the southern edge of the San Joaquin kangaroo rat range. A review of the CNDDB (CDFG 2012) and the Upland Species Recovery Plan (USFWS 1998a) indicates that the Wildlife RSA crosses the known geographic range of Tipton kangaroo rat. Recent genetic studies have shown that, within the Wildlife RSA, the Tipton kangaroo rat range is restricted to south of the Kings River (Cypher, pers. comm. 2010).

The Upland Species Recovery Plan (USFWS 1998a) provides guidance and recommendations for the recovery of Tipton kangaroo rat. One recommendation calls for consolidation and protection of large blocks of suitable habitat for the species within identified recovery areas. It also recommends maintaining and establishing linkages (or movement corridors) in existing natural lands and between islands of habitat in the San Joaquin Valley basin. The action area overlaps two Recovery Areas identified in the Recovery Plan (USFWS 1998a): (1) the Pixley NWR-Allensworth ER; and (2) the Kern River Alluvial Fan Satellite area. These Recovery Areas correspond with the habitat linkages of the Highway 43 – Garces Highway linkage and the Kern River linkage (Penrod et al. 2001) (Figure 4-3).

4.3.11.3 Action Area

Within the project action area, the limit of direct and indirect effects for Tipton kangaroo rat includes areas suitable to support this species within the project footprint south of the Kings River and an additional 500-foot buffer.

4.3.11.4 Documented Occurrences and Survey Results

Forty-one occurrences of this species have been reported to the CNDDB within a 10-mile radius of the proposed project footprint. A total of nine occurrences of Tipton kangaroo rat were reported within 1 mile of the project footprint. Two occurrences, documented in 1929 and 1976, are considered extirpated; however, the seven other occurrences are presumed extant by the CNDDB. These seven extant occurrences were reported from 1985 through 2003. These occurrences consist of observations of adults, including males and females, their burrows, and breeding, wintering, and foraging sites (CDFG 2012). All occurrences were observed in either alkali scrub habitat or grassland within flat topography south of the Kings River.

According to the Upland Species Recovery Plan (USFWS 1998a), current populations occur in various communities along the I-99 corridor from Tipton to Pixley, and in the Allensworth ER and Pixley NWR, which “provides some of the best remaining habitat for Tipton kangaroo rat.” The Endangered Species Recovery Program has been conducting surveys twice per year in the Refuge since 1992. Population numbers on Pixley NWR crashed in the mid-1990s when the areas were flooded two winters in a row. Since 2005, few or no individuals have been trapped (USFWS 2005a).

Although this species was not observed during spring 2010 field surveys, kangaroo rat sign including active kangaroo rat-sized burrows and freshly excavated soils, fresh scat, and fresh tracks, were observed in the vicinity of Allensworth that could indicate Tipton kangaroo rat activity (Figure 4-4).

Figure 4-4 contains confidential information and has therefore not been included on the website.

4.3.11.5 Potential to Occur in the Action Area

Tipton kangaroo rat has potential to occur where suitable habitat between the Kings River and Bakersfield is present. The presence of Tipton kangaroo rat is inferred in this area based on the known distribution of the species, the presence of suitable habitat within the Wildlife RSA, and documented occurrences of the species within the Wildlife RSA.

4.3.12 Fresno Kangaroo Rat

The Fresno kangaroo rat (*D. n. exilis*) is one of three subspecies of San Joaquin kangaroo rats that is federally listed as endangered. The USFWS designated critical habitat for Fresno kangaroo rat on January 30, 1985 (Federal Register 50:4222). Designated critical habitat for Fresno kangaroo rat comprises approximately 857 acres in western Fresno County. The unit is south of the San Joaquin River, north of the Fresno Slough Bypass, east of the Fresno Slough, and approximately 25 miles west of the project footprint.

The species is included in the Upland Species Recovery Plan (USFWS 1998a).

4.3.12.1 Species Description

The Fresno kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat, and is closely related to the two other subspecies, Tipton kangaroo rat, and short-nosed kangaroo rat. Geographic location is used to distinguish between the three subspecies. Structural distinctions between the subspecies are only evident by dissection (USFWS 1998a).

This subspecies exhibits the characteristic kangaroo rat features discussed in section 4.3.11, and it is physically distinguished by its smaller average measurements than the Tipton and the short-nosed kangaroo rats. Its total length averages about 9.09 inches for males and 8.86 inches for females and the hind foot usually is less than 1.42 inches in length (typically 1.33 for males and 1.31 for females). Its fur is dark yellow dorsally and white ventrally, with a white stripe that extends from the hips to the end of its tufted tail (USFWS 1998a). Limited information is known about Fresno kangaroo rat reproduction and most mating behavior and mating system details were obtained from studies of the species in captivity. Fresno kangaroo rats breed during the winter, spring and summer months. Reproduction is heavily dependent on food availability and density of populations. Adult females will not breed in times of drought and when food is in short supply. Once they breed, they can have one to three litters per year, typically with two young per litter. The gestation period lasts approximately 30 days. Young Fresno kangaroo rats will remain in the nests within the burrows for approximately six weeks before making their way aboveground (USFWS 1998a).

The principle threats to the species are habitat loss and fragmentation due to conversion to agriculture.

4.3.12.2 Habitat Requirements and Range

This species inhabits the native alkali desert scrub and grassland plant community of western Fresno County. Although the historic range of the species is not entirely known, it most likely extended to the Merced River in Merced County in the north, to the edge of the valley floor in the east, to the wetlands of the Fresno Slough and San Joaquin River in the west, and to the northern edge of marshes around Tulare Lake, Kings County in the south (USFWS 1998a).

This animal, unlike other rodents, is not known to use areas that have been cultivated or irrigated. Fresno kangaroo rats are nocturnal animals and feed primarily on seeds, which they carry in large cheek pouches (Hoffman 1974). Suitable habitat for Fresno kangaroo rat may occur

in the Wildlife RSA between Fresno and the Kings River in the following CWHR wildlife habitat types: alkali desert scrub, annual grassland, barren, and pasture.

A review of the CNDDB (CDFG 2012) and the Upland Species Recovery Plan (USFWS 1998a) indicates that a northern section of the Wildlife RSA occurs within the historical geographic range of the Fresno kangaroo rat. Recent genetic studies have shown that the Fresno kangaroo rat only occurs north of the Kings River (Cypher, pers. comm. 2010). No USFWS Recovery Plan core areas have been identified for this species in the Wildlife RSA (USFWS 1998a).

4.3.12.3 Action Area

Within the project action area, the limit of direct and indirect effects for the Fresno kangaroo rat includes areas suitable to support this species within the project footprint north of the Kings River and an additional 500-foot buffer.

4.3.12.4 Documented Occurrences and Survey Results

Two historical occurrences have been reported within a 10-mile radius of the proposed project footprint. The closest occurrence (Number 15; dated 1898) is now considered extirpated. The second reported occurrence (Number 10; dated 1972) is approximately 10 miles west of Hanford (Figure 4-2b, Sheet 2) and is considered extirpated due to agricultural development (CDFG 1998a).

According to the Upland Species Recovery Plan (USFWS 1998a), no extant populations of the Fresno kangaroo rat are known. A single male was trapped west of Fresno in the Alkali Sink Ecological Reserve in 1992, 25 miles west of the project footprint. No Fresno kangaroo rats have been trapped within the species' historical range since 1992, despite multiple trapping efforts.

Although this species was not observed during the spring 2010 field surveys, kangaroo rat sign, including active kangaroo rat-sized burrows with freshly excavated soils, fresh scat, and fresh tracks, were observed within the Wildlife RSA south of the town of Allensworth, these locations are outside of the known range of the species. In the region north of the Kings River, land is intensely farmed and natural areas have been reduced to very small, isolated fragments. Fields are treated with chemical application and rodenticides are employed for ground squirrel control. The minimal natural habitat that is still intact has extremely limited connectivity to areas that historically were known to, or currently might support Fresno kangaroo rat. These conditions reduce the habitat value for Fresno kangaroo rats to poor or marginal.

4.3.12.5 Potential to Occur in the Action Area

To assess where and whether Fresno kangaroo rats may persist within the action area, an additional desktop historical land use analysis was performed to supplement field habitat surveys. Potential to occur within the action area was refined after field surveys by using the desktop methodology discussed in Section 4.1.1.

Based on the historic distribution of the Fresno kangaroo rat and the limited number of parcels with potentially suitable habitat for the species, the Wildlife RSA is not anticipated to support Fresno kangaroo rats. The presence of Fresno kangaroo rat is inferred where potentially suitable habitat is present within the Wildlife RSA north of Kings River.

4.3.13 San Joaquin Kit Fox

The San Joaquin kit fox (*Vulpes macrotis mutica*) is a subspecies of the kit fox that has a broad distribution in the San Joaquin Valley. The species is federally endangered and state threatened. The USFWS listed the species in the Federal Register on March 11, 1967 (Federal Register

32:4001) and discussed the San Joaquin kit fox in the Upland Species Recovery Plan (USFWS 1998a). Consistent with the 1998 Upland Species Recovery Plan, this BA considers San Joaquin kit fox as an umbrella species and assumes that passage opportunities designed and provided for this species will also extend movement opportunities to other species within the San Joaquin Valley. In February 2010, a 5-year review of the plan was conducted to review the status of the species. The review did not suggest any changes to the listing (USFWS 2010c).

Critical habitat for San Joaquin kit fox has not been designated; however, designated landscape linkages for the species are present in the Central Valley.

4.3.13.1 Species Description

The San Joaquin kit fox has a small, slim body with an average body length of 30 inches, and stands about 12 inches high at the shoulder with long legs, large ears, and a long bushy tail that tapers at the tip. The average weight of an adult male is about five pounds. The ears are conspicuously large and densely covered on the inside with stiff, white hairs. The summer coat is light buff to buff- gray on the back and white on the belly; its winter coat is grizzled gray on the back, rust to buff on the sides, and white beneath. The tail is distinguished by a prominent black tip (USFWS 1998a, 2010c).

The San Joaquin kit fox is primarily nocturnal. Adult foxes are usually solitary during the late summer and fall. By September and October, adult females (vixens) begin to excavate, clean, and enlarge their pupping dens. Adult males join the vixens in October or November (Morrell 1972), and mating occurs between December and March (USFWS 1998a). Pups are typically born in late February or early March (Egoscue 1962, Morrell 1972), emerge from dens in March and April, and begin foraging for themselves between June and August, dispersing shortly thereafter in August or September (Morrell 1972; USFWS 2010c). Numerous threats to this species have been identified. In addition to habitat loss and fragmentation due to agricultural and urban development, predation, starvation, flooding, disease, drought, shooting, trapping, poisoning, and road kills are implicated in the decline of the species. The San Joaquin kit fox has declined throughout its range as a result of habitat loss, predator and pest control programs, and inter-specific competition with coyotes (Cypher et al. 2000).

4.3.13.2 Habitat Requirements and Range

The San Joaquin kit fox inhabits arid valley and foothill grasslands, sparsely vegetated scrub/shrub habitats (O'Farrell 1983; USFWS 1998a), and some agricultural and urban areas (Jensen 1972, Morrell 1972). In Kern County, the species most frequently uses grassland and saltbush scrub. San Joaquin kit fox are quite tolerant of human disturbances and will, to a minimal extent, use oil fields, developed and agricultural lands, particularly for foraging and movement or migration. However, the use of agricultural lands by San Joaquin kit fox is dependent on prey availability and refugia opportunities. Lands producing row crops are subjected to weekly inundation during irrigation, which impedes foraging and precludes the establishment, maintenance, and use, of earthen dens (Warrick et al. 2007). On the other hand, orchards and vineyards that are within 1 mile of natural lands have been reported to potentially provide adequate habitat for night-time foraging by the species (Warrick et al. 2007). Within the city of Bakersfield, San Joaquin kit fox are known to fully utilize urban environments. Urban environments other than Bakersfield are not known to support populations of San Joaquin kit fox. In natural lands, the abundance of San Joaquin kit fox appears to be strongly correlated to the presence and abundance of kangaroo rats (*Dipodomys* spp.) (USFWS 2010c).

San Joaquin kit fox use complex dens for shelter, protection, and rearing of young (USFWS 1998a). Dens may be used year round. Most dens are in flat terrain or on the lower slopes of hills, and are commonly found in washes, drainages, and roadside berms. San Joaquin kit fox are

reputed to be poor diggers and are usually found in areas with loose-textured, friable soils (Morrell 1972, O'Farrell 1983). Some studies have suggested that where hardpan layers predominate, some individuals create dens by enlarging California ground squirrel or American badger (*Taxidea taxus*) burrows (Morrell 1972, Jensen 1972, Orloff et al. 1986). They also commonly den in human-made structures such as small-diameter culverts. A diet of small rodents such as kangaroo rats and California ground squirrels is common for kit fox (Jameson and Peeters 1988). Kit fox appear to be affected by precipitation-related prey availability.

The historic range of San Joaquin kit fox included the San Joaquin Valley, from southern Kern County north to Tracy in San Joaquin County, and portions of the Inner Coast Range, such as the Carrizo Plain, Salinas Valley, Temblor Range, Cholame Hills, and Elkhorn Plain (USFWS 1998a). The present-day distribution is composed of fragmented populations that use remaining natural lands, mostly from Merced County southward to southern Kern County. The largest remaining populations occur in western Kern County in and near the Elk Hills and the Buena Vista Valley, as well as in the Carrizo Plain in San Luis Obispo County (USFWS 1998a). In the Wildlife RSA, suitable natural habitat for the San Joaquin kit fox may be present in the following CWHR habitat types: alkali desert scrub, annual grassland, barren, and pasture.

Two recovery recommendations for San Joaquin kit fox in the Upland Species Recovery Plan (USFWS 1998a) are: (1) to expand and connect existing refuges and reserves; and (2) to maintain, expand, and establish linkages/movement corridors.

The HST project footprint intersects satellite areas (i.e., portions of habitat that support isolated populations of a species but may be too isolated to support populations of species in the wake of significant climatic or environmental events) and linkage recovery areas (i.e., areas that provide a spatial linkage between satellite and core population areas) identified by the Upland Species Recovery Plan (USFWS 1998a) for the San Joaquin kit fox. Core recovery areas, which are portions of habitat large enough to sustain long-term populations of specific species, will not be affected by this project. The HST project will traverse two areas identified as “other lands with potential” for San Joaquin kit fox recovery (referred to as satellite areas): these are the Southwestern Tulare County Satellite area (Pixley NWR-Allensworth ER) and Metropolitan Bakersfield Satellite area.

In areas outside of the Core, Satellite, and Linkage areas, populations of San Joaquin kit fox are not expected to occur frequently; however, dispersing individuals may be present on occasion. In general, habitats that are natural and are not disturbed on a regular basis or are in urban areas in the city of Bakersfield may provide suitable habitat and opportunity for breeding, denning, foraging, or dispersing activities. In contrast, agricultural and other developed areas provide limited opportunity for denning; however, individual San Joaquin kit foxes may disperse or forage in these areas.

The California Essential Habitat Connectivity Project describes habitat linkages as large, regional connections between habitat blocks meant to facilitate animal movement between different sections of the landscape (Spencer et al. 2010). The proposed project crosses a total of seven habitat linkages which have been identified for the San Joaquin kit fox in *Missing Linkages*: *Restoring Connectivity to the California Landscape*; Kings River, St. Johns River – Cross Creek, Deer Creek – Sand Ridge, Highway 43 – Garces Highway (two crossings), Tule River, Poso Creek and Kern River (Penrod et al. 2001). The Highway 43 – Garces Highway and Deer Creek – Sand Ridge linkages are within the Southwestern Tulare County Satellite area, whereas the Poso Creek linkage closely follows a linkage in the Upland Species Recovery Plan. The Kern River linkage occurs within the Metropolitan Bakersfield Satellite area and Kern River Alluvial Fan Linkage area. The Kings River and St. Johns River – Cross Creek linkages are not associated with San Joaquin kit fox recovery areas; however, individuals may use these linkages (Figure 4-3).

4.3.13.3 Action Area

Within the project action area, the limit of direct and indirect effects for the San Joaquin kit fox includes areas suitable to support this species within the project footprint and an additional 1,000-foot buffer. This area is equivalent to the auxiliary Wildlife RSA as defined during the 2010 field surveys.

4.3.13.4 Documented Occurrences and Survey Results

A review of the CNDDB (CDFG 2012) and CWHR (CDFG 2005) databases as well as the Upland Species Recovery Plan (USFWS 1998a) and the San Joaquin kit fox 5-Year Review (USFWS 2010c) indicates that the majority of the Wildlife RSA occurs within the known geographic range of the San Joaquin kit fox. The Allensworth ER, located adjacent to the project action area, is considered a key area for this species which has been observed in the area for the past 10 years (USFWS 1998a). Additionally, several movement corridors and linkages for this species occur in the project area.

A wide-ranging species, San Joaquin kit fox has been reported in Fresno, Kings, Tulare, and Kern Counties. Almost 200 occurrences of the have been reported within a 10-mile radius of the project footprint. Of those, a total of 35 of San Joaquin kit fox individuals, their dens, and/or sign of their presence have been reported approximately 1 mile or less from the project footprint 1972 and 2007. The project overlaps occurrence number 487 in the Allensworth ER (Figure 4-2b, Sheet 4) (CDFG 2012). Prior to the wet winters of the mid-1990s, San Joaquin kit fox dens were documented at the Pixley NWR (CDFG 2012, USFWS 2005). Since that time, their prey population numbers in the refuge collapsed and denning activities has not been confirmed there. Most of the reported occurrences were either near roads, in alkali desert scrub habitats, or in non-irrigated agricultural lands. Observations consisted of dens and scat, sightings, spotlighting, or road kill. In particular, dead kit foxes are occasionally found on the roads near the Refuge (USFWS 2005).

The Upland Species Recovery Plan (USFWS 1998a) describes current populations throughout the San Joaquin Valley floor and surrounding foothills to the east and west. San Joaquin kit fox are reported in the larger islands of natural habitat within Fresno, Kings, Tulare, and Kern counties, and within the city of Bakersfield.

During the spring 2010 field surveys, medium and large mammal burrows that could provide suitable denning or refugia habitat for San Joaquin kit fox were identified based on physical signs, including possible San Joaquin kit fox scat and tracks, and medium-sized mammal burrows with dimensions in accordance with typical kit fox dens (i.e., usually between eight and ten inches [USFWS 1998a]). The potential San Joaquin kit fox burrows were in relatively undisturbed alkali desert scrub habitats characterized by an abundance of small-, medium-, and large-mammal burrow complexes. No protocol level presence/absence surveys were conducted for San Joaquin kit fox during the 2010 field season.

4.3.13.5 Potential to Occur in the Action Area

This species is documented to occur in the city of Bakersfield and within the Allensworth ER. The species has the potential to occur in areas of suitable habitat throughout the action area. These areas are described below.

Outside of the city of Bakersfield, suitable foraging and breeding habitat for the San Joaquin kit fox in the Wildlife RSA may be found in natural lands such as alkali desert scrub, annual grassland, barren, and pasture. Although they may be found in natural areas throughout the project footprint, San Joaquin kit fox have a greater potential to den and breed in natural areas within or adjacent to refuges and ecological reserves. The species is also expected to have a greater potential to occur within identified linkage areas and satellite recovery areas described in

the Upland Species Recovery Plan and 5-Year Review Plan (USFWS 1998a, 2010c). California Connectivity Project linkages (Spencer et al. 2010), where large blocks of natural areas and less habitat fragmentation occur, are also considered to have high potential for San Joaquin kit fox to den and breed. Kit foxes may be found in riparian corridors and habitat linkages, which provide dispersal opportunities and may provide foraging or breeding habitat.

Although agricultural lands are suboptimal for San Joaquin kit fox breeding, the species may use agricultural lands for foraging and dispersal. Grain crops and alfalfa, in particular, may host appropriate San Joaquin kit fox prey species. Agricultural areas within 1 mile of natural habitat blocks may be used more frequently for foraging and dispersal than agricultural lands isolated from movement corridors and natural lands. Urban areas outside of Bakersfield are not expected to support San Joaquin kit fox.

The presence of San Joaquin kit fox is inferred throughout the Wildlife RSA with the exception of the urban habitats outside of the city of Bakersfield. This inference is based on the known distribution of the species, the presence of suitable habitats within the Wildlife RSA, and documented occurrences of the species near the project footprint.

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Chapter 5
Effects Analysis

5.0 Effects Analysis

As described in Chapter 4, 12 federally listed plant and wildlife species have potential to occur in all or a portion of the project action area, defined as the project footprint plus a 1,000-foot buffer. The potential for species to occur within the action area is inferred based on (1) the known distribution of the species, (2) the presence of habitat suitable to support the species within the RSA, (3) documented occurrences of the species near the project footprint and (4) observations made during spring 2010 field surveys.

The federally listed species inferred to be present within all or a portion of the action area includes:

- California jewelflower *Caulanthus californicus* Endangered
- Kern mallow *Eremalche kernensis* Endangered
- San Joaquin woolly threads *Monolopia congdonii* Endangered
- Hoover's spurge *Chamaesyce hooveri* Threatened
- Vernal pool tadpole shrimp *Lepidurus packardi* Endangered
- Vernal pool fairy shrimp *Branchinecta lynchi* Threatened
- Valley elderberry longhorn beetle *Desmocerus californicus dimorphus* Threatened
- California tiger salamander *Ambystoma californiense* Threatened
- Blunt-nosed leopard lizard *Gambelia (=Crotaphytus) sila* Endangered
- Tipton kangaroo rat *Dipodomys nitratoides nitratoides* Endangered
- Fresno kangaroo rat *Dipodomys nitratoides exilis* Endangered
- San Joaquin kit fox *Vulpes macrotis mutica* Endangered

In addition to the federally listed species, designated critical habitat for vernal pool fairy shrimp occurs within 250 feet of the project footprint.

This chapter discusses potential adverse effects to the listed species and their designated critical habitats that have been determined to have potential to occur within the project action area. The acreage of effects for the various species is analyzed differently for some species; because wildlife may move in, out, and across suitable habitat, acreages of direct effects to most listed wildlife species were calculated by using the overlap of the species distribution or range, their suitable habitat, and the proposed project footprint. In the case of vernal pool tadpole shrimp and vernal pool fairy shrimp, the acres of suitable habitat for each species was calculated using vernal pools and seasonal wetland habitats that occur within the project footprint and a 250-foot buffer surrounding the project footprint, because effects to the water table or clay soils may radiate beyond the footprint boundary. Since habitat for valley elderberry longhorn beetle is generally restricted to elderberry shrubs, direct effects to the beetle are presented as the number of impacted elderberry shrubs within the project footprint.

Only listed plant populations that appear within an area of federal interest that are removed, cut, dug up, damaged or destroyed in known violation of a state law or regulation are protected under the FESA. No federally listed plant species were observed within the Botanical RSA during protocol level botanical surveys. Section 9(a)(2)(B) of the FESA limits the USFWS jurisdiction of federally listed endangered plants to those that occur on federal land and on federal property interest such as conservation easements, leasehold estates, and management areas. A recent Ninth Circuit court decision further restricted the definition of the federal land and federal property interest, with the court rejecting the argument that private land identified as wetlands or other waters of the U.S. under Section 404 of the Clean Water Act are areas under Federal jurisdiction (*Northern California River Watch v. Wilcox*). Due to absence of any federal interest lands within the action area, USFWS jurisdiction is not anticipated to apply to any federally listed plant species with potential to occur in the project footprint. The Authority will obtain all other

necessary state or local construction and environmental permits to ensure that it is conducting a lawful activity.

Due to the absence of observations of any federally listed plants from the Botanical RSA, the potential effects to plant species are reported in Table 5-1 as the minimum and maximum acreages in potentially suitable habitats that were not surveyed due to lack of permission to enter that will be affected by the construction of the HST system. Habitat within these unsurveyed areas was broadly classified using aerial imagery. This estimate does not assume that all of the acreage within the unsurveyed potential habitat is covered by the listed plants species; it is just the total amount of habitat that will be impacted by project construction. The potential for all four federally listed plant species to occur on the parcels is limited to where permission to enter was not granted.

Table 5-1 presents the range of potential direct effects to suitable habitat for the 12 listed plant and wildlife species.

Table 5-1
Potential Effects to Federally Listed Species in the Project Footprint

Federally Listed Species Name (Common Name/Scientific Name)	CWHR Vegetation Community or Wildlife Association	Type	MIN	MAX
			Acres of Effects[a]	
California jewelflower (*Caulanthus californicus*) **Kern mallow** (*Eremalche kernensis*) **San Joaquin woolly threads** (*Monolopia congdonii*) **Hoover's spurge** (*Chamaesyce hooveri*)	Unsurveyed potentially suitable habitat that could support special-status plant species[b]	Direct	437.59	603.26
Vernal pool tadpole shrimp (*Lepidurus packardi*) **Vernal pool fairy shrimp** (*Branchinecta lynchi*)	Vernal pools / seasonal wetlands[c]	Direct	12.05	38.14
		Indirect	34.51	80.80
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Elderberry shrubs (*Sambucus* spp.)	Direct and Indirect	12 shrubs[d]	36 shrubs[d]
California tiger salamander (*Ambystoma californiense*)	AQUATIC: Vernal pools/seasonal wetlands	Direct	—	—
	UPLAND: alkali desert scrub, annual grasslands, pasture surrounding vernal pools/seasonal wetlands	Direct	0.02	5.50
Blunt-nosed leopard lizard (*Gambelia [=Crotaphytus] sila*)	Alkali desert scrub, annual grassland, barren and valley foothill riparian	Direct	27.60	98.05
Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)	Alkali desert scrub, annual grassland, barren and pasture	Direct	362.45	445.38

Table 5-1
Potential Effects to Federally Listed Species in the Project Footprint

Federally Listed Species Name (Common Name/Scientific Name)	CWHR Vegetation Community or Wildlife Association	Type	MIN	MAX
			Acres of Effects[a]	
Fresno kangaroo rat (*Dipodomys nitratoides exilis*)	Alkali desert scrub, annual grassland, barren and pasture	Direct	28.50	30.39
San Joaquin kit fox (*Vulpes macrotis mutica*)	Southwestern Tulare County Satellite Area – Natural	Direct	86.81	153.94
	Southwestern Tulare County Satellite Area – Agricultural		521.45	640.64
	Metropolitan Bakersfield Satellite Area – Natural	Direct	215.96	216.85
	Metropolitan Bakersfield Satellite Area – Agricultural		—	—
	Metropolitan Bakersfield Satellite Area – Urban		247.17	302.70
	Linkage – Natural	Direct	0.00	20.12
	Linkage – Agricultural		124.56	350.58
	Outside of Recovery Areas – Natural	Direct	206.80	284.47
	Outside of Recovery Areas-Agricultural		1,903.06	2,906.34

NOTES:
[a] Does not include Heavy Maintenance Facilities (See Section 5.1.4)
[b] Acres presented is area of potential effects to species where suitable habitat was not surveyed during 2010 field studies
[c] This acreage includes vernal pool and seasonal wetland habitats that were identified through aerial photograph interpretation as described in Section 4.1.2.
[d] Data presented as number of identified elderberry shrubs and number of shrubs estimated to be both directly and indirectly affected.

"MIN" and "MAX" determinations are based on the smallest and largest amount of acreage covered by any continuous combination of HST Alternatives.
Effects on all federally listed plant species were based on suitable CHWR habitats and wetlands and other waters features within the Botanical RSA.
Effects on all federally listed wildlife species are based on the CWHR determinations of habitats and range, except as noted below:
{vernal pool tadpole shrimp and vernal pool fairy shrimp} Disturbances based on vernal pools/wetland habitat in the Wetland RSA.
{elderberry longhorn beetle} Data presented as number of identified elderberry shrubs within Botanical RSA.
{California tiger salamander} Potential aquatic habitat limited to the Corcoran Irrigation Water District; potential upland habitat determined by identifying associated vegetation communities within a 1.24-mile radius of potential aquatic habitat.
{Fresno kangaroo rat} Range limited to the San Joaquin and Kings rivers based on distribution data provided by Brian Cypher, ESRP (Cypher 2010, Personal Communication) and areas potentially suitable to support this species within that range.
{Tipton kangaroo rat} Range data taken from the Endangered Species Recovery Program distribution data. *Tipton Kangaroo Rat* (Dipodomys nitratoides nitratoides) *5-Year Review: Summary and Evaluation* (USFWS 2010d).
{San Joaquin kit fox} Recovery areas based on the 5-year review of the San Joaquin kit fox (USFWS 2010c). Natural lands include alkali desert scrub, annual grasslands, barren and pasture. Agricultural lands include grain crop, deciduous orchard, row crop, hayfield, vineyard, etc. Urban lands include urban areas of metropolitan Bakersfield including the BNSF right-of-way.
Data in this table was calculated using the 15% engineering design construction footprint.

5.1 Non-Linear Features Located in Potential Habitat for Federally Listed Species

As discussed in Section 2.2, non-linear features associated with the HST include local road overcrossings of at-grade track, 18 small electrical facilities of less than 1 acre each, two or three train stations, and potentially one large HMF in any of five possible locations. Each non-linear feature was evaluated for the potential to affect federally listed species based on CWHR habitat types and field data. The effects of both construction and operation (including maintenance activities) of these features would be as discussed for each species in Sections 5.2 through 5.14. The total acreage where direct effects may occur to federally listed species, with the exception of the HMF acreage, is included in Table 5-1. The locations where the HST system non-linear features may affect federally listed species are identified below.

