Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

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Finding of No Significant Impact (FONSI)
Environmental Assessment for a Taxiway M Bypass Road
Travis Air Force Base, Fairfield, California

Introduction

This Finding of No Significant Impact (FONSI) was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA); the President's Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA, Title 40 Code of Federal Regulations (CFR) 1500–1508; and the *Environmental Impact Analysis Process*, 32 CFR 989. The decision in this FONSI is based on information contained in the *Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base* (EA).

The purpose of the EA is to determine the extent of the environmental impact that may result from the proposed bypass road at Travis Air Force Base (Travis AFB) and evaluate whether these impacts, if any, would be significant. The purpose of the Proposed Action is to divert commercial traffic away from Taxiway M. Ragsdale Street crosses Taxiway M and is located close to the active runway, creating a safety and security concern.

Description of Proposed Action and Alternatives

The alternatives that have been analyzed include two possible routes for a bypass road. To be considered a reasonable alternative, the chosen alternative should route traffic around Taxiway M to stop use of the existing section of Ragsdale Street that crosses Taxiway M and provide safe, secure, and efficient access for commercial traffic to Travis AFB. The chosen alternative must meet or exceed state environmental requirements for road construction; comply with U.S. Air Force (USAF) and Department of Defense (DoD) planning and design manuals, design standards, and safety requirements for airfield operations; and meet minimum DoD antiterrorism/force protection requirements.

The bypass road would be used for commercial vehicle traffic from the South Gate and would be capable of accommodating vehicles up to 45 feet long and 12 feet wide. The bypass would be a two-lane asphalt road, 36 feet wide, with three emergency stops (48 feet wide by 180 feet long). The total construction footprint under the Proposed Action would be approximately 399,600 square feet (9.17 acres); under the Alternative Action it would be approximately 323,640 square feet (7.43 acres).

All alternatives considered for the action are analyzed in the EA. The No Action Alternative was analyzed in accordance with 32 CFR 989.8(d).

Decision

After a review of the EA, the USAF has decided to proceed with construction of the Proposed Action. The potential impacts on the human and natural environment were evaluated relative to the existing environment. For each environmental resource or issue, anticipated direct and indirect effects were assessed, considering both short-term and long-term project effects.

With the mitigation measures described below, only minor, short-term impacts would be expected from implementation of the Proposed Action, as described in the EA. During construction and operation, the Proposed Action would result in less than significant impacts on air quality, noise, hazardous materials, waste, environmental restoration sites, stored fuels, water resources, floodplains and wastewater, vegetation and wildlife, cultural resources, land use and environmental management (geology and soils, and pollution prevention). During construction, the Proposed Action would provide short-term socioeconomic benefits through the generation of construction jobs. During operation, socioeconomic impacts would be less than significant. During construction, the Proposed Action would result in less than significant adverse impacts on transportation systems, airspace/airfield operations, and safety and occupational health; during operation the Proposed Action would result in slightly beneficial effects to

those resources. During construction and operation, the Proposed Action would result in no impact on environmental justice and protection of children. The Proposed Action with mitigation would result in less than significant impacts on federal and state listed threatened or endangered species and wetlands.

The United States Fish and Wildlife Service (USFWS) issued a Biological Opinion 81420-2011-F-0370-1 under the Endangered Species Act on 11 August 2011. The Biological Opinion found that the Proposed Action is likely to adversely affect, but is not likely to jeopardize the continued existence of the threatened California tiger salamander, threatened vernal pool fairy shrimp, and endangered vernal pool tadpole shrimp. Permanent and temporary impacts on habitat for the California tiger salamander and indirect impacts on vernal pool branchiopod habitat will occur as a result of construction; however, restoration of the temporarily disturbed areas back to original conditions and compensation for permanent impacts at an approved mitigation bank will reduce impacts to less than significant levels. Mitigation measures required by the USFWS are described below.

Mitigation

The Air Force will implement and comply with the Conservation and Minimization Measures listed in the Biological Opinion, including mitigation for permanent impacts on 10.87 acres of upland habitat for the California tiger salamander through the purchase of 32.61 acres of Central California tiger salamander compensation credits and the purchase of 6.92 acres of vernal pool fairy shrimp and vernal pool tadpole shrimp habitat at a USFWS approved conservation bank in Solano County. The Air Force will implement Best Management Practices (BMPs) to control runoff and sedimentation and regenerate vegetation, establish restricted boundaries for project related activities, and establish a work restriction buffer around the vernal pools located within the Proposed Action area as an avoidance measure.

Overall, the analysis for this EA indicates that the construction of a bypass road would not result in or contribute to significant negative cumulative or indirect impacts on the resources in the region.

Finding of No Significant Impact

In accordance with the CEQ regulations implementing NEPA and the Air Force Environmental Impact Analysis Process, the Air Force concludes that the Proposed Action will have no significant impact on the quality of the human environment and that the preparation of an environmental impact statement is not warranted.

The EA and FONSI were available for public review from 8 Nov 11 to 9 Dec 11. No comments were received. Accordingly, the proposed action will be implemented.

Conclusion

On the basis of my review of the facts and analyses contained in the EA, I conclude that implementation of either the Proposed Action or Alternative Action will not have a significant impact either by itself or when considering cumulative impacts. Accordingly, NEPA requirements, regulations promulgated by the Council of Environmental Quality, and 32 CFR 989 are fulfilled and an environmental impact statement is not required.

SIGNED:

DATE: 16 DEC 11

DWIGHT C. SONES, Colonel, USAF
Commander

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Acronyms and Abbreviations

µg/m^3	micrograms per cubic meter
AB	Assembly Bill
AFB	Air Force Base
Air Force	U.S. Air Force
AMOG	Air Mobility Operations Group
AMW	Air Mobility Wing
AST	aboveground storage tank
AT/FP	anti-terrorism force protection
BAAQMD	Bay Area Air Quality Management District
Base	Travis Air Force Base
Basin	San Francisco Bay Area Air Basin
BRPM	Base Remediation Program Manager
CAA	Clean Air Act of 1970, as amended
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CDFG	California Department of Fish and Game
CEQ	President's Council on Environmental Quality
CEQA	California Environmental Quality Act
CES/CEA	Civil Engineering Squadron Environmental Flight
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CTS	California tiger salamander
CWA	Clean Water Act
dB	decibel(s)
EA	Environmental Assessment

EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
ft^2	square feet
GHG	greenhouse gas
GMU	grazing management unit
LUC	land use controls
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NEWIOU	North/East/West/Industrial Operable Unit
NO_x	nitrogen oxide
OU	operable unit
PM_{10}	particulate matter less than or equal to 10 micrometers
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers
ppm	parts per million
Q/D arc	explosive safety quantity-distance zone
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SIP	State Implementation Plan
SO_2	sulfur dioxide
SWPP	storm water pollution prevention plan
tpy	ton or tons per year
Travis AFB	Travis Air Force Base
Travis AFB General Plan	*General Plan for Travis Air Force Base, California*
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
VOC	volatile organic compound
WABOU	West/Annexes/Basewide Operable Unit

SECTION 1

Purpose of and Need for the Proposed Action

1.1 Introduction

The U.S. Air Force (Air Force) Air Mobility Command at Travis Air Force Base (Travis AFB or Base) in Fairfield, California, proposes to construct a bypass in the southwest portion of Travis AFB to divert commercial traffic away from Taxiway M. Travis AFB proposes to construct the bypass by modifying the existing road from the South Gate and constructing a new road west of Taxiway M. In addition, Travis AFB proposes to improve part of the existing C Bunker Access Road near the western boundary of the Base and a portion of W Street northeast of Taxiway M.

Travis AFB, with the support of Air Mobility Command and the Air Force Center for Engineering and the Environment, has prepared this environmental assessment (EA) in accordance with National Environmental Policy Act (NEPA) implementing regulations 40 Code of Federal Regulations (CFR) 1500 – 1508, Air Force Regulation 32 CFR 989, and Department of Defense directives. This EA was prepared to determine whether the Proposed Action would have a significant adverse effect on the quality of the environment.

1.2 Need for the Proposed Action

Currently, Ragsdale Street is used by commercial vehicles to access Travis AFB via the South Gate. Ragsdale Street crosses Taxiway M, which leads to a munitions hazardous cargo pad where aircraft load and unload munitions. Ragsdale Street and Taxiway M are located close to an active runway. Travis AFB needs to route commercial vehicles around Taxiway M because of safety, security, and accessibility concerns (see Figure 1-1).

There is a safety concern because (1) vehicle traffic entering the Base via Ragsdale Street must cross Taxiway M, (2) vehicle traffic comes close to the entrance of the munitions hazardous cargo pad, and (3) commercial vehicle traffic and aircraft share space at the intersection of Ragsdale Street and Taxiway M. There is an anti-terrorism/force protection (AT/FP) security concern because of the risk of unauthorized access to Taxiway M, the munitions hazardous cargo pad, parking ramps, and runway. In addition, the proximity of Ragsdale Street to the runway creates a particularly vulnerable situation for flight operations; a catastrophic event (e.g., terrorist action or a hazardous material incident) could disrupt runway operations and the delivery of supplies to the Base. There is an accessibility concern because commercial vehicle traffic is stopped two times every week for a minimum period of 1 hour when the taxiway is in use. This disrupts deliveries to the Base and requires personnel be assigned to direct traffic. These deficiencies need to be resolved.

1.3 Objectives of the Proposed Action

The objectives of both action alternatives are to route traffic around Taxiway M by constructing a bypass. Alternatives would include the following features:

- Route traffic around Taxiway M and stop using the section of Ragsdale Street crossing Taxiway M.
- Improve W Street to accommodate increased traffic flow and two way traffic. The new road would accommodate vehicles up to 45 feet long and 12 feet wide.
- Meet AT/FP criteria.
- Comply with Air Force regulations for road construction on Travis AFB.
- Use environmentally compliant practices to construct the bypass improvements.
- Provide safe, secure, and efficient vehicle travel for commercial deliveries to Travis AFB.

1.4 Location of Proposed Action

Travis AFB is located 7 miles north of the city of Fairfield, Solano County, California. The Base occupies approximately 5,128 acres (see Figure 1-2) near Interstate 80, between Sacramento and San Francisco. The site of the Proposed Action is in the southwestern portion of the Base. The Base boundary is west of the site, W Street is to the north and northeast, and Ragsdale Street is to the south and east.

1.5 Scope of this Environmental Assessment

This EA documents and analyzes the potential environmental and socioeconomic effects associated with the Proposed Action and the Alternative Action, relative to the No Action Alternative.

1.6 Decisions that Must be Made

The Base Commander (60 Air Mobility Wing [AMW]/CC) and the Environmental, Safety, and Occupational Health Council at Travis AFB are responsible for selecting an alternative to route traffic around Taxiway M via a bypass road. A decision to take no action (Alternative 1) would result in Travis AFB not constructing a bypass road around Taxiway M. The taxiway would continue to be used by aircraft and commercial vehicles. In addition, there would be no improvements to the C Bunker Access Road or W Street. A decision to implement Alternative 2 or Alternative 3 would result in the construction of the Taxiway M bypass and portions of W Street. Implementation of Alternative 2 would include improvements to C Bunker Access Road.

1.7 Applicable Regulatory Requirements and Required Coordination

This EA has been conducted in accordance with the President's Council on Environmental Quality (CEQ) regulations, 40 CFR Sections 1500-1508, as they implement the requirements of NEPA; 42 U.S. Code (USC) Sections 4321 et seq.; and 32 CFR 989, *The Environmental Impact Analysis Process*. 32 CFR 989 specifies the procedural requirements for implementing NEPA and preparing an EA; it directs the Air Force to consider environmental consequences as part of the planning and decision making process.

Other environmental regulatory requirements relevant to the Proposed Action and the Alternative Action are identified in this EA. Regulatory requirements under the following laws, among others, are assessed:

- Noise Control Act of 1972
- Clean Air Act of 1970 (CAA)
- Clean Water Act (CWA)
- National Historic Preservation Act
- Archaeological Resources Protection Act
- Endangered Species Act of 1973
- Resource Conservation and Recovery Act (RCRA)
- Comprehensive Environmental Restoration, Compensation, and Liability Act
- Toxic Substances Control Act of 1970
- Occupational Safety and Health Act

The selected alternative must also comply with the following:

- Executive Order (EO) 11988, *Floodplain Management*
- EO 11990, *Protection of Wetlands*
- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*

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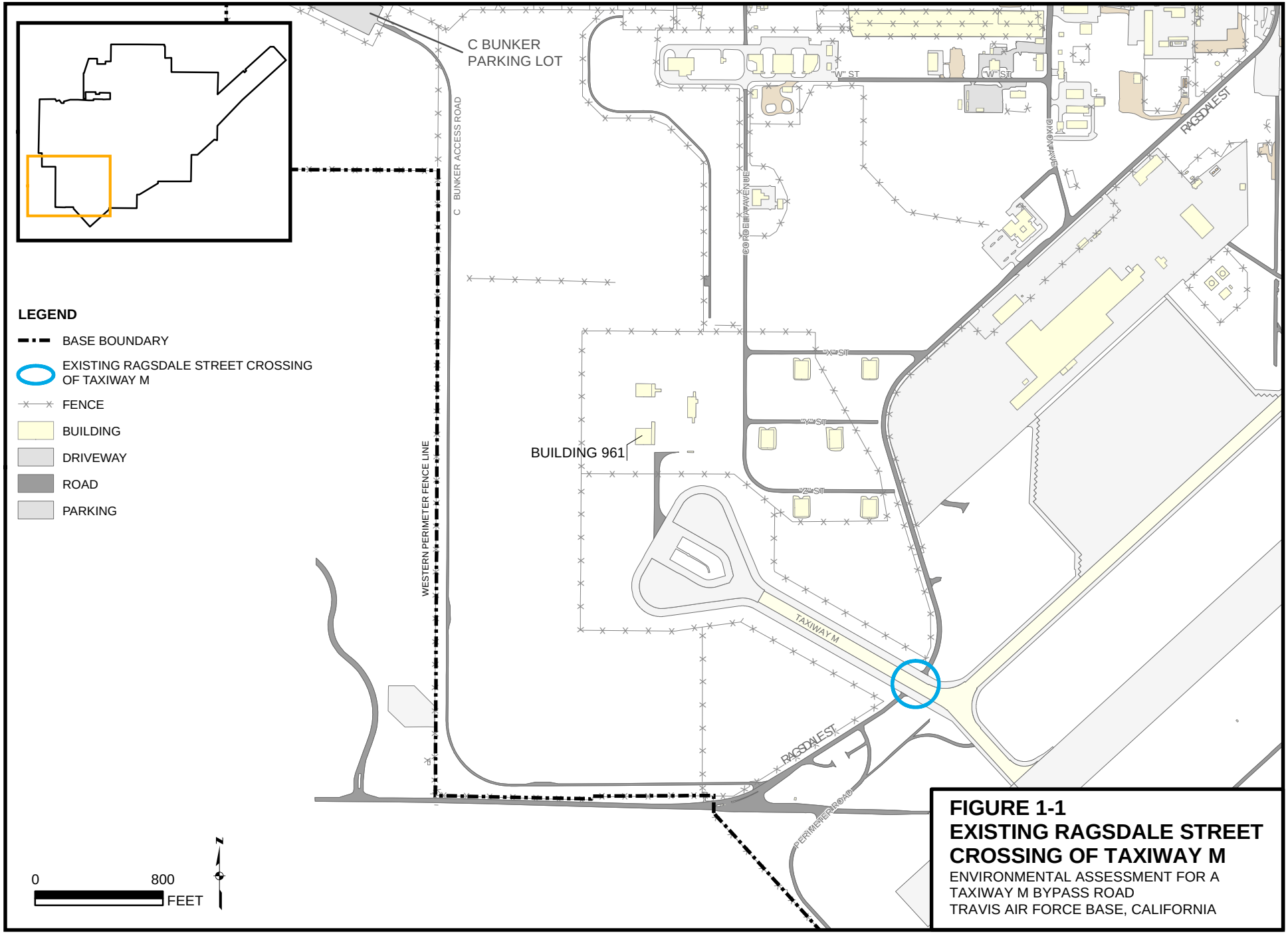

FIGURE 1-1
EXISTING RAGSDALE STREET CROSSING OF TAXIWAY M
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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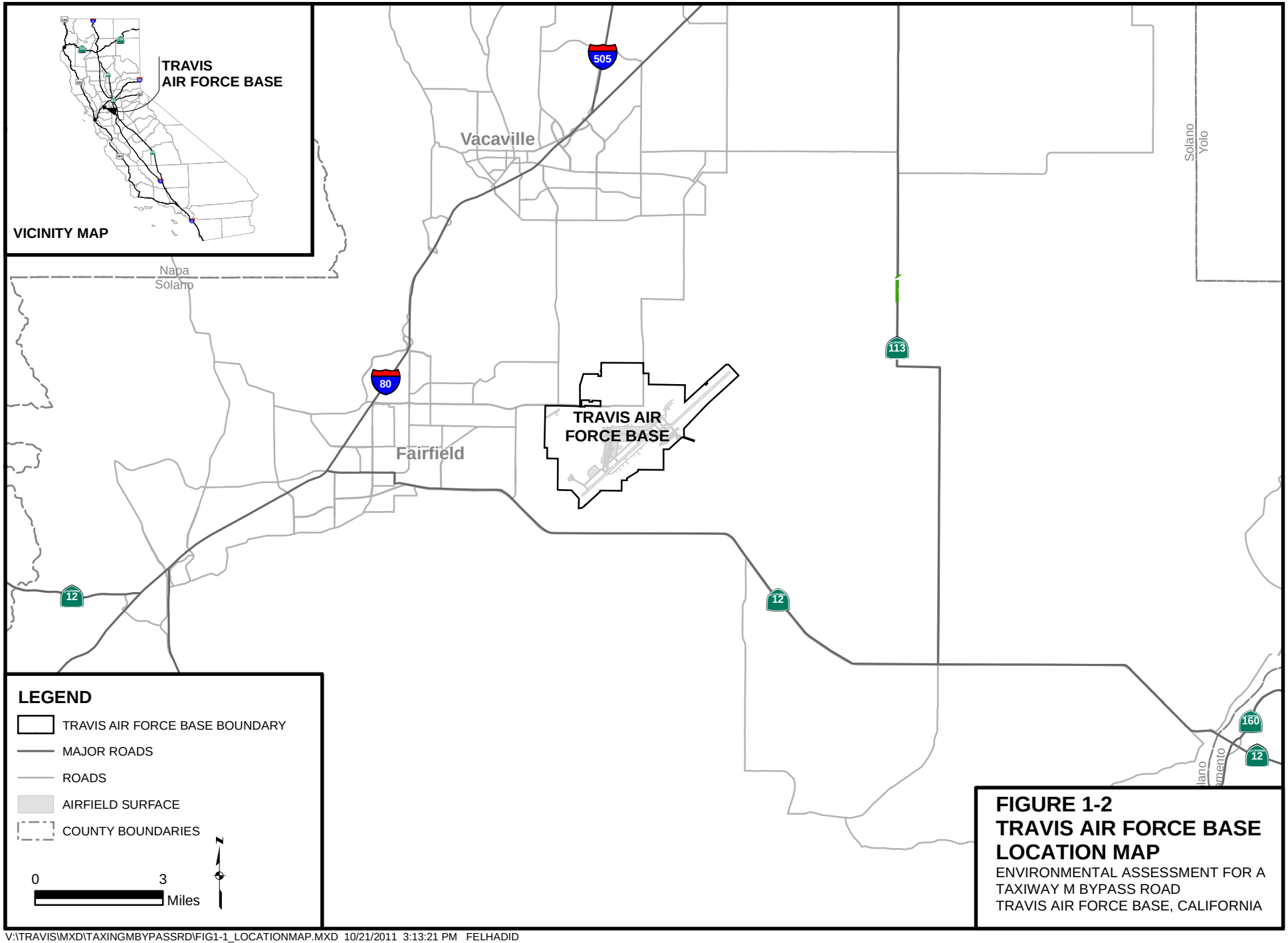

FIGURE 1-2
TRAVIS AIR FORCE BASE
LOCATION MAP
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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SECTION 2

Description of the Alternatives, Including the Proposed Action

2.1 Introduction

This section presents the criteria for selecting the alternatives considered in this EA and describes the alternatives carried forward for detailed analysis.

2.2 Selection Criteria for Alternatives

Reasonable alternatives for constructing a bypass road around Taxiway M at Travis AFB should accomplish the following cost-efficiently and cost-effectively, with minimal impact on human health and the environment:

- Meet or exceed state environmental requirements for road construction
- Comply with Air Force and Department of Defense planning and design manuals, design standards, and safety requirements for airfield operations
- Meet minimum AT/FP requirements
- Meet Travis AFB General Plan transportation improvements for truck traffic linking Perimeter Road from the South Gate to Dixon Road and continuing to Ragsdale Street.
- Accommodate safe truck access to the C Bunker parking lot.

2.3 Alternatives Considered but Eliminated from Detailed Study

This EA analyzes the No Action Alternative, the Proposed Action, and one other action alternative. The Base considered an additional action alternative to reroute traffic around Taxiway M using an existing route (see Figure 1-1). This alternative would have closed Ragsdale Street at either side of Taxiway M and routed commercial traffic around Taxiway M through an alternate gate at Travis AFB or around Taxiway M via an existing onbase road. Traffic could be routed through the Main Gate or North Gate, or traffic entering from the South Gate could be routed via Perimeter Road around the east end of the runway to the main base cantonment area. This alternative would not meet the purpose and need because it would not provide an efficient route for traffic entering the southwest portion of the Base. That traffic would likely be routed through the heavy-traffic areas of the Main Gate and North Gate and the Base main cantonment area. In addition, this alternative would not fulfill the requirements for (1) traffic improvements identified in the Travis AFB General Plan or (2) improvements to C Bunker Access Road. Therefore, this alternative was eliminated from further consideration.

No other alternatives were considered and eliminated from further consideration; therefore, no other alternatives are discussed in this EA.

2.4 Description of Proposed Alternatives

2.4.1 Alternative 1 – No Action

Under the No Action Alternative, construction of the Taxiway M bypass road would not occur and the existing portion of Ragsdale Street crossing Taxiway M would continue to be used. Commercial vehicle traffic would continue to conflict with AT/FP provisions because vehicles would continue to cross Taxiway M and potentially encounter aircraft carrying munitions on the runway.

2.4.2 Alternative 2 – Proposed Action

The Proposed Action would include constructing a bypass road to route traffic around Taxiway M and improve the existing road to the C Bunker parking lot and the eastern portion of W Street. The Proposed Action would include a bypass road from the South Gate, passing west of the munitions bunkers (Buildings 959, 960, and 961) and C Bunker Access Road, across Cordelia Avenue and connecting to W Street. Under the Proposed Action, a portion of W Street and the road leading to the C Bunker parking lot would be improved. A new road would be constructed south of Ragsdale Street to connect the bypass road to Perimeter Road. The end of Ragsdale Street, toward the beginning of the new intersection of the bypass road, would be demolished. Figure 2-1 shows the proposed construction area for the Proposed Action.