5.1.1 Road Crossings

Road overcrossings would be built to allow existing traffic patterns to continue without disruption by the HST. Thus, the overcrossings would be built at existing roads, primarily in urban and agricultural areas. They will require embankment build-up on road shoulders, and could cause the removal of habitats that may support federally listed species that are adjacent to the existing road. The following road crossings have potential to affect federally listed species:

- Road crossings at Avenue 24 and Schuster Road on the BNSF alignment are adjacent to areas containing alkali desert scrub, which may provide suitable habitat for vernal pool fairy shrimp, blunt nosed-leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox.
- The Garces Highway crossing along the BNSF Alternative is approximately 280 feet from a population of Kern mallow. This population of mallow is not the population of conservation concern because it does not match the description provided in the Upland Recovery Plan (USFWS 1998a). However, avoidance and minimization measures as discussed in Section 5.3 will be implemented in this area to avoid direct and indirect effects to this population. No additional operational affects are expected, as the road crossing will simply prevent the disruption of existing traffic along the Garces Highway. This crossing also occurs adjacent to, but not on, a parcel of alkali desert scrub that provides suitable habitat for vernal pool fairy shrimp, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox.
- Three road crossings near the Allensworth area (Avenue 128 near Pixley NWR, County Road J22, and Avenue 44), include or are touching vernal pools and/or seasonal wetlands, which may provide suitable habitat for vernal pool fairy shrimp, blunt nosed-leopard lizard, Tipton kangaroo rat and San Joaquin kit fox. In addition, the Avenue 88 road crossing in the same area is within 130 feet of a vernal pool.

Effects to federally listed species are described in the species specific sections below.

5.1.2 Railway Stations

Railway stations provide passenger loading and unloading areas and act as transportation hubs (2.2.3). Railway stations will be built in urban Fresno and urban Bakersfield. A third station, the Kings/Tulare Regional Station, may potentially be constructed as part of the project.

Construction and operation of the urban Fresno station is not expected to impact habitat suitable for federally listed species, or to affect federally listed species.

Construction and operation of the Bakersfield Station would affect between 21 and 24 acres of urban habitat. This urban land is potential habitat for San Joaquin kit fox that occur within urban Bakersfield.

The potential Kings/Tulare Regional Station would be constructed on 20 acres of urban or agricultural habitat (Appendix B, Sheets 7 and 8). This station occurs in the range of, and provides poor to marginal habitat for, the San Joaquin kit fox. Construction and operation of the Kings/Tulare Regional Station is not expected to impact habitat suitable for federally listed species, or to affect federally listed species.

Effects to federally listed species are described in the species specific sections below.

5.1.3 Electrical Stations

Electrical stations are small (< 1 acre), fenced enclosures that will provide power services to the HST. They are described in detail in Section 2.2.4, and include paralleling, supply, and switching stations. The following electrical stations have the potential to affect federally listed species:

- A paralleling station at Avenue 88 would impact 0.18 acre of annual grassland. The station would be on a disturbed road adjacent to a long grassland strip between the existing railway, SR 43, and dryland grain crops. Within the annual grassland, a vernal pool is approximately 212 feet from the paralleling station. The vernal pool may provide suitable habitat for vernal pool fairy shrimp. The annual grassland may support blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox.
- A switching station at Avenue 44 would remove 0.22 acre of annual grassland in an area of grassland contiguous with Allensworth Historic State Park. The switching station footprint is within 34 feet of a riparian area. This area may provide habitat for vernal pool fairy shrimp, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox.
- Two paralleling stations will be built within urban Bakersfield: one along Windsong Street in a barren lot, and a second in a barren lot bordered by 14th and S streets, a canal, and an existing railway. Each station will impact 0.18 acre of potential habitat for the San Joaquin kit fox population that occurs within urban Bakersfield.

Effects to federally listed species are described in the species specific sections below.

5.1.4 Heavy Maintenance Facility

If included in this project section, one HMF may be constructed at one of five potential locations (i.e., Fresno Works-Fresno, Kings County-Hanford, Kern Council of Governments–Wasco, Kern Council of Governments–Shafter East, and Kern Council of Governments–Shafter West). Tables 5-2 and 5-3 list the amount of terrestrial and aquatic habitat (in acres) that would potentially be permanently affected by the HMFs.

The Fresno Works-Fresno HMF would be constructed on developed and undeveloped lands (Table 5-2; Table 5-3). The small fragments of potentially suitable land within the footprint of the Fresno HMF are unlikely to support federally listed plant species, but have the potential to support vernal pool tadpole shrimp, vernal pool fairy shrimp, Fresno kangaroo rat, and San Joaquin kit fox. Effects will be as described in Sections 5.6, 5.12 and 5.13.

The Kings County-Hanford HMF would be within the range of the Tipton kangaroo rat and San Joaquin kit fox, and contains some small, isolated areas of pasture (Table 5-2; Appendix B, Sheet 8). Effects will be as described in Sections 5.11 and 5.13.

The Kern Council of Governments–Wasco HMF is in agricultural and urban areas (Table 5-2) that lack suitable habitat for many of the federally listed species. Lacustrine areas (e.g., limited to man-made basins) within the footprint of this HMF (Table 5-3) are not expected to be used by federally listed species with ranges that overlap this area. The Kern Council of Governments-Wasco HMF is not expected to affect federally listed species.

The Kern Council of Governments–Shafter East HMF overlaps urban, agricultural, and annual grassland habitats (Table 5-2). The small fragments of potentially suitable habitat in the footprint of this HMF are unlikely to support federally listed plant and wildlife species, but could potentially support blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox. Effects will be as described in Sections 5.10, 5.11, and 5.13.

The Kern Council of Governments-Shafter West HMF overlaps with urban and agricultural habitats (Table 5-2). These areas lack suitable habitat for federally listed species; therefore, Kern Council of Governments-Shafter West HMF is not expected to affect federally listed species.

Table 5-2
Terrestrial Communities Potentially Affected by the Heavy Maintenance Facility Site Alternatives (acres)

Heavy Maintenance Facility Alternatives	Developed Areas		Agricultural Lands	Annual Grass-land	Valley Foothill Riparian	Alkali Desert Scrub	Pasture	Valley Oak Woodland
	Barren	Urban						
	Impact Acreage							
Fresno Works–Fresno	—	194.85	316.36	—	—	—	68.28	—
Kings County–Hanford	—	28.67	454.82	—	—	—	26.40	—
Kern Council of Governments–Wasco	—	18.03	396.81	—	—	—	—	—
Kern Council of Governments–Shafter East	—	10.22	483.26	0.04	—	—	—	—
Kern Council of Governments–Shafter West	—	27.85	448.44	—	—	—	—	—

Notes:
— = No impact or not applicable
All impacts were calculated based on 15% engineering design construction footprint.

Table 5-3
Aquatic Communities Potentially Affected by the Heavy Maintenance Facility Site Alternatives (acres)

Heavy Maintenance Facility Alternatives	Vernal Pools[a]	Seasonal Wetlands	Fresh Emergent Wetland	Riverine	Lacustrine
	Impact Acreage				
Fresno Works–Fresno	—	0.67	—	4.29	1.66
Kings County–Hanford	—	—	—	1.88	—
Kern Council of Governments–Wasco	—	—	—	0.27	1.13
Kern Council of Governments–Shafter East	—	—	—	—	1.14
Kern Council of Governments–Shafter West	—	—	—	—	—

Notes:
— = No impact or not applicable
All impacts were calculated based on 15% engineering design construction footprint.
[a] Vernal Pools includes three feature types: vernal pools, vernal swales, and vernal pool and swale complexes.

Where suitable habitat is present, several mechanisms may contribute to direct or indirect effects to federally listed species including: the clearing of native vegetation, construction related soil disturbances, operation of construction equipment, and noise, vibration, or light disturbances. Direct effects from the construction and the future operation of the HMF may include: harm, mortality, habitat modification, or population fragmentation. Habitat modification may occur through the reduction, degradation, fill, pollution, loss, or conversion of suitable native habitat, including soil compaction, loss of vegetative cover, burrows, or other refugia. Indirect effects may include shifts in foraging patterns or territories due to noise or vibration, reduction of prey availability, habitat fragmentation, or increased predation on the species.

In order to avoid or minimize adverse effects to federally listed species and their designated critical habitat, the FRA proposes a number of general conservation measures, including compensatory mitigation, to mitigate for direct effects on these species (Section 2.7). In addition, species specific avoidance and minimization measures are proposed and discussed later in this chapter.

5.2 Project Effects on California Jewelflower

Currently, the California jewelflower is known to occur in Fresno, San Luis Obispo, and Santa Barbara counties. Historically, this species also occurred in Kings, Tulare, and Kern counties. Although this species was not found within the Botanical RSA during protocol level botanical surveys, areas that may support this species remain to be surveyed where permission to enter was not available, as discussed in Section 4.1.2. The species has potential to occur within the action area in high quality potentially suitable areas mapped as alkali scrub and annual grassland habitats.

Direct and indirect effects to California jewelflower and other federally listed plant species are discussed for the purpose of disclosure; however, only those effects occurring within a federal interest area are under the jurisdiction of the USFWS.

5.2.1 Mechanism / Explanation of Possible Effects

Construction in areas where permission to enter was not available may include suitable habitat for California jewelflower and may result in adverse effects to California jewelflower if the species is present. Only listed plant populations found within an area of federal interest that are removed, cut, dug up, damaged, or destroyed in known violation of a state law or regulation are protected under the FESA.

In the unlikely event that this species is present within the project footprint plus a 100-foot buffer in previously unsurveyed areas, effects to this species may occur as result of construction and operation activities.

5.2.1.1 Construction Phase – Direct Effects

Where undocumented California jewelflower may occur, construction activities may result in the permanent or temporary removal, destruction, covering, or unearthing of individuals, or populations of this species. Direct effects may result from the use of heavy machinery to clear, excavate, compact, or otherwise prepare the ground surface for construction of the project. Vegetation will be allowed to reestablish after construction in some areas (primarily associated with temporary construction easements), which may allow the species to re-colonize, as the seeds can naturally persist in a soil seed bank (USFWS 2005b).

Where suitable habitat that could support California jewelflower occurs, construction activities may disturb, penetrate, drain, fill, pollute, or otherwise modify or degrade habitats, causing direct effects to federally listed plants, including California jewelflower.

5.2.1.2 Construction Phase – Indirect Effects

Within the action area and where potentially suitable habitat is present, indirect effects to California jewelflower may occur. The indirect effects may result from construction related changes to habitat heterogeneity, hydrology, fragmentation, dust, shading, soil disturbance, and from the introduction of non-native invasive plant species. Each of these may result in mortality or harm individuals or populations and potentially result in loss of plants and suitable habitat.

Construction activities may facilitate the spread of nonnative invasive plant species through the introduction of seeds and propagules, thereby increasing competition for resources (i.e., sun, water, soil nutrients) and potentially decreasing success in blooming, flowering, pollinating, seeding, setting seed, and germination. Ground disturbance will create an opportunity for non-native invasive plants species to compete with California jewelflower and destructively alter appropriate habitat both in and outside the project footprint.

5.2.1.3 Operations Phase – Direct Effects

Direct effects associated with operation and maintenance will be limited where habitats within the project footprint were modified or degraded during construction. Wherever suitable lands are modified or degraded during construction, the species is unlikely to reoccur and operational activities that require maintenance of the railway are unlikely to result in direct effects to the species.

In some areas, where the track is at-grade and drainage swales are constructed, appropriate habitat for the species may occur and the species may colonize a portion of the operational right-

of-way. If operations and maintenance activities occur where the species re-colonizes the areas, potential direct effects may occur where maintenance-associated ground disturbance, clearing, or grubbing are required. These direct effects may be either permanent or temporary (if the plant is able to reestablish) in duration. These effects would be caused by similar mechanisms as those described above for construction, but to a lesser degree, as operational activities have a smaller footprint than construction activities.

5.2.1.4 Operations Phase – Indirect Effects

Indirect effects to the California jewelflower may occur in the operations phase where habitats within the project footprint will be modified or degraded during construction. Because potentially suitable habitat will be converted and made unsuitable during construction, operational activities that require maintenance of the railway are not expected to result in indirect effects to the species.

In some areas, where the track is at-grade and drainage swales are constructed, appropriate habitat for the species may occur and the species may colonize a portion of the right-of-way. If operation and maintenance activities occur where the species recolonizes the area within the project action area, indirect effects may occur where ground disturbing, clearing, or grubbing are required. Such effects would be caused by similar mechanisms as those described above for construction, but to a much lesser degree given that operation activities have a smaller footprint than construction activities.

5.2.2 Conservation Measures

In the unlikely event that California jewelflower is located and confirmed within the project footprint, the general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid the effects of the project on this species as appropriate. These include:

- Construction Work Windows for Wetlands and other Waters of the U.S.
- Pre-Construction Surveys
- Contractor Education And Environmental Training
- Biological Monitoring During Construction
- Cleaning Of Construction Equipment
- ESA (Environmentally Sensitive Area) Fence And WEF (Wildlife Exclusion Fence) Fencing For Wildlife Exclusion And Habitat Protection
- Restoration Of Temporarily Disturbed Areas

In addition, the measures listed below will be implemented to avoid and minimize effects to this species:

- Protocol level, pre-construction botanical surveys for federally listed plants species including the California jewelflower will be conducted prior to any ground disturbing activities in areas where permission to enter was not available, where timing previously prevented full protocol level botanical surveys, or where the project design changes. Surveys will be conducted in areas of suitable habitat and areas identified as “unsurveyed potentially suitable habitat.”

- Areas that support California jewelflower that will be temporarily disturbed will be restored on-site to pre-construction conditions. Prior to disturbance, pre-construction conditions will be documented detailing species composition, species richness, percent cover of key species, and photo points will be established. Success criteria of restored areas will be determined through consultation with the USFWS.

- All populations of California jewelflower that will be directly affected will be documented. Documentation will include the density and percent cover of the species and key habitat

characteristics including soil type, associated species, hydrology, topography, and photo documentation of pre-construction conditions.

5.2.2.1 Compensatory Mitigation

The action area does not contain any properties that meet the definition of federal jurisdiction under the FESA. Areas of federal interest occur within the Tulare Lakebed Mitigation Site and at Pixley NWR. To date, neither the California jewelflower nor other federally listed plants have been identified in areas of federal interest. While potentially suitable habitats are present that could support federally listed species, the habitats associated with the Tulare Lakebed Mitigation Site are degraded and unlikely to support this or other federally listed plant species. The Tulare Lakebed Mitigation Site and Pixley NWR are located outside of the action area and therefore no direct or indirect effects to listed plants are anticipated within these federal interest areas.

In the unlikely event that California jewelflower or other federally listed plant species is observed during protocol level pre-construction surveys, compensation for adverse effects will be determined through consultation with the USFWS. The compensatory mitigation provided to upland and vernal pool wildlife species; *e.g.,* vernal pool branchiopods, California tiger salamander, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox are anticipated to provide ample conservation of suitable habitat with appropriate habitat to support this and other federally listed plant species.

5.2.3 Net Project Effects on the Species

California jewelflower is not known to occur in the action area and was not found during protocol level botanical surveys where permission to enter was available. However, depending on the alignment selected, the project may affect between 437.59 and 603.26 acres of habitat potentially suitable to support the species on lands where permission to enter was not available.

Protocol level surveys will be conducted prior to construction to confirm the presence or absence of California jewelflower within the project footprint. Due to the low potential for this species to occur within the action area, the direct and indirect effects to the species are anticipated to be insignificant and discountable with implementation of the conservation measures outlined above. There are no interrelated actions that may affect this species. Therefore, this project is not likely to adversely affect California jewelflower.

In the event that California jewelflower is identified during protocol level pre-construction botanical surveys, the FRA will reinitiate formal consultation with the USFWS.

5.3 Project Effects on Kern Mallow

Populations identified in the Jepson Manual as Kern mallow were found outside of the Botanical RSA during 2010 field surveys. As discussed in Section 4.3.2, the taxonomic and regulatory classification for this species is ambiguous. The FRA, through its consultants, has requested technical assistance with species experts at the USFWS to determine if the observed populations are regulated under FESA. Although a federally listed population of this species was not found within the Botanical RSA during protocol level botanical surveys, unsurveyed potentially suitable habitat that may support this species remains where permission to enter was not available, as discussed in Section 4.1.2. The species has potential to occur within the action area in high quality suitable habitat mapped as alkali scrub and annual grassland near the settlement of Lokern.

As discussed in Section 5.2, no properties within the action area meet the definition of federal interests. Direct and indirect effects to Kern mallow and other federally listed plant species are discussed for the purpose of disclosure.

5.3.1 Mechanism / Explanation of Possible Effects

The conservation focus of this species is centered on the metapopulation in Lokern, and the species is not expected to occur in the project affected federal interest areas. As such, no direct or indirect effects to protected populations of the Kern mallow are anticipated to occur. Construction activities in unsurveyed potentially suitable habitat where permission to enter was not available may result in adverse effects to Kern mallow if the species is determined to be present. As discussed for California jewelflower in Section 5.2, only listed plant populations found within an area of federal interest that are removed, cut, dug up, damaged, or destroyed in known violation of a state law or regulation are protected under the FESA. In the unlikely event that this species is present within the project footprint plus a 100-foot buffer in previously unsurveyed areas, effects to this species may occur as a result of construction and operation activities. The direct and indirect effects would be similar to those described for California jewelflower in Section 5.2.

Adverse effects to plants identified (using the Jepson Manual) as potential Kern mallow which do not appear to represent the federally listed population of concern, are not expected to occur as a result of construction and operation activities, as the identified populations were outside of potential impact areas. Direct and indirect effects to individuals or populations of Kern mallow on as-yet unsurveyed land will be similar to those described in Section 5.2.

5.3.2 Conservation Measures

Regardless of the location and flower color, the FRA proposes to implement the conservation measures that would be required if the species were in the Lokern region, because these measures would be implemented for other federally listed species that have potential to occur in the action area. The general and species-specific conservation measures discussed in Section 2.7 and 5.2.2 will be implemented to minimize and avoid the effects of the project on protected populations of Kern mallow.

In addition, the measures listed below will be implemented to avoid and minimize effects to Kern mallow:

- Where the potential population of Kern mallow has been documented (near the intersection of SR 155 and SR 43), ESA fencing will be installed at the edge of the project footprint prior to construction to minimize any effects to this population.

5.3.2.1 Compensatory Mitigation

Compensatory mitigation will only be necessary should protocol level surveys identify populations of Kern mallow. If populations are identified during protocol level surveys, then the compensatory mitigation proposed for California jewelflower will be applied for this species.

5.3.3 Net Project Effects on the Species

Kern mallow is not known to occur within the action area. However, the project may affect between 437.59 and 603.26 acres of unsurveyed land that could potentially support the species.

Protocol level surveys will be conducted prior to construction to confirm the presence or absence of Kern mallow within the project footprint. Due to the low potential for this species to occur within the action area, the direct and indirect effects to the species are anticipated to be

insignificant and discountable with implementation of the conservation measures outlined in 5.2.2. There are no interrelated actions that may affect this species. Therefore, this project is not likely to adversely affect the federally listed population of Kern mallow.

In the event that federally listed populations of Kern mallow are identified during protocol level pre-construction surveys, the FRA will reinitiate formal consultation with the USFWS.

5.4 Project Effects on San Joaquin Woolly Threads

San Joaquin woolly threads is known both currently and historically from Fresno, Tulare, Kings, and Kern County. Although this species was not found within the Botanical RSA during protocol level botanical surveys, potentially suitable habitat to support this species may occur in unsurveyed potentially suitable habitat areas on lands where permission to enter was not available during the survey period, as discussed in Section 4.1.2. The species has potential to occur within the action area in high quality potentially suitable areas mapped as alkali scrub and annual grassland habitats which contain vernal pools.

As discussed in Section 5.2, no properties within the action area meet the definition of federal interests. Direct and indirect effects to San Joaquin woolly threads and other federally listed plant species are discussed for the purpose of disclosure.

5.4.1 Mechanism / Explanation of Possible Effects

Construction activities in potentially suitable habitat where permission to enter was not available may result in effects to San Joaquin woolly threads if the species is present. Like the California jewelflower (Section 5.2), only listed plant populations found within an area of federal interest that are removed, cut, dug up, damaged, or destroyed in known violation of a state law or regulation are protected under the FESA. The location of known occurrences indicates that the potential direct and indirect effects to other populations of the San Joaquin woolly threads are most likely to occur in Kern County. Due to the hydrologic conditions within the action area, which do not support the requirements of the species, San Joaquin woolly threads is unlikely to occur and is therefore not likely to be adversely affected by project construction or operation. If this species is present within the project footprint plus a 100-foot buffer, effects to this species may occur as a result of construction and operation activities. The direct and indirect effects would be similar to those described in Section 5.2.

5.4.2 Conservation Measures

The general and species-specific conservation measures discussed in Section 2.7 and 5.2.2 will be implemented to minimize and avoid effects of the project on this species.

5.4.2.1 Compensatory Mitigation

Compensatory mitigation is not proposed at this time, because this species is not known to occur within the Botanical RSA, and direct or indirect effects are not expected. If populations are identified during protocol level surveys, the compensatory mitigation proposed for California jewelflower (Section 5.2) will also be applied for this species.

5.4.3 Net Project Effects on the Species

San Joaquin woolly threads is not known to occur within the action area. However, the project may affect between 437.59 and 603.26 acres of habitat potentially suitable to support the species on unsurveyed land where permission to enter was not available during the survey period.

Protocol level surveys will be conducted prior to construction to confirm the species' presence or absence within the project footprint. Due to the low potential for the species to occur within the action area, the direct and indirect effects to the species are anticipated to be insignificant and discountable with implementation of the conservation measures. There are no interrelated actions that may affect this species. Therefore, this project is not likely to adversely affect San Joaquin woolly threads.

In the event that San Joaquin woolly threads is identified during protocol level pre-construction botanical surveys, the FRA will reinitiate formal consultation with the USFWS.

5.5 Project Effects on Hoover's Spurge

Hoover's spurge has limited potential to occur in the action area based on the historical distribution of the species. Potentially suitable habitats (vernal pools) for the species occur within portions of the action areas in Kings and Tulare County. While no occurrences are known from Kings County, the habitats are appropriate and the action area is close to Tulare County, where the species has been identified (CDFG 2012). The occurrences from Tulare County are more than 10 miles east of the action area and are believed to be extirpated (CDFG 2012). As such, the potential for this species to occur in either Kings or Tulare County is low.

Although Hoover's spurge was not found within the Botanical RSA during protocol level botanical surveys, potentially suitable habitat that may support this species remains to be surveyed where permission to enter was not available, as discussed in Section 4.1.2. The species has potential to occur within the action area in high quality potentially suitable areas mapped as alkali desert scrub and annual grassland habitats which contain vernal pools.

This species has no potential to occur in the action area within Fresno or Kern County because the species is not known from these counties, potentially suitable habitat is extremely limited, and the hydrology required by this species is not present.

As discussed in Section 5.2, no properties within the action area meet the definition of federal interests. Direct and indirect effects to Hoover's spurge and other federally listed plant species are discussed for the purpose of disclosure.

5.5.1 Mechanism/Explanation of Possible Effects

Construction activities in potentially suitable habitat areas where permission to enter was not available may result in effects to Hoover's spurge if the species is present. Like the California jewelflower (Section 5.2), only listed plant populations found within an area of federal interest that are removed, cut, dug up, damaged, or destroyed in known violation of a state law or regulation are protected under the FESA. This species is not historically known from Kings County. In addition, the hydrologic management of the adjacent Tulare Lakebed Mitigation Site likely limits the ability for this species to grow and reproduce. However, the seeds of Hoover's spurge germinate after water evaporates, suggesting that the seeds can remain dormant until appropriate temperature and moisture conditions are present (Stone et al. 1988).

In the unlikely event that this species is present within the project footprint plus a 100-foot buffer, effects to this species may occur as a result of construction and operation activities. The direct and indirect effects would be similar to those described in Section 5.2.

5.5.2 Conservation Measures

The general and species-specific conservation measures discussed in Section 2.7 and reiterated in Section 5.2.2 will be implemented to minimize and avoid the effects of the project on this species.

5.5.2.1 Compensatory Mitigation

Compensatory mitigation will only be necessary should pre-construction surveys identify populations of Hoover's spurge. If populations are identified during protocol level surveys, the compensatory mitigation proposed for California jewelflower (Section 5.2) will also be applied for this species.

5.5.3 Net Project Effects on the Species

Hoover's spurge is not known to occur within the action area. However, the project may affect between 437.59 and 603.26 acres of habitat suitable to support this species (annual grasslands and alkali desert scrub with vernal pools) where permission to enter was not available during the survey period.

Protocol level surveys will be conducted prior to construction to confirm the species' presence or absence within the project footprint. Due to the low potential for this species to occur within the action area, the direct and indirect effects to the species are anticipated to be insignificant and discountable with implementation of the conservation measures. There are no interrelated actions that may affect this species. Therefore, this project is not likely to adversely affect Hoover's spurge.

In the event that Hoover's spurge is identified during protocol level pre-construction botanical surveys, the FRA will reinitiate formal consultation with the USFWS.

5.6 Project Effects on Federally Listed Branchiopods: Vernal Pool Tadpole Shrimp & Vernal Pool Fairy Shrimp

As discussed in Sections 4.3.5 and 4.3.6, the vernal pool tadpole shrimp and the vernal pool fairy shrimp, respectively, are federally listed branchiopod species that may occur in similar habitats. Although the species were not observed during field surveys in the Wildlife RSA, suitable vernal pool areas were identified in alkali desert scrub, annual grassland, and pasture habitats throughout the project footprint. These species have potential to occur within the action area in areas with vernal pool habitat where permission to enter was not available.

5.6.1 Mechanism / Explanation of Possible Effects

The known range of vernal pool tadpole shrimp and vernal pool fairy shrimp includes the entire project footprint. Construction and operation of the proposed project may result in direct and indirect effects to both species, and may result in degradation or loss of suitable aquatic habitats, including vernal pools and seasonal wetlands in alkali desert scrub, annual grassland, and pasture habitats (Table 5-1). The clearing of native vegetation, soil disturbance, the operation of construction equipment, and noise are some of the mechanisms that may contribute direct or indirect effects to the species. Direct effects from construction and operation of the HST system through these sections may include: harm or mortality from heavy equipment, disruption or penetration of the underlying hardpan soils, and water pollution in vernal pools and seasonal wetlands. Indirect effects from HST construction and operation activities may be caused by erosion, soil compaction, increased siltation/sedimentation, fractures in the hardpan soils,

destruction of native vegetation, or alteration of wetland hydrology to vernal pools or seasonal wetlands.

5.6.1.1 Construction Phase – Direct Effects

Where suitable habitat exists for federally listed branchiopods, construction activities may lead to mortality and habitat modification for vernal pool tadpole shrimp and vernal pool fairy shrimp. Mortality may occur if vehicles, equipment, or construction personnel destroy suitable aquatic habitats which results in harm to individuals and/or the cysts of these species; or if construction activities disturb the hydrology of vernal pools or seasonal wetlands. Habitat modification may occur through the disturbance, reduction, degradation, fill, pollution, loss, or conversion of suitable vernal pools or seasonal wetlands.

5.6.1.2 Construction Phase – Indirect Effects

In the action area, indirect effects to federally listed branchiopods may occur from construction related changes in hydrology, including the disruption, fracturing, or penetration of the hardpan soils underlying the seasonal wetlands, and vernal pools may prevent these features from becoming inundated. Other indirect effects to the branchiopods may include erosion and sedimentation that potentially changes vernal pool turbidity and water quality; water pollution; increased dust/shading; the introduction of invasive species; or the reduction or fragmentation of suitable upland habitats.

5.6.1.3 Operations Phase – Direct Effects

The operation of the HST system may contribute to population fragmentation or habitat modification through the reduction, degradation, fill, pollution, or loss of suitable native habitat. Areas where vernal pools or seasonal wetlands are present within the operational right-of-way may provide suitable habitat where vernal pool branchiopods may be established. In such areas, maintenance activities required by the operation of the proposed HST system, including ground disturbance, clearing, or grubbing, may cause erosion and sedimentation that will directly affect nearby pool hydrology.

5.6.1.4 Operations Phase – Indirect Effects

Operational indirect effects to federally listed branchiopods may occur from the long-term changes in native vegetation, fragmentation of suitable habitat, introduction of invasive species, changes in hydrology, or water pollution. Maintenance activities, such as those described above, may also indirectly affect nearby pool hydrology. If operational maintenance involves the use of herbicides for weed abatement activities, these activities could alter pool vegetation in such a way as to affect vernal pool fairy shrimp or vernal pool tadpole shrimp through alterations to water chemistry, shade cover, or an increase in predation. Chemical runoff from trucks or equipment along the right-of-way access road could leach into wetlands adjacent to the HST system and harm or kill vernal pool fairy or vernal pool tadpole shrimp. The extent of direct and indirect effects is expected to be restricted to within 250 feet of the project footprint.

5.6.1.5 Interrelated Actions

The Phase 1 sections San Jose to Merced and Merced to Fresno may also adversely affect the vernal pool tadpole shrimp and vernal pool fairy shrimp. The adverse effects on these species from the interrelated sections of the HST system would be similar in nature, but they have not been quantified yet at a project level. These species are not expected to occur in other remaining sections of the HST system.

The project-level effects to the vernal pool fairy shrimp and vernal pool tadpole shrimp have not formally been studied, however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to these species are anticipated to be similar. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system. The direct and indirect effects to these species would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, each HST section would be required to consult with the USFWS under Section 7 of the FESA.

5.6.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid effects of the project to these species. To avoid and minimize potential adverse effects to the federally listed branchiopods, the measures listed below will be implemented in the project footprint plus a 250-foot buffer where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur.

- Non-disturbance exclusion zones will be maintained and monitored by a USFWS approved biological monitor to ensure that no unnecessary take or destruction of vernal pool branchiopods or their habitat occurs outside of the project footprint. Work will not occur within 250 feet of suitable aquatic habitats from October 15 to June 1, or April 15 if no inundation is present, (corresponding to the rainy season) or as determined through informal or formal consultation with USFWS. Ground-disturbing activities may begin once the habitat is no longer inundated for the year and it is after April 15.

- If construction activities must occur during the October 15 – June 1 period, initial ground disturbance activities will be scheduled to begin during the dry season, June 2 – October 14, to minimize the effects to vernal pool branchiopods and their breeding habitat. If any work remains to be completed after October 15, the Contractor's Biologist, under the supervision of the Project Biologist, will install exclusion fencing and erosion control measures in those areas where construction activities need to be completed.

5.6.2.1 Compensatory Mitigation

As proposed in Section 2.7.2, unavoidable adverse effects to federally listed branchiopods will be determined by the acreages of direct and indirect effects to habitats that support the species. These acreages of suitable habitat will be mitigated through compensation that is based on the Programmatic BO (USFWS 1996a). Compensatory mitigation for the loss of vernal pool fairy shrimp and vernal pool tadpole shrimp includes both a preservation component and creation component.

Preservation component:

For every acre of habitat **directly** or **indirectly** affected,

- Two vernal pool preservation credits will be dedicated within a USFWS approved habitat mitigation bank, OR

- Based on USFWS evaluation of site-specific conservation values, two acres of vernal pool habitat will be preserved at a non-bank location as approved by USFWS.

Creation component:

For every acre of habitat **directly** affected,

- One vernal pool creation credit will be dedicated within a USFWS approved habitat mitigation bank, OR
- Based on USFWS evaluation of site-specific conservation values, 2 acres of vernal pool habitat will be created and monitored at a non-bank location as approved by USFWS.

5.6.3 Net Project Effects on the Species

The HST project may directly affect between 12.05 and 38.14 acres of suitable habitat for vernal pool tadpole shrimp and vernal pool fairy shrimp. It will indirectly affect from 34.51 to 80.80 acres of suitable habitat for the species. Based on the known range of the vernal pool tadpole shrimp and the vernal pool fairy shrimp, their documented occurrences near the action area, the removal of suitable habitat in the project footprint, and field observation of unspecified *Branchinecta* sp., this project is likely to adversely affect both species of federally listed branchiopods.

The direct and indirect effects of the proposed action and the effects of interrelated actions are likely to adversely affect vernal pool tadpole shrimp and vernal pool fairy shrimp. The adverse effects of the proposed project on these species are likely to be similar in nature and magnitude to those that occur in other sections (San Jose to Merced and Merced to Fresno) of the statewide HST system.

5.7 Project Effects on Vernal Pool Fairy Shrimp Critical Habitat

As discussed in Section 4.3.7, critical habitat for vernal pool fairy shrimp was first designated in 2003, and finalized in 2006 (Federal Register 28-7117). In the final designation, the PCEs for vernal pool fairy shrimp critical habitat included vernal pools, seasonal wetlands, and other ephemeral wetlands and depressions that become dry in the summer but maintain inundation and moisture long enough to support the full cycle of the fairy shrimp's life. The PCEs also included vernal pool complexes, such as networks of pools, swales, and other ephemeral features that are hydrologically and ecologically connected to those vernal pools, swales, and other ephemeral wetlands and depressions that are hydrologically and ecologically connected (USFWS 2003).

5.7.1 Mechanism/Explanation of Possible Effects

Approximately 54 square feet of vernal pool fairy shrimp designated Critical Habitat Unit 27B is within the Wetland RSA (250-foot buffer of the project footprint). However, that portion of the critical habitat unit does not contain the PCEs listed in the designation. The vernal pools, seasonal wetlands, and other ephemeral wetlands elements do not occur within the 54 square feet described above, and this area is hydrologically and ecologically disconnected from the remainder of Critical Habitat Unit 27B by SR 43 and the BNSF right-of-way. Therefore, this project will not adversely modify or destroy PCEs and is not likely to adversely affect critical habitat designated for the vernal pool fairy shrimp.

5.7.2 Net Project Effects on the Critical Habitat

Although 54 square feet of designated critical habitat for vernal pool fairy shrimp is within the Wetland RSA, the PCEs for critical habitat are absent. The project will have no direct or indirect effect on designated critical habitat for vernal pool fairy shrimp.

5.8 Project Effects on Valley Elderberry Longhorn Beetle

As discussed in Section 4.3.8, the valley elderberry longhorn beetle is a federally threatened insect that is dependent on its host plant, elderberry shrubs, to complete its lifecycle.

Elderberry shrubs were observed during field surveys within the Botanical RSA in the riparian corridor of the Kings River, north of Layton. Some elderberry shrubs mapped during biological field surveys fall within the project footprint of at-grade tracks and will be removed. Clusters of elderberry shrubs associated with Cole Slough, Kings River, and Dutch John Cut, all within the Kings River floodplain, occur where the HST will be constructed on an elevated structure. Elderberry shrubs could be present at all locations where construction would occur on elevated structures. Depending on the final placement of piers, elderberry shrubs in Cole Slough, the Kings River, and Dutch John Cut may be removed. Additional elderberry shrubs in Cole Slough, Dutch John Cut, and the Kings River may be temporarily impacted by construction activities but not removed.

Riparian and non-riparian occurring elderberry shrubs may also occur in areas where permission to enter was not available. Due to extensive agricultural land use in the region, no elderberry shrubs are anticipated within these areas. Protocol level surveys for the valley elderberry longhorn beetle using elderberry shrub stem diameter and exit holes were not conducted as part of the field surveys.

5.8.1 Mechanism / Explanation of Possible Effects

Valley elderberry longhorn beetles have potential to occur in a limited portion of the action area where the elderberry shrub host plant is present. The removal or disturbance of elderberry shrubs and other native riparian vegetation, soil disturbance, erosion, soil compaction, creation and dispersal of dust, the operation of construction equipment, noise, vibration, or light disturbance are some of the mechanisms that may contribute direct or indirect effects to valley elderberry longhorn beetle. Direct effects to both valley elderberry longhorn beetle and the elderberry shrub host plant from construction and operation of the HST system where either beetle or occupied shrubs are present may include: harm, mortality, population fragmentation, host plant disturbance, or abandonment. Indirect effects from HST construction and operation activities may include: host plant disturbance or abandonment due to noise or vibration, higher stress and lower survivorship of elderberry shrubs through the creation and dispersal of dust and particulate matter, root exposure/compaction due to erosion and soil compaction, and changes in site hydrology (alterations in water flow patterns, inundation patterns, ground water, or water quality) due to project construction.

5.8.1.1 Construction Phase – Direct Effects

Where the valley elderberry longhorn beetle host plant is present, construction activities may lead to valley elderberry longhorn beetle or host plant species mortality, and to habitat modification. Mortality may occur if vehicles, equipment, or construction personnel remove or disturb elderberry shrubs occupied by valley elderberry longhorn beetles, or destroy native riparian vegetation or riparian habitat.

Habitat modification may occur through the reduction, degradation, clearing/removal, compaction, fill, loss, or conversion of suitable native riparian vegetation, or changes to site hydrology. The exact effects of construction activities will depend on the final placement of piers, construction technique, and the level of permanent and temporary disturbance. Impacts that reduce the fitness or that destroy elderberry shrubs occupied by valley elderberry longhorn beetles, their larvae, or their eggs would be considered an effect to valley elderberry longhorn

beetles. The movement of heavy construction equipment and placement of permanent structures in the project footprint will require the removal of an undetermined number of elderberry shrubs.

5.8.1.2 Construction Phase – Indirect Effects

Where the valley elderberry longhorn beetle host plant is present, indirect effects to valley elderberry longhorn beetle may occur from host plant disturbance or abandonment due to noise or vibration from construction equipment. During groundbreaking and construction activities, the creation and dispersal of dust and particulate matter could coat elderberry leaves, which may affect the plant's respiratory processes, reduce the fitness, and lower survivorship of elderberry shrubs. Additionally, erosion and soil compaction may result in root exposure or root compaction. Pile driving, excavation, rail bed build up, placement of permanent and temporary structures, and vehicle traffic may result in changes to the hydrology of habitat suitable for elderberry shrubs. Changes to hydrology may include alterations in water flow patterns, inundation patterns, ground water, or water quality. These changes may affect the survival of elderberry shrubs. Elderberry shrubs occupied by valley elderberry longhorn beetles, their larvae, or their eggs that are disturbed would be considered an indirect effect to valley elderberry longhorn beetles.

5.8.1.3 Operations Phase – Direct Effects

Direct effects to valley elderberry longhorn beetles are not expected from long-term operations and maintenance activities. The HST will operate on bridges or elevated structures above major riparian corridors. Where the HST will operate at-grade in areas outside of riparian corridors, adverse effects to valley elderberry longhorn beetles are not expected. Juvenile valley elderberry longhorn beetles are confined to their host plant, and adult beetles are generally found close to host plants (USFWS 1984); therefore, collisions between elevated trains and riparian-dwelling valley elderberry longhorn beetles are not anticipated.

5.8.1.4 Operations Phase – Indirect Effects

Where the elderberry shrub host plant is present, indirect effects to valley elderberry longhorn beetle may occur from the operation of the train and maintenance vehicles. Any maintenance activities that involve pesticides or herbicides may reduce populations of the species or its host plant. Furthermore, dust or particulate matter created by HST operations could affect the plant's respiratory processes, reduce fitness, and lead to lower survivorship of elderberry shrubs. Such effects are expected to be limited to the project footprint and a 100-foot buffer in habitats that support elderberry shrubs.

5.8.1.5 Interrelated Actions

The Phase 1 sections San Jose to Merced, Merced to Fresno, and Bakersfield to Palmdale may also affect the valley elderberry longhorn beetle. The adverse effects on this species from the interrelated sections of the HST system would be similar in nature, but they have not been quantified yet at a project level. This species is not expected to occur in remaining sections of the HST system.

The project-level effects to the valley elderberry longhorn beetle have not formally been studied, however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to the species are anticipated to be similar. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system. The direct and indirect effects to this species would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, these sections would be required to consult with the USFWS under Section 7 of the FESA.

5.8.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid the effects of the project on this species. In addition, the measures following the USFWS (1999b) *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* will be implemented to avoid and minimize potential adverse effects to the valley elderberry longhorn beetle. These measures include:

- Protocol level presence/absence surveys for elderberry shrubs and valley elderberry longhorn beetle exit holes, per the USFWS' *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b), conducted year-round, prior to construction.
- If protocol-level surveys determine that valley elderberry longhorn beetle may occur within the project footprint plus a 100-foot buffer, then:
  - In temporarily impacted areas, a 100-foot non-disturbance exclusion zone will be established during construction around all elderberry shrubs with stems at ground level 1-inch diameter or greater; construction fencing will be composed of high-visibility ESA fencing, AND/OR
  - If encroachment within the 100-foot non-disturbance zone is unavoidable, a 20-foot non-disturbance exclusion zone will be provided from the dripline of each elderberry shrub; fencing will be composed of ESA high-visibility construction fencing.
  - If encroachment occurs within the 20-foot non-disturbance zone, appropriate compensatory mitigation, as described in Section 5.2.2 will be required.
  - Where possible, elderberry shrubs will be relocated according to the USFWS' *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b).
- Dust control procedures, such as regular watering of disturbed soils and soil piles, and covering of soil piles, would be used throughout the construction period.

5.8.2.1 Compensatory Mitigation

As proposed in Section 2.7.2, the project will provide compensatory mitigation measures following the USFWS (1999b) *Conservation Guidelines for the Valley Elderberry Longhorn Beetle*. The extent of compensation will be based on the number of elderberry shrubs affected by the project. Compensatory mitigation measures will be implemented following the Conservation Guidelines as summarized below:

- Elderberry shrubs must be transplanted if they cannot be avoided by the project. All elderberry shrubs with one or more stems measuring 1 inch or greater in diameter (at ground level) will be will be transplanted to a USFWS approved conservation area during the dormancy period (November 1 to February 15). A USFWS-approved conservation area will be established that provides at least 1,800 square feet for each transplanted elderberry shrub.
- Compensatory mitigation ratios will be based on the characteristics of the various elderberry shrubs and stems removed. These characteristics included the habitat, number of stems, stem diameter at ground level, and presence or absence of exit holes. Compensatory mitigation includes both elderberry seedling/cuttings and planting of associated native plants. Table 5-4 summarizes the compensatory mitigation ratios identified in the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999b).

Table 5-4
Summary of Compensatory Mitigation Ratios for Impacts to Suitable Habitat for the Valley Elderberry Longhorn Beetle[a]

Habitat	Stem Size Class (maximum diameter at ground level, in inches)	Exit Holes on Shrub[b]	Elderberry Seedling / Cutting Ratio[c]	Associated Native Plant Ratio[d]
Riparian	Stems 1 to 3	Yes	1:1	1:1
		No	2:1	2:1
	Stems 3 to 5	Yes	2:1	1:1
		No	4:1	2:1
	Stems > 5	Yes	3:1	1:1
		No	6:1	2:1
Non-Riparian	Stems 1 to 3	Yes	2:1	1:1
		No	4:1	2:1
	Stems 3 to 5	Yes	3:1	1:1
		No	6:1	2:1
	Stems > 5	Yes	4:1	1:1
		No	8:1	2:1

[a] Mitigation ratios were determined following the guidelines in the U.S. Fish and Wildlife Services "*Conservation Guidelines for the Valley Elderberry Longhorn Beetle*", established in July 1999.

[b] All stems measuring at least 1inch in diameter at ground level on a single shrub are considered occupied when exit holes are present anywhere on the shrub.

[c] Ratios in the *Elderberry Seedling Ratio* column correspond to the number of cuttings or seedlings to be planted per elderberry stem (at least 1 inch in diameter at ground level) affected by the proposed project.

[d] Ratios in the *Associated Native Plant Ratio* column correspond to the number of associated native species to be planted per elderberry (seedling or cutting) planted.

5.8.3 Net Project Effects on the Species

Twelve individual elderberry shrubs were identified within the Botanical RSA. These individuals could host an undetermined number of stems per shrub. In addition, elderberry shrubs could occur in riparian and non-riparian areas where permission to enter was not available. The results of the botanical surveys, and the amount of unsurveyed potentially suitable habitat that could support the valley elderberry longhorn beetle, indicate that an estimated 36 valley elderberry shrubs (containing stems of various widths) could occur within the action area. This number is a conservative estimate assuming that all of the 12 blue elderberry shrubs identified within the Botanical RSA would be affected by the project and that any remaining shrubs are in unsurveyed potentially suitable habitat. Since approximately 35% of the area was surveyed the number of the shrubs present in the entire action area may be approximately three times as many as the number identified. The exact number of elderberry shrubs affected by the project would be determined through completion of the protocol level surveys as described in the species conservation measures.

During construction, the HST project is likely to result in the removal of elderberry shrubs (associated with at-grade structures and elevated structures). Due to the presence of the valley elderberry longhorn beetle host plants and the location of the project within the known range of the species, this project is likely to adversely affect valley elderberry longhorn beetle.

The direct and indirect effects of the proposed action and the effects of interrelated actions are likely to adversely affect valley elderberry longhorn beetle. The adverse effects of the proposed project on the species are likely to be similar in nature and magnitude to those that occur in other sections (San Jose to Merced, Merced to Fresno, and Bakersfield to Palmdale) of the statewide HST system.

5.9 Project Effects on California Tiger Salamander

As discussed in Section 4.3.9, the California tiger salamander is a federally threatened species with potential to occur when alkali desert scrub, annual grassland, or pasture habitats are present within the action area.

5.9.1 Mechanism/Explanation of Possible Effects

California tiger salamanders have potential to occur in a limited portion of the action area. Suitable habitat for the species occurs within approximately 5 linear miles of the alignment, an area of mostly annual grassland from just north of Cross Creek to approximately 1 mile north of Corcoran (the Cross Creek grassland region). In the vicinity of Cross Creek, HST tracks will be elevated for 0.31 to 1.29 linear miles, and will be at-grade for approximately 2.6 linear miles of potentially suitable upland habitat for the species. The construction and operation of the train through these sections may have direct or indirect effects on California tiger salamander. Populations of this species are not expected to occur outside of the Cross Creek grassland region because suitable breeding and upland habitat has been eliminated by intensive agricultural development. Therefore, adverse effects to California tiger salamanders are not anticipated within the project footprint outside of the Cross Creek grassland region.

The clearing of native vegetation, soil disturbance, the operation of construction equipment, noise, vibration, or light disturbance are some of the mechanisms that may contribute direct or indirect effects to California tiger salamander. Direct effects from construction and operation of the HST system through these sections may include: harm, mortality, population fragmentation, burrow/breeding pool disturbance or abandonment. Indirect effects from HST construction and operation activities may include: shifts in foraging patterns or territories due to noise or vibration, reduction of prey availability, habitat fragmentation, or increased predation on the species within the limited area of potentially suitable habitat in the Cross Creek region.

5.9.1.1 Construction Phase – Direct Effects

Where suitable habitat exists for California tiger salamander, construction activities may lead to both species mortality and to habitat modification. Mortality may occur if vehicles, equipment, or construction personnel trample this species; destroy their burrows or other upland refugia; if construction activities result in destruction of a breeding pool that harms or kills California tiger salamander adults, juveniles or eggs; or if individuals of the species become entrapped in open, excavated areas. Habitat modification may occur through the reduction, degradation, fill, loss, or conversion of suitable native habitat, upland burrows, or other refugia.

5.9.1.2 Construction Phase – Indirect Effects

Within the action area, indirect effects to California tiger salamanders may occur from construction related reduction/displacement of burrowing host species (ground squirrels and

other burrowing mammals); sound and vibration related disruptions of breeding, feeding, or sheltering behaviors; the reduction or fragmentation of suitable habitat; noise or light disturbance; or an increase in predation. Other indirect effects to the species may include the construction related changes in hydrology, including disruption or penetration of seasonal pools, water pollution, erosion, increased siltation/sedimentation, fractures in the hardpan soils, or changes in native vegetation.

5.9.1.3 Operations Phase – Direct Effects

Operation of the proposed project may result in injury or mortality to California tiger salamander within the right-of-way. Security fencing is not designed or expected to prohibit California tiger salamander from accessing the operational right-of-way where tracks are at-grade. In at-grade locations where appropriate habitat is present (approximately 2.6 linear miles of track) the species may access tracks or track ballast during either daily movements or seasonal migrations between aquatic and upland habitats. The majority of California tiger salamander migration occurs during nighttime hours, which includes hours when the train will be operational and hours when maintenance activities will occur on the right-of-way. Trains may kill dispersing California tiger salamander on or near at-grade tracks. Maintenance vehicles may also harm or kill dispersing California tiger salamanders when traveling on associated maintenance access roads.

At-grade linear project components such as rail beds may result in increased injury or mortality to California tiger salamander if they encounter predators (e.g. raccoon, coyotes, domestic/wild animals) while traveling parallel to the rail line, which is this species' typical behavior when encountering an obstacle during its migration. At-grade project components such as ballast and tracks may also serve as an impermeable barrier, obstructing dispersal and migratory movements. Tall or elevated project components such as security fencing, electrical infrastructure, and elevated structures will provide artificial perch sites, and may increase opportunities for increased avian predation upon California tiger salamander.

In addition, the operation of the HST system may contribute to population fragmentation or habitat modification through the reduction, degradation, fill, pollution, or loss of suitable native habitat. California tiger salamander may be directly affected during seasonal migrations because the significant habitat modifications in the right-of-way may significantly impair the behavioral patterns of the species such as breeding, feeding, and sheltering.

5.9.1.4 Operations Phase – Indirect Effects

At-grade linear project components may interfere with seasonal movements and dispersal of California tiger salamander in the vicinity of the Cross Creek area. They also have the potential to lead to changes in hydrology. Operational indirect effects to California tiger salamander may occur from the fragmentation of suitable habitat, or a reduction of prey availability that impairs breeding, feeding, or sheltering behaviors. An increase in predation may occur after the HST system is constructed where security fencing, elevated structures, and other project components create new perch sites or provide protective cover for predatory birds and mammals.

Indirect effects caused by noise, vibration, or light disturbance during the operation of trains could disrupt or displace individual salamanders, causing them to abandon burrows or breeding sites. Any maintenance activities that involve pesticides or herbicides may reduce prey species or ground squirrel populations, which may reduce the availability of California tiger salamander refugia. The extent of direct and indirect effects is expected to be restricted to within 250 feet of the project footprint.

5.9.1.5 Interrelated Actions

The Phase 1 sections San Francisco to San Jose, San Jose to Merced and Merced to Fresno may also affect the California tiger salamander. The adverse effects on this species from the interrelated sections of the HST system would be similar in nature, but they have not been quantified yet at a project level. This species is not expected to occur in remaining sections of the HST system.

The project-level effects to the California tiger salamander has not formally been studied; however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to the species are anticipated to be similar. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system. The direct and indirect effects to this species would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, these sections would be required to consult with the USFWS under Section 7 of the FESA.

5.9.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid the effects of the project on California tiger salamander. In addition, the measures listed below will be implemented in the Cross Creek grassland region to avoid and minimize potential adverse effects to this species:

- Visual preconstruction surveys will be conducted in suitable habitats in the Cross Creek grassland region to determine the presence or absence of California tiger salamanders within the construction footprint. Surveys will be conducted no more than 30 days before the start of ground-disturbing activities and will be phased with project build-out.
- Non-disturbance exclusion zones will be established, maintained and monitored by a qualified biologist(s) to ensure that no take or destruction of California tiger salamander or their potential habitat occurs outside of the project footprint; fencing will be composed of a combination of both ESA high-visibility construction fencing and wildlife exclusion fencing.
- Construction activities will not be conducted within 250 feet of potential California tiger salamander breeding habitat during the wet season (October 15 through June 1, or April 15 if no inundation is present).

5.9.2.1 Compensatory Mitigation

As proposed in Section 2.7.2, the total number of credits or acres of compensatory mitigation provided by the project will be determined by the amount of upland habitat impacted in the Cross Creek grasslands region. A compensatory mitigation ratio of 3:1 for impacts on upland habitat will be provided to offset the direct effects on California tiger salamanders.

5.9.3 Net Project Effects on the Species

California tiger salamander is not known to occur within the action area. However, the project may impact up to 5.50 acres of potential upland habitat for California tiger salamander. The HST project will not impact any potential aquatic habitat for the species. Due to the direct and indirect effects to the species from habitat modifications, which are significant and quantifiable, this project is likely to adversely affect upland habitat for California tiger salamander within the Cross Creek grassland region. The project is expected to have no effect on California tiger salamander in all other areas of the Fresno to Bakersfield Section outside of the Cross Creek area.

The direct and indirect effects of the proposed action and the effects of interrelated actions are likely to adversely affect California tiger salamander. The adverse effects of the proposed project on the species are likely to be similar in nature and magnitude to those that occur in other sections (San Jose to Merced and Merced to Fresno) of the statewide HST system.

5.10 Project Effects on Blunt-Nosed Leopard Lizard

As discussed in Section 4.3.10, the blunt-nosed leopard lizard is a federally listed endangered species with potential to occur when alkali desert scrub and annual grassland habitats occur within the action area. Blunt-nosed leopard lizard are territorial, and USFWS density estimates range from 0.1 to 4.2 lizards per acre (USFWS 2010b), although densities in marginal habitat generally do not exceed 0.2 blunt-nosed leopard lizard per acre. The overall population size of this species is unknown (USFWS 2010b).

The HST project will be constructed in the Pixley NWR – Allensworth ER area (which includes two linkages identified in Missing Linkages report: (1) the Highway 43 – Garces Highway linkage; and (2) the Deer Creek – Sand Ridge linkage (Figure 4-3) (Penrod et al. 2001). Both the BNSF Alternative and the Allensworth Bypass Alternative traverse the Pixley-Allensworth area. However, only the BNSF Alternative intersects with portions of the Pixley NWR and Allensworth ER parcels. The potential BNSF alignment runs adjacent to one large parcel of the Allensworth ER, and intersects another large parcel in the same area as SR 43 and BNSF. The BNSF alignment would run adjacent and parallel to these features, therefore providing no further habitat fragmentation, but potentially adding a third barrier to blunt-nosed leopard lizard migration from the Pixley NWR to Allensworth ER. The NEPA/CEQA analysis process will determine which of these potential alignments is built.

5.10.1 Mechanism/Explanation of Possible Effects

The known range of blunt-nosed leopard lizard overlaps the project footprint in a limited area, from just north of the Allensworth area to just north of Neufeld. Within the blunt-nosed leopard lizard's range, tracks will be elevated for 0 to 0.6 linear miles through suitable habitat for the species and will be at-grade through 4.6 to 5.3 linear miles of the suitable habitat for the species. The clearing of native vegetation, soil disturbance, the operation of construction equipment, noise, vibration, or light disturbance are some of the mechanisms that may contribute direct or indirect effects to the species. Direct effects from construction and operation of the HST system through these sections may include: harm, mortality, population fragmentation, burrow/nest disturbance, or abandonment during breeding season. Indirect effects from HST construction and operation activities may include: shifts in foraging patterns or territories due to noise or vibration, shifts in breeding site selection, reduction in prey availability, habitat fragmentation, or increased predation on the species.

5.10.1.1 Construction Phase – Direct Effects

Where suitable habitat exists for blunt-nosed leopard lizard, construction activities may lead to both species mortality and habitat modification. Mortality may occur if vehicles, equipment, or construction personnel trample this species, or crush their burrows or nests; or if blunt-nosed leopard lizard individuals become trapped in open, excavated areas. Habitat modification may occur through the reduction, degradation, fill, pollution, loss or conversion of suitable native habitat, including loss of vegetative cover, burrows, or other refugia.

5.10.1.2 Construction Phase – Indirect Effects

In the action area, indirect effects to blunt-nosed leopard lizards may occur from changes in native vegetation, the reduction or fragmentation of suitable habitat, noise or light disturbance,

or an increase in predation. Other indirect effects to the species may include the construction related reduction of prey availability (grasshoppers, moths, small mammals, and young lizards), or sound and vibration related disruptions of breeding, feeding, or sheltering behaviors.

5.10.1.3 Operations Phase – Direct Effects

Individual blunt-nosed leopard lizard may access the operational right-of-way when temperatures are appropriate (rock or rail temperatures of 75°F to 95°F), for basking, resting, thermoregulation or feeding. An individual blunt-nosed leopard lizard within the right-of-way may be killed by a direct strike with the train or maintenance vehicle. Operation of the proposed project may result in injury or mortality to blunt-nosed leopard lizard within or along the right-of-way as discussed in Section 5.9.1.C for California tiger salamander for direct train strikes.

The operation of the HST system may contribute to population fragmentation or habitat modification through the reduction, degradation, fill, pollution, or loss of suitable native habitat. Direct effects from the operation of trains through the Allensworth area may be lower if an elevated structure is selected over an at-grade alignment.

5.10.1.4 Operations Phase – Indirect Effects

Operational indirect effects to blunt-nosed leopard lizards may occur from the long-term changes in native vegetation, the fragmentation of suitable habitat, noise or light disturbance, a reduction of prey availability that impairs breeding, feeding, or sheltering behaviors, or an increase in predation that occurs after the HST system is constructed. The security fencing, elevated structures, and other HST system components can create new perch sites or provide protective cover for predatory birds and mammals. The extent of direct and indirect effects is expected to be restricted to within 500 feet of the project footprint.

5.10.1.5 Interrelated Actions

The Phase 1 sections San Jose to Merced and Bakersfield to Palmdale may also affect blunt-nosed leopard lizards. The adverse effects on this species from the interrelated sections of the HST system would be similar in nature, but they have not been quantified yet at a project level. This species is not expected to occur in remaining sections of the HST system.

The project-level effects to the blunt-nosed leopard lizards have not formally been studied, however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to the species are anticipated to be similar. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system. The direct and indirect effects to this species would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, these sections would be required to consult with the USFWS under Section 7 of the FESA.

5.10.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to mitigate the effects of the project on this species. To avoid and minimize potential adverse effects to this species, the measures listed below will be implemented in the project footprint where suitable habitat occurs and the species has potential to occur:

- Surveys will be conducted in suitable habitat (alkali desert scrub, annual grassland, barren, valley foothill riparian) within the project footprint by a qualified, agency-approved biologist(s) to determine presence or sign of blunt-nosed leopard lizard, including:

  - Protocol level presence/absence surveys will be conducted within 1-year prior to the start of construction following the California Department of Fish and Game *Approved Survey Methodology for the Blunt-Nosed Leopard Lizard* (CDFG 2004).
  - Pre-construction surveys will be conducted within 30 days before the start of construction.

- If at any time blunt-nosed leopard lizard is documented on site, USFWS and CDFG will be contacted immediately.
- During the active season (April 15 through October 15; or as conditions warrant), in areas where blunt-nosed leopard lizard or blunt-nosed leopard lizard sign are present, ground-disturbing activities will occur when air temperatures are between 75 and 95°F. This temperature range corresponds to the period when this species is moving around and can avoid danger.
  - Following the preconstruction survey for blunt-nosed leopard lizard within the construction footprint, if active burrows or egg clutch sites are identified within the construction footprint a 50-foot non-disturbance buffer will be established, maintained, and monitored around these active burrows and egg clutch sites. The 50-foot buffers will be established by routing the high-visibility construction fence and wildlife exclusion fence around the active burrow and clutch sites in a manner that allows for blunt-nosed leopard lizard to leave the construction footprint after the young have hatched. Project-related activities within the 50-foot buffers, including vegetation clearing and grubbing (as described below), will be prohibited until the eggs have hatched and blunt-nosed leopard lizard have been allowed to leave the construction footprint.
  - Following the preconstruction survey for blunt-nosed leopard lizard within the construction footprint, if no active burrows or egg clutch sites are identified within the construction footprint, vegetation clearing and grubbing activities will be performed with hand tools. Cleared vegetation will be cut to four inches above the ground level and all trimmings will be removed from the construction footprint. The vegetation-free work area will be allowed to sit undisturbed for a minimum of 72 hours to allow blunt-nosed leopard lizards to passively relocate from the site. A follow-up preconstruction survey will be conducted in the vegetation-free work area to look for blunt-nosed leopard lizards or their sign. Any blunt-nosed leopard lizards observed during the follow-up survey will be allowed to leave the work site of their own volition. Immediately after the follow-up preconstruction survey of the vegetation-free work area (assuming no blunt-nosed leopard lizards are detected), the construction footprint will be delineated with high-visibility construction fence and wildlife exclusion fence. The vegetation-free work area within the wildlife exclusion fence will be maintained and monitored daily.
  - If blunt-nosed leopard lizards are observed at any time during preconstruction surveys or the construction period, USFWS and CDFG will be contacted. Appropriate measures to avoid take of the species will be established through consultation with the USFWS and CDFG.