The bypass road would be constructed for commercial vehicle transportation from the South Gate and would accommodate vehicles up to 45 feet long and 12 feet wide. The bypass would be a two-lane asphalt road, 36 feet wide, with three emergency stops (48 feet wide by 180 feet long). The total construction footprint under the Proposed Action would be approximately 399,600 square feet (ft^2) (9.17 acres). The new road and W Street would be used to route traffic around Taxiway M, and the improved C Bunker Access Road would continue to provide access to the C Bunker parking lot.

The C Bunker parking lot (see Figure 2-1) is a secured area used to temporarily park vehicles (generally, large trucks) that contain shipments of hazardous materials entering the Base after hours. Operations at the parking lot would not change as a result of road improvements. The proposed C Bunker Access Road improvements would be designed to accommodate safe truck access to the C Bunker parking area. The existing road is narrow and is in degraded condition (cracked asphalt with vegetation growing in the center and on the edges of road).

The Proposed Action is discussed in the context of four components:

1. **Construct a new road from south Ragsdale Street to W Street.** This component of the project involves constructing a new road between south Ragsdale Street to W Street. The road would pass southwest of Taxiway M, cross Cordelia Avenue, and intersect W Street (see Figure 2-1).

2. **Improvements to W Street.** W Street is an existing one-way street located north of the munitions buildings and northwest of Taxiway M. W Street currently consists of an asphalt road, lined on either side by buildings. W Street connects on the east end with Dixon Avenue. The new road would intersect with W Street. As part of the Proposed Action, the eastern end of W Street would be improved by widening it to 36 feet and repaving. Improvements to W Street include making it a two-lane, two-way street.

3. **Construct a new road from Ragsdale Street to Perimeter Road.** This component of the project involves constructing a new road from south of Ragsdale Street to Perimeter Road (see Figure 2-1).

4. **Improvements to C Bunker Access Road.** The existing access road leading from south Ragsdale Street to C Bunker consists of a one-lane asphalt road that is used by commercial vehicles to access the C Bunker parking lot. The existing road is in deteriorating condition. The new access road to the C Bunker parking lot would join the proposed bypass road near the western boundary of the Base. A stop sign for traffic from the C Bunker parking lot would be placed at the intersection with the new bypass road.

The Proposed Action would take approximately 12 months to construct. Staging of equipment used during construction would occur on existing paved areas near the new bypass road and C Bunker Access Road. Staging would also occur at the C Bunker parking lot. Typical construction equipment that would be used includes a dump truck, backhoe, and a truck concrete mixer. Construction is scheduled to begin in spring 2011.

Additional details about the Proposed Action are included in Appendices A and B, which contain Air Force Form 813 and Air Force Form 1391 (the programming document), respectively

2.4.3 Alternative 3 – Alternate Route for Taxiway M Bypass Road

Alternative 3 would include constructing a bypass road around Taxiway M and improve W Street. The bypass road would extend from the South Gate, passing west of the munitions bunkers (Buildings 959, 960, and 961) and C Bunker Access Road to connect to the west end of W Street. Another road would be constructed from Ragsdale Street to connect the bypass road to Perimeter Road. The road to the C Bunker parking lot would not be improved. Figure 2-1 shows the proposed construction area for Alternative 3. The construction footprint under Alternative 3 would be approximately 323,640 ft^2 (7.43 acres).

Alternative 3 is discussed in the context of the following three components:

1. **Construct a new road from south Ragsdale Street to W Street.** This component of the alternative involves constructing a new road between south Ragsdale Street to the west end of W Street (see Figure 2-1).

2. **Improvements to W Street.** W Street would be widened to 36 feet and repaved. W Street would become a two-lane, two-way street.

3. **Construct a new road from Ragsdale Street to Perimeter Road.** This component of the alternative involves constructing a new road from south Ragsdale Street to Perimeter

Road (see Figure 2-1). The location of the proposed new road is currently occupied by a degraded asphalt road.

The construction schedule, equipment staging, and typical construction equipment would be similar to that discussed under the Proposed Action.

2.5 Description of Past and Reasonably Foreseeable Future Actions Relevant to Cumulative Impacts

This EA identifies actions that have been conducted in the past, are ongoing, or are in the planning stages. This EA also identifies future actions that are related to the Proposed Action. Details regarding the actions that have the potential to interact with the Proposed Action are included in Section 4.15.

2.6 Identification of Preferred Alternative

The Air Force's preferred alternative for the EA is Alternative 2, the Proposed Action, as described in Section 2.4.2. This alternative best meets the selection criteria.

2.7 Comparison of the Environmental and Socioeconomic Consequences Impacts of the Alternatives Studied

Table 2-1 summarizes the potential environmental and socioeconomic consequences of the alternatives analyzed in this EA.

TABLE 2-1
Summary of Potential Environmental and Socioeconomic Consequences
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

	Environmental and Socioeconomic Consequences		
Resource	**Alternative 1 No Action[a]**	**Alternative 2 Proposed Action[b]**	**Alternative 3 Action Alternative[b]**
Air Quality	No impact	Less than significant	Less than significant
Noise	No impact	Less than significant	Less than significant
Hazardous Materials, Waste, ERP Sites, and Stored Fuels	No impact	Less than significant	Less than significant
Hazardous Materials	No impact	Less than significant	Less than significant
Waste	No impact	Less than significant	Less than significant
ERP Sites	No impact	Less than significant	Less than significant
Stored Fuels	No impact	Less than significant	Less than significant
Water Resources, Floodplains and Wastewater			
Water Quality	No impact	Less than significant	Less than significant
Wastewater	No impact	Less than significant	Less than significant

TABLE 2-1
Summary of Potential Environmental and Socioeconomic Consequences
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Resource	Environmental and Socioeconomic Consequences		
	Alternative 1 No Action[a]	**Alternative 2 Proposed Action[b]**	**Alternative 3 Action Alternative[b]**
Flooding	No impact	Less than significant	Less than significant
Biological Resources – Wetlands and Special-status Species			
Vegetation and Wildlife	No effect	Less than significant	Less than significant
Federal- and State-listed Threatened or Endangered Species	No effect	Less than significant with mitigation	Less than significant with mitigation
Wetlands	No effect	Less than significant with mitigation	Less than significant with mitigation
Socioeconomic Resources	No effect	Short-term beneficial (construction); less than significant (operation)	Short-term beneficial (construction); Less than significant (operation)
Cultural Resources	No effect	Less than significant	Less than significant
Land Use	No effect	Less than significant	Less than significant
Transportation System	No effect	Less than significant (construction); beneficial effect (operation)	Less than significant (construction); beneficial effect (operation)
Airspace/Airfield Operations	No effect	No effect (construction); beneficial effect (operation)	No effect (construction); beneficial effect (operation)
Safety and Occupational Health	No effect	Less than significant (construction); beneficial effect (operation)	Less than significant (construction); beneficial effect (operation)
Environmental Management			
Geology and Soils	No effect	Less than significant	Less than significant
Pollution Prevention	No effect	Less than significant	Less than significant
Environmental Justice and Protection of Children	No effect	No impact	No impact
Indirect and Cumulative Impacts	No effect	Less than significant	Less than significant

[a]Under Alternative 1, construction would not take place, and, therefore, there would be no effects from construction.

[b]Effects are compared with the No Action Alternative.

Note:

ERP = Environmental Restoration Program

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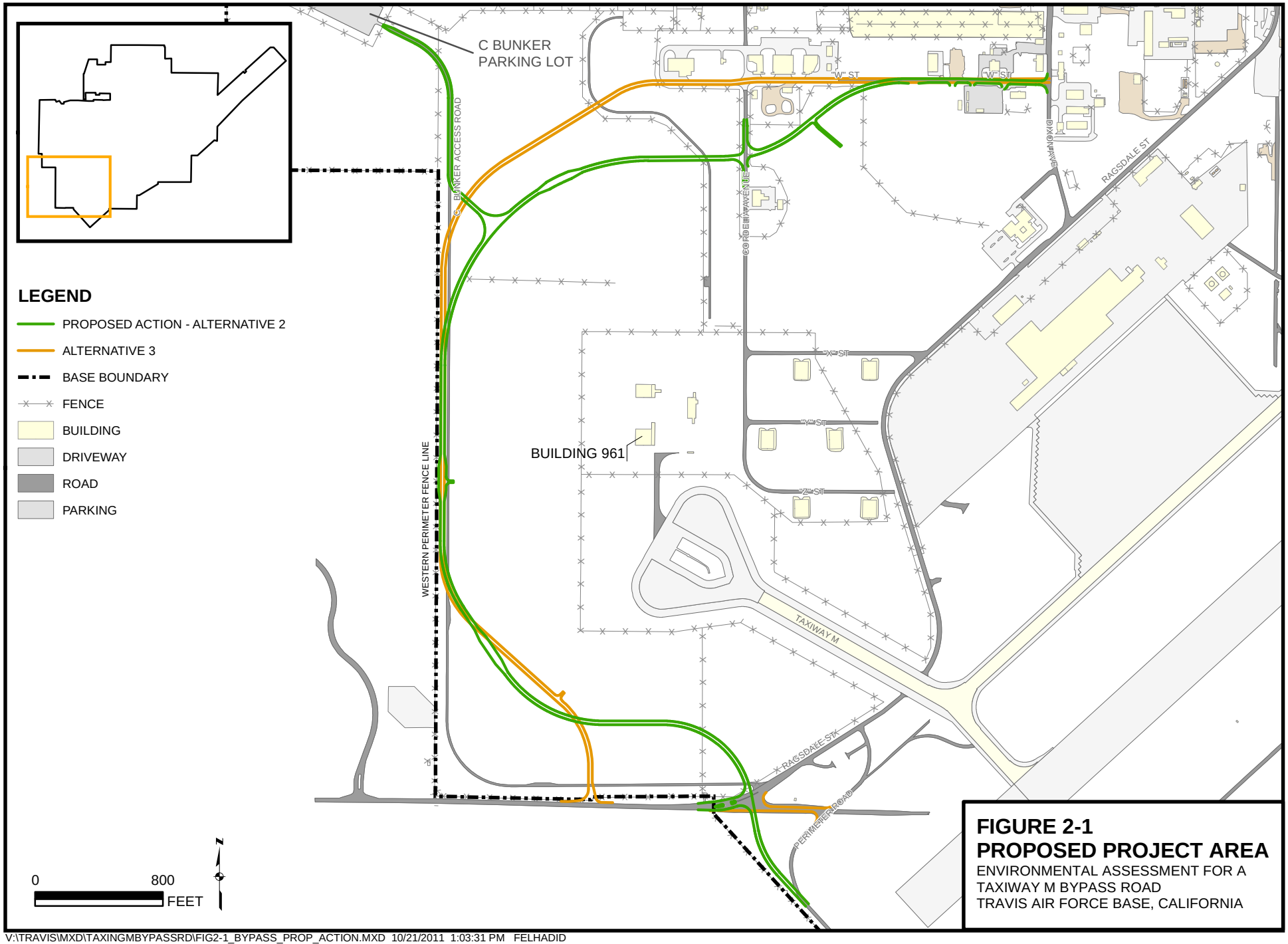

FIGURE 2-1
PROPOSED PROJECT AREA
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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SECTION 3

Affected Environment

3.1 Introduction

This section describes the environment at Travis AFB that could be affected as a result of implementing the EA alternatives (see Section 2). The potential impacts of the Proposed Action and the alternatives are described in detail in Section 4.

3.2 Air Quality

Travis AFB is located in central Solano County, which is at the eastern edge of the San Francisco Bay Area Air Basin (Basin). The Basin extends from Napa County in the north to Santa Clara County in the South. The Basin encompasses 5,340 square miles and 19 percent of California's population. The Basin is under the jurisdiction of the Bay Area Air Quality Management District (BAAQMD) pursuant to a mandate from the California Air Resources Board (CARB). Only the golf course at Travis AFB extends into a neighboring jurisdiction, the Yolo-Solano Air Pollution Control District.