- During the non-active season (October 16 through April 14), suitable blunt-nosed leopard lizard burrows identified during protocol level and preconstruction surveys will be avoided during construction activities. A 50-foot no-work buffer will be established around burrows to prevent impacts until the active season, when blunt-nosed leopard lizards will be able to leave the vegetation-free work area on their own accord. The no-work buffer will be established by routing the high-visibility construction fence and wildlife exclusion fence around the suitable burrow sites in a manner that allows for blunt-nosed leopard lizards to

leave the construction footprint during the active season. If construction activities are required during this period, appropriate measures will be established through consultation with the USFWS and CDFG.

- Non-disturbance exclusion zones will be established along the project footprint in potentially suitable areas (alkali desert scrub, annual grassland, barren, valley foothill riparian); fencing will be composed of a combination of both ESA high-visibility construction fencing and wildlife exclusion fencing.
- Non-disturbance exclusion zones will be maintained and monitored by a qualified biologist(s) to minimize the take of blunt-nosed leopard lizards, their burrows/nests, or the species' habitat outside of the project footprint.
- In order to comply with the Upland Species Recovery Plan, project design plans will be further refined to identify optimal wildlife-friendly crossing locations within linkages in the Pixley NWR-Allensworth ER area to maintain or enhance crossing, dispersal, and migration opportunities for blunt-nosed leopard lizard across the HST system. Optimal wildlife corridor locations will be sited through future consultation with species experts and through consultation with the USFWS to coincide with existing potentially suitable habitats (e.g., alkali desert scrub, annual grassland, barren, valley foothill riparian). The goal of the wildlife movement corridors will be to enhance permeability through the project to the maximum extent feasible.

5.10.2.1 Compensatory Mitigation

The Upland Species Recovery Plan (USFWS 1998a) provides guidance and recommendations for the recovery of the blunt-nosed leopard lizard. One recommended recovery action for blunt-nosed leopard lizard is to protect potentially suitable habitat and retired agricultural lands around Pixley NWR, with an objective of expanding and connecting the refuge units with each other and with the Allensworth ER. The Upland Species Recovery Plan also recommends maintaining and establishing linkages (or movement corridors) in existing suitable habitat and between islands of habitat on the San Joaquin Valley floor.

As proposed in Section 2.7.2, the total number of credits or acres to be compensated for will be determined by the amount of impacts to suitable habitat that is determined through protocol level surveys to support the species.

5.10.3 Net Project Effects on the Species

The project would impact from 27.60 to 98.05 acres of potential blunt-nosed leopard lizard habitat. The project is expected to include 4.6 to 5.3 linear miles of at-grade track through habitat suitable to support the species. Potential project alternatives may reduce the maximum at-grade distance by 0.5 mile through habitat avoidance and/or 0.6 mile of elevated structure. Operation of the HST at-grade through habitat suitable to support blunt-nosed leopard lizards may lead to additional effects to individuals compared to an elevated structure in the same habitat. Due to the direct and indirect effects to the species from habitat modifications, which are significant and quantifiable, and based on the known range of the species, documented occurrences near the action area, and the removal of suitable habitat in the project footprint, this project is likely to adversely affect blunt-nosed leopard lizard.

The direct and indirect effects of the proposed action and the effects of interrelated actions are likely to adversely affect blunt-nosed leopard lizard. The adverse effects of the proposed project on the species are likely to be similar in nature and magnitude to those that occur in other sections (San Jose to Merced and Bakersfield to Palmdale) of the statewide HST system.

5.11 Project Effects on Tipton Kangaroo Rat

As discussed in Section 4.3.11, the Tipton kangaroo rat is a federally threatened species with potential to occur when alkali desert scrub, annual grassland, barren or pasture habitats are present within the action area.

The HST project may intersect with two recovery areas from the USFWS (1998a) Upland Species Recovery Plan: (1) the Pixley NWR / Allensworth ER (which includes the Garces Highway and the Highway 43 linkage); and (2) the Kern River Alluvial Fan Area. Two HST alternatives pass through the Pixley-Allensworth area; neither alternative is anticipated to degrade the habitat values of any of the Pixley-Allensworth parcels. In the Bakersfield area, the HST project will be elevated over the Kern River Alluvial Fan Area, maintaining the permeability recommended by the Upland Species Recovery Plan (USFWS 1998a) and the Tipton kangaroo rat 5-Year Review (USFWS 2010d).

5.11.1 Mechanism / Explanation of Possible Effects

The known range of Tipton kangaroo rat overlaps the project footprint from the Kings River south through Bakersfield. Potentially suitable habitat types for the species include: alkali desert scrub, annual grassland, barren, and pasture. Potential effects to the species will vary depending on whether tracks are elevated or at-grade. The tracks will be on elevated structure for 4.17 to 4.9 linear miles, and will be at-grade through 4.69 to 6.48 linear miles of suitable Tipton kangaroo rat habitat. Operation of the HST at-grade through habitat suitable to support Tipton kangaroo rat may lead to additional effects to individuals compared to an elevated structure in the same habitat.

From the Kings River south through Bakersfield, where suitable habitat exists for this species the clearing of native vegetation, soil disturbance, the operation of construction equipment, noise, vibration, or light disturbance are some of the mechanisms that may contribute to direct or indirect effects to Tipton kangaroo rat. Direct effects from construction and operation of the HST system through these sections may include harm, mortality, population fragmentation, and burrow disturbance or abandonment. Indirect effects from HST construction and operation activities may include shifts in foraging patterns or territories due to noise or vibration, reduction of food sources, habitat fragmentation, or increased predation on the species.

5.11.1.1 Construction Phase – Direct Effects

Where suitable habitat exists for Tipton kangaroo rat, construction activities may lead to both species mortality and habitat modification. Mortality may occur if vehicles, equipment, or construction personnel trample this species; destroy their burrows or nests; or if Tipton kangaroo rat individuals become trapped in open, excavated areas. Habitat modification may occur through the reduction, degradation, fill, pollution, loss, or conversion of suitable native habitat, including soil compaction, loss of vegetative cover, burrows, or other refugia.

5.11.1.2 Construction Phase – Indirect Effects

Within the action area, indirect effects to Tipton kangaroo rats may occur from changes in native vegetation, the reduction or fragmentation of suitable habitat, noise or light disturbance, or an increase in predation. Other indirect effects to the species may include construction related reduction of prey availability, changes to hydrology and plant cover or composition, or sound and vibration related disruptions of breeding, feeding, or sheltering behaviors.

5.11.1.3 Operations Phase – Direct Effects

If an individual Tipton kangaroo rat enters the operational right-of-way where tracks are at-grade, they may be killed by a direct strike by a train or maintenance vehicle. They may start to use the embankments to forage and disperse (e.g., use the rail bed as a substitute to open travel corridors). This will increase the likelihood of a direct strike by the train. The linear project components such as security fencing and rail beds may also result in increased injury or mortality if Tipton kangaroo rats become trapped by predators (e.g. coyotes, domestic/wild dogs) while traveling parallel to the rail line. Security fencing, electrical infrastructure, and elevated structures will provide artificial perch sites that may attract avian predators, and result in an increase in predation upon Tipton kangaroo rats along the length of the proposed project.

In addition, the operation of the HST system may contribute to population fragmentation or habitat modification through the reduction, degradation, fill, pollution, or loss of suitable native habitat. Tipton kangaroo rats may be directly affected because the significant habitat modifications in the right-of-way may significantly impair the behavioral patterns of the species such as breeding, feeding, and sheltering.

5.11.1.4 Operations Phase – Indirect Effects

Operational indirect effects to Tipton kangaroo rat may occur from the long term changes in native vegetation, the fragmentation of suitable habitat, or a reduction of prey availability that impairs breeding, feeding, or sheltering behaviors. An increase in predation may occur after the HST system is constructed where security fencing, elevated structures, and other project components create new perch sites or provide protective cover for predatory birds and mammals. Indirect effects caused by noise, vibration, or light disturbance during the operation of trains could disrupt or displace Tipton kangaroo rats, causing them to abandon burrows. Any maintenance activities that involve pesticides or herbicides may reduce prey species. The extent of direct and indirect effects is expected to be restricted to within 500 feet of the project footprint.

5.11.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid the effects of the project on this species. The measures listed below will be implemented in areas that overlap between the project footprint and the known geographic range of federally listed Tipton kangaroo rats, to avoid and minimize potential adverse effects to the species:

- Prior to construction, a habitat assessment will be conducted in potentially suitable habitat (alkali desert scrub, annual grassland, pasture, barren) within the project footprint by a qualified, agency-approved biologist(s) to determine presence of Tipton kangaroo rat burrows or their sign. The habitat assessment surveys will be at conducted within 2 years, and no more than 14 days prior to the start of construction or ground disturbing activities, and may be phased with project build-out.
- If no burrows or sign of kangaroo rats are detected, no further measures will be required.
- Based on the results of the habitat assessment, in areas where Tipton kangaroo rat are believed to be present, non-disturbance exclusion zones will be established at least 14 days prior to construction or ground disturbing activities. The fencing will be installed under the supervision of a qualified biologist(s) along the project footprint in potentially suitable habitat (alkali desert scrub, pasture, annual grassland, barren). Fencing will be composed of a combination of both ESA fencing and wildlife exclusion fencing with one way exit/escape points. Additional measures such as the following will be implemented after the exclusion fencing is installed.

- Vegetation will be trimmed and cleared to the ground by hand or hand operated equipment to discourage presence in the project footprint. The cleared vegetation will remain undisturbed by project construction equipment for 14 days to allow species to passively relocate through the one way exit/escape points along the wildlife exclusion fencing, OR
- Small mammal trapping and relocation in general accordance with the *Survey Protocol for the Morro Bay Kangaroo Rat* (USFWS and CDFG 1996) or as determined in consultation with either CDFG or USFWS. The small mammal trapping surveys would occur within the project footprint in potentially suitable habitat (alkali desert scrub, pasture, annual grassland, and barren) that contain Tipton kangaroo rat sign. The trapping will be conducted prior to construction and phased with project build-out; trapping would be limited to the dry, summer months on evenings when the nightly low temperature is forecast to exceed 50°F; small mammal trapping and relocation will be performed by a qualified biologist(s) with the necessary permits.

- To maintain consistency with the Upland Species Recovery Plan, project design plans will be further refined to identify optimal wildlife-friendly crossing locations within linkages in the Pixley-Allensworth area to maintain or enhance crossing, dispersal, and migration opportunities for Tipton kangaroo rat across the HST alternatives. Optimal wildlife corridor locations will be sited through future consultation with species experts, and through consultation with the USFWS, to coincide with existing suitable habitats (e.g., alkali desert scrub, annual grassland), and to either avoid redundancy or provide permeability, as feasible.

5.11.2.1 Compensatory Mitigation

As proposed in Section 2.7.2, compensatory mitigation will be provided to offset the loss of suitable habitat for Tipton kangaroo rat. The total number of credits or acres to be compensated for will be determined by the amount of suitable habitat (i.e., alkali desert scrub, annual grassland, pasture, or barren) that is impacted by the proposed project. A mitigation ratio of 3:1 for direct effects on suitable habitat will be used to compensate for adverse effects to this species.

5.11.3 Net Project Effects on the Species

The HST project will impact from 362.45 to 445.38 acres of potential habitat for Tipton kangaroo rat. Direct and indirect effects to Tipton kangaroo rat, which are significant and quantifiable, would result from construction and operation of the proposed project. Therefore, this project is likely to adversely affect Tipton kangaroo rat. Due to the limited distribution of the species, there are no interrelated actions that may affect this species.

5.12 Project Effects on Fresno Kangaroo Rat

As discussed in Section 4.3.12, the Fresno kangaroo rat is a federally endangered species with potential to occur when alkali desert scrub, annual grassland, barren, or pasture habitats are present within the portion of the action area located north of the Kings River. The HST project does not intersect with any areas identified in the Upland Recovery Plan (USFWS 1998a) as having potential for Fresno kangaroo rat recovery.

5.12.1 Mechanism / Explanation of Possible Effects

Fresno kangaroo rats have potential to occur in a limited portion of the action area. Suitable habitat for the species in the action area is restricted to highly fragmented habitat within the Wildlife RSA. The methodology used to assess where and whether Fresno kangaroo rats may

persist within the action area is discussed in Section 4.1.1. Potentially suitable habitat in the Wildlife RSA is located between the southern extent of the city limits of Fresno and the Kings River.

The BNSF Alternative overlaps up to 20 parcels of land with suitable habitat for the Fresno kangaroo rat. The Fresno HMF overlaps one parcel of land with suitable habitat for the species that is shared by the BNSF Alternative. The potentially suitable habitat within the action area consists of annual grassland, barren, and pasture habitats that experience light use, and/or limited to moderate connectivity to adjacent potentially suitable habitat (e.g., through ditches, absence of dispersal barriers). Conceivably, Fresno kangaroo rat could use these highly fragmented parcels if populations of the species still exist in these areas, which is unlikely.

Although suitable habitat is present, the Fresno kangaroo rat is not likely to occur in the action area. As detailed in Section 4.3.12, no extant populations of Fresno kangaroo rat are known (USFWS 1998a) and the CNDDB occurrences within a 10-mile radius of the project footprint are historical and considered extirpated by CDFG (Section 4.3.12 D; CDFG 2012).

The project would result in modification of fragmented habitat that may provide suitable habitat for Fresno kangaroo rat; however, since the species is not likely to occur in the action area the HST project is not expected to result in direct or indirect effects to the species. To further reduce the possibility of adverse effects to this species, conservation measures will be implemented, as described below.

5.12.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid the effects of the project on this species. The measures listed below will be implemented within the portions of the action area that overlap the project footprint and were identified as providing potentially suitable habitat for the Fresno kangaroo rat.

- Prior to construction, a habitat assessment will be conducted on the parcels that may support the Fresno kangaroo rat. The habitat assessment would be conducted within the project footprint by a qualified, agency-approved biologist(s) to determine presence of kangaroo rat burrows or their sign.
- If no burrows or sign of kangaroo rats are detected, no further conservation measures will be required.
  - If kangaroo rats are confirmed to be absent from the project footprint, exclusion fencing composed of a combination of both ESA fencing and wildlife exclusion fencing with one way exit/escape points will be installed along the perimeter of the project footprint.
  - Vegetation will be trimmed and cleared to the ground by hand or hand operated equipment to discourage the small mammal presence in the project footprint. The cleared vegetation will remain undisturbed by project construction equipment for 14 days to allow the other small mammal species to passively relocate through the one way exit/escape points along the wildlife exclusion fencing.
- In the unlikely event that kangaroo rat individuals, their burrows, or sign are found within the project footprint during the habitat assessment, the USFWS and CDFG will be notified immediately and the FRA will reinitiate consultation to identify appropriate avoidance and minimization measures.
  - With agency permission, small mammal trapping may be conducted by a qualified biologist(s) with the necessary permits. The trapping surveys, will be conducted in

general accordance with *Survey Protocol for the Morro Bay Kangaroo Rat* (USFWS and CDFG 1996) or as determined in consultation by either USFWS or CDFG.

5.12.2.1 Compensatory Mitigation

The project effects to the Fresno kangaroo rat are expected to be insignificant and discountable, as such, no compensatory mitigation is proposed at this time. If the species is not observed during the pre-construction field surveys proposed as a conservation measure, then no direct or indirect effects to the species will occur and no further conservation measures would be required. However, in the event that Fresno kangaroo rats are determined to be present in the project footprint plus a 500-foot buffer, the USFWS will be contacted to reinitiate consultation and to determine the appropriate conservation measures, including compensation, required to offset the unavoidable adverse effects to this species.

5.12.3 Net Project Effects on the Species

The HST project will directly affect 28.50 to 30.39 acres of habitats that are suitable for, but unlikely to support Fresno kangaroo rat. Based on the known limited range of the species and the absence of documented occurrences near the action area, the potential for the Fresno kangaroo rat to occur in the action area is low. The effects to the species are anticipated to be insignificant and discountable; therefore, this project is not likely to adversely affect the species. Due to the limited distribution of the species, there are no interrelated actions that may affect this species.

5.13 Project Effects on San Joaquin Kit Fox

As discussed in Section 4.3.13, the San Joaquin kit fox is a federally endangered and state threatened species with potential to occur when alkali desert scrub, annual grassland, barren, and pasture habitats are present within the action area. The HST project footprint is within the historic and current range of the San Joaquin kit fox, which includes the majority of the southern and eastern portions of the San Joaquin Valley. The species is well documented in the vicinity of the project footprint, with almost 200 recorded occurrences within a 10-mile radius of the project footprint (Section 4.3.13 D).

The HST project avoids all three of the San Joaquin kit fox core recovery areas identified in the Upland Species Recovery Plan (USFWS 1998a) and the 5-Year Review (USFWS 2010c). As described in Section 5.10, the HST system will pass through Satellite and Linkage areas, including the Southwestern Tulare County Satellite area (Pixley and Allensworth area) where populations of the San Joaquin kit foxes are known to occur. Populations are also known from the Metropolitan Bakersfield Satellite area and two areas identified as important linkages that connect Satellite and Core populations, the Kern River Alluvial Fan linkage and Poso Creek linkage.

In some instances the HST project will be at-grade (Pixley-Allensworth), and elevated on aerial structures (Bakersfield). The use of elevated aerial structures will maintain the permeability recommended by the Upland Species Recovery Plan. At Poso Creek, the HST tracks would be elevated either on elevated structures or on a bridge structure.

In areas outside of the Core, Satellite and Linkage areas, populations of San Joaquin kit fox are not expected to occur frequently; however, dispersing or foraging individuals may be present on occasion. In general, habitats that are potentially suitable and are not disturbed on a regular basis or are in urban areas, in the city of Bakersfield, may provide suitable habitat and opportunity for breeding, denning, foraging, and or dispersing activities. By contrast, agricultural and other developed areas provide limited opportunity for denning; however, San Joaquin kit fox individuals may forage or disperse in these areas.

The proposed project crosses a total of seven habitat linkages, five of which have been identified for the San Joaquin kit fox in the 2001 *Missing Linkages* report: Kings River, St. Johns River – Cross Creek, Tule River, Deer Creek – Sand Ridge, Highway 43 – Garces Highway (2 crossings), Poso Creek, and Kern River (Penrod et al. 2001). The Highway 43 – Garces Highway and Deer Creek – Sand Ridge linkages are within the Southwestern Tulare County Satellite area (Pixley NWR–Allensworth ER area), whereas the Poso Creek linkage closely parallels the linkage in the Recovery Plan. The Kern River linkage occurs within the Metropolitan Bakersfield Satellite and Kern River Alluvial Fan Satellite area. The Kings River and St. Johns River – Cross Creek linkages are not associated with San Joaquin kit fox recovery areas; however, individuals may utilize these linkages.

5.13.1 Mechanism / Explanation of Possible Effects

Where suitable habitat exists for this species, the clearing of native vegetation, soil disturbance, the operation of construction equipment, noise, vibration, or light disturbance are some of the mechanisms that may contribute to direct or indirect effects to San Joaquin kit fox. Direct effects from construction and operation of the HST system through these sections may include: harm, mortality, population fragmentation, and den disturbance or abandonment. Indirect effects from HST construction and operation activities may include: shifts in foraging patterns or territories due to noise or vibration, reduction of food sources, habitat fragmentation, changes in habitat connectivity, or increased predation on the species.

Construction activities may result in habitat loss for the San Joaquin kit fox. Loss of habitat may result from the collapsing of occupied dens, or destruction of unoccupied dens, as well as the placement of hardscape over areas that could provide suitable den/burrow habitat, all of which could decrease the amount of refuge available in an area, making the San Joaquin kit fox more vulnerable to predators. In addition, construction activities may result in the trapping of San Joaquin kit fox in trenches, excavated holes, pipes, or other equipment used for construction, which could lead to injury or mortality.

5.13.1.1 Construction Phase – Direct Effects

Where suitable habitat exists for San Joaquin kit fox, construction activities may lead to both species mortality and habitat modification. Mortality may occur if vehicles, equipment, or construction personnel trample this species; destroy their dens; or if San Joaquin kit fox individuals become entrapped in open, excavated areas, pipes, or other equipment used for construction. Habitat modification may occur through the reduction, degradation, fill, pollution, loss or conversion of suitable habitat, including soil compaction, loss of vegetative cover, dens, or other refugia.

5.13.1.2 Construction Phase – Indirect Effects

In the action area, indirect effects to San Joaquin kit fox may occur from changes in native vegetation, the reduction or fragmentation of suitable habitat, noise or light disturbance, or an increase in predation. Other indirect effects to the species may include construction related reduction of prey availability, changes to plant cover or composition, or sound and vibration related disruptions of breeding, feeding, or sheltering behaviors.

Despite attempts by the proposed project to incorporate wildlife friendly movement facilities (overpasses and structures), the linear nature of the project will change existing, and limit future, dispersal and movement patterns. This may adversely affect individual viability by increasing the energetic costs and risks of activities, including mate selection, genetic exchange between dispersed populations, breeding success, hunting, and colonization of new habitats.

5.13.1.3 Operations Phase – Direct Effects

The operation of the HST system may contribute to population fragmentation or habitat modification through the reduction, degradation, fill, pollution, or loss of suitable native habitat. San Joaquin kit foxes could be directly affected because significant habitat modifications in the right-of-way may significantly impair the behavioral patterns of the species, such as breeding, feeding, and sheltering.

Operation and maintenance activities would not result in entrapment or mortality of San Joaquin kit fox on tracks or within equipment areas. Project design components, such as security fencing, will exclude San Joaquin kit fox from entering the HST right-of-way where the tracks are at-grade. However, there may be an increase in mortality if San Joaquin kit fox become trapped by predators (e.g. coyotes, domestic/wild dogs) while traveling parallel to the rail line. Where tracks are on elevated structures, these structures will provide ample opportunity for species to cross under the HST. Operation and maintenance activities could result in increased predator presence, noise and light pollution at stations and HMFS, vibration along the right-of-way, and wind, light and visual disturbance along the project footprint. These disturbances may cause displacement in areas of at-grade track, where San Joaquin kit fox have reduced ability to avoid these disturbances.

5.13.1.4 Operations Phase – Indirect Effects

Operational indirect effects to San Joaquin kit fox may occur from the long-term changes in native vegetation; the fragmentation of suitable habitat; or a reduction of prey availability that impairs breeding, feeding, or sheltering behaviors. Indirect effects caused by noise, vibration, or light disturbance during the operation of trains, could disrupt or displace San Joaquin kit foxes, causing them to abandon dens. Any maintenance activities that involve pesticides or herbicides may reduce prey species.

Operational activities may result in changes in habitat connectivity for the San Joaquin kit fox. The proposed project will contain a combination of bridges, elevated structures, and at-grade tracks, which may cause varying degrees of affects to habitat connectivity throughout the action area. Tracks will be at-grade through potential San Joaquin kit fox habitat, and elevated on an elevated structure in other areas. To minimize effects to habitat connectivity in at-grade locations, the project is designed to include wildlife undercrossing structures (Section 2.7.1). The anticipated indirect effects as a result of changes in habitat connectivity include possible shifts in San Joaquin kit fox home range location or size, and possible changes in overall species community composition. The extent of direct and indirect effects is anticipated to be restricted to within 1,000 feet of the project footprint.

5.13.1.5 Interrelated Actions

The Phase 1 sections San Jose to Merced, Merced to Fresno, and Bakersfield to Palmdale may also affect San Joaquin kit fox. The adverse effects on this species from the interrelated sections of the HST system would be similar in nature, but they have not been quantified yet at a project level. This species is not expected to occur in remaining sections of the HST system.

The project-level effects to the San Joaquin kit fox have not formally been studied, however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to the species are anticipated to be similar. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system. The direct and indirect effects to this species would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, these sections would be required to consult with the USFWS under Section 7 of the FESA.

5.13.2 Conservation Measures

The general conservation measures discussed in Section 2.7 will be implemented to minimize and avoid effects of the project on San Joaquin kit fox. In addition, the *USFWS Standard Measures for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 1999c) will be implemented to avoid and minimize direct effects to this species, and are summarized below.

- Pre-construction surveys will be conducted between May 1 and September 30 within the project footprint in suitable habitat areas (alkali desert scrub, annual grassland, pasture, and barren) to identify known/potential San Joaquin kit fox dens. Pre-construction surveys will be conducted by a qualified, agency-approved biologist(s), within 30 days prior to the start of construction or ground disturbing activities, and will be phased with project build-out.
- If San Joaquin kit fox or individuals, burrows, or diagnostic sign are detected, the following steps will be taken:
  - Disturbance to all San Joaquin kit fox dens should be avoided to the maximum extent possible.
  - During the breeding season (December 1 through July 31), all construction activities will be prohibited within the following limits:
  - Non-natal den exclusion zone of 100 feet surrounding occupied/non-occupied non-natal dens.
  - Natal den exclusion zone of 200 feet for San Joaquin kit fox (or as determined in consultation with USFWS) surrounding occupied/non-occupied natal dens.
  - Non-exclusion zone fencing will be composed of ESA high-visibility construction fencing within the boundaries of the project footprint.
  - All construction activities near any occupied dens will cease one-half hour before sunset and will not begin earlier than one-half hour before sunrise, when feasible.
  - Vacant natal dens may be excavated only between August 15 and November 1 AND after pups have vacated the den.
- If San Joaquin kit fox is observed at the den during this period and construction activities within the non-disturbance exclusion zone of active San Joaquin kit fox burrows cannot be avoided, a qualified biologist(s) will initiate relocation efforts in accordance with the *USFWS Standardized Recommendations for Protection of the San Joaquin kit fox Prior to or During Ground Disturbance* (USFWS 1999c):
  - Destruction of any known or natal/pupping kit fox den requires take authorization/permit from USFWS and CDFG, respectively.
  - A minimum of 5 days of den-monitoring is required to allow animals to relocate, during which time passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage relocation.
  - After a non-natal den is determined to be unoccupied, it may be excavated under the direction of a qualified biologist(s) year-round.
- All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for San Joaquin kit foxes before the pipe is subsequently buried, capped, or

otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until USFWS has been consulted. If necessary, and under the direct supervision of the USFWS-approved biological monitor, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

- To maintain consistency with the Upland Species Recovery Plan, project design plans will be further refined to identify optimal wildlife-friendly crossing locations within linkages in the Pixley-Allensworth area to maintain or enhance crossing, dispersal, and migration opportunities for San Joaquin kit fox and other wildlife across the HST alternatives. As an umbrella species passage opportunities designed and provided for San Joaquin kit fox will also extend movement opportunities to other species within the San Joaquin Valley. Optimal wildlife corridor locations will be sited to coincide with existing, potentially suitable habitats to either avoid redundancy or provide permeability, as feasible, and through continued consultation with regional species experts and the USFWS.

5.13.2.1 Compensatory Mitigation

As proposed in Section 2.7.2, compensatory mitigation will be provided for direct effects to San Joaquin kit fox (including destruction of natal dens, if necessary). Compensation will be pursued in weighted ratios between 3:1 and 1.1:1 according to the follow factors (in decreasing order):

- Priority status of habitats discussed in the Upland Species Recovery Plan (USFWS 1998a) (Southwestern Tulare County Satellite area [Pixley NWR-Allensworth ER]; Metropolitan Bakersfield Satellite area; linkage areas; remaining areas).
- Type of affected habitat (natural; agriculture; urban).

The compensatory mitigation ratios for effects to the San Joaquin kit fox are based on the location of effects (i.e., Recovery Plan area) and the type of habitat being affected (natural or developed) by the project. Natural lands, which provide potentially suitable habitats for San Joaquin kit fox, include alkali desert scrub, annual grasslands, pasture, and barren. Developed lands include various agricultural land uses (e.g., grain fields, orchards, croplands, hayfield, vineyards, and row crops) and urban areas.

Compensation for direct effects to potentially suitable habitats will be mitigated at a ratio ranging between 2:1 and 3:1, depending on whether the land is within or outside of an identified recovery area. Mitigation for impacts to potentially suitable habitats will be established in-kind, meaning that other suitable habitat will be preserved, enhanced, or created for the San Joaquin kit fox.

Compensation for direct effects to disturbed habitats (e.g., agricultural or urban land uses) will be provided at a ratio ranging between 0.1:1 and 0.5:1. Mitigation for direct effects to these land uses will be mitigated out-of-kind, through the preservation, enhancement, or creation of suitable habitat for the San Joaquin kit fox.

Furthermore, impacts to agricultural lands protected under the Williamson Land Act (prime farmland, farmland of state importance, unique farmland, and farmland of local importance) are proposed for preservation at a ratio of no less than 1:1 in the *Agricultural Lands* section of the EIR/EIS. Currently, the agricultural impacts, and associated mitigation, to Williamson Land Act are estimated to be approximately 1,600 acres. Preservation of agricultural lands will maintain foraging and dispersal habitat for the San Joaquin kit fox in existing agricultural production.

A summary of the compensatory mitigation for the San Joaquin kit fox is provided in Table 5-5.

Table 5-5
Compensatory Mitigation Ratios Proposed for Direct Effects to the San Joaquin kit fox

San Joaquin kit fox Area	Habitat	Mitigation Ratio
Southwestern Tulare County Satellite Areas	Natural	3:1
	Developed	0.5:1
Metropolitan Bakersfield Satellite Area	Natural	3:1
	Developed	0.1:1
Recovery Plan-Linkage	Natural	3:1
	Developed	0.5:1
Other Areas (outside of Recovery Areas)	Natural	2:1
	Developed	0.1:1

Note:
Natural includes lands identified as alkali desert scrub, annual grasslands, pasture, and barren.
Developed lands included agricultural areas (grain fields, orchards, croplands, hayfield, vineyards, and row crops) and urban areas.

5.13.3 Net Project Effects on the Species

The project would result in effects to habitat suitable for San Joaquin kit fox in natural lands (alkali desert scrub, annual grasslands, pasture, and barren) north of Bakersfield and to urban habitat within the city of Bakersfield (Table 5-1 and Table 5-6).

The majority of the natural lands that could support San Joaquin kit fox are associated with lands outside of the Core, Satellite, and Linkage areas identified in the Upland Species Recovery Plan and 5-year review for the San Joaquin kit fox (USFWS 1998a, 2010c). The natural lands outside of the Satellite and Linkage areas are fragmented and in many cases small in size, and as a result do not likely support large populations of San Joaquin kit fox. However, individuals of the species may disperse, forage, or den in these areas and could be affected by project activities.

Within the Satellite areas, direct and indirect effects could occur to San Joaquin kit fox that potentially use these natural areas to breed, den, forage, or disperse. The number of San Joaquin kit fox in satellite areas would be expected to be higher (i.e., population level) as compared to natural areas outside of Satellite areas. Populations of San Joaquin kit fox are known from the Satellite areas and effects to the species in these areas range from individual level (i.e. mortality of individuals, destruction of dens) to population level (i.e., genetic exchange between dispersed populations) direct and indirect effects.

Within the Linkage areas, direct and indirect effects to natural lands are not likely to result in effects on denning San Joaquin kit fox given the highly developed and disturbed nature of the surrounding agricultural lands. However, the extensive agricultural areas and the fragmented natural areas within the Linkage areas provide suitable foraging and dispersal habitat for the San Joaquin kit fox individuals that could be directly or indirectly affected.

Agricultural lands, including those within the Upland Species Recovery Plan and 5-year review Satellite and Linkage areas, do not likely provide suitable habitat for denning activities; however, this species may forage or disperse through these areas. San Joaquin kit fox are more likely to use agricultural lands in Satellite or Linkage areas than agricultural lands outside of these areas.

Where San Joaquin kit fox use agricultural lands, direct and indirect effects may occur to this species.

The only urban area where San Joaquin kit fox are expected is the city of Bakersfield, in the Metropolitan Bakersfield Satellite area. Natural habitats are absent in this area; however, San Joaquin kit fox have adapted in the city to utilize fragmented urban habitats to den, forage, and disperse. Direct and indirect effects may occur to individuals or populations residing in this satellite area.

Due to the direct and indirect effects to San Joaquin kit fox from habitat modifications, which are significant and quantifiable, and based on the known range of the species, documented occurrences near the action area, and the removal of suitable habitat in the project footprint, this project is likely to adversely affect San Joaquin kit fox. The range of potential direct effects to San Joaquin kit fox within the Core, Satellite, and Linkage areas identified in the Upland Species Recovery Plan and 5-year review for the San Joaquin kit fox (USFWS 1998a, 2010c) is detailed in Table 5-6.

Table 5-6
Potential Effects to San Joaquin kit fox in the Project Footprint

Land Prioritization	CWHR Vegetation Community or Wildlife Association	Type	Effects (Acres)	
			Minimum	Maximum
Southwestern Tulare County Satellite Area	Natural	Direct	86.81	153.94
	Agricultural	Direct	521.45	640.64
Metropolitan Bakersfield Satellite Area (Urban Bakersfield)	Natural	Direct	215.96	216.85
	Agricultural	Direct	—	—
	Urban	Direct	247.17	302.70
Linkage Areas	Natural	Direct	0.00	20.12
	Agricultural	Direct	124.56	350.58
Remainder Areas (outside of Recovery Areas)	Natural	Direct	206.80	284.47
	Agricultural	Direct	1,903.06	2,906.34

Notes:
Natural lands include alkali desert scrub, annual grasslands, pasture, and barren.
Agricultural lands include grain crop, deciduous orchard, row crop, hayfield, vineyard, etc.
Urban lands include urban areas of metropolitan Bakersfield including the BNSF right-of-way.
"MIN" and "MAX" determinations are based on the smallest and largest amount of acreage covered by any continuous combination of HST Alternatives.
Effects on San Joaquin kit fox are based on the CWHR determinations of habitats and range.
{San Joaquin kit fox} Effects are provided separately for urban communities in vicinity of Bakersfield. Range is based on CWHR.
Data in this table was calculated using the 15% engineering design construction footprint.

The adverse effects of the proposed project on the species are likely to be similar in nature and magnitude to those that occur in other sections (San Jose to Merced, Merced to Fresno, and Bakersfield to Palmdale) of the statewide HST system.

5.14 Effects from Interrelated Actions

The HST system is planned to be implemented in two phases. Phase 1 would connect San Francisco to Los Angeles via the Central Valley. Phase 2, which is intended to be a long-term future build-out, would construct additional track from Merced to Sacramento and from Los Angeles to San Diego. The Fresno to Bakersfield alignment is one section of the statewide Phase 1 HST system. The individual sections of the system are separate from each other and can function on their own without further construction of an adjoining section. Each section is designed to have independent utility and logical termini and does not rely on other sections for operations to commence at a local level. Therefore, the proposed action is considered to be interrelated but not interdependent to the statewide HST system.

In addition to the project activities that will be implemented as part of the Fresno to Bakersfield action, interrelated activities that will be implemented in other sections of the Phase 1 HST system may affect federally listed species that are adversely affected by the action proposed in this document. Federally listed species that may occur in other Phase 1 sections include vernal pool tadpole shrimp, vernal pool fairy shrimp, valley elderberry longhorn beetle, California tiger salamander, blunt-nosed leopard lizard, and San Joaquin kit fox.

The adverse effects on the federally listed species from the interrelated sections of the HST system have not formally been studied; however, based on species' range and similarities in the project elements (e.g., infrastructure and supporting facilities), the direct and indirect effects to the species in other Phase 1 sections (San Jose to Merced, Merced to Fresno, Bakersfield to Palmdale) are anticipated to be similar in nature and magnitude to those in the Fresno to Bakersfield Section. The quality and quantity of habitat removed and potential extent of take, would vary between the identified sections of the statewide HST system; however, the direct and indirect effects to federally listed species' would be avoided and minimized utilizing similar strategies as described in this BA. Furthermore, these sections would be required to consult with the USFWS under Section 7 of the FESA.

A summary of listed species that may be subject to adverse effects from interrelated sections of Phase 1 is provided in Table 5-7.

Table 5-7
Listed Species with Potential to Occur in other Interrelated Sections

Species Name	Phase 1*						
	San Francisco to San Jose	San Jose to Merced	Merced to Fresno	Fresno to Bakersfield	Bakersfield to Palmdale	Palmdale to Los Angeles	Los Angeles to Anaheim
Vernal Pool Tadpole Shrimp	N/A	✓	✓	✓	N/A	N/A	N/A
Vernal Pool Fairy Shrimp	N/A	✓	✓	✓	N/A	N/A	N/A
Valley Elderberry Longhorn Beetle	N/A	✓	✓	✓	✓	N/A	N/A
California Tiger Salamander	✓	✓	✓	✓	N/A	N/A	N/A

Table 5-7
Listed Species with Potential to Occur in other Interrelated Sections

Species Name	Phase 1*						
	San Francisco to San Jose	San Jose to Merced	Merced to Fresno	Fresno to Bakersfield	Bakersfield to Palmdale	Palmdale to Los Angeles	Los Angeles to Anaheim
Blunt-nosed Leopard Lizard	N/A	✓	N/A	✓	✓	N/A	N/A
San Joaquin Kit Fox	N/A	✓	✓	✓	✓	N/A	N/A

Notes:
* The HST system projects under Phase 2 are unplanned at this time.
✓ Species has the potential to occur
N/A Species does not have the potential to occur

5.15 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this BA. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Cumulative effects to federally listed species addressed in this report would occur in association with other projects in the action area that would affect similar species and habitats.

The proposed project will be the largest project to be constructed in the Tulare Basin, followed by the construction and operation of portions of the Merced to Fresno and Bakersfield to Palmdale alignments of the HST. Projects in the Tulare Basin region which may have cumulative effects on federally listed species include various transportation, residential, agricultural, commercial, and industrial projects.

Cumulative effects from these projects will contribute to the overall loss or degradation of wildlife resources in the Tulare Basin. Disturbances will be direct and indirect, and temporary and permanent and may include:

- Impairment to federally listed wildlife species populations, dynamics, behavior, and ability to carry out species' lifecycle.
- Impairment of wildlife movement and migration corridors, including effects to species' genetic variation, population gene flow, and ability for species to migrate to areas that are required to carry out the species' important life history events (including breeding).
- Adverse effects to the various functions and values provided by federally listed plant and wildlife species habitats.
- Potential adverse modification of designated critical habitat or conflict with the provisions of a conservation plan relevant to a federally listed wildlife species.

The successful implementation of the general conservation measures discussed in Section 2.7, along with the specific conservation discussed for each federally listed plant and wildlife species,

will reduce the nature and magnitude of the project's effects to federally listed plant and wildlife species.

Cumulative projects in the Tulare Basin will be required to comply with the same regulatory requirements (e.g., federal, state, and local government laws and regulations) that protect federally listed species, their habitats, and wildlife movement and migration corridors. The other cumulative projects that were identified to occur within the action area are largely being completed in portions of the project alignment that have already been subjected to urban or industrial development. The cumulative effects of projects within the action area combined with the effects of the proposed HST project are not anticipated to cumulatively contribute to adverse effects on federally listed species.

Chapter 6
Conclusion and Determination of Effects for Federally Listed Species and their Designated Critical Habitat

6.0 Conclusion and Determination of Effects for Federally Listed Species and their Designated Critical Habitat

This BA has been prepared to evaluate the potential adverse effects of the proposed HST system from Fresno to Bakersfield on species federally listed as endangered or threatened in compliance with Section 7 of the FESA. The criteria used to determine which federally listed species were considered for this BA, the results of field surveys conducted in all areas where permission to enter was granted, and the potential adverse effects to listed species from the HST project were presented in the preceding chapters. In addition, this BA proposes measures to avoid and minimize take to listed species. The proposed project has utilized design alternatives, including elevated aerial structures and realignment of the HST system, to avoid and minimize effects to listed species to the maximum extent practicable.

To further avoid and minimize adverse effects of the project on federally listed species, a number of conservation measures will be implemented. These measures, proposed in Section 2.7.1, are intended to reduce direct and indirect effects from project construction and operation (including maintenance activities) to listed species.

The listed species and designated critical habitat discussed within this BA are regulated by the U.S. Fish and Wildlife Service. No species or designated critical habitat under the jurisdiction of the National Marine Fisheries Service occurs in the action area.

6.1 Conclusions

- The construction and operation of the HST system will create permanent impacts to habitats and may result in direct and indirect effects to four plant species and eight wildlife species protected under the FESA. Direct effects to federally listed species may include significant habitat modification or degradation, loss or destruction of breeding habitats, or individual species mortality. The mechanism of these direct effects will come from the fill and removal of soils, vegetation clearing, and the construction of new railway tracks, road overcrossings, and associated railway support facilities. In areas where vegetation clearing that is temporary in duration occurs, the location will be revegetated and allowed to reestablish after construction.

- Indirect effects to federally listed species are reasonably expected to occur due to the potential changes in hydrology, increased dust and shading, habitat fragmentation, and possible changes in dispersal or migration patterns. These indirect effects may be caused by ground disturbance, visual disturbance, and operational noise or vibration.

- The species that were recognized as having potential to occur on the action area were evaluated based on three criteria: (1) the known distribution of the species, (2) suitable habitat that appears within the RSA, and (3) documented occurrences of the species within each species' accepted dispersal distance of the project footprint. Designated critical habitats for federally listed species were also evaluated as having potential to occur in the action area. The federally listed species and designated critical habitats considered as meeting these criteria are discussed in Table 4-1.

- The range of potential effects to federally listed species in the project footprint is presented in Table 5-1. Many of the listed species in the BA share the same wildlife habitat types. Due to this overlap of habitat, it is anticipated that the listed species will be limited to the areas where natural habitats (alkali desert scrub, annual grassland, etc.) exist. Therefore, the total acreage of effects presented in Table 5-1 would not be accurately reflected by summing the minimum or maximum acreages of all of the species presented.

Effects from Interrelated Actions

In addition to the project activities that will be implemented as part of the Fresno to Bakersfield action, interrelated activities that will be implemented in other sections of the Phase 1 HST system may affect federally listed species that are adversely affected by the action proposed in this document. Federally listed species that may occur in other Phase 1 sections include vernal pool tadpole shrimp, vernal pool fairy shrimp, valley elderberry longhorn beetle, California tiger salamander, blunt-nosed leopard lizard, and San Joaquin kit fox.

The adverse effects on the federally listed species' from the interrelated sections of the HST system have not formally been studied, however, based on species range and similarities in the project elements (e.g., infrastructure and facilities), the direct and indirect effects to the species' are anticipated to be similar to that of the Fresno to Bakersfield Section.

Cumulative Effects

The proposed project will be the largest project to be constructed in the Tulare Basin, follow by the construction and operation of portions of the Merced to Fresno and Bakersfield to Palmdale alignments of the HST. Other cumulative projects in the Tulare Basin region include various transportation, residential, agricultural, commercial, and industrial projects, which will contribute to the overall loss or degradation of wildlife resources in the Tulare Basin. The successful implementation of the general conservation measures discussed in Section 2.7, along with the specific conservation discussed for each federally listed plant and wildlife species, will reduce the nature and magnitude of the project's effects to federally listed plant and wildlife species.

6.2 Determination

FRA and the Authority have proposed general conservation measures to reduce the direct and indirect effects to listed species and their habitats. In addition to the general conservation measures, Sections 5.2 through 5.14 present species specific conservation measures to further avoid and minimize project effects to listed plant and wildlife species. Compensatory mitigation is proposed for unavoidable direct effects to federally listed species. Appropriate compensation will be determined through consultation with the USFWS.

Given implementation of these measures, FRA and the Authority have determined that the California High-Speed Train System, Fresno to Bakersfield Section, is **likely to adversely affect** seven federally threatened or endangered species. FRA and the Authority have also determined that the project **is not likely to adversely affect** five federally threatened or endangered species. Finally, FRA and the Authority have determined that the project **is not likely to adversely affect** designated critical habitat for the vernal pool fairy shrimp, because PCEs are not present within 250 feet of the project footprint. The effects determinations are summarized in Table 6-1.

Table 6-1
Determination of Effects for Federally Listed Species and their Designated Critical Habitat

Species	Federal Status	Determination
California jewelflower (*Caulanthus californicus*)	Endangered	Not Likely to Adversely Affect
Kern mallow (*Eremalche kernensis*)	Endangered	Not Likely to Adversely Affect
San Joaquin woolly-threads (*Monolopia congdonii*)	Endangered	Not Likely to Adversely Affect
Hoover's spurge (*Chamaesyce hooveri*)	Threatened	Not Likely to Adversely Affect
Vernal pool tadpole shrimp (*Lepidurus packardi*)	Endangered	Likely to Adversely Affect
Vernal pool fairy shrimp (*Branchinecta lynchi*)	Threatened	Likely to Adversely Affect
Designated Critical Habitat, Vernal pool fairy shrimp	Designated	Not Likely to Adversely Affect Critical Habitat
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Threatened	Likely to Adversely Affect
California tiger salamander, central population (*Ambystoma californiense*)	Threatened	Likely to Adversely Affect
Blunt-nosed leopard lizard *(Gambelia sila*)	Endangered	Likely to Adversely Affect
Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)	Endangered	Likely to Adversely Affect
Fresno kangaroo rat (*Dipodomys nitratoides exilis*)	Endangered	Not Likely to Adversely Affect
San Joaquin kit fox (*Vulpes macrotis mutica*)	Endangered	Likely to Adversely Affect

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Chapter 7
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7.0 References

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Chapter 8
Preparer Qualifications

8.0 Preparer Qualifications

This section summarizes the URS/HMM/Arup Joint Venture employees, and provides a summary of their qualifications, roles, and responsibilities in the preparation of this BA.

Alexandra Fraser, Ph.D. **Deputy Environmental Project Manager/Group Leader**	**Ph.D., Ecology, University of Kansas; M.A., Ecology, University of Kansas; B.S., Biology, Baylor University. 15 years of experience in wetland science, restoration ecology, botany, and environmental impact assessments.** • Deputy Project Manager, and project management review of this document.
Lorena Solórzano-Vincent **Project Biologist/Group Manager**	**M.S., Conservation Biology, Stanford University; B.S., Biology, University of Virginia. 13 years of experience in Endangered Species Act consultations, wildlife surveys, habitat assessments, permitting, and environmental impact analysis.** • Internal Technical Review.
Justin Whitfield **Senior Ecologist**	**B.S., Biological Sciences, Florida State University. 10 years of experience in biological assessments and preparation of environmental documents.** • Biology Task Manager. • Organized and planned report preparation. • Prepared, reviewed and edited sections in this report.
Biological Assessment	
Ode Bernstein **Wildlife Biologist**	**B.S., Biological Sciences, Humboldt State University. 8 years of experience in tidal wetland ecology and restoration, avian ecology, and invasive species mapping.** • Prepared and reviewed text and tables.
Matthew Bettelheim **Senior Wildlife Biologist**	**B.S., Ecology, Behavior, and Evolution, University of California-San Diego. 10 years of experience in environmental impact assessments, special-status species surveys, construction monitoring, and herpetology.** • Field Survey Wildlife Habitat Assessment Manager. • Prepared and reviewed wildlife data and text. • Coordinated preparation of wildlife-related GIS figures.
Kevin Melanephy **Senior Biologist**	**B.S., Ecology and Systematic Biology, California Polytechnic State University, San Luis Obispo. 12 years of experience in biological resource assessments, fisheries surveys, environmental permitting and preparation of environmental documents.** • Biological Assessment Task Manager. • Prepared and reviewed text and tables. • Coordinated production of federally listed species sections. • Coordinated preparation of GIS figures.

Melissa Newman **Senior Wildlife Biologist**	**M.S., Biology, University of California-San Diego; B.S., General Biology, University of California-San Diego. 7 years experience in biological research studies, 4 of which in environmental consulting, including environmental impact analysis, preparation of environmental documents, and special-status species surveys.** • Reviewed wildlife data and text. • Author of wildlife sections.
Rebecca Verity **Senior Biologist**	**Ph.D.c., M.S. Microbiology, Cornell University; M.S. Oceanography, Scripps Institute of Oceanography, B.S., Biology, Humboldt State University. 14 years experience environmental sciences, 7 years in environmental consulting, including impact analysis and environmental compliance and permitting.** • Prepared Executive Summary, Section 2 and Section 5 • Coordinated preparation of figures and appendices
GIS	
Chris Bente, GISP **Senior GIS Analyst**	**B.A., Geography, San Francisco State University. 8 years of experience in environmental and geotechnical mapping programs; GIS data transformation, management, and analysis; and methodologies of land surveys.** • Technical GIS lead and map production lead. • Reviewed and assisted with maps and data production. • GIS support for map production.
Clayton Statham **GIS Specialist**	**B.S., Geography, University of Nevada-Reno. 4 years of experience in GIS and graphic design.** • GIS support for wildlife related figures and tables.
	Editing
Deb Fournier **Senior Word Processing Technician**	**10 years of experience creating formatting and processing word processing requests.** • Formatted and prepared document for reproduction.
Dennis Rowcliffe **Senior Technical Editor**	**B.A., American Studies and Journalism, California State University-Los Angeles. 22 years of experience conducting a variety of technical editing, document coordination and document production duties.** • Senior Technical Editor.

Appendix A

Construction Equipment and Schedules

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Mobilization (March 2013-October 2013)						
Flatbed Truck - 1 Ton	175	15	3	45	174	10
Flatbed Truck - 5 Ton	210	15	3	45	174	10
Flatbed Tractor/Trailer	300-500	30	3	90	174	10
Service Truck - Fuel/Lube	300	5	3	15	174	10
Water Truck	210	5	3	15	174	10
Light Plant - 4 Lights	10	10	3	30	174	10
Truck dump 18 CY triaxle	200	5	3	15	174	10
Boom Truck 20 ton	330	5	3	15	174	10
CAT 416E Backhoe	87	2	3	6	174	10
Cat 330 2.5 CY Excavator	300	1	3	3	174	10
CAT D6K Dozer	125	2	3	6	174	10
Demolition (April 2013-August 2013)						
Concrete/ Industrial Saw	10	1	1	1	109	8
Rubber Tired Dozer	357	1	1	1	109	1
Tractors/ Loaders/ Backhoes	108	2	1	2	109	6
Land Clearing (April 2013-August 2013)						
CAT 416E Backhoe	87	5	3	15	109	10
CAT 426 Backhoe	97	5	3	15	109	10
CAT D6K Dozer	125	5	3	15	109	10
CAT D8N Dozer	310	5	3	15	109	10
CAT D9N Dozer	410	5	3	15	109	10
CAT D11N Dozer	850	5	3	15	109	10
Cat 330 2.5 CY Excavator	300	5	3	15	109	10
CAT 375 Excavator (36)	450	5	3	15	109	10
CAT 930H Wheel loader 2.6CY	149	5	3	15	109	10
CAT 950H Wheel Loader 4CY	197	5	3	15	109	10
CAT 966H Wheel loader 5.5CY	262	5	3	15	109	10
CAT 980H Wheel Loader 7.5CY	349	5	3	15	109	10
Scissor Lift 19'	15	1	3	3	109	10
Scissor Lift 32'	28	1	3	3	109	10
Flatbed Truck - 1 Ton	175	15	3	45	109	10
Flatbed Truck - 5 Ton	210	15	3	45	109	10
Water Truck	210	15	3	45	109	10
Service Truck - Fuel/Lube	300	2	3	6	109	10
CAT 631E Scraper (31 CY)	335	2	3	6	109	10
Earth Moving (August 2013-August 2015)						

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Roadway Saw (w/Blades)	120	5	3	15	543	8
CAT 416E Backhoe	87	5	3	15	543	8
CAT 426 Backhoe	97	5	3	15	543	8
CAT D6K Dozer	125	5	3	15	543	8
CAT D8N Dozer	310	5	3	15	543	8
CAT D9N Dozer	410	5	3	15	543	8
CAT D11N Dozer	850	2	3	6	543	8
Cat 330 2.5 CY Excavator	300	4	3	12	543	8
CAT 375 Excavator (36)	450	4	3	12	543	8
Chain Trencher	40	2	3	6	543	8
CAT 930H Wheel loader 2.6CY	149	5	3	15	543	8
CAT 950H Wheel Loader 4CY	197	5	3	15	543	8
CAT 966H Wheel loader 5.5CY	262	5	3	15	543	8
CAT 980H Wheel Loader 7.5CY	349	5	3	15	543	8
Cat 120H Motorgrader	158	5	3	15	543	8
CAT 14G Motorgrader	260	5	3	15	543	8
Pad foot roller	83	5	3	15	543	8
Pneumatic roller	156	5	3	15	543	8
Steel wheel roller	174	5	3	15	543	8
Walk Behind Whacker	15	5	3	15	543	8
Cat 627 Scraper (20)	266	10	3	30	543	8
CAT 631E Scraper (31 CY)	335	10	3	30	543	8
Cat 633D Scraper (34 CY)	400	10	3	30	543	8
Flatbed Truck - 1 Ton	175	10	3	30	543	8
Flatbed Truck - 5 Ton	210	10	3	30	543	8
CAT 735 Articu Truck (16 CY)	385	2	3	6	543	8
Truck dump 18 CY triaxle	200	10	3	30	543	8
Distributor Truck	150	10	3	30	543	8
Service Truck - Fuel/Lube	300	10	3	30	543	8
Water Truck	210	10	3	30	543	8
Light Plant - 4 Lights	10	40	3	120	543	8
Road Crossings (June 2013-December 2017)						
Air Compressor - 185 CFM	50	10	3	30	1196	8
Air Compressor - 900 CFM	450	10	3	30	1196	8
Asphalt Paver (LG)	180	5	3	15	1196	8
Aggregate Spreader	60	5	3	15	1196	8
Sweeper	25	5	3	15	1196	8
Shuttle Buggy	20	5	3	15	1196	8
Roadway Saw (w/Blades)	120	2	3	6	1196	8

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Auger truck mounted Large	250	3	3	9	1196	8
Auger truck mounted Small	200	3	3	9	1196	8
CAT 416E Backhoe	87	5	3	15	1196	8
CAT 426 Backhoe	97	5	3	15	1196	8
Concrete Paver 12'/15'	30	5	3	15	1196	8
Concrete Conveyer (100')		5	3	15	1196	8
Gas Engin Vibartor	15	5	3	15	1196	8
Concrete Saw	13	5	3	15	1196	8
Concrete Pump - 50 cy/hr	100	5	3	15	1196	8
Crane, 50 T , Crawler	420	5	3	15	1196	8
Boom Truck 20 ton	330	5	3	15	1196	8
Crawler Crane 250 Ton	420	2	3	6	1196	8
Crawler Crane 300 Ton	470	2	3	6	1196	8
Carrydeck Crane 8 Ton	140	2	3	6	1196	8
Crane Flat Bed Mount 3 Ton	75	2	3	6	1196	8
CAT D6K Dozer	125	1	3	3	1196	8
CAT D8N Dozer	310	1	3	3	1196	8
CAT D9N Dozer	410	1	3	3	1196	8
CAT D11N Dozer	850	1	3	3	1196	8
Cat 330 2.5 CY Excavator	300	5	3	15	1196	8
CAT 375 Excavator (36)	450	1	3	3	1196	8
CAT 930H Wheel loader 2.6CY	149	2	3	6	1196	8
CAT 950H Wheel Loader 4CY	197	2	3	6	1196	8
CAT 966H Wheel loader 5.5CY	262	2	3	6	1196	8
CAT 980H Wheel Loader 7.5CY	349	2	3	6	1196	8
Scissor Lift 19'	15	2	3	6	1196	8
Scissor Lift 32'	28	2	3	6	1196	8
Cat 120H Motorgrader	158	2	3	6	1196	8
CAT 14G Motorgrader	260	2	3	6	1196	8
Off-Highway Trucks / 725	309	3	3	9	1196	8
Off-Highway Trucks / 740	469	3	3	9	1196	8
Delmag D36-32 (Diesel)	92	2	3	6	1196	8
Delmag D80 (Diesel)	245	2	3	6	1196	8
Delmag D100-13 (Diesel)	335	2	3	6	1196	8
Electric Sump Pump - 4"	2	5	3	15	1196	8
Electric Sump Pump - 8"	4	5	3	15	1196	8
Pad foot roller	83	5	3	15	1196	8
Pneumatic roller	156	5	3	15	1196	8
Steel wheel roller	174	5	3	15	1196	8

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Walk Behind Whacker	15	5	3	15	1196	8
Flatbed Truck - 1 Ton	175	5	3	15	1196	8
Flatbed Truck - 5 Ton	210	2	3	6	1196	8
CAT 735 Articu Truck (16 CY)	385	2	3	6	1196	8
Ready Mix Truck	200	20	3	60	1196	8
Truck dump 18 CY triaxle	200	20	3	60	1196	8
Distributor Truck	150	10	3	30	1196	8
Service Truck - Fuel/Lube	300	5	3	15	1196	8
Water Truck	210	10	3	30	1196	8
Welding Machine		10	3	30	1196	8
Butt Fusion Machine Electric	30	10	3	30	1196	8
Genset - 15 kW	20	10	3	30	1196	8
Genset - 100 kW	134	5	3	15	1196	8
Light Plant - 4 Lights	10	25	3	75	1196	8
Concrete Batch Plant		1	3	3	1196	8
Flatbed Tractor/Trailer	500	5	3	15	1196	8
Track At-Grade (January 2014-August 2017)-in 1,000 foot segments.						
Aerial Lifts	60	1	508	508	956	1.1
Air Compressors	106	1	508	508	956	2.9
Bore/Drill Rigs	291	1	508	508	956	0
Cement and Mortar Mixers	10	1	508	508	956	0.3
Concrete/Industrial Saws	10	1	508	508	956	0.3
Cranes	399	1	508	508	956	0.7
Crawler Tractors	147	1	508	508	956	4.3
Crushing/Processing Equipment	142	1	508	508	956	0
Dumpers/Tenders	16	1	508	508	956	4.3
Excavators	168	1	508	508	956	1.4
Forklifts	145	1	508	508	956	0.6
Generator Sets	549	1	508	508	956	1.4
Graders	174	1	508	508	956	2.9
Off Highway Tractors	267	1	508	508	956	2.9
Off Highway Trucks	479	1	508	508	956	3.6
Plate Compactors	8	1	508	508	956	2.9
Pressure Washers	1	1	508	508	956	1.4
Rollers	95	1	508	508	956	3.6
Rough Terrain Forklifts	93	1	508	508	956	1.4
Scrapers	313	1	508	508	956	3.6
Signal Boards	15	1	508	508	956	0
Skid Steer Loaders	44	1	508	508	956	2.9
Surfacing Equipment	362	1	508	508	956	2.9
Sweepers/Scrubbers	91	1	508	508	956	1.4