The purpose of this section is to provide an overview of regional air quality. The information presented in this section includes a discussion of existing meteorological and topographical conditions, applicable federal and state regulations, regional air quality management programs, and the current air quality conditions.

3.2.1 Regional Climate

California has a Mediterranean climate, with wet winters and dry summers. Although Travis AFB is not located near the coast, it is located near the Carquinez Strait, a major break in the Coast Range that allows the ocean to moderate temperatures at Travis AFB. The Base usually experiences mild temperatures; the mean annual temperature is 60 degrees Fahrenheit. The lowest temperatures occur in January, with a mean of 46 degrees Fahrenheit. The highest temperatures occur in July and August, with a mean of 72 degrees Fahrenheit. Monthly mean relative humidity typically ranges from a low of 50 percent in June to a high of 77 percent in January. The mean annual relative humidity is 60.5 percent. Precipitation is approximately 17 inches per year.

During the late summer and early fall months, Travis AFB is subject to marine air flowing from high pressure cells offshore toward low pressure in the Central Valley. Winds tend to flow from the west at 15 to 20 miles per hour and are typically strongest in the afternoon. The Base occasionally experiences easterly winds generated in the Central Valley. Winds from the Central Valley tend to have higher pollutant loads.

3.2.2 Current Air Quality Conditions

The Basin has been assessed for compliance with California Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS). Three air quality designations can be given to an area for a particular pollutant, as follows:

- **Nonattainment:** This designation applies when air quality standards have not been consistently achieved.
- **Attainment:** This designation applies when air quality standards have been achieved.
- **Unclassified:** This designation applies when there is not enough monitoring data to determine whether the area is in nonattainment or attainment.

According to CARB, the Basin is designated nonattainment for state ozone standards, particulate matter less than 10 micrometers in diameter (PM_{10}), or fugitive dust, and particulate matter less than 2.5 micrometers ($PM_{2.5}$) (CARB, 2010). Relevant ambient air quality standards are listed in Table 3-1, with their respective attainment status. For federal standards, the Basin is designated nonattainment for 8-hour ozone and $PM_{2.5}$, and is in maintenance for carbon monoxide (CO). All other criteria pollutants are designated attainment or are unclassified.

TABLE 3-1
Bay Area Air Quality Management District Attainment Status as of October 2008
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

		CAAQS		NAAQA	
Pollutant	**Averaging Time**	**Standard**	**State Attainment Status**	**Standard**	**Federal Attainment Status**
O_3	8 Hour 1 Hour	0.07 ppm 0.09 ppm	Nonattainment	0.075 ppm NA	Nonattainment (marginal)
CO	8 Hour 1 Hour	9.0 ppm 20.0 ppm	Attainment	9.0 ppm 35.0 ppm	Attainment/maintenance
NO_2	Annual 1 Hour	0.03 ppm 0.18 ppm	Attainment	0.053 ppm 0.100 ppm	Attainment/unclassified
SO_2	Annual 24 Hour 3-hour 1 Hour	NA 0.04 ppm 0.25 ppm	Attainment	0.03 ppm 0.14 ppm NA	Attainment/unclassified
PM_{10}	Annual geometric mean 24 Hours	20 $\mu g/m^3$ 50 $\mu g/m^3$	Nonattainment	NA 150 $\mu g/m^3$	Attainment/unclassified
$PM_{2.5}$	Annual arithmetic mean 24 Hours	12 $\mu g/m^3$ NA	Nonattainment	15 $\mu g/m^3$ 35 $\mu g/m^3$	Nonattainment

[a]Annual arithmetic mean

Source: CARB, 2010

Notes:

NA = not applicable
NO_2 = nitrogen dioxide
O_3 = ozone
SO_2 = sulfur dioxide

Table 3-2 lists the number of days when pollutant concentrations exceeded NAAQS or CAAQS in BAAQMD from 1999 to 2008 for state and federal nonattainment and maintenance pollutants (ozone, CO, PM_{10}, and $PM_{2.5}$). There are no exceedances of CO concentrations for the 1-hour and 8-hour state and federal standards from 1999 to 2008.

TABLE 3-2
San Francisco Bay Area Air Basin Exceedances of the California and National Ambient Air Quality Standards, 1999 through 2008
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

	Standard Exceeded	Period	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
O_3	CAAQS	1-hour	20	12	15	16	19	7	9	18	4	9
	NAAQS	8-hour	9	4	7	7	7	0	1	12	1	12
	CAAQS	8-hour	N/A	N/A	N/A	N/A	N/A	N/A	9	22	9	20
CO	NAAQS	1-hour	0	0	0	0	0	0	0	0	0	0
	CAAQS	1-hour	0	0	0	0	0	0	0	0	0	0
	NAAQS	8-hour	0	0	0	0	0	0	0	0	0	0
	CAAQS	8-hour	0	0	0	0	0	0	0	0	0	0
PM_{10}	NAAQS	24-hour	0	0	0	0	0	0	0	0	0	0
	CAAQS	24-hour	12	7	10	6	6	7	6	15	4	5
$PM_{2.5}$	NAAQS	24-hour	N/A	1	5	7	0	1	0	10	14	12

Source: BAAQMD, 2007

Note:
N/A = not available

Ozone concentrations exceeded the NAAQS (8-hour) and CAAQS (1-hour and 8-hour) every year in BAAQMD from 1999 to 2008. Exceedances are generally attributed to unique meteorological patterns combined with increases in emissions during the summer months. Urban vehicular emissions, industrial emissions, and high ambient temperatures in the San Francisco Bay Area Air Basin contribute to summer ozone generation and subsequent air standard violations.

The closest ozone monitoring station is located about 5 miles north of Travis AFB, at 2012 Ulatis Drive in Vacaville, Solano County. The Vacaville-Ulatis station started monitoring ozone concentrations in 2003. The 8-hour ozone concentrations range from 0.078 to 0.103 parts per million (ppm), exceeding the CAAQS and NAAQS in all 6 years since the monitoring started.

Particulate matter is generated within the project area by combustion sources and wind during dry conditions. PM_{10} levels are elevated during the winter because of stable conditions and low mixing heights and because of wood smoke, vehicle exhaust, and dry, windy conditions. The closest PM_{10} monitoring station is at 650 Merchant Street in Vacaville. The 24-hour PM_{10} concentrations range from 35 to 82 micrograms per cubic meter ($\mu g/m^3$), exceeding the CAAQS in 5 of the 10 years since 1998. The 24-hour PM_{10} NAAQS has not been exceeded since monitoring began.

$PM_{2.5}$ concentrations are monitored at 304 Tuolumne Street in Vallejo. The 98th percentile $PM_{2.5}$ concentration exceeded the NAAQS in 8 of 10 years.

3.3 Noise

The Air Force typically uses the Air Installation Compatible Use Zone guidelines to promote compatible land use development. Noise is one consideration to be addressed under the Air Installation Compatible Use Zone and, accordingly, Travis AFB has assessed noise levels in relation to the flightline. The descriptor of noise levels that is typically used in California is the Community Noise Equivalent Level (CNEL). The CNEL is the average sound energy level for a 24-hour day determined after the addition of a 5-decibel (dB) penalty to noise events generated between 7:00 a.m. and 10:00 p.m. and a 10-dB penalty to noise events occurring at night between 10:00 p.m. and 7:00 a.m. The CNEL is calculated by using the sound energy generated by individual noise events, the number of events occurring during a 24-hour period, and the time of day when the events occur.

Maximum CNELs exceed 80 dB during flight operations. These noise levels are intermittent and localized to the flightline. The majority of the Base experiences CNELs ranging from 60 to 75 dB. Some activities at the Base produce noise levels higher than the CNELs produced by flight operations.

3.4 Hazardous Materials, Waste, Environmental Restoration Program Sites, and Stored Fuels

3.4.1 Hazardous Materials and Hazardous Waste

The activities conducted at Travis AFB that use most of the hazardous materials include maintaining aircraft, transportation, equipment, and facilities. These activities contribute approximately 95 percent of the total volume of hazardous waste generated at the Base, including flammable solvents, contaminated fuels and lubricants, stripping chemicals, waste oils, waste paint, absorbent materials, chemicals stored beyond their expiration date, and asbestos.

Hazardous materials are ordered, stored, and used in accordance with the Base *Hazardous Waste Management Plan* (Travis AFB, 2005). Base maintains and implements the plan to comply with state, RCRA, and Air Force regulations. The plan establishes the procedures, training requirements, inspections, and record management processes for hazardous waste. The Base has one facility, Building 1365, that is permitted for long-term storage of hazardous waste. Building 1365 is managed by the 60th Civil Engineering Squadron Environmental Flight (60 CES/CEA) and operated by contractors (Travis AFB, 2006).

3.4.2 Solid Waste

Nonhazardous waste generated at Travis AFB during fiscal year 2003 totaled 32.7 tons per day, or 11,927 tons for the year, including both recycled waste and waste sent to a disposal facility. The amount of diverted applications (which includes composting, mulching, recycling, and reusing) averaged approximately 13.48 tons per day (4,921 tons per year [tpy]). The amount of nonhazardous waste sent to disposal facility averaged approximately 19.19 tons per day (7,006 tpy) (Travis AFB, 2006). Nonhazardous solid wastes and refuse at Travis AFB are collected and disposed of by Solano County Garbage Company. The Potrero

Hill Landfill site is used for solid waste disposal. All solid waste is disposed of in accordance with the *Hazardous Waste Management Plan* (Travis AFB, 2005).

3.4.3 Operable Units and Environmental Restoration Program Sites

An operable unit (OU) is a geographical area that contains sites with soil or groundwater contamination. Two OUs on Travis AFB contain approximately 32 ERP sites that are contaminated: the West/Annexes/Basewide Operable Unit (WABOU) (Travis AFB, 2002a), and the North/East/West Industrial Operable Unit (NEWIOU).

The ERP at Travis AFB is administered by the 60 CES/CEA, Restoration Section, to remediate all accident, disposal, and spill sites that might pose a potential threat to human health and welfare or the environment. ERP sites include landfills, spill areas, waste disposal sites, drum storage areas, underground storage tanks (UST) and piping, oil/water separators, waste treatment plants, and munitions disposal sites. Some ERP sites have had extraction/remediation systems installed to facilitate site cleanup (Travis AFB, 2003a). The soil record of decision (ROD) documents describing the selected remedies for ERP sites on Travis AFB include the following:

- *Soil ROD for the West/Annexes/Basewide Operable Unit* (Travis AFB, 2002a)
- *North/East/West Industrial Operable Unit Soil, Sediment and Surface Water (SSSW) ROD* (URS, 2006)
- *Groundwater Interim ROD for the WABOU* (CH2M HILL, 1999)
- *Groundwater Interim ROD for the NEIWOU* (URS, 1997)

Several ERP sites are located adjacent to the Alternative 2 and Alternative 3 sites (see Figure 3-1). Both Alternatives 2 and 3 are located on a portion of ERP Site SD033 for which "no action" was selected as the remedy. ERP sites that had soil contamination include SS041, SD045 and RW013 (Travis AFB, 2006). Existing Land Use Controls (LUCs) for SD043 are discussed in Section 3.9.2.2.

Land use controls (LUC) for contaminated areas within WABOU and NEIWOU are discussed in Section 3.9.2.2.

3.4.4 Stored Fuels

Fuel is stored onbase in USTs and aboveground storage tanks (AST). Fuel is supplied to the flightline by a hydrant system that is supplied by seven bulk ASTs having a combined capacity of 7 million gallons. The hydrant fueling system is also associated with 21 USTs and 2 smaller ASTs, with a combined capacity of almost 19 million gallons (Travis AFB, 2006).