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Tractors/Loaders/Backhoes	108	1	508	508	956	4.3
Trenchers	63	1	508	508	956	2.9
Water Trucks	189	1	508	508	956	4.3
Welders	45	1	508	508	956	1.4
rail swing	500	1	508	508	956	4.3
Rail Tamper	400	1	508	508	956	4.3
Surface aligning machine	400	1	508	508	956	2.9
Concrete Pumps	600	1	508	508	956	0
Track Elevated (January 2014-August 2017)-in 1,000 foot segments						
Aerial Lifts	60	1	93	93	956	3.6
Air Compressors	106	1	93	93	956	2.9
Bore/Drill Rigs	291	1	93	93	956	2.1
Cement and Mortar Mixers	10	1	93	93	956	2.9
Concrete/Industrial Saws	10	1	93	93	956	2.9
Cranes	399	1	93	93	956	3.6
Crawler Tractors	147	1	93	93	956	1.7
Crushing/Processing Equipment	142	1	93	93	956	0
Dumpers/Tenders	16	1	93	93	956	2.9
Excavators	168	1	93	93	956	0.6
Forklifts	145	1	93	93	956	2.9
Generator Sets	549	1	93	93	956	1.4
Graders	174	1	93	93	956	1.4
Off Highway Tractors	267	1	93	93	956	2.9
Off Highway Trucks	479	1	93	93	956	2.1
Plate Compactors	8	1	93	93	956	2.9
Pressure Washers	1	1	93	93	956	1.4
Rollers	95	1	93	93	956	1.4
Rough Terrain Forklifts	93	1	93	93	956	1.4
Scrapers	313	1	93	93	956	1.4
Signal Boards	15	1	93	93	956	0
Skid Steer Loaders	44	1	93	93	956	1.4
Surfacing Equipment	362	1	93	93	956	0
Sweepers/Scrubbers	91	1	93	93	956	1.4
Tractors/Loaders/Backhoes	108	1	93	93	956	4.3
Trenchers	63	1	93	93	956	2.9
Water Trucks	189	1	93	93	956	2.9
Welders	45	1	93	93	956	5.7
rail swing	500	1	93	93	956	3.4
Rail Tamper	400	1	93	93	956	0
Surface aligning machine	400	1	93	93	956	0
Concrete Pumps	600	1	93	93	956	1.4
Elevated Structures (June 2013-December 2017)-in 1,000 foot segments						
Aerial Lifts	60	1	93	93	1196	3.6

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Air Compressors	106	1	93	93	1196	2.9
Bore/Drill Rigs	291	1	93	93	1196	2.1
Cement and Mortar Mixers	10	1	93	93	1196	2.9
Concrete/Industrial Saws	10	1	93	93	1196	2.9
Cranes	399	1	93	93	1196	3.6
Crawler Tractors	147	1	93	93	1196	1.7
Crushing/Processing Equipment	142	1	93	93	1196	0
Dumpers/Tenders	16	1	93	93	1196	2.9
Excavators	168	1	93	93	1196	0.6
Forklifts	145	1	93	93	1196	2.9
Generator Sets	549	1	93	93	1196	1.4
Graders	174	1	93	93	1196	1.4
Off Highway Tractors	267	1	93	93	1196	2.9
Off Highway Trucks	479	1	93	93	1196	2.1
Plate Compactors	8	1	93	93	1196	2.9
Pressure Washers	1	1	93	93	1196	1.4
Rollers	95	1	93	93	1196	1.4
Rough Terrain Forklifts	93	1	93	93	1196	1.4
Scrapers	313	1	93	93	1196	1.4
Signal Boards	15	1	93	93	1196	0
Skid Steer Loaders	44	1	93	93	1196	1.4
Surfacing Equipment	362	1	93	93	1196	0
Sweepers/Scrubbers	91	1	93	93	1196	1.4
Tractors/Loaders/Backhoes	108	1	93	93	1196	4.3
Trenchers	63	1	93	93	1196	2.9
Water Trucks	189	1	93	93	1196	2.9
Welders	45	1	93	93	1196	5.7
rail swing	500 hp	1	93	93	1196	3.4
Rail Tamper	400 hp	1	93	93	1196	0
Surface aligning machine	400 hp	1	93	93	1196	0
Concrete Pumps	600 hp	1	93	93	1196	1.4
Demobilization (August 2017-December 2019)						
Flatbed Truck - 1 Ton	175	15	3	45	630	10
Flatbed Truck - 5 Ton	210	15	3	45	630	10
Flatbed Tractor/Trailer	300-500	30	3	90	630	10
Service Truck - Fuel/Lube	300	5	3	15	630	10
Water Truck	210	5	3	15	630	10
Light Plant - 4 Lights	10	10	3	30	630	10
Truck dump 18 CY triaxle	200	5	3	15	630	10
Boom Truck 20 ton	330	5	3	15	630	10
CAT 416E Backhoe	87	2	3	6	630	10
Cat 330 2.5 CY Excavator	300	1	3	3	630	10

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
CAT D6K Dozer	125	2	3	6	630	10
Fresno Station (December 2014-October 2019)						
Grader	174	1	1	1	1282	6
Rubber Tired Dozer	357	1	1	1	1282	6
Tractor/Loaders/Backhoes	108	2	1	2	1282	7
Water Trucks	189	1	1	1	1282	8
Cranes	399	1	1	1	1282	4
Forklifts	145	2	1	2	1282	6
Welders	45	3	1	3	1282	8
Generator Set	49	1	1	1	1282	8
Bakersfield Station (January 2015-November 2019)						
Grader	174	1	1	1	1281	6
Rubber Tired Dozer	357	1	1	1	1281	6
Tractor/Loaders/Backhoes	108	2	1	2	1281	7
Water Trucks	189	1	1	1	1281	8
Cranes	399	1	1	1	1281	4
Forklifts	145	2	1	2	1281	6
Welders	45	3	1	3	1281	8
Generator Set	49	1	1	1	1282	8
HMF Construction (Phase 1: August 2017-December 2017, Phase 2: June 2018-December 2018, Phase 3: January 2021-July 2021)						
Grader	174	1	1	1	391	8
Rubber Tired Dozer	357	1	1	1	391	8
Tractor/Loaders/Backhoes	108	4	1	4	391	8
Water Trucks	189	1	1	1	391	8
Cranes	399	1	1	1	391	6
Forklifts	145	2	1	2	391	6
Excavator	168	1	1	1	391	8
Scrapers	313	3	1	3	391	8
Pavers	100	1	1	1	391	8
Paving Equipment	104	2	1	2	391	8
Rollers	95	2	1	2	391	6
Generator Sets	49	1	1	1	391	8
Welders	45	3	1	3	391	8
HMF Track at Grade (January 2021-July 2021)-in 1,000 foot segments						
Aerial Lifts	60	1	47	47	129	1.1
Air Compressors	106	1	47	47	129	2.9
Bore/Drill Rigs	291	1	47	47	129	0
Cement and Mortar Mixers	10	1	47	47	129	0.3
Concrete/Industrial Saws	10	1	47	47	129	0.3
Cranes	399	1	47	47	129	0.7
Crawler Tractors	147	1	47	47	129	4.3
Crushing/Processing Equipment	142	1	47	47	129	0

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Dumpers/Tenders	16	1	47	47	129	4.3
Excavators	168	1	47	47	129	1.4
Forklifts	145	1	47	47	129	0.6
Generator Sets	549	1	47	47	129	1.4
Graders	174	1	47	47	129	2.9
Off Highway Tractors	267	1	47	47	129	2.9
Off Highway Trucks	479	1	47	47	129	3.6
Plate Compactors	8	1	47	47	129	2.9
Pressure Washers	1	1	47	47	129	1.4
Rollers	95	1	47	47	129	3.6
Rough Terrain Forklifts	93	1	47	47	129	1.4
Scrapers	313	1	47	47	129	3.6
Signal Boards	15	1	47	47	129	0
Skid Steer Loaders	44	1	47	47	129	2.9
Surfacing Equipment	362	1	47	47	129	2.9
Sweepers/Scrubbers	91	1	47	47	129	1.4
Tractors/Loaders/Backhoes	108	1	47	47	129	4.3
Trenchers	63	1	47	47	129	2.9
Water Trucks	189	1	47	47	129	4.3
Welders	45	1	47	47	129	1.4
rail swing	500 hp	1	47	47	129	4.3
Rail Tamper	400 hp	1	47	47	129	4.3
Surface aligning machine	400 hp	1	47	47	129	2.9
Concrete Pumps	600 hp	1	47	47	129	0
Maintenance of Way Facility (January 2018-December 2018)						
Grader	174	1	1	1	391	8
Rubber Tired Dozer	357	1	1	1	391	8
Tractor/Loaders/Backhoes	108	4	1	4	391	8
Water Trucks	189	1	1	1	391	8
Cranes	399	1	1	1	391	6
Forklifts	145	2	1	2	391	6
Excavator	168	1	1	1	391	8
Scrapers	313	3	1	3	391	8
Pavers	100	1	1	1	391	8
Paving Equipment	104	2	1	2	391	8
Rollers	95	2	1	2	391	6
Generator Sets	49	1	1	1	391	8
Welders	45	3	1	3	391	8
Maintenance of Way Facility-Track (January 2018-December 2018)-in 1,000 foot segments						
Aerial Lifts	60	1	4	4	131	1.1
Air Compressors	106	1	4	4	131	2.9
Bore/Drill Rigs	291	1	4	4	131	0
Cement and Mortar Mixers	10	1	4	4	131	0.3
Concrete/Industrial Saws	10	1	4	4	131	0.3

Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Cranes	399	1	4	4	131	0.7
Crawler Tractors	147	1	4	4	131	4.3
Crushing/Processing Equipment	142	1	4	4	131	0
Dumpers/Tenders	16	1	4	4	131	4.3
Excavators	168	1	4	4	131	1.4
Forklifts	145	1	4	4	131	0.6
Generator Sets	549	1	4	4	131	1.4
Graders	174	1	4	4	131	2.9
Off Highway Tractors	267	1	4	4	131	2.9
Off Highway Trucks	479	1	4	4	131	3.6
Plate Compactors	8	1	4	4	131	2.9
Pressure Washers	1	1	4	4	131	1.4
Rollers	95	1	4	4	131	3.6
Rough Terrain Forklifts	93	1	4	4	131	1.4
Scrapers	313	1	4	4	131	3.6
Signal Boards	15	1	4	4	131	0
Skid Steer Loaders	44	1	4	4	131	2.9
Surfacing Equipment	362	1	4	4	131	2.9
Sweepers/Scrubbers	91	1	4	4	131	1.4
Tractors/Loaders/Backhoes	108	1	4	4	131	4.3
Trenchers	63	1	4	4	131	2.9
Water Trucks	189	1	4	4	131	4.3
Welders	45	1	4	4	131	1.4
Rail swing	500 hp	1	4	4	131	4.3
Rail Tamper	400 hp	1	4	4	131	4.3
Surface aligning machine	400 hp	1	4	4	131	2.9
Concrete Pumps	600 hp	1	4	4	131	0
Paralleling Power Supply Station (July 2016-November 2018)						
Grader	174	1	12	12	609	6
Rubber Tired Dozer	357	1	12	12	609	6
Tractor/Loaders/Backhoes	108	2	12	24	609	7
Water Trucks	189	1	12	12	609	8
Cranes	399	1	12	12	609	4
Forklifts	145	2	12	24	609	6
Switching Power Supply Station (July 2016-November 2018)						
Grader	174	1	3	3	609	6
Rubber Tired Dozer	357	1	3	3	609	6
Tractor/Loaders/Backhoes	108	2	3	6	609	7
Water Trucks	189	1	3	3	609	8
Cranes	399	1	3	3	609	4
Forklifts	145	2	3	6	609	6
Traction Power Supply Station (July 2016-November 2018)						
Grader	174	1	4	4	609	6

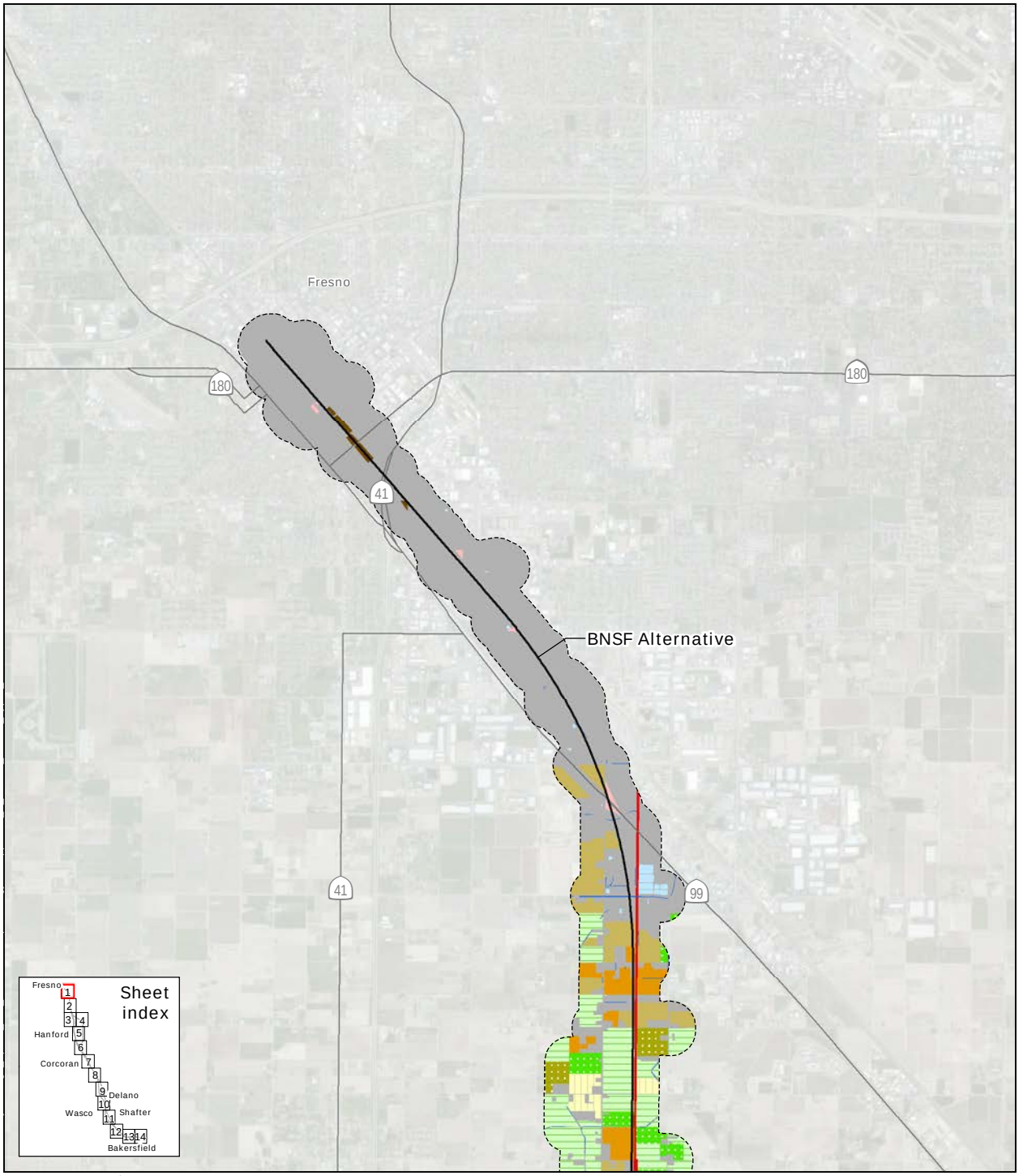
Table A-1
List of equipment by activity

Equipment	Horse-power	Quantity (each/site)	No. of Sites	Total Pieces	Approximate Activity Duration (days)	Hours/Day
Rubber Tired Dozer	357	1	4	4	609	6
Tractor/Loaders/Backhoes	108	2	4	8	609	7
Water Trucks	189	1	4	4	609	8
Cranes	399	1	4	4	609	4
Forklifts	145	2	4	8	609	6

Note:
This table was generated using information presented in the Air Quality Technical Report Appendix A. Calculations include a number of assumptions. Please see Air Quality Technical Report for additional information.

Appendix B

Wildlife Habitat Types



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

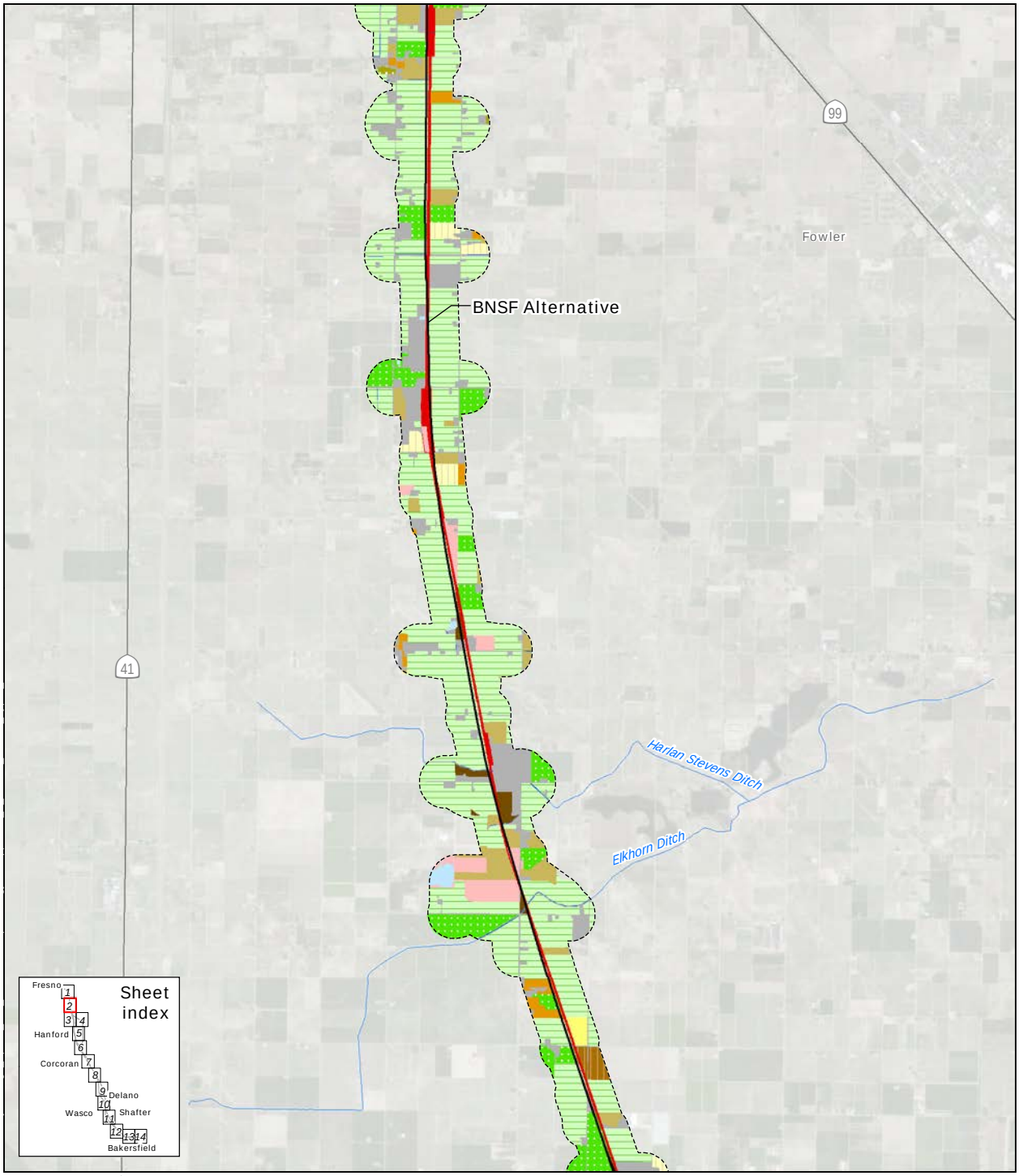
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1a
Observed habitats within
the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

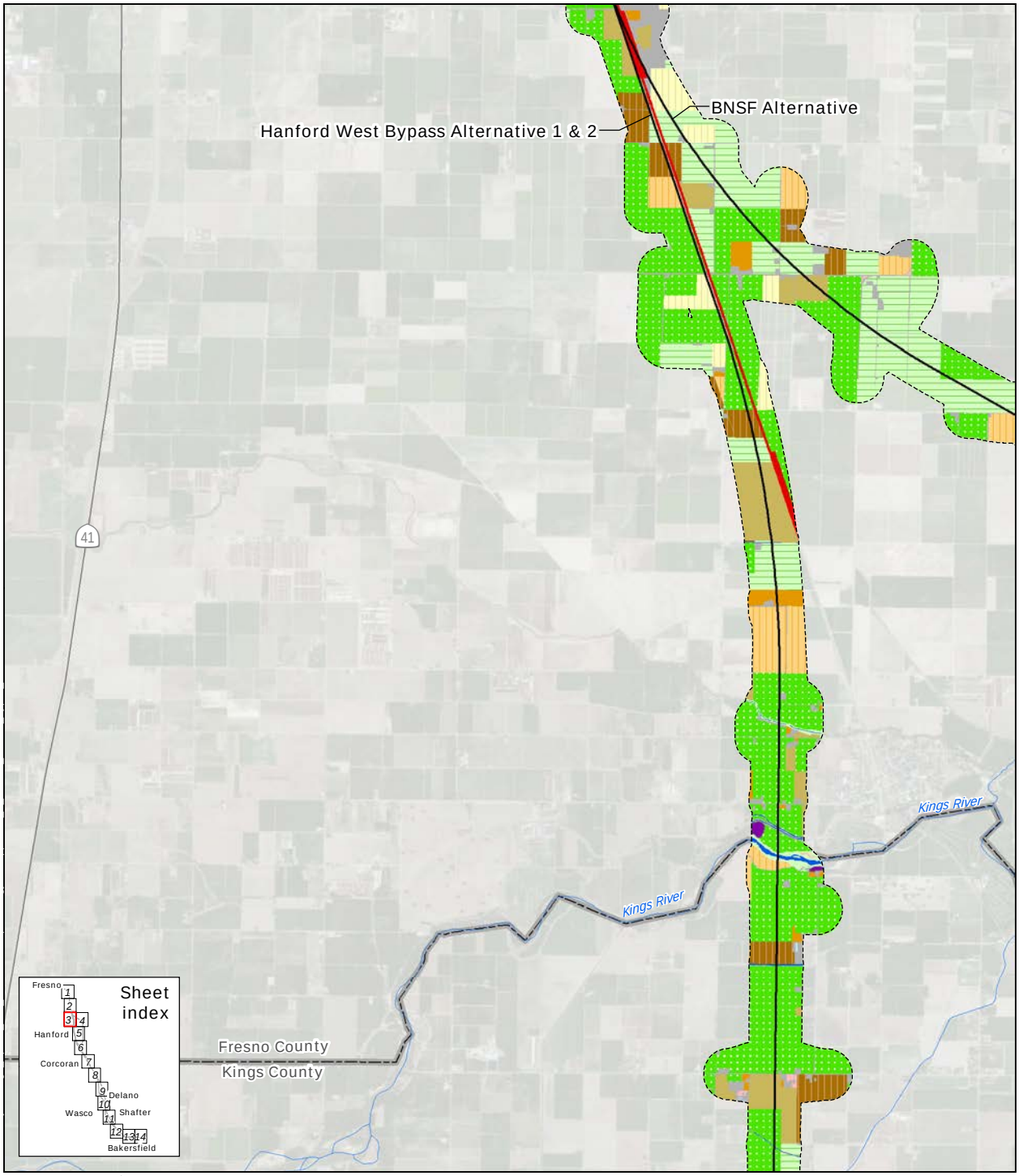
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1b
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

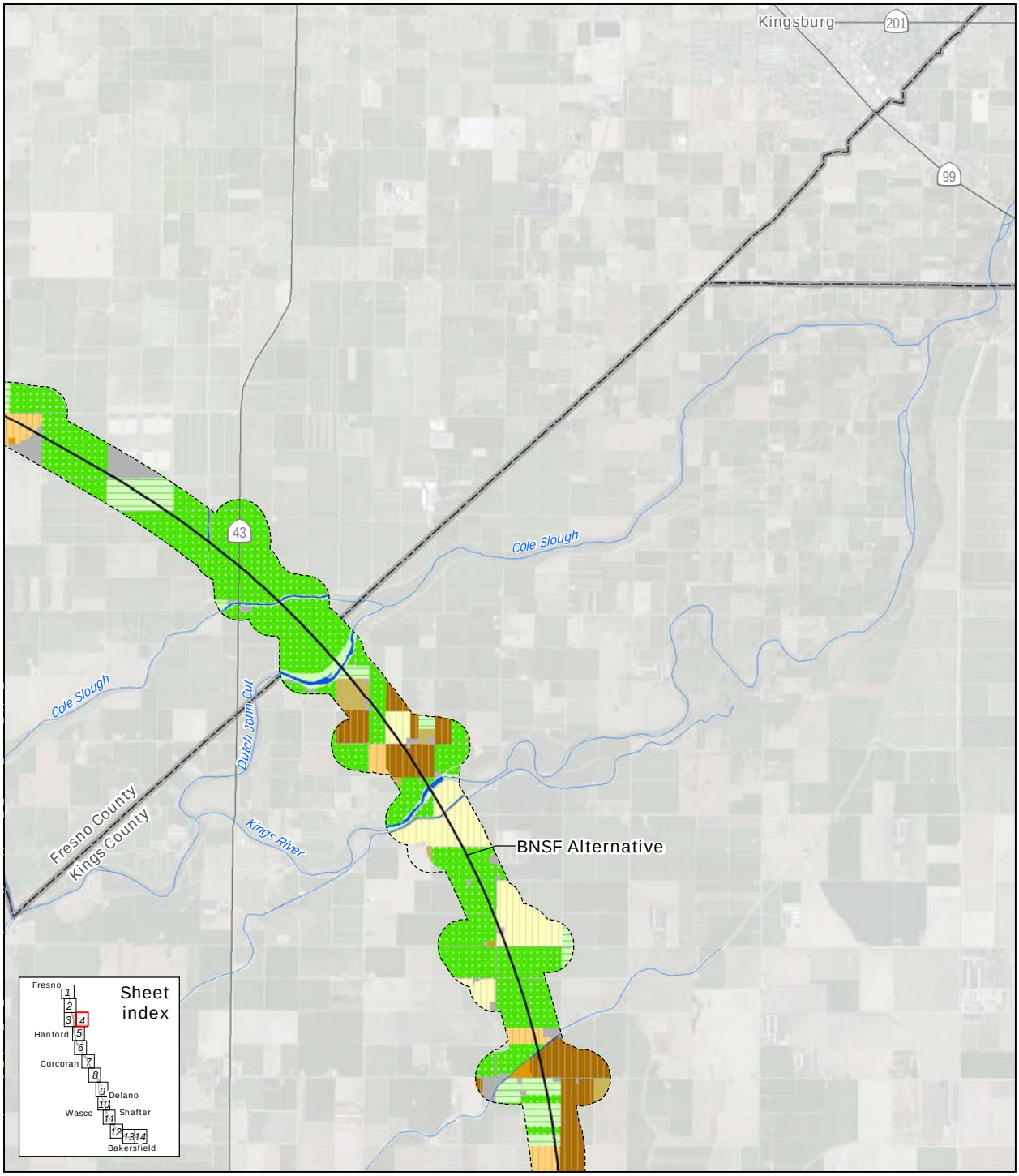
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1c
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

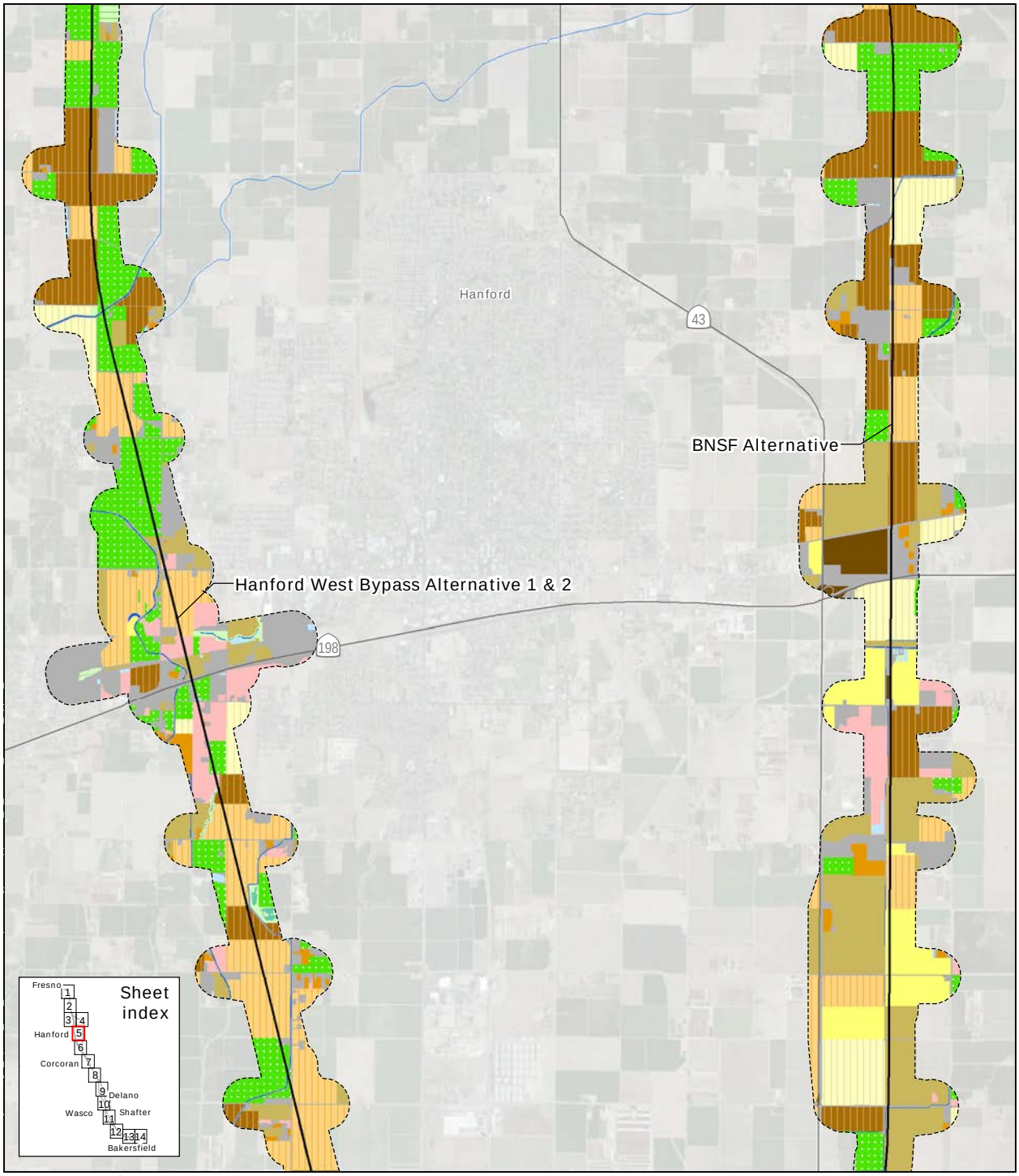
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1d
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

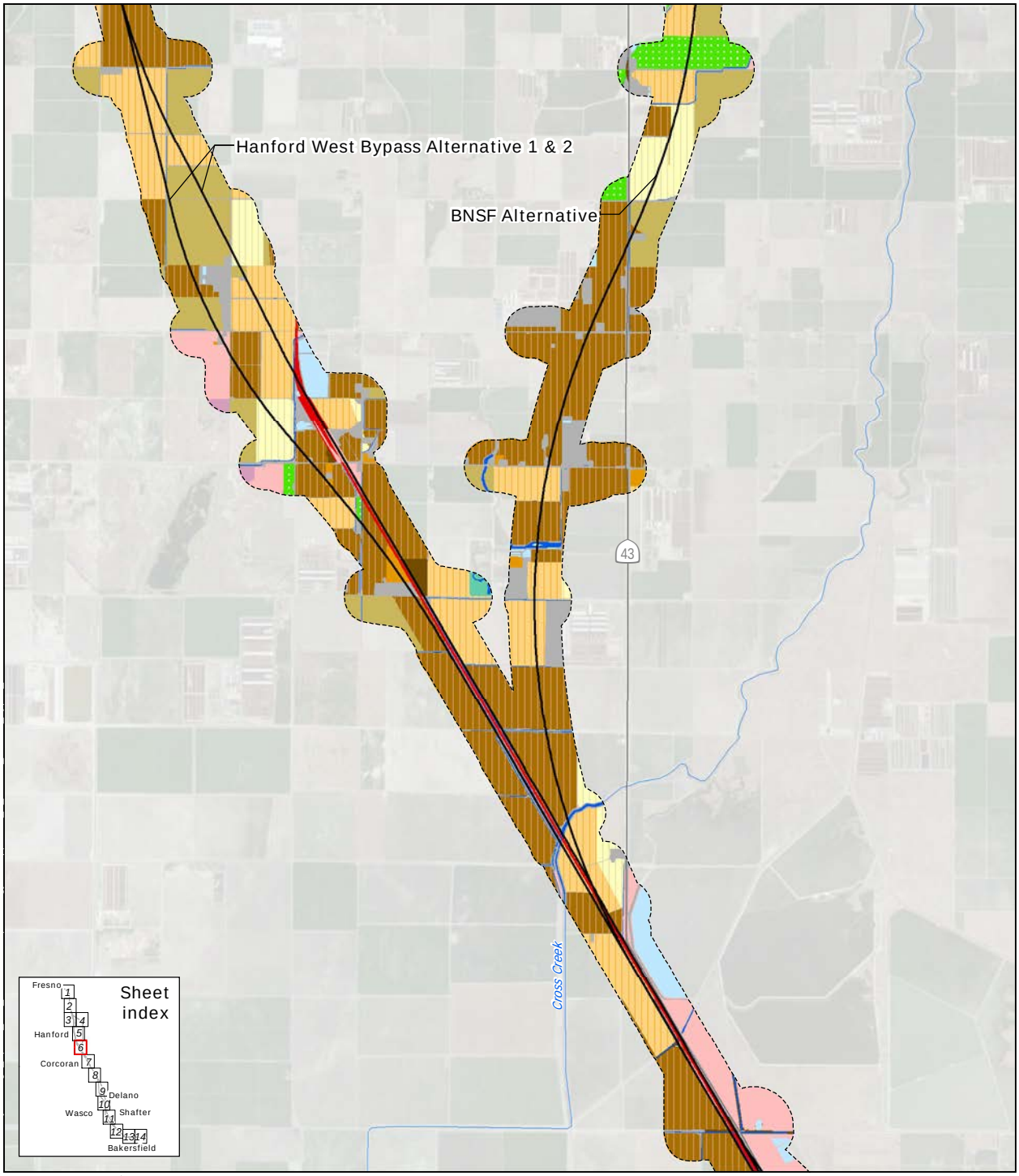
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1e
Observed habitats within
the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

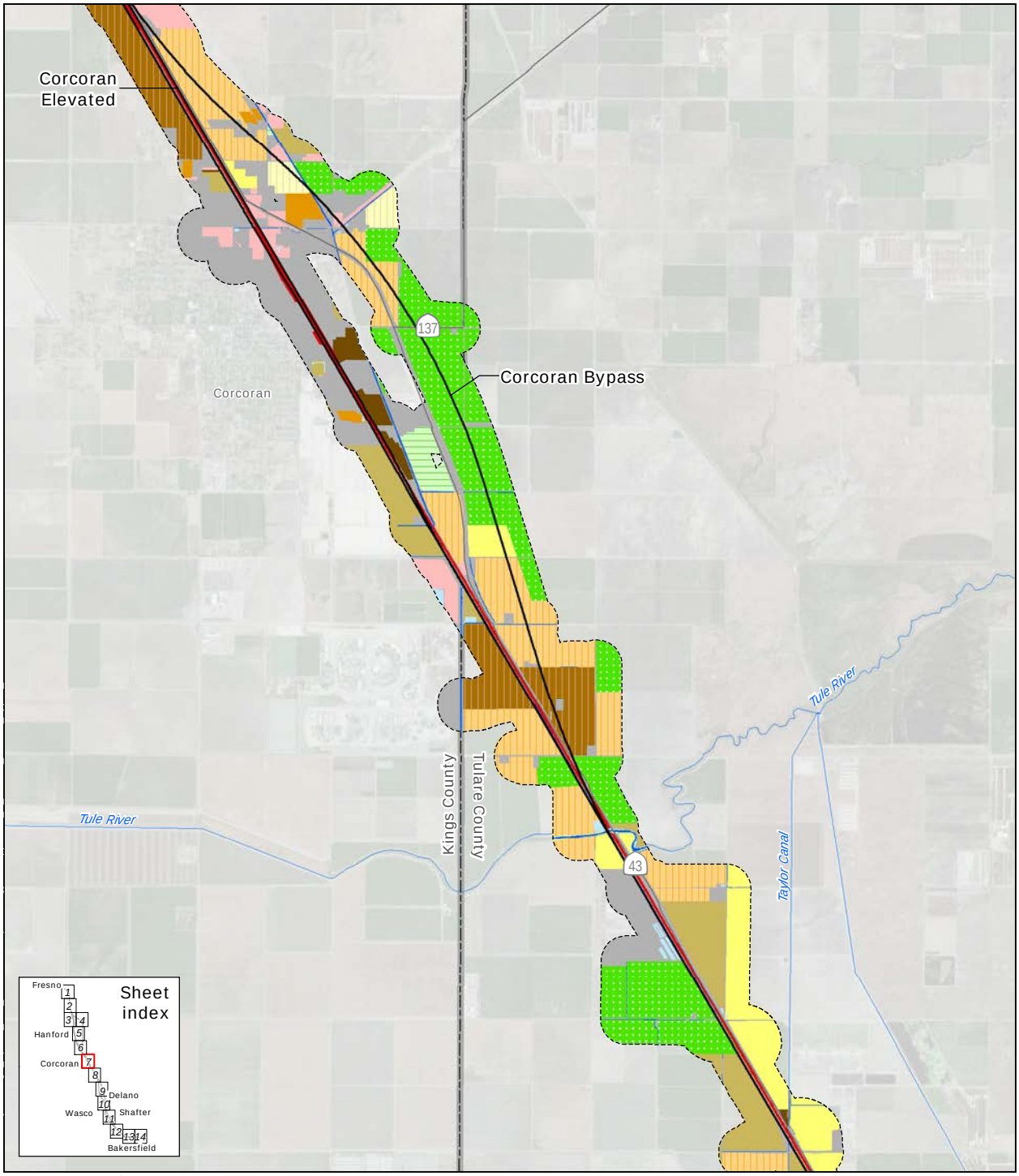
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1f
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

Alternative alignments
Habitat Study Area
County boundary

Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

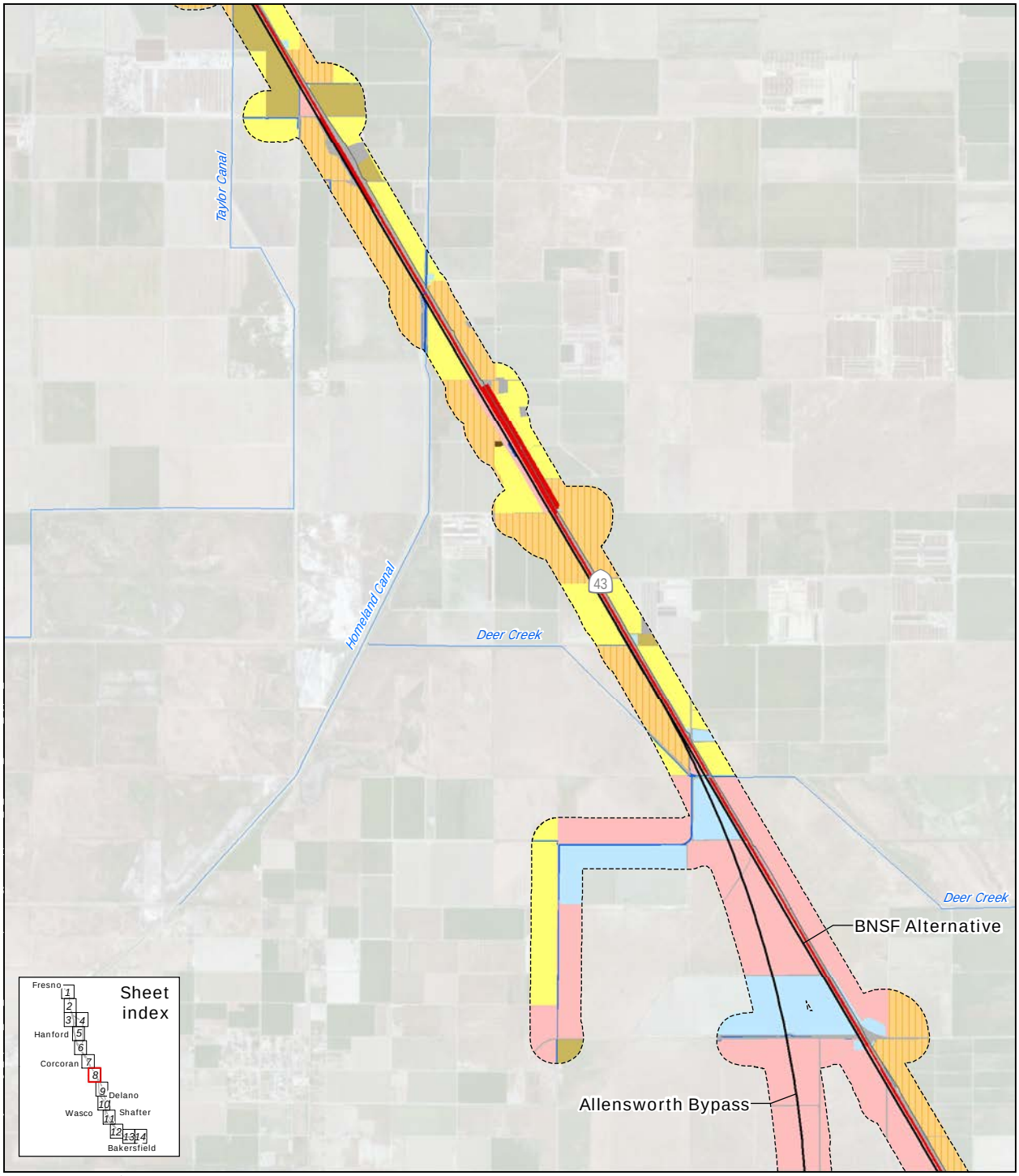
Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

N

0 0.5 1
Miles

0 1 2
Kilometers

Figure A3-1g
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

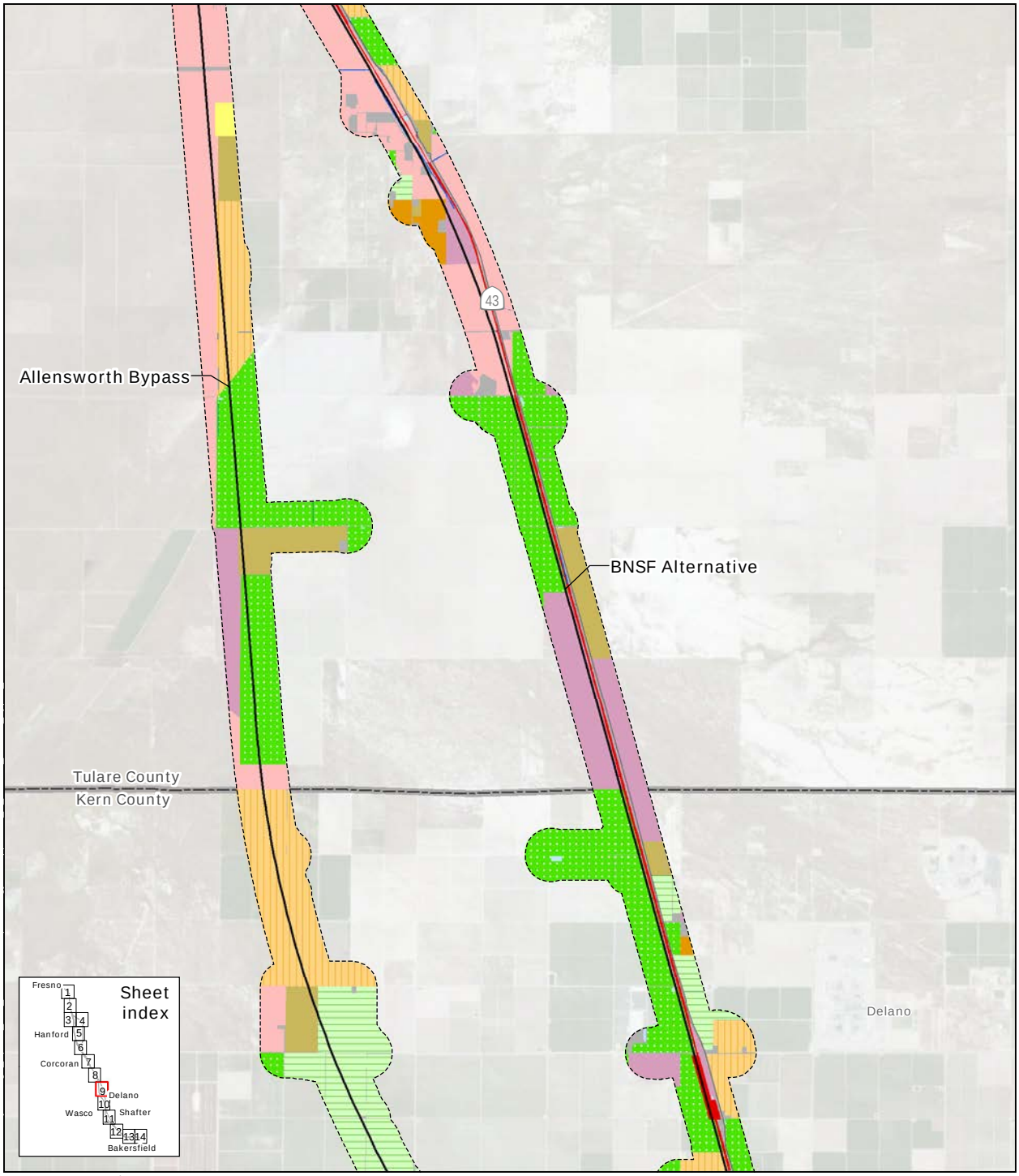
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1h
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

Alternative alignments
Habitat Study Area
County boundary

Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

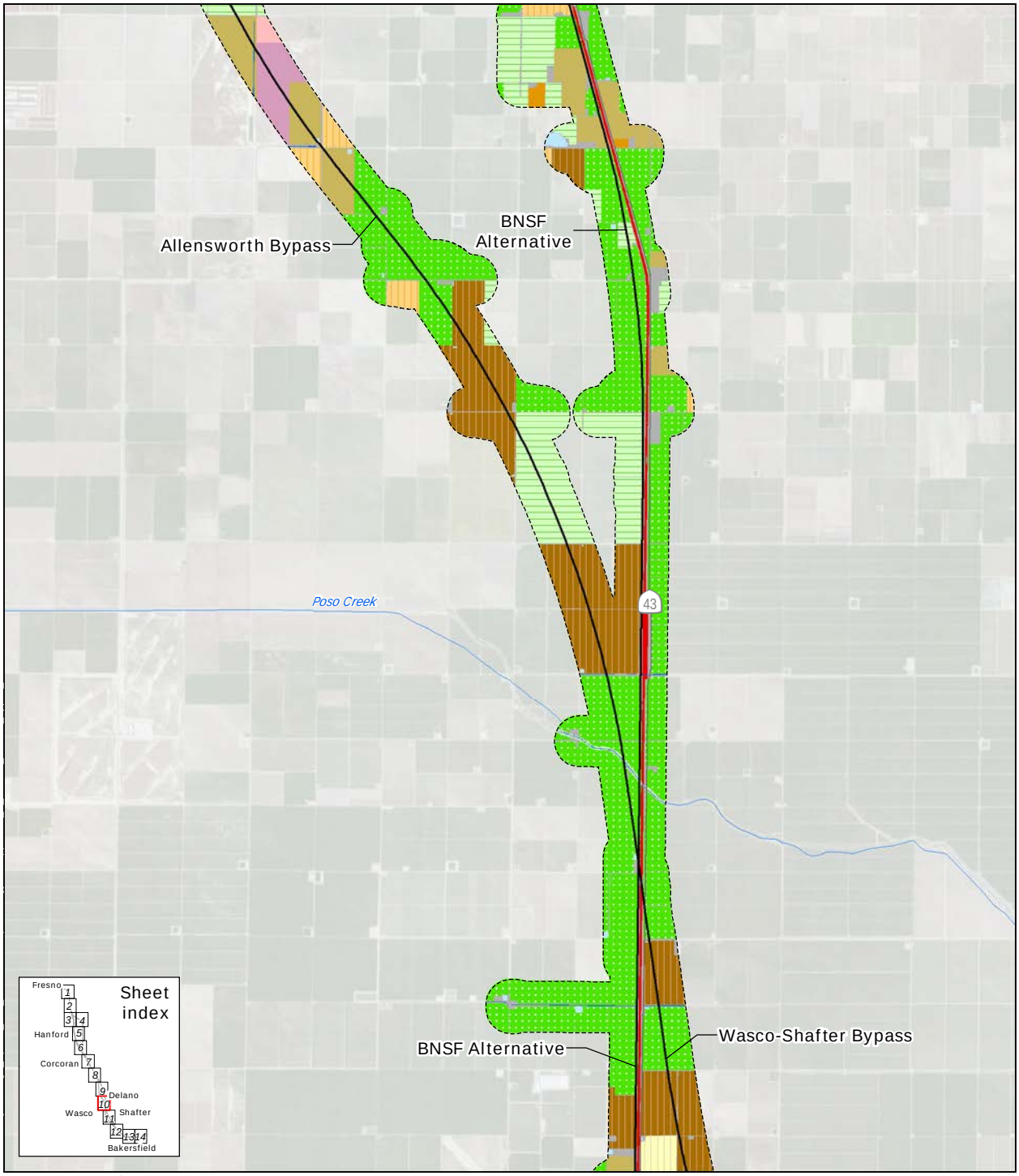
Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

N

0 0.5 1
Miles

0 1 2
Kilometers

Figure A3-1i
Observed habitats within
the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

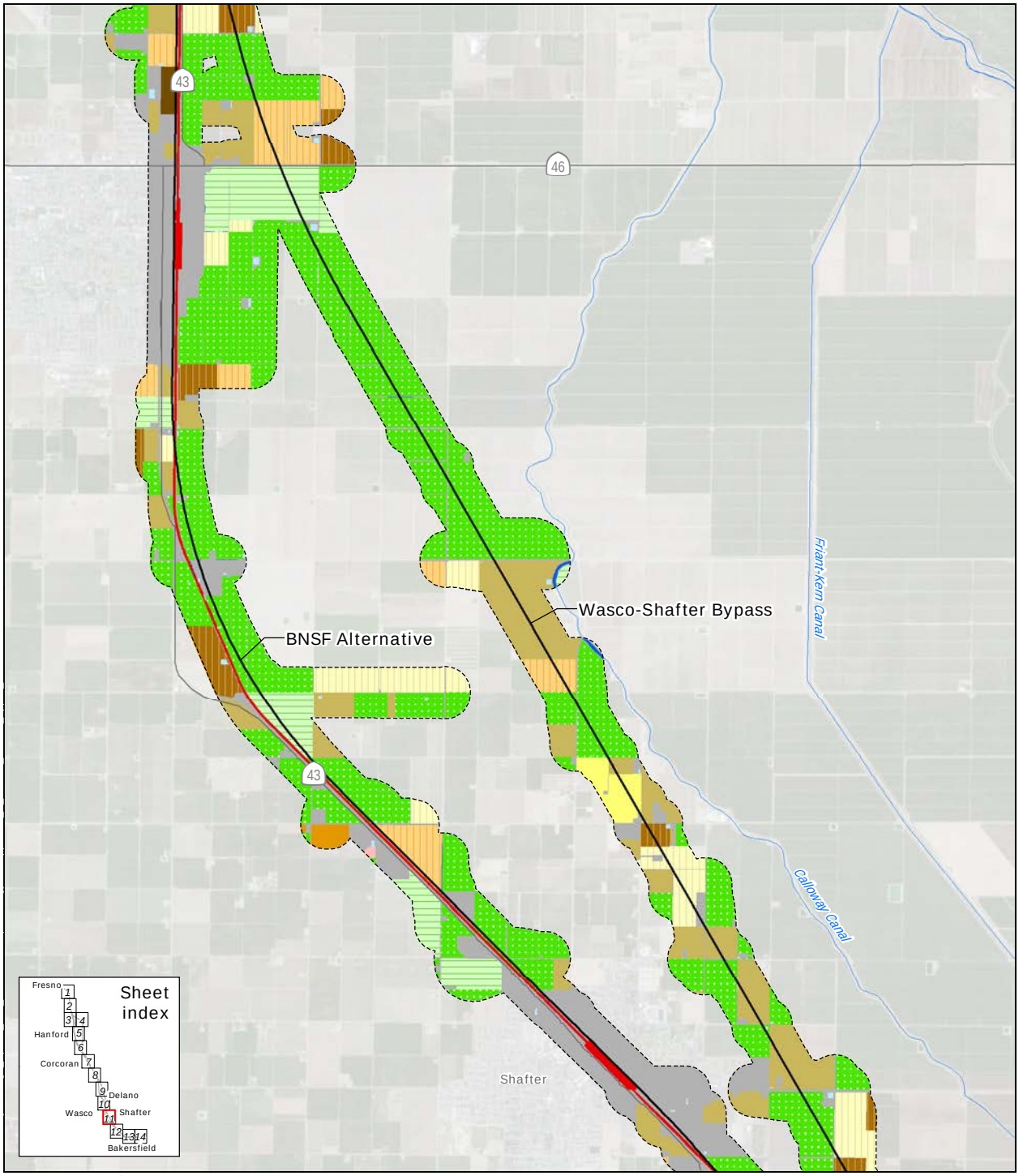
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1j
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

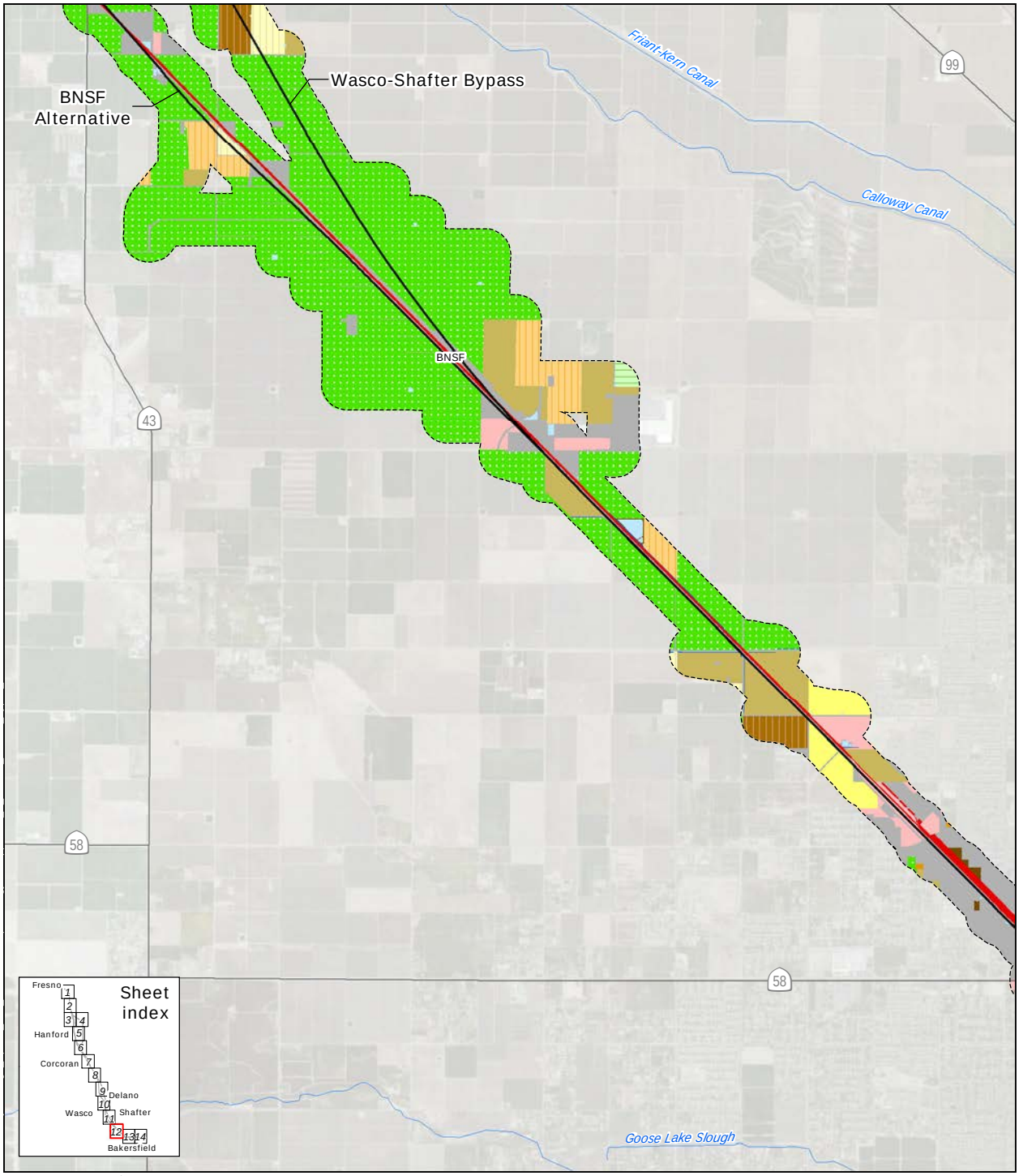
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1k
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

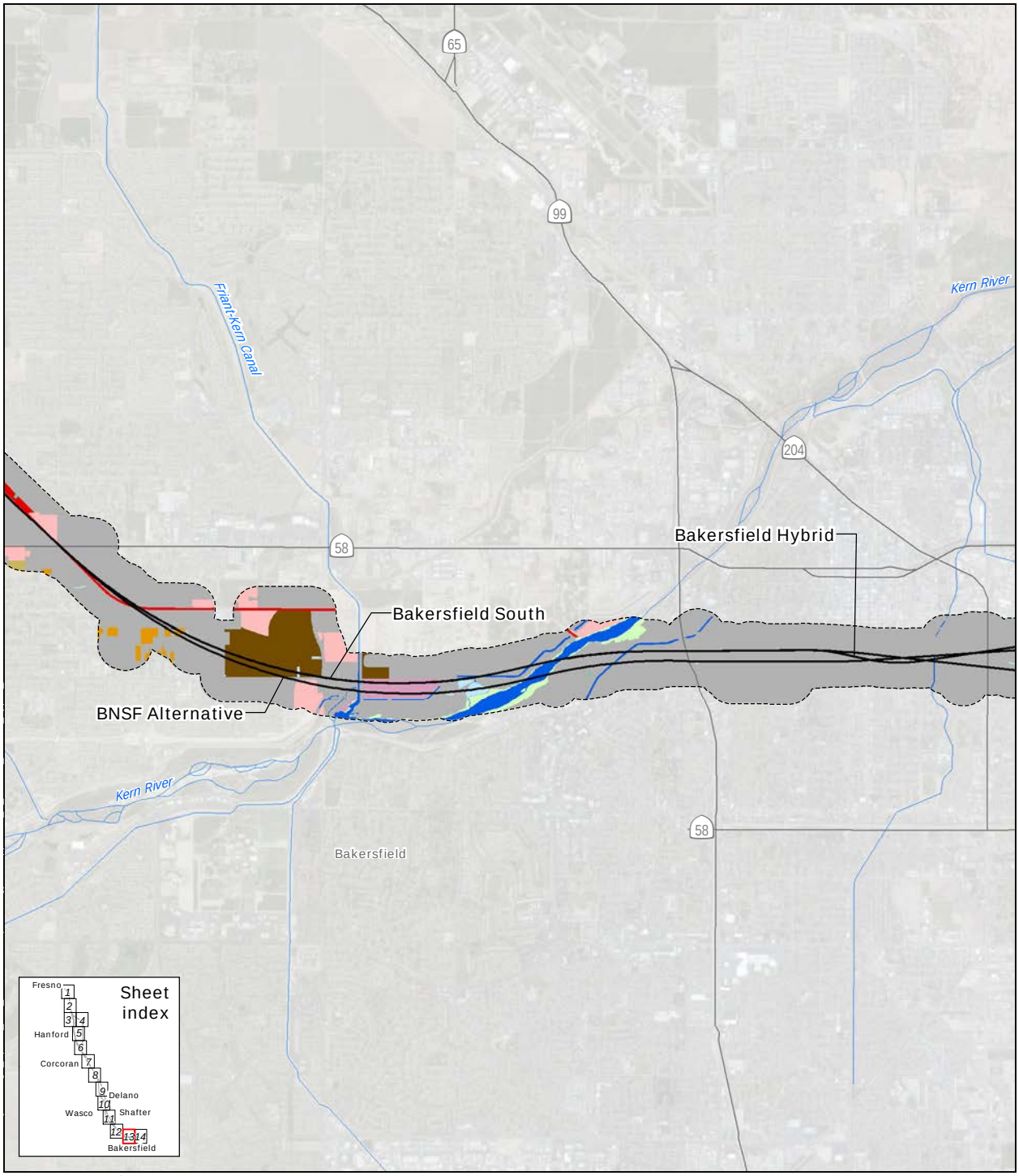
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1l
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignments
Habitat Study Area
County boundary