Gasoline and diesel fuel used for military vehicles and ground equipment are stored in ASTs and USTs in various locations at the Base. Thirty USTs are currently in use and regulated by the California UST program. Activities for removing or replacing 20 USTs are being conducted under the Solano County and State of California UST programs. There are also 38 deferred/exempt USTs at the Base (Travis AFB, 2006).

3.5 Water Resources, Floodplains, and Wastewater

This section describes the groundwater and surface water resources, floodplains, and wastewater at Travis AFB.

3.5.1 Groundwater

The depth to unconfined groundwater aquifers in Travis AFB varies seasonally from approximately 12 to 30 feet below ground surface. Intensive extraction of groundwater does not occur at Travis AFB because of poor water-bearing subsurface geology. Intensive extraction occurs west of Travis AFB and Fairfield, where the alluvium is thicker and contains a greater abundance of coarse-grained sediment. Groundwater wells in the area of Travis AFB are limited to domestic, stock-watering, and irrigation wells with typical screened depths within 100 feet of ground surface (CH2M HILL, 2001). Domestic wells, several of which are downgradient from Travis AFB, are typically used to provide water to households for domestic use (CH2M HILL, 2001).

The groundwater gradient beneath Travis AFB flows to the south and follows the regional trend. The horizontal hydraulic gradient ranges from 0.003 to 0.005 vertical foot per horizontal foot in the upper portion of the aquifer (URS Corporation, 2004). In the deeper portion of the aquifer, the hydraulic gradient ranges from 0.003 to 0.10 vertical foot per horizontal foot (Air Force, 1998).

3.5.2 Surface Water

Travis AFB is located in the northeastern portion of the Fairfield-Suisun Hydrologic Basin. Within this basin, water generally flows south to southeast toward Suisun Marsh, an 85,000-acre tidal marsh that is both the largest contiguous estuarine marsh and the largest wetland in the continental United States (CH2M HILL, 2001). Suisun Marsh drains into Grizzly and Suisun Bays. Water from these bays flows through the Carquinez Strait to San Pablo Bay and San Francisco Bay, and ultimately discharges into the Pacific Ocean near the city of San Francisco.

Travis AFB lies in the southern portion of the Union Creek watershed. The headwaters of Union Creek are located approximately 1 mile north of the Base, near the Vaca Mountains. Union Creek splits into two branches north of the Base. Onbase, the main (eastern) branch is impounded to create a recreational pond designated as the Duck Pond. At the exit from the Duck Pond, the creek is routed through an underground storm drainage system to the southeastern Base boundary, where it empties into an open creek channel.

Union Creek is the primary surface water drainage for runoff at Travis AFB (see Figure 3-2). Stormwater runoff flows into the creek through a network of pipes, culverts, and open drainage ditches. Local drainage patterns have been substantially altered by the rerouting of Union Creek, the construction of the aircraft runway and apron, the installation of storm sewers and ditches, and general development (e.g., construction of buildings, roads and parking lots).

The surface water collection system divides the Base into eight independent drainage areas. The eight drainages are shown on Figure 3-2. Drainage Basins I through VI drain into Union Creek.

3.5.3 Floodplains

The most recent Flood Insurance Rate Map (with an effective date of May 4, 2009) issued by the Federal Emergency Management Agency (FEMA) indicates that the installation is in an area "with possible but undetermined flood hazards. No flood hazard analysis has been conducted" (FEMA, 2009a). An earlier FEMA map (dated February 2009) made available for advisory purposes, showed almost the entire Base to be within a 500-year floodplain (i.e., having a 0.2 percent annual chance of flooding). The February 2009 map showed that only a small portion of the Base near the main gate is associated with the western branch of Union Creek and lying within the 100-year floodplain (i.e., having a 1 percent chance of annual flooding) (FEMA, 2009b).

3.5.4 Stormwater

Approximately 38 percent of Travis AFB consists of impervious areas. To prevent flooding, runoff from the impervious areas enters the Base stormwater drainage system. The storm drain system on Travis AFB consists of a series of underground storm drains and open ditches. These may be divided into six drainage areas, Sites I through VI, based on the Storm Water Permit (Travis AFB, 2002b). The stormwater drainage system is designed to accommodate a 10-year, 24-hour storm (Travis AFB, 2002b).

3.6 Biological Resources – Wetlands and Special-status Species

3.6.1 Areas Subject to Regulation under Sections 404 and 401 of the Clean Water Act

3.6.1.1 Overview

The U.S. Army Corps of Engineers (USACE) regulates the discharge of dredge and fill material into Waters of the United States (including wetlands) under Section 404 of the CWA. Waters of the United States are defined as all navigable waters, including the following:

- All tidal waters
- All interstate waters and wetlands
- All other waters, such as lakes, rivers, streams (perennial or intermittent), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, that the use, degradation, or destruction of which could affect interstate commerce
- All impoundments of water mentioned above
- All tributaries to waters mentioned above
- Territorial seas
- All wetlands adjacent to waters mentioned above

Waste treatment systems, including treatment ponds, are not Waters of the United States (33 CFR 328.3).

Wetlands are areas that "are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE, 1987). Any actions that involve the placement of fill material into jurisdictional waters and wetlands must comply with Sections 404 and 401 of the CWA.

USACE and EPA issued a joint memorandum on June 5, 2007, issuing new guidelines for establishing whether or not wetlands or other Waters of the United States are within USACE jurisdiction (USACE and EPA, 2007). Under these guidelines, the agencies assert jurisdiction over traditional navigable waters, wetlands adjacent to traditional navigable waters, non-navigable tributaries to traditional navigable waters that are relatively permanent waters, and wetlands that abut relatively permanent waters. The agencies may take jurisdiction over non-navigable tributaries that are not relatively permanent waters, wetlands that are adjacent to non-relatively permanent waters, and wetlands adjacent to but not directly abutting a relatively permanent, non-navigable tributary. The agencies will generally not assert jurisdiction over swales, erosional features, or ditches excavated within and draining only uplands and that do not carry a relatively permanent flow of water.

A formal wetland delineation has not been conducted for the project area because construction would not occur in a wetland, but numerous wetland resource areas in the vicinity of the proposed Taxiway M bypass road have been mapped. The proposed bypass road alternatives have been designed to avoid and minimize impacts on these wetland areas (see Figure 3-1).

3.6.1.2 Riparian Habitat

Riparian vegetation grows along the shores of freshwater creeks, rivers, and lakes. Riparian wetland habitat at Travis AFB is limited to the banks of Union Creek. The most extensive riparian area is located along the northern portion of the eastern branch of Union Creek, upstream from the Duck Pond in the northeast part of the Base (Travis AFB, 2003a). No riparian habitat occurs within the sites for Alternative 2 or Alternative 3.

3.6.1.3 Vernal Pools

Vernal pools are shallow depressions or small, shallow pools that fill with water during the winter rainy season. Vernal pools begin drying out during the spring and are completely dry during the summer. Most vernal pools at Travis AFB are northern claypan vernal pools that occur on deep alluvial soils. Vernal pools have developed an ecologically unique flora that has evolved to tolerate the extreme wetting and drying cycle. Vernal swales, which are ecologically and floristically similar to vernal pools, also occur at Travis AFB. Vernal swales consist of drainways or poorly defined depressions that are inundated seasonally but hold standing water for relatively short periods (Travis AFB, 2003a). Numerous vernal pools and swales occur near the proposed bypass road (see Figure 3-1). The alternatives have been designed to avoid all of the mapped wetland areas.

A few low, weakly expressed vernal swales are present along the proposed access route. Vegetation in these areas includes species typically associated with vernal pools such as popcorn flower (*Plagiobothrys stipitatus*), coyote thistle (*Eryngium* sp.), annual hairgrass (*Deschampsia danthonioides*), spotted-throat downingia (*Downingia concolor*), and Mediterranean barley (*Hordeum murinum*). In addition, a few excavated drainage channels are present near Cordelia Avenue (see Figure 3-1). These drainages are generally characterized by species found in the adjacent annual grassland, such as rip-gut brome, vetch, Medusa-head, and cut leaf geranium (*Geranium dissectum*). In a few areas, Italian ryegrass and Mediterranean barley are also present in the ditch channel. At the time of the April 2008 field survey, there was no evidence or indication of recent water flow in these areas.

3.6.2 Special-status Species

For the purposes of this EA, special-status species are defined as follows:

- Any species officially listed by the federal government as endangered or threatened or any species that are candidates for federal listing as endangered or threatened under the federal Endangered Species Act
- California-listed threatened, endangered, or rare species and California Department of Fish and Game (CDFG) fully protected or species of concern
- Plant species listed as rare, threatened or endangered by the California Native Plant Society

A study area was established to create a 500-foot-wide corridor, with 250 feet on both sides of the proposed alignment centerline. A list of species that potentially occur in the study area was compiled from the results of previous studies conducted on Travis AFB (see Table 3-3) as well as information from the California Natural Diversity Database (CDFG, 2008) and the California Native Plant Society (2008). Preliminary database searches included the following nine U.S. Geological Survey Topographic Quadrangles: Denverton (481B), Elmira (498C), Dozier (498D), Fairfield South (482A), Vine Hill (482D), Fairfield North (499D), Birds Landing (481A), Honker Bay (481C), and Antioch North (481D). Information on federally listed species, candidate species, and critical habitat for the Denverton Quadrangle was also obtained from the U.S. Fish and Wildlife Service (USFWS), Sacramento Field Office.

TABLE 3-3
Previous Environmental Studies Reviewed
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Title	Author	Date
Basewide Ecological Habitat Assessment for Travis Air Force Base, California	Roy F. Weston, Inc.	1994
Assessment of Special-Status Plant and Animal Species at Travis Air Force Base, Solano County, California, Phase II Surveys.	Biosystems Analysis, Inc.	1993
California Tiger Salamander Habitat Assessment at Travis Air Force Base, Solano County, California	Rana Resources	2005
Results of First Year Special-Status Vernal Pool Invertebrate Surveys at Travis Air Force Base – Winter/Spring 2004/2005	EcoAnalysts, Inc.	2005
Results of Special-Status Vernal Pool Invertebrate Surveys at Travis Air Force Base	EcoAnalysts, Inc	2006
Travis Air Force Base – Final Natural Resource Liability and Assessment Management Report	CH2M HILL	2006
Travis Air Force Base – Final Summary of Rare, Threatened, and Endangered Species Associated with Seasonal Wetlands	CH2M HILL	2006
California Tiger Salamander Breeding Habitat Assessment at Travis Air Force Base	University of California at Davis	2010

Thirty-five special-status species, including 21 plants and 14 animals, were identified as having potential to occur at Travis AFB (see Table 3-4).