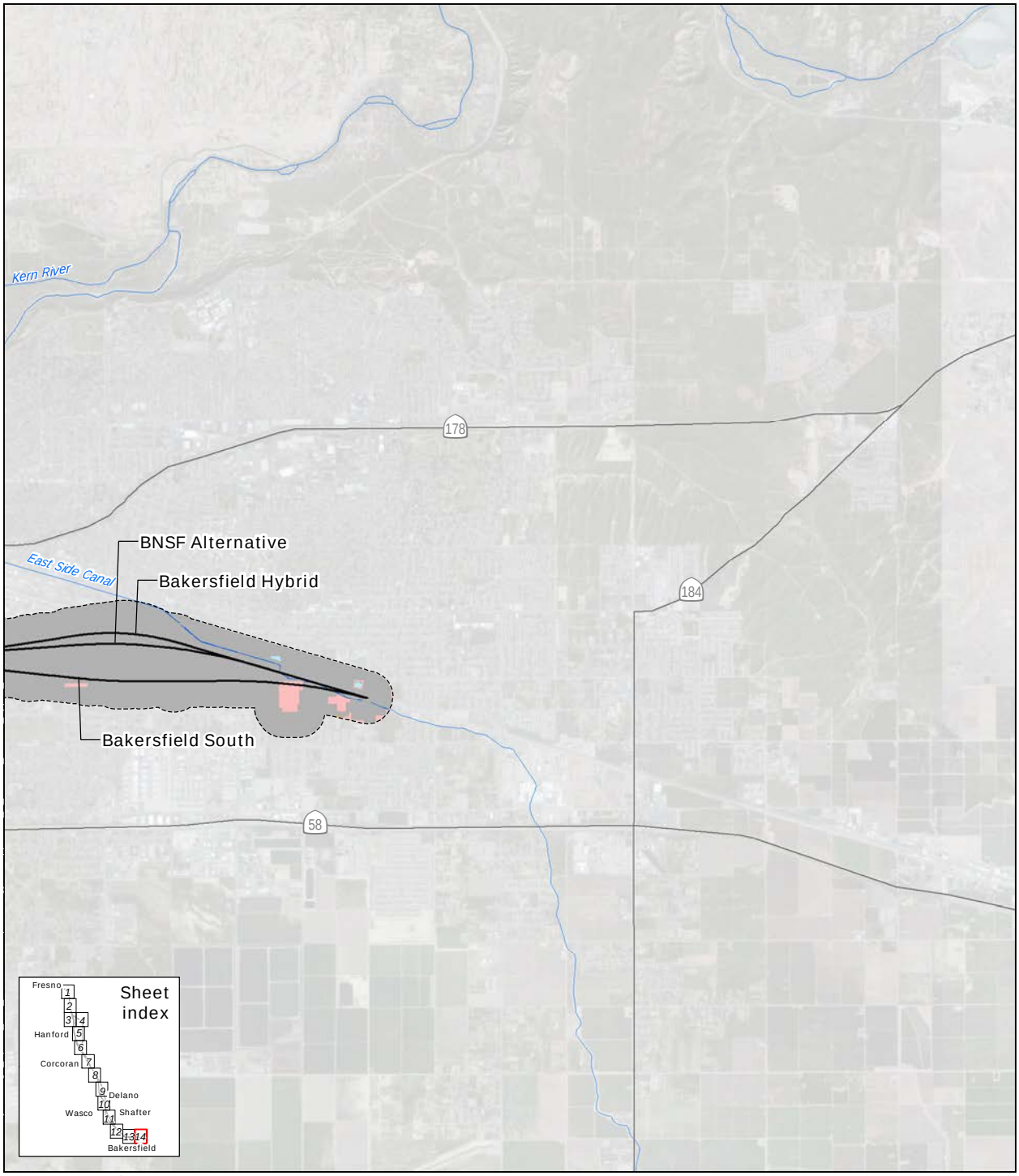
Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

Figure A3-1im
Observed habitats within the Habitat Study Area



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

May 17, 2012

Data source: URS, 2012

Alternative alignments
Habitat Study Area
County boundary

Agricultural land
Cropland (CRP)
Dryland Grain Crop (DGR)
Deciduous Orchard (DOR)
Evergreen Orchard (EOR)
Irrigated Grain Crop (IGR)
Irrigated Row and Field Crop (IRF)
Irrigated Hayfield (IRH)
Vineyard (VIN)

Aquatic habitat
Fresh Emergent Wetland (FEW)
Lacustrine (LAC)
Riverine (RIV)

Developed area
BNSF right-of-way (BNSF)
Barren (BAR)
Urban (URB)

Natural and seminatural area
Annual Grassland (AGS)
Alkali Desert Scrub (ASC)
Pasture (PAS)
Valley Oak Woodland (VOW)
Valley Foothill Riparian (VRI)

N

0 0.5 1
Miles

0 1 2
Kilometers

Figure A3-1in
Observed habitats within the Habitat Study Area

Appendix C

USFWS Species List

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120116071828

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)

- Branchinecta lynchi
  - Critical habitat, vernal pool fairy shrimp (X)
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Lepidurus packardi
  - Critical habitat, vernal pool tadpole shrimp (X)
  - vernal pool tadpole shrimp (E)

Fish

- Hypomesus transpacificus
  - delta smelt (T)

- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)

Amphibians

- Ambystoma californiense
  - California tiger salamander, central population (T)

    - Critical habitat, CA tiger salamander, central population (X)

- Rana draytonii
    - California red-legged frog (T)

Reptiles

- Gambelia (=Crotaphytus) sila
    - blunt-nosed leopard lizard (E)

- Thamnophis gigas
    - giant garter snake (T)

Birds

- Charadrius alexandrinus nivosus
    - western snowy plover (T)

- Empidonax traillii extimus
    - southwestern willow flycatcher (E)

- Gymnogyps californianus
    - California condor (E)

Mammals

- Dipodomys ingens
    - giant kangaroo rat (E)

- Dipodomys nitratoides exilis
    - Fresno kangaroo rat (E)

- Dipodomys nitratoides nitratoides
    - Tipton kangaroo rat (E)

- Sorex ornatus relictus
    - Buena Vista Lake shrew (E)

- Vulpes macrotis mutica
    - San Joaquin kit fox (E)

Plants

- Castilleja campestris ssp. succulenta
    - Critical habitat, succulent (=fleshy) owl's-clover (X)
    - succulent (=fleshy) owl's-clover (T)

- Caulanthus californicus
  - California jewelflower (E)

- Chamaesyce hooveri
  - Critical habitat, Hoover's spurge (X)

- Eremalche kernensis
  - Kern mallow (E)

- Monolopia congdonii (=Lembertia congdonii)
  - San Joaquin woolly-threads (E)

- Opuntia treleasei
  - Bakersfield cactus (E)

- Orcuttia inaequalis
  - Critical habitat, San Joaquin Valley Orcutt grass (X)
  - San Joaquin Valley Orcutt grass (T)

- Orcuttia pilosa
  - hairy Orcutt grass (E)

- Pseudobahia peirsonii
  - San Joaquin adobe sunburst (T)

- Tuctoria greenei
  - Greene's tuctoria (=Orcutt grass) (E)

Quads Containing Listed, Proposed or Candidate Species:

ARVIN (214A)

WEED PATCH (214B)

CONNER (215A)

MILLUX (215B)

RIO BRAVO RANCH (239A)

OIL CENTER (239B)

LAMONT (239C)

EDISON (239D)

OILDALE (240A)

ROSEDALE (240B)

STEVENS (240C)

GOSFORD (240D)

RIO BRAVO (241A)

BUTTONWILLOW (241B)

TUPMAN (241D)

KNOB HILL (262C)

DEEPWELL RANCH (263A)

MCFARLAND (263B)

FAMOSO (263C)

NORTH OF OILDALE (263D)

POND (264A)

WASCO NW (264B)

WASCO SW (264C)

WASCO (264D)

LOST HILLS NE (265A)

SEMITROPIC (265D)

SAUSALITO SCHOOL (287B)

DELANO EAST (287C)

PIXLEY (288A)

ALPAUGH (288B)

ALLENSWORTH (288C)

DELANO WEST (288D)

HACIENDA RANCH NE (289A)

HACIENDA RANCH NW (289B)

HACIENDA RANCH (289D)

TULARE (311A)

PAIGE (311B)

TAYLOR WEIR (311C)

TIPTON (311D)

WAUKENA (312A)

GUERNSEY (312B)

EL RICO RANCH (312C)

CORCORAN (312D)

STRATFORD (313A)

STRATFORD SE (313D)

TRAVER (334B)

GOSHEN (334C)

BURRIS PARK (335A)

LATON (335B)

HANFORD (335C)

REMNOY (335D)

RIVERDALE (336A)

BURREL (336B)

LEMOORE (336D)

REEDLEY (356C)

SANGER (357A)

MALAGA (357B)

CONEJO (357C)

SELMA (357D)

FRESNO SOUTH (358A)

KEARNEY PARK (358B)

RAISIN (358C)

CARUTHERS (358D)

CLOVIS (378C)

ROUND MOUNTAIN (378D)

HERNDON (379C)

FRESNO NORTH (379D)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be April 15, 2012.

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Appendix D

CNDDB List of Plants and Wildlife

Selected Elements by Scientific Name

California Department of Fish and Game

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	None	G2G3	S2	SSC
Ambystoma californiense California tiger salamander	AAAAA01180	Threatened	Threatened	G2G3	S2S3	SSC
Ammospermophilus nelsoni Nelson's antelope squirrel	AMAFB04040	None	Threatened	G2	S2	
Andrena macswaini An andrenid bee	IIHYM35040	None	None	G1G3	S1S3	
Anniella pulchra pulchra silvery legless lizard	ARACC01012	None	None	G3G4T3T4Q	S3	SSC
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Aquila chrysaetos golden eagle	ABNKC22010	None	None	G5	S3	FP
Ardea alba great egret	ABNGA04040	None	None	G5	S4	
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S2	SSC
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S2S3	
Buteo swainsoni Swainson's hawk	ABNKC19070	None	Threatened	G5	S2	
Chaetodipus californicus femoralis Dulzura pocket mouse	AMAFD05021	None	None	G5T3	S2?	SSC
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G4T3	S2	SSC
Charadrius montanus mountain plover	ABNNB03100	Proposed Threatened	None	G2	S2?	SSC
Cicindela tranquebarica ssp. San Joaquin tiger beetle	IICOL0220E	None	None	G5T1	S1	
Coccyzus americanus occidentalis western yellow-billed cuckoo	ABNRB02022	Candidate	Endangered	G5T3Q	S1	
Danaus plexippus monarch butterfly	IILEPP2010	None	None	G5	S3	
Dendrocygna bicolor fulvous whistling-duck	ABNJB01010	None	None	G5	S1	SSC
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Dipodomys ingens giant kangaroo rat	AMAFD03080	Endangered	Endangered	G2	S2	
Dipodomys nitratoides brevinasus short-nosed kangaroo rat	AMAFD03153	None	None	G3T1T2	S1S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Dipodomys nitratoides exilis Fresno kangaroo rat	AMAFD03151	Endangered	Endangered	G3T1	S1	
Dipodomys nitratoides nitratoides Tipton kangaroo rat	AMAFD03152	Endangered	Endangered	G3T1	S1	
Efferia antiochi Antioch efferian robberfly	IIDIP07010	None	None	G1G3	S1S3	
Egretta thula snowy egret	ABNGA06030	None	None	G5	S4	
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Entosphenus hubbsi Kern brook lamprey	AFBAA02040	None	None	G1G2	S1S2	SSC
Eremophila alpestris actia California horned lark	ABPAT02011	None	None	G5T3Q	S3	WL
Eumops perotis californicus western mastiff bat	AMACD02011	None	None	G5T4	S3?	SSC
Gambelia sila blunt-nosed leopard lizard	ARACF07010	Endangered	Endangered	G1	S1	FP
Helminthoglypta callistoderma Kern shoulderband	IMGASC2080	None	None	G1	S1	
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4?	
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G3	S2S3	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G3	S2S3	
Lithobates pipiens northern leopard frog	AAABH01170	None	None	G5	S2	SSC
Lytta hoppingi Hopping's blister beetle	IICOL4C010	None	None	G1G2	S1S2	
Lytta moesta moestan blister beetle	IICOL4C020	None	None	G2	S2	
Lytta molesta molestan blister beetle	IICOL4C030	None	None	G2	S2	
Lytta morrisoni Morrison's blister beetle	IICOL4C040	None	None	G1G2	S1S2	
Masticophis flagellum ruddocki San Joaquin whipsnake	ARADB21021	None	None	G5T2T3	S2?	SSC
Metapogon hurdi Hurd's metapogon robberfly	IIDIP08010	None	None	G1G3	S1S3	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Nycticorax nycticorax black-crowned night heron	ABNGA11010	None	None	G5	S3	
Onychomys torridus tularensis Tulare grasshopper mouse	AMAFF06021	None	None	G5T1T2	S1S2	SSC
Perognathus inornatus inornatus San Joaquin pocket mouse	AMAFD01061	None	None	G4T2T3	S2S3	
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G4G5	S3S4	SSC
Plegadis chihi white-faced ibis	ABNGE02020	None	None	G5	S1	WL
Sorex ornatus relictus Buena Vista Lake shrew	AMABA01102	Endangered	None	G5T1	S1	SSC
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC
Taxidea taxus American badger	AMAJF04010	None	None	G5	S4	SSC
Thamnophis gigas giant garter snake	ARADB36150	Threatened	Threatened	G2G3	S2S3	
Toxostoma lecontei Le Conte's thrasher	ABPBK06100	None	None	G3	S3	SSC
Vulpes macrotis mutica San Joaquin kit fox	AMAJA03041	Endangered	Threatened	G4T2T3	S2S3	
Xanthocephalus xanthocephalus yellow-headed blackbird	ABPBXB3010	None	None	G5	S3S4	SSC

Record Count: 54

Selected Elements by Scientific Name

California Department of Fish and Game

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Astragalus hornii var. hornii Horn's milk-vetch	PDFAB0F421	None	None	G4G5T2T3	S1	1B.1
Atriplex cordulata heartscale	PDCHE040B0	None	None	G2?	S2.2?	1B.2
Atriplex coronata var. vallicola Lost Hills crownscale	PDCHE04250	None	None	G4T2	S2	1B.2
Atriplex depressa brittlescale	PDCHE042L0	None	None	G2Q	S2.2	1B.2
Atriplex erecticaulis Earlimart orache	PDCHE042V0	None	None	G2	S2.2	1B.2
Atriplex minuscula lesser saltscale	PDCHE042M0	None	None	G1	S1.1	1B.1
Atriplex persistens vernal pool smallscale	PDCHE042P0	None	None	G2	S2.2	1B.2
Atriplex subtilis subtle orache	PDCHE042T0	None	None	G2	S2.2	1B.2
Atriplex tularensis Bakersfield smallscale	PDCHE04240	None	Endangered	GX	SX	1A
California macrophylla round-leaved filaree	PDGER01070	None	None	G2	S2	1B.1
Calochortus striatus alkali mariposa-lily	PMLIL0D190	None	None	G2	S2	1B.2
Castilleja campestris ssp. succulenta succulent owl's-clover	PDSCR0D3Z1	Threatened	Endangered	G4?T2	S2.2	1B.2
Caulanthus californicus California jewel-flower	PDBRA31010	Endangered	Endangered	G1	S1	1B.1
Chloropyron molle ssp. hispidum hispid bird's-beak	PDSCR0J0D1	None	None	G2T2	S2.1	1B.1
Cirsium crassicaule slough thistle	PDAST2E0U0	None	None	G2	S2.2	1B.1
Clarkia tembloriensis ssp. calientensis Vasek's clarkia	PDONA05141	None	None	G3T1	S1.1	1B.1
Delphinium purpusii rose-flowered larkspur	PDRAN0B1G0	None	None	G2	S2	1B.3
Delphinium recurvatum recurved larkspur	PDRAN0B1J0	None	None	G3	S3	1B.2
Eremalche kernensis Kern mallow	PDMAL0C031	Endangered	None	G3?T1Q	S1	1B.1
Eriastrum hooveri Hoover's eriastrum	PDPLM03070	Delisted	None	G3	S3.2	4.2
Eryngium spinosepalum spiny-sepaled button-celery	PDAPI0Z0Y0	None	None	G2	S2.2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Eschscholzia lemmonii ssp. kernensis Tejon poppy	PDPAP0A071	None	None	G5T1	S1.1	1B.1
Fritillaria striata striped adobe-lily	PMLIL0V0K0	None	Threatened	G2	S2.1	1B.1
Heterotheca shevockii Shevock's golden-aster	PDAST4V0T0	None	None	G1	S1.3	1B.3
Imperata brevifolia California satintail	PMPOA3D020	None	None	G2	S2.1	2.1
Lasthenia glabrata ssp. coulteri Coulter's goldfields	PDAST5L0A1	None	None	G4T3	S2.1	1B.1
Layia heterotricha pale-yellow layia	PDAST5N070	None	None	G2	S2	1B.1
Layia leucopappa Comanche Point layia	PDAST5N0A0	None	None	G1	S1.1	1B.1
Layia munzii Munz's tidy-tips	PDAST5N0B0	None	None	G1	S1.1	1B.2
Lepidium jaredii ssp. album Panoche pepper-grass	PDBRA1M0G2	None	None	G1T1	S1.2	1B.2
Leptosiphon serrulatus Madera leptosiphon	PDPLM09130	None	None	G1?	S1?	1B.2
Mimulus pictus calico monkeyflower	PDSCR1B240	None	None	G2	S2.2	1B.2
Monolopia congdonii San Joaquin woollythreads	PDASTA8010	Endangered	None	G3	S3	1B.2
Nama stenocarpum mud nama	PDHYD0A0H0	None	None	G4G5	S1S2	2.2
Navarretia setiloba Piute Mountains navarretia	PDPLM0C0S0	None	None	G1	S1.1	1B.1
Opuntia basilaris var. treleasei Bakersfield cactus	PDCAC0D055	Endangered	Endangered	G5T1	S1	1B.1
Orcuttia inaequalis San Joaquin Valley Orcutt grass	PMPOA4G060	Threatened	Endangered	G1	S1	1B.1
Orcuttia pilosa hairy Orcutt grass	PMPOA4G040	Endangered	Endangered	G2	S2.1	1B.1
Pseudobahia peirsonii San Joaquin adobe sunburst	PDAST7P030	Threatened	Endangered	G2	S2.1	1B.1
Pterygoneurum californicum California chalk moss	NBMUS65020	None	None	GH	SH	1B.1
Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
Stylocline citroleum oil neststraw	PDAST8Y070	None	None	G2	S2	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Stylocline masonii	PDAST8Y080	None	None	G1	S1.1	1B.1
Mason's neststraw						
Tortula californica	NBMUS7L090	None	None	G2?	S2	1B.2
California screw moss						
Tropidocarpum californicum	PDBRA33010	None	None	G1	S1.1	1B.1
Kings gold						
Tropidocarpum capparideum	PDBRA2R010	None	None	G1	S1.1	1B.1
caper-fruited tropidocarpum						
Tuctoria greenei	PMPOA6N010	Endangered	Rare	G1	S1	1B.1
Greene's tuctoria						

Record Count: 47

Appendix E

Field Personnel

Table E-1
Botanical Surveys Personnel and Survey Dates

Botanist	Education/Degree/Years Experience	Early Spring Survey (March 15–April 2)	Late Spring Survey (April 19–April 23)	Early Summer Survey (May 17–May 28)	Late Season Survey (July 5- July 9)
Alyssa Berry	B.A., Earth and Environmental Science, Wesleyan University. 4 years of experience.	X	—	—	—
Karen Brimacombe	M.S., Botany, University of Hawaii; B.S., Psychology, Miami University. 16 years of experience.	—	X	—	—
Chris Hargreaves	B.S., Environmental Studies, University of Utah. 6 years of experience.	X	X	X	—
Dr. Bob Holland	Ph.D., Ecology, University of California–Davis. 1978 M.S., Ecology, University of California– Davis. 1974 B.A., Environmental Studies, Antioch College, Yellow Springs, OH. 1972. 32 years of experience.	—	X	X	—
David Kisner	M.S., Ecology, San Diego State University; B.A., Biology, Evolution, and Ecology, University of California–Santa Barbara. 17 years of experience.	X	—	—	—
Danni Kline	B.S., Botany, University of Washington. 11 years of experience.	X	X	X	—
Todd Lemein	B.S., Ecology and Evolution, University of California-Santa Barbara. 5 years of experience.	X	X	—	—
Robin Murray	B.S., Botany and Environmental Biology, Humboldt State University. 3 years of experience.	X	—	—	—
Ivan Parr	B.S., Environmental Science, Saint Mary's College of California. 3 years of experience.	X	X	X	X
Galen Peracca	Master of Forestry, Forestry, University of California–Berkeley; B.S., Resource Management, University of California–Berkeley. 7 years of experience.	—	X	—	—
Casey Stewman	M.A., Biological Sciences, Humboldt State University; B.S., Biological Sciences, Humboldt State University. 11 years of experience.	X	X	X	X
George Strnad	M.S., Regional Planning and Landscape Architecture, Czech Technical University, Praha; B.A., Architecture, Czech Technical University, Praha. 25 years of experience.	X	—	X	—
Kristiaan Stuart	M.S., Biology, Plant Ecology, California State University–Chico; B.S., Biology, Ecology, California State University–Chico. 18 years of experience.	—	—	X	—
Jeff Walker	B.S., Botany and Environmental Studies, Wetland Science Management Certification, University of Washington. 15 years of experience.	X	X	X	—

Table E-2
Special Aquatic Resource Survey Personnel and Experience

Wetland Scientist	Education/Degree/Years Experience
Sundeep Amin	B.S., Ecology, Behavior, and Evolution, University of California–San Diego. 5 years of experience.
Joe Bandel	B.S., Wildlife, Fish, and Conservation Biology, University of California–Davis. 8 years of experience.
Jessica Brinbaun	M.S., Natural Resources: Planning and Interpretation, Humboldt State University; B.S., Biology, Trinity College. 4 years of experience.
Brian Carver	B.S., Aquatic Biology, University of California–Santa Barbara. 12 years of experience.
John Davis IV	M.S., Biology, Cal Poly State University, San Luis Obispo; B.S., Ecology, San Diego State University. 13 years of experience.
Fletcher Halliday	B.S., Molecular Environmental Biology, University of California–Berkeley. 2 years of experience.
Paul Hamidi	M.S., Forestry, University of Montana; B.S., Forestry, University of Montana. 14 years of experience.
Greg Hoisington	M.S., Biology, California State University–Long Beach; B.S., Ecology and Environmental Biology, California State University–Long Beach. 5 years of experience.
Jeffrey Jarvis	M.S., Biology, California State University–Fullerton; B.S., Biological Science, California State University–Fullerton. 3 years of experience.
Chris Julian	B.S., Biology, University of California–Santa Barbara. 8 years of experience.
Marina Kasa	M.S., Environmental Science and Management, University of California–Santa Barbara; B.S., Animal Biology–Wildlife Conservation, University of California– Davis. 2 years of experience.
Bill Kidder	Certificate of Wetland Science and Management, University of Washington; B.S., Wildlife Ecology, University of Maine; B.S., Forestry, University of Maine. 11 years of experience.
Julie Love	M.S., Environmental Science and Management, University of California–Santa Barbara; B.S., Marine Biology, University of California–Los Angeles. 8 years of experience
Mary McClanahan	M.S., Plant Science, California State University-Fresno; B.S., Range Science, University of Idaho-Moscow. 25 years of experience.
Jan Novak	B.S., Soil Science, California Polytechnic State University, San Luis Obispo. 8 years of experience.
Kristiaan Stuart	M.S., Biology, Plant Ecology, California State University–Chico; B.S., Biology, Ecology, California State University–Chico. 18 years of experience.
Jennifer Teschler	B.S., Environmental Systems: Ecology, Behavior, and Evolution, University of California–San Diego. 2 years of experience.

Table E-3
Wildlife Habitat Assessment Personnel and Experience

Wildlife Biologist	Education/Degree/Year of Experience
Rachel Avila	B.A., Anthropology, University of California–Santa Cruz. 3 years of experience.
Matthew Bettelheim	B.S., Ecology, Behavior, and Evolution, University of California–San Diego. 10 years of experience.
Dave Compton	M.A., U.S. History, Marquette University; B.A., History, Christian Brothers College. 11 years of experience.
Ronald Cummings	B.S., General Biology, Oregon State University. 21 years of experience.
Heidi Dunbar	B.S., Biology, California State University–Fresno. 2 years of experience.
Kate Eldredge	B.S., Biology, California State University–Bakersfield; B.A., Anthropology, California State University–Bakersfield. 21 years of experience.
Jim Hornback	B.S., Natural Resources, California State University–Humboldt. 18 years of experience.
Brian Latta	B.S., Natural Resource Management, University of Maryland. 21 years of experience.
Melissa Newman	M.S., Biology, University of California–San Diego; B.S., General Biology, University of California–San Diego. 7 years of experience.
David Pecora	B.S., Marine Science, Kutztown University of Pennsylvania. 6 years of experience.
Crissy Slaughter	B.A., Aquatic Biology, University of California–Santa Barbara. 13 years of experience.
Rebecca Verity	Ph.D. Candidate & M.S., Microbiology, Cornell University; M.S., Oceanography, Scripps Institution of Oceanography; B.S., Marine Biology, Humboldt State University. 9 years of experience.

Table E-4
BNSF Survey Personnel and Experience

BNSF Surveyor	Education/Degree/Year of Experience
Kate Eldredge Wildlife Biologist	B.S., Biology, California State University–Bakersfield; B.A., Anthropology, California State University–Bakersfield. 21 years of experience.
Chris Hargreaves Botanist	B.S., Environmental Studies, University of Utah. 6 years of experience.
Jeffrey Jarvis Wetland Scientist	M.S., Biology, California State University–Fullerton; B.S., Biological Science, California State University–Fullerton. 3 years of experience
Brian Latta Wildlife Biologist	B.S., Natural Resource Management, University of Maryland. 21 years of experience.
Ivan Parr Botanist	B.S., Environmental Science, Saint Mary's College of California. 3 years of experience.
Galen Peracca Wetland Scientist/BNSF Team Leader	Master of Forestry, Forestry, University of California–Berkeley; B.S., Resource Management, University of California–Berkeley. 7 years of experience.
Kristiaan Stuart Wetland Scientist/BNSF Team Leader	M.S., Biology, Plant Ecology, California State University–Chico; B.S., Biology, Ecology, California State University–Chico. 18 years of experience.

Table E-5
Engineering Design Considerations Personnel and Experience

Surveyor	Education/Degree/Year of Experience
Jessica Birnbaum Wetland Scientist	M.S., Natural Resources: Planning and Interpretation, Humboldt State University; B.S., Biology, Trinity College. 4 years of experience.
Ronald Cummings Wildlife Biologist/Team Leader	B.S., General Biology, Oregon State University. 21 years of experience.
Connor Dibble Wetland Scientist	B.S., Environmental Sciences, University of California–Berkeley, B.A., Integrative Biology, University of California–Berkeley. 2 years of experience.
Chris Hargreaves Botanists	B.S., Environmental Studies, University of Utah. 6 years of experience.
Greg Hoisington Wetland Scientist	M.S., Biology, California State University-Long Beach; B.S., Ecology and Environmental Biology, California State University-Long Beach. 5 years of experience.
Jeffrey Jarvis Wildlife Biologist	M.S., Biology, California State University-Fullerton; B.S., Biological Science, California State University-Fullerton. 3 years of experience.
Brian Latta Wildlife Biologist	B.S., Natural Resource Management, University of Maryland. 21 years of experience.
Ivan Parr Botanist	B.S., Environmental Science, Saint Mary's College of California. 3 years of experience.
Kristiaan Stuart Wetland Scientist/ Team Leader	M.S., Biology, Plant Ecology, California State University–Chico; B.S., Biology, Ecology, California State University–Chico. 18 years of experience.

Table E-6
Cost Containment Engineering Surveys Personnel and Experience

Surveyor	Education/Degree/Year of Experience
Karen Brimacombe Botanist	M.S., Botany, University of Hawaii; B.S., Psychology, Miami University. 16 years of experience.
David Pecora Wildlife Biologist	B.S., Marine Science, Kutztown University of Pennsylvania. 6 years of experience.
Erin Maroni Wildlife Biologist	B.S., Environmental Science, University of New Hampshire. 1 year of experience.

Table E-7
Supplemental Surveys for Hanford West Bypass Alternatives and Engineering Design Considerations Personnel and Experience

Surveyor	Education/Degree/Year of Experience
Amy Langston Wetland Scientist	M.S., Ecology and Systematic Biology, San Francisco State University; B.S., Ecology, California Polytechnic State University. 10 years of experience.
Emily Magnaghi Botanist	M.S., Ecology and Systematic Biology, San Francisco State University; B.A., Botany, University of Michigan. 10 years of experience.
David Pecora Wildlife/Fisheries Biologist	B.S., Marine Science, Kutztown University of Pennsylvania. 6 years of experience.
Mark Wilson Biologist	B.S., Environmental Science , St. Mary's College of California. 3 years of experience