TABLE 3-4
Special-status Species Potentially Occurring at Travis Air Force Base
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Species Scientific Name	Species Common Name	Protection Status	Presence
Plants			
Astragalus tener var. *tener*	Alkali milk-vetch	CNPS 1B.2	Known
Navarretia leucocephala ssp. *bakeri*	Baker's navarretia	CNPS 1B.1	Potential
Gratiola heterosepala	Boggs Lake hedge-hyssop	SE/CNPS 1B.2	Potential
Atriplex depressa	Brittlescale	CNPS 1B.2	Known
Isocoma arguta	Carquinez goldenbush	CNPS 1B.1	Potential
Neostapfia colusana	Colusa grass	FT/SE/CNPS 1B.1	Potential
Lasthenia conjugens	Contra Costa goldfields	FE/CNPS 1B.1	Known
Tuctoria mucronata	Crampton's tuctoria	FE/SE/1B.1	Potential
Downingia pusilla	Dwarf downingia	CNPS 2.2	Potential
Astragalus tener var. *ferrisiae*	Ferris' milk-vetch	CNPS 1B.1	Potential
Fritillaria liliacea	Fragrant fritillary	CNPS 1B.2	Potential
Atriplex cordulata	Heartscale	CNPS 1B.2	Potential

TABLE 3-4
Special-status Species Potentially Occurring at Travis Air Force Base
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Species Scientific Name	Species Common Name	Protection Status	Presence
Lepidium latipes var. *heckardii*	Heckard's pepper-grass	CNPS 1B.2	Potential
Cordylanthus mollis ssp. *hispidus*	Hispid bird's-beak	CNPS 1B.1	Potential
Legenere limosa	Legenere	CNPS 1B.1	Potential
Centromadia parryi ssp. *parryi*	Pappose tarplant	CNPS 1B.2	Potential
Trifolium depauperatum var. *hydrophilum*	Saline clover	CNPS 1B.2	Potential
Atriplex joaquiniana	San Joaquin spearscale	CNPS 1B.2	Known
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	FT/SE/CNPS 1B.1	Potential
Trifolium amoenum	Showy Indian clover	FE/CNPS 1B.1	Potential
Atriplex persistens	Vernal pool smallscale	CNPS 1B.2	Potential
Animals			
Athene cunicularia	Burrowing owl	CSC	Known
Rana aurora draytonii	California red-legged frog	FT	Potential
Ambystoma californiense	California tiger salamander	FT/SC	Known
Branchinecta conservatio	Conservancy fairy shrimp	FE	Potential
Elaphrus viridis	Delta green ground beetle	FT	Potential
Thamnophis couchi gigas	Giant garter snake	FT/ST	Potential
Charadrius montanus	Mountain plover	CSC	Potential
Circus cyaneus	Northern harrier	CSC	Potential
Asio flammeus	Short-eared owl	CSC	Potential
Buteo swainsoni	Swainson's hawk	ST	Potential
Agelaius tricolor	Tricolored blackbird	CSC	Potential
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	FT	Potential
Branchinecta lynchi	Vernal pool fairy shrimp	FT	Known
Lepidurus packardi	Vernal pool tadpole shrimp	FE	Potential

Sources: Travis AFB, 2003a; CDFG, 2004

Notes:

FE = Federal Endangered
FT = Federal Threatened
SE = State Endangered
ST = State Threatened
SC = State Candidate for Listing
CSC = State Species of Special Concern
CNPS 1B.1 = Plants rare, threatened, or endangered in California and elsewhere**.** Seriously threatened in California (over 80% of occurrences are threatened/high degree and immediacy of threat).

TABLE 3-4
Special-status Species Potentially Occurring at Travis Air Force Base
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Species Scientific Name	Species Common Name	Protection Status	Presence

CNPS 1B.2 = Plants rare, threatened, or endangered in California and elsewhere. Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).

CNPS 2.2 = Plants rare, threatened, or endangered in California but more common elsewhere. Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).

3.6.2.1 Botanical Surveys

Spring botanical surveys were conducted along the proposed bypass road sites by CH2M HILL on April 10, 2008. Surveys were floristic in nature and were conducted by walking meandering transects within an approximately 100-foot-wide corridor along each of the proposed routes for the bypass road (see Figure 3-1). Prior to the surveys, a reference population for Contra Costa goldfield (*Lasthenia conjugens*) (California Natural Diversity Database Occurrence #20), which is located approximately 1.3 miles to the south of the project study area, was visited to ensure that the timing of the survey coincided with the blooming period for this species. All of the plants at the reference site were in full bloom and readily identifiable to species.

Special-status plants are known to occur on Travis AFB including the federally listed Contra Costa goldfield (see Table 3-4), but there are no known occurrences of special-status plants near the proposed bypass road. During the April 2008 field surveys, no special-status plants were observed along any of the proposed bypass road alternatives. The nearest reported occurrences of Contra Costa goldfield are approximately 700 and 2,000 feet to the south and east of the study area, respectively.

3.6.2.2 Wildlife Surveys

Wildlife surveys were conducted by CH2M HILL on April 10, 2008, concurrent with the botanical survey. Surveys involved walking meandering transects along each of the proposed roadway alternatives and recording all bird, butterfly, mammal, and reptile species observed.

Two California species of concern, tricolor blackbird (*Agelaius tricolor*) and northern harrier (*Circus cyaneus*), were observed flying over the site during the surveys, but no nests were evident in the immediate vicinity of the proposed project. No other special-status wildlife species were observed during the April field surveys, and there are no known reports of special-status wildlife species in this area. Some small mammal burrows (presumably meadow voles) and evidence of pocket gopher activity were noted in the grassland/cattle pasture, but California ground squirrel burrows or potential burrowing owl nest locations were not observed.

3.6.2.3 Vernal Pool Branchiopods Surveys

EcoAnalysts conducted basewide surveys for vernal pool branchiopods between November 29, 2004, and March 21, 2005, as well as between January 8 and April 27, 2006. Surveys were conducted according to the *Interim Survey Guidelines to Permittees* (USFWS,

1996). Areas of potential habitat were sampled by using a large dip net at 2-week intervals throughout the wet season. Additional surveys for vernal pool branchiopods were conducted by CH2M HILL on February 8, 2008, for the Travis AFB South Gate Improvement Project. The surveys were performed on the property immediately south of Petersen Road.

No federally listed large vernal pool branchiopods were observed in any of the areas sampled near the proposed Taxiway M bypass road alternatives during the 2004 through 2006 wet season surveys conducted by EcoAnalysts, Inc. Vernal pool fairy shrimp have been reported at other locations on Travis AFB in the project vicinity, including a seasonal wetland approximately 750 feet southwest of the proposed intersection of the bypass road and Peterson Road. The only unique species identified by EcoAnalysts, Inc., in the immediate project vicinity was the hairy water flea (*Dumontia oregonensis*), which was found in one of the large seasonal wetlands north of Petersen Road, approximately 500 feet to the west of the proposed bypass road. Although this species is not state or federally listed as threatened or endangered, there are only two reported occurrences in California, one at Travis AFB and one at Mather Field in Sacramento County.

3.6.3 California Tiger Salamander

Protocol-level surveys for California tiger salamander (CTS) have not been conducted in the project study area. A general habitat assessment for CTS was conducted for selected wetlands on Travis AFB including the larger seasonal wetlands immediately north of Petersen Road (Rana Resources, 2005). The habitat assessment considered wetland characteristics such as water depth, size, density of aquatic vegetation, species of amphibian larvae, and the presence of small mammal burrows. Selected wetlands were sampled during daylight hours by using a 0.25-inch-mesh dip net. All amphibian larvae were noted and keyed to species; native and introduced fish or aquatic invertebrates were also noted. Pools considered likely breeding habitat for CTS had water levels deeper than 1 foot, were inhabited by aquatic invertebrates and amphibian larvae, and were surrounded by small mammal burrows. Such pools were rated on a scale of low, medium, and high with regard to the likelihood of being CTS breeding habitat. The rating was based on water depth and the relative abundance of food. Wetlands with abundant food resources and deep water were given the highest the rating. Pools not fitting these criteria were likely to be small, contained fish, or were completely dry. Those pools were rated "None" (with regard to the likelihood of being CTS breeding habitat).

According to the habitat assessments conducted by Rana Resources, none of the large seasonal wetlands in the project study area were considered to be suitable CTS breeding habitat. Factors considered in this determination included shallow water levels, eutrophication, dense mats of aquatic vegetation, and the presence of introduced fish (mosquitofish [*Gambusia affinis*]). Surveys conducted within vernal pools at the project site in spring 2010 did not identify the presence of California tiger salamander larvae and also determined that suitable breeding habitat is absent in the project area (Johnson and Shaffer, in press). USFWS identified a potential breeding pond within migration range of the project area outside the Base boundary southwest of the project area. The accepted range for an area to be considered upland habitat is 1.3 miles from a breeding pond. Based on life-cycle descriptions of this species, the California tiger salamander can migrate from this potential

breeding pond southwest of the project area. The annual grassland vegetation within the project area meets the requirements of upland habitat for this species; therefore, this species has the potential to be present within the action area and may be affected by the Proposed Action. Reported occurrences of California tiger salamanders on Base and adjacent properties are shown in Figure 3-3.

3.7 Socioeconomic Resources

Socioeconomic resources include the population, income, employment, and housing conditions of a community or region of influence. Socioeconomic conditions could be affected by changes in the rate of population growth, the demographic characteristics of a community, or employment within the region of influence caused by the implementation of Alternative 2 or Alternative 3.

The total population of Solano County, based on a 2006 estimate, is approximately 412,000 (U.S. Census Bureau, 2000). Travis AFB is the largest employer in Solano County, employing more than 14,000 people, including 3,494 civilians. The Base provides approximately 10 percent of the total local employment and has an annual payroll of $451 million. The Base adds an annual value of $176 million to the community by creating an estimated 5,300 indirect jobs. Travis AFB workers participate in numerous group and charity projects and contribute more than $333,000 annually to charitable organizations. The Base's overall impact on the county and surrounding area is estimated to exceed $790 million (Travis AFB, 2003b).

The Base is located in a rapidly growing part of the San Francisco Bay Area. Solano County grew at a rate 50 percent higher than the San Francisco Bay Area as a whole between 1990 and 2000. During the same period, the city of Fairfield grew at twice the overall rate. This accelerated rate of growth is expected to continue, and more than 80,000 additional residents are expected to have migrated to Solano County by 2010. The local communities are creating development patterns that are compatible with the Base and its mission through their local plans and ordinances (Travis AFB, 2003b).

3.8 Cultural Resources

3.8.1 Cultural History

The region where Travis AFB is located was once inhabited by the Southern Patwin (also known as Wintuan) tribe of Native Americans. The early inhabitants of the region established tribelets (i.e., inhabitants of individual villages or affiliated groups of villages) adjacent to freshwater marshes where they hunted, gathered, and fished for subsistence. The primary tribelets in the region were the Suisun and Talenas. Spanish missionaries arrived circa A.D. 1750 to find a proto-agriculture culture in the region (Travis AFB, 2010). The Southern Patwin were adversely affected by mission activities, disease, and disruption by gold miners, who eventually became settlers and had largely abandoned the area prior to epidemics of malaria and smallpox in 1833 and 1837. Descendants of the Southern Patwin currently reside in the northern part of their former range in the Sacramento Valley (URS Corporation, 2004).

The area surrounding Travis AFB is cultivated for agricultural products and used for grazing livestock. These activities were first performed during the Spanish Mission Period and later by Mexicans and European Americans during the Mexican Period and early American Period. Spain ruled the region from 1750 until the Mexican government took control in 1830. American rule replaced Mexican rule beginning in the 1840s (Travis AFB, 2010).

The land currently occupied by Travis AFB was initially known as "poor man's acres" and was not considered prime farmland. The first known settler, a farmer named Brinkerhoff, arrived in the 1850s. The Base site was historically used for ranching and limited irrigated farming (Travis AFB, 2010).

Travis AFB was originally created as a temporary bomber base in 1942. The Base was quickly recognized as an excellent air transport facility and was commissioned as the Fairfield-Suisun Army Air Base in 1943. In 1950, the Base was renamed after a former commander of the 9th Heavy Bombardment Wing, Brigadier General Robert Falligant Travis. Today, Travis AFB is known as "The Gateway to the Pacific," and is among the largest and busiest military air terminals in the United States.

3.8.2 Cultural Resource Investigations and Resources

Since 1909, 19 cultural resource studies have been conducted at or near Travis AFB and surrounding areas. These studies identified 10 archeological sites and 27 buildings and structures on Base property that are potentially significant. Three of the 10 archeological sites are considered potentially prehistoric, and the remaining 7 are considered potentially historical in age (Travis AFB, 2010). All 10 sites were evaluated for eligibility for the National Register of Historic Places but were not eligible.

Twenty-seven buildings and structures associated with the Cold War are potentially eligible for inclusion on the National Register of Historic Places and are the only known historic cultural resources at Travis AFB (Travis AFB, 2010). Of the 27 potential historical buildings, 7 are located near the Alternative 2 site, and 15 are located near the Alternative 3 site, along W Street and Dixon Avenue. The 15 potentially historical buildings, their original uses, and the year each was built are listed in Table 3-5. Figure 3-1 shows the location of these buildings in relation to the Alternative 2 and Alternative 3 sites.

TABLE 3-5
Potentially Historical Buildings near Alternative 2 at Travis Air Force Base
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Building Number	Original Use	Year Built
902	Base Spares Office	1951 – 1953
903	Storage, C Structure	1951 – 1953
904	Base Spares Warehouse #1	1951 – 1953
905	Base Spares Warehouse #2	1951 – 1953
906	Base Spares Warehouse	1951 – 1953
908	Supply and Issue Shop	1953 – 1954
912	Base Communications Office	1956 – 1957
930	Readiness Crew and Operations Facility	1951 – 1953

TABLE 3-5
Potentially Historical Buildings near Alternative 2 at Travis Air Force Base
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Building Number	Original Use	Year Built
931	Heavy Equipment Shop	1951 – 1953
932	Surveillance and Inspection Shop	1951 – 1953
934	Surveillance and Inspection Shop	1951 – 1953
936	Surveillance and Inspection Shop	1951 – 1953
938	Base Spares Warehouse	1958 – 1959
940	Paint Shop	1959 – 1960
942	Surveillance and Inspection Shop	1956 – 1956

Source: Travis AFB, 2010

3.9 Land Use

Travis AFB occupies approximately 5,128 acres near the center of Solano County, California (Travis AFB, 2003a). The Base is located less than 5 miles east of downtown Fairfield and approximately 8 miles south of downtown Vacaville (see Figure 1-2).

3.9.1 Land Use Categories

Land uses at Travis AFB are grouped into 12 functional categories, as follows:

- **Administrative –** uses include personnel, family services, police and security, wing/ group headquarters, legal services, communications, gate and visitor management, and other support facilities.
- **Aircraft Operations and Maintenance –** uses include aircraft operations, aircraft maintenance, aircrew and maintenance training facilities, and passenger and freight terminal facilities.
- **Airfield –** uses consist of pavement system, related open space, navigational aids, and airfield and airway clearance surfaces.
- **Community (Commercial) –** uses include the exchange, commissary, banking, dining facilities, eating establishments, indoor recreation facilities, and service stations. Supports the needs of Base personnel and their families.
- **Community (Service) –** uses include schools, education centers, library, chapel, post office, and child development facilities. Supports the needs of Base personnel and families.
- **Housing (Accompanied) –** uses include family housing, mobile home parks, and temporary lodging facilities.
- **Housing (Unaccompanied) –** uses include dormitories for bachelors and quarters for visiting personnel.

- **Industrial –** uses include fire stations, base supply and equipment complex, fuel facilities, vehicle maintenance, civil engineer complex, open storage, utilities infrastructure, emergency response, ordinance and weapons storage, and other industrial uses.
- **Medical –** uses include medical, dental, and Veterans Administration clinics, veterinary clinics, and bioenvironmental engineering facilities.
- **Open Space –** uses include conservation and preservation areas, safety, security, and buffer zones including spaces that are unsuitable for development.
- **Outdoor Recreation –** uses include activities such as golf and swimming, park and picnic facilities, and recreation equipment checkout and storage.
- **Water –** uses include open space, outdoor recreation activities, and buffer space between incompatible uses. Typically comprise ponds, streams, lakes, shorefronts, and oceans.

Alternative 2 and Alternative 3 sites are primarily Open Space. Adjacent land uses along W Street include Administrative, Aircraft Operations and Maintenance, and Industrial, (Travis AFB, 2006). Portions of the project area are classified as grazing management units (GMU). GMU 4 (cattle grazing) and GMU 10 (horse grazing) are located in the project area (Travis AFB, 2003a). The Alternative 2 and Alternative 3 sites are currently in an open grassland, much of which is currently leased for cattle grazing.

3.9.2 Land Use Restrictions

Land use restrictions and controls are established as buffers around certain facilities and contaminated areas on Travis AFB to protect human health from potential adverse effects.

3.9.2.1 Quantity-distance Zones

Travis AFB has established explosive safety quantity-distance zones (Q/D arcs) to protect onbase military and civilian population from hazards associated with the handling and storage of explosives. The radii of the Q/D arcs range from 1,260 to 2,100 feet. These Q/D arcs ensure that any area where explosives are stored or handled (e.g., the munitions storage area) are separated from the following:

- Other areas containing explosives or propellants
- Petroleum, oil, and lubricant storage
- Inhabited buildings and facilities not related to explosives operations
- Aircraft parking, storage, and operation areas

Building 961 is located to the northwest of Taxiway M, and to the south and east of the Alternative 2 and Alternative 3 sites (see Figure 2-1). Building 961 and its adjacent storage area are currently used by Travis AFB for munitions storage. The storage of munitions adjacent to Building 961 currently violates the 1,260-foot minimum setback requirement (between munitions facilities and for public transportation routes on Travis AFB) (Travis AFB, No date).

3.9.2.2 Land Use Controls for ERP Sites Near Alternative 2 and 3 Sites

Two OUs on Travis AFB contain approximately 32 ERP sites. Section 3.4.3 provides more information regarding OUs and ERP sites.

The Alternative 2 and 3 sites are located on a portion of ERP Site SD033 for which "no action" was the selected remedial action and there are no Land Use Controls (LUCs) associated with this portion of SD033. Of all ERP Soil Sites adjacent to the Alternative 2 and 3 sites, only SD043, Building 916, has LUCs in effect. In general, those LUCs restrict soil disturbances and further site development without ERP staff review and notice to regulators. Additionally, down-gradient monitoring of groundwater is conducted within the Travis AFB Groundwater Sampling and Analysis Program for SD043.

LUCs for ERP sites on or adjacent to Alternatives 2 or 3 include the following (Travis AFB, 2006):

- SS041: Building 905 is in active use. Soil cleanup was completed in 2003. Groundwater cleanup is complete. No further remedial action is planned. This site will be closed in a future decision document.
- SD042 (closed): This site is a drainage ditch adjacent to three industrial facilities. Soil remediation was completed in 2003 to residential standards, allowing unrestricted land use.
- SD043: Building 916 is in active use, and LUCs are in effect. Groundwater is undergoing cleanup.
- SD033: Contaminated sediment was excavated in 2007. Contaminated groundwater is undergoing cleanup.
- SD045: Contaminated soil was excavated in 2007.
- RW013 (closed): Soil cleanup action was completed in 2003. RW013 is available for unrestricted use.

3.10 Transportation System

This section describes the components of the transportation system at Travis AFB. Information regarding the transportation system has been summarized from the *General Plan for Travis Air Force Base, California* (Travis AFB, 2006). The road network surrounding Travis AFB is shown on Figure 3-4.

The road network serving Travis AFB consists of several major thoroughfares including Travis Avenue, Ragsdale Street/Cannon Drive, Burgan Boulevard, Parker Road, Hickam Avenue, and Hangar Avenue. Minor streets, branching off from these main roadways are Skymaster Drive, Broadway Street, W Street, Cordelia Avenue, and 1st Street, which serve as collector facilities for the Base.

Ragsdale Street is a two- to four-lane road oriented in a north-south direction. Ragsdale Street is centrally located and, therefore, serves much of the traffic to and from the flightlines and freight-handling areas. Approximately twice a week, traffic is halted on Ragsdale Street at the Taxiway M crossing for taxiway operations. Base personnel are used to control

traffic, and barriers are temporarily placed on both sides of Taxiway M to prevent traffic from entering the taxiway during operations.

W Street is a two-lane paved road on the east end (connecting with Dixon Avenue); at the west end there is a one-way loop that reconnects to the two-lane portion of the street. Cordelia Avenue and Perimeter Road are two-lane, paved roads. There are no sidewalks or bicycle paths on Ragsdale Street, W Street, or Cordelia Avenue.

Facilities within Travis AFB's transportation system include parking areas, sidewalks, bicycle paths, mass transit, a passenger/cargo terminal, and a railhead. The maximum design capacity of onbase roads is 14,000 pounds (i.e., Highway Class).

3.11 Airspace/Airfield Operations

Airfield operations refer to any takeoff or landing at an air base. The activity may be either part of a training maneuver or defense-related operations. In fiscal year 2003, the air crews at Travis AFB flew more than 68,000 hours, hauling 300 million pounds of cargo and 93,000 passengers (Travis AFB, 2003b).

Travis AFB has established several clearance zones, in accordance with Unified Facilities Criterion 3-260-01, *Airfield and Heliport Planning and Design*. Clearance zones are imaginary surfaces developed to promote safe operations in the airfield vicinity and include the following:

- **Primary Surface –** extends 200 feet beyond each end of the runway and 1,000 feet on both sides of the runway centerline.
- **Clear Zone –** extends 3,000 feet from the end of the runway and 1,500 feet on either side of the runway centerline.
- **Accident Potential Zones I and II –** Accident Potential Zone I extends 5,000 feet from the clear zone; Accident Potential Zone II extends an additional 7,000 feet from the edge of Accident Potential Zone I.
- **Approach/Departure Clearance Surface –** established to ensure safe landing/takeoff of aircraft at Travis AFB. The inclined plane, which is 2,000 feet wide at one end of the runway and 16,000 feet wide at the opposite end, extends 50,000 feet outward from the runway, at a slope of 50:1 along the runway centerline, to an elevation of 500 feet above ground surface. Activities are restricted in this area to ensure safe aircraft operations. Restricted activities include those that penetrate the clearance surface, release substances into the atmosphere that could reduce visibility or impair pilots' vision (e.g., smoke, dust, light emissions), produce emissions that could impact aircraft operation (e.g., communication or navigational equipment), or could attract birds.
- **Transitional Imaginary Surface –** an inclined plane extending outward and upward, beginning at 1,000 feet from the runway centerline, at right angles to the centerline at a slope of 7:1.
- **Taxiway Clearance Line –** extends 200 feet from the taxiway centerline. No obstacles, fixed or mobile, are allowed within this zone.

The portion of Ragsdale Street that crosses Taxiway M is within the Taxiway Clearance Line zone and the Clear Zone. Alternative 2 and Alternative 3 would be located outside of the Taxiway Clearance Line zone and would remain within the Clear Zone. The UFC 3-260-01 states that, to meet specific airspace/airfield operations criteria, construction must be more than 1,000 feet from the runway centerline, and constructed structures should be under a 7:1 ratio from the 1,000-foot line. Air Force Instruction 32-7084 lists the compatibility of various land uses with the different types of zones surrounding the airfield.

3.12 Safety and Occupational Health

Safety and occupational health is managed by BioEnvironmental. Construction site safety and accident prevention are ongoing activities for any Air Force job site. As part of the contracts for construction services, standard terms and conditions include safety as a priority. Areas of concern include compliance with regulations typical for construction projects, such as confined-space regulations, handling of hazardous materials, minimum personal protection equipment standards, and limited access to the construction area.

Building 961 is located northwest of Taxiway M (see Figure 2-1). Building 961 and its adjacent storage area are currently used by Travis AFB for munitions storage. The storage of munitions adjacent to Building 961 violates the 1,260-foot minimum setback requirement between munitions facilities and for public transportation routes on Travis AFB (Travis AFB, Undated).

3.13 Environmental Management

Environmental Management includes geology, soils, and pollution prevention. The following sections describe the regional geology of Travis AFB, the soil types present, and pollution prevention plans that are in place at the Base.

3.13.1 Geology

Travis AFB is located on the western edge of the Sacramento Valley segment of the Great Valley Geomorphic Province. The Coast Range Geomorphic Province, which consists of folded and uplifted bedrock mountains, lies to the west of Travis AFB (Thomasson et al., 1960; Olmsted and Davis, 1961).

The geomorphology of Travis AFB is characterized by gently sloping alluvial plains and fans. These coalescing, low-relief fans were deposited by Ulatis, Union, Alamo, Laurel, and Suisun Creeks. Most of the alluvial material was deposited prior to the last period of glaciation during the Pleistocene Epoch, and is referred to as Older Alluvium. During the last 15,000 years, as sea levels have risen, the drainages have refilled with alluvium. This material is referred to as Younger Alluvium. Some topographic relief in the form of very low ridges is caused by outcroppings of sedimentary rock in the Travis AFB area.

Figure 3-5 is a geologic map illustrating the distribution of shallow bedrock units and alluvium in the vicinity of Travis AFB. Bedrock at Travis AFB consists of consolidated to semiconsolidated sedimentary rock.

Uplift of the Coast Ranges and sedimentary deposition in adjacent basins continued throughout the Pleistocene Epoch and formed the current Fairfield-Suisun Hydrologic Basin. Travis AFB is located on an alluvial fan that extends from the Vaca Mountains to Suisun Marsh. The alluvium in the vicinity of Travis AFB originated from the erosion of the elevated bedrock formations and subsequent deposition in various continental environments. Sediment eroded from the Vaca Mountains has been carried in several streams (e.g., Union Creek) that have migrated laterally across the Base.

At Travis AFB, the overall thickness of the alluvium ranges from 0 to approximately 70 feet but is generally less than 50 feet. West of Travis AFB, the thickness of the alluvium increases to more than 200 feet (Thomasson et al., 1960).

Past tectonic processes folded and uplifted the bedrock to form the hills and mountains located north, west, and south of Travis AFB. Outcrops of relatively resistant Markley Sandstone, Domengine Sandstone, and Tehama Formation form most of the topographic high points onbase.

Travis AFB is located within the San Francisco Bay region, a region that is susceptible to frequent earthquake activity. The U.S. Geological Survey concluded that there is a 70 percent probability that at least one Magnitude 6.7 or greater earthquake, capable of causing widespread damage, striking the San Francisco Bay region before 2030 (Travis AFB, 2006).

The Vaca Fault system, shown on Figure 3-5, traverses the eastern portion of the Base. A potentially more devastating fault, the Green Valley Fault, is located 10 miles west of the Base. The most prominent fault zones in the San Francisco Bay region are the San Andreas, the Hayward, and the Calaveras Faults, which are located 20 miles or more from the Base (Travis AFB, 2006).

3.13.2 Soils

Soil develops from geologic material exposed at the earth's surface as the material is altered through physical, chemical, and biological processes. The nature of soil is in part a function of climate, surface slope, time of exposure at the surface, and the type of original (parent) material. Soils in the vicinity of Travis AFB are classified as alfisols, which are primarily silt and clay loams that exhibit low permeability and poor drainage characteristics.

Soil types in the area of the Proposed Project include Altamont-San Ysidro, Antioch-San Ysidro, and Solano Loam. A soil map depicting the distribution of soil types for Travis AFB and vicinity is provided on Figure 3-6.

Farmland of statewide importance is land that has a combination of physical and chemical characteristics that make it good for food, feed, forage, fiber, and oilseed crops. Farmland of statewide importance exists on Travis AFB in several locations, including the southwest corner adjacent to the western perimeter fence, within a portion of the project area. Portions of the project area are classified as GMUs. GMU 4 (cattle grazing) and GMU 10 (horse grazing) are located in the project area (Travis AFB, 2003a).

3.13.3 Pollution Prevention

Travis AFB has an active Pollution Prevention Program to reduce the generation of wastes through a hierarchy of actions ranging from the preferred choice of source reduction to recycling, treatment, and finally, disposal as a last resort. The *Pollution Prevention Management Action Plan* (Travis AFB, 2004) defines the framework to accomplish these actions. The plan analyzes all processes that use hazardous materials and generate hazardous waste streams, and then evaluates options to reduce the volume or toxicity of generated wastes. The program includes minimizing wastes generated by ERP sampling activities.

3.14 Environmental Justice and Protection of Children

EO 12898 requires each federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." A minority population can be described as being composed of people who identify themselves to the U.S. Census Bureau as American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic, and where such populations exceed 50 percent of the population in an area or where the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population (CEQ, 1997).

Each year, the U.S. Census Bureau defines the national poverty thresholds, which are measured in terms of household income and the number of people within the household. Individuals falling below the poverty threshold ($21,386 for a household of four in 2007) are considered low-income individuals. (U.S. Census Bureau, 2008)

Solano County is a large, demographically diverse county, with communities ranging from the urban areas of Vallejo and Fairfield in the southwest to small rural towns, such as Dixon and Rio Vista. The estimated 2006 population of Solano County was 411,680, with 63.9 percent White; 15.4 percent African American; and 22.0 percent Hispanic (U.S. Census Bureau 2000).

The city of Vallejo, the largest city in Solano County, had an estimated 2003 population of 119,708 people. Vallejo is more diverse than the county as a whole, with a population that is 36 percent White, 23.7 percent African American, and 15.9 percent Hispanic. Approximately 10 percent of the population in Vallejo is at or below the poverty level. Fairfield is the second largest city in the county, with a 2006 estimated population of 102,762. Fairfield is the closest city to Travis AFB. Fairfield more closely reflects the cultural composition of the county. The greater part of the population in Fairfield is White (56.2 percent), with lower percentages of Hispanic (18.8 percent) and African American (15.0 percent). Approximately 9.3 percent of individuals live at or below the poverty level (U.S. Census Bureau, 2000).

The resident population of the Base was 11,598 people in 2003 (Travis AFB, 2003b). Although demographic data for Travis AFB were not available, the racial composition of the Air Force serves as an approximation of the racial composition of the Base.

Children are present on Travis AFB in family housing, child development centers, the Travis AFB youth center, schools, and playgrounds.

C BUNKER PARKING LOT

C BUNKER ACCESS ROAD

WESTERN PERIMETER FENCE LINE

BUILDING 961

SD042

SD043

SS041

RW013

WIOU

SD045

SD033

SS014

SD001

"W" ST

"X" ST

"Y" ST

"Z" ST

GORDEN AVENUE

BIXLER AVENUE

TAXIWAY M

RAGSDALE ST

PERIMETER ROAD

KEY MAP

LEGEND

- SEWER INLET
- STORM MANHOLE
- PROPOSED ACTION – ALTERNATIVE 2
- ALTERNATIVE 3
- BASE BOUNDARY
- ELECTRICAL CABLE LINE
- FENCE
- FUEL PIPELINE
- OPEN DRAINAGE DITCH
- SEWER PIPE
- STORM PIPE
- WATER LINE
- SURFACE WATER
- ERP SITES
- WETLAND
- SURFACE WATER
- HISTORIC BUILDING
- BUILDING
- PARKING
- ROAD
- DRIVEWAY

N

0 250 500 FEET

FIGURE 3-1
ENVIRONMENTAL RESOURCES AND INFRASTRUCTURE

ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

V:\TRAVIS\MXD\TAXINGMBYPASSRD\FIG3-1_ENV_RES_INFA.MXD 10/21/2011 1:04:43 PM FELHADID

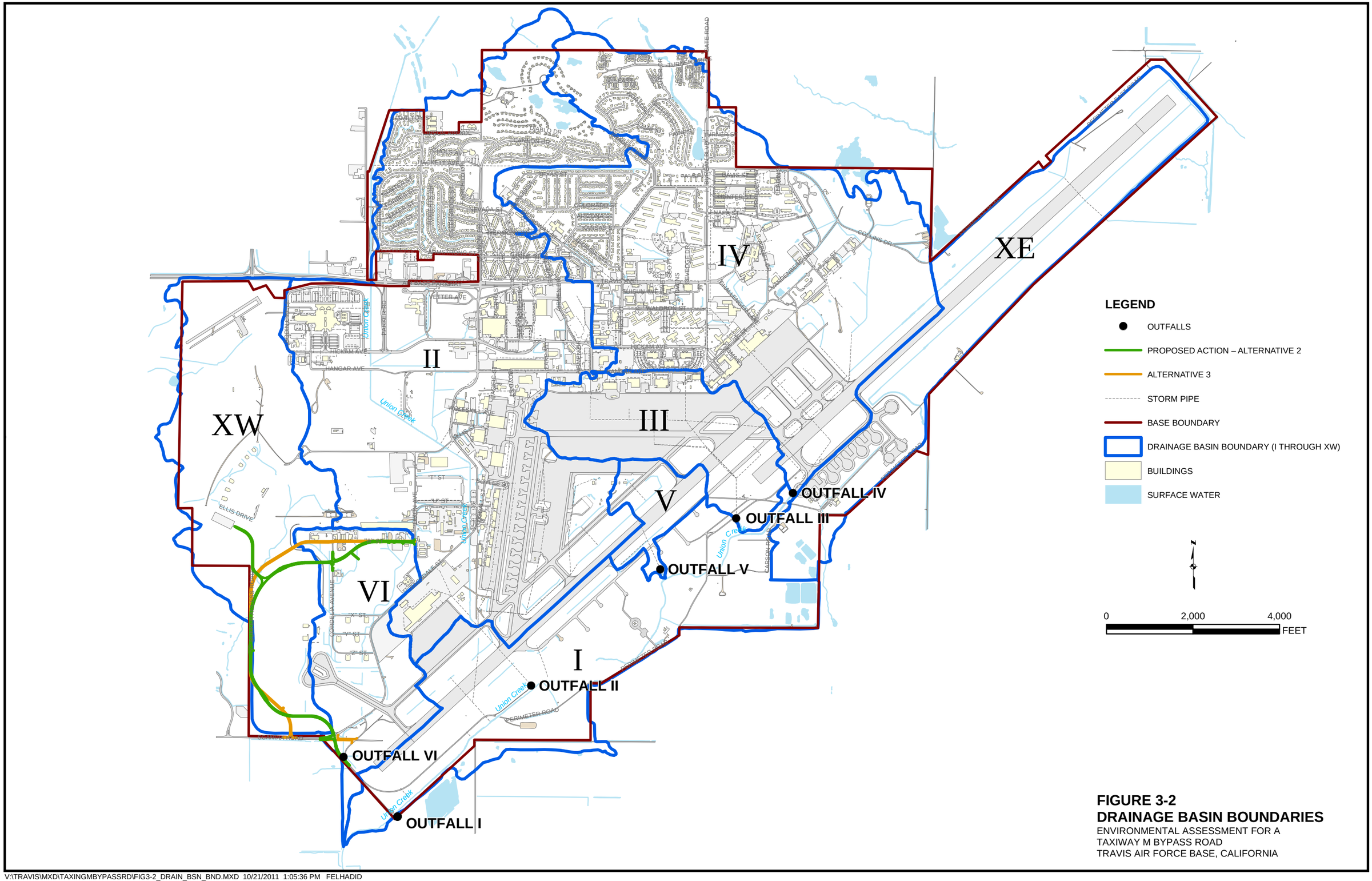

FIGURE 3-2
DRAINAGE BASIN BOUNDARIES
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

V:\TRAVIS\MXD\TAXINGMBYPASSRD\FIG3-2_DRAIN_BSN_BND.MXD 10/21/2011 1:05:36 PM FELHADID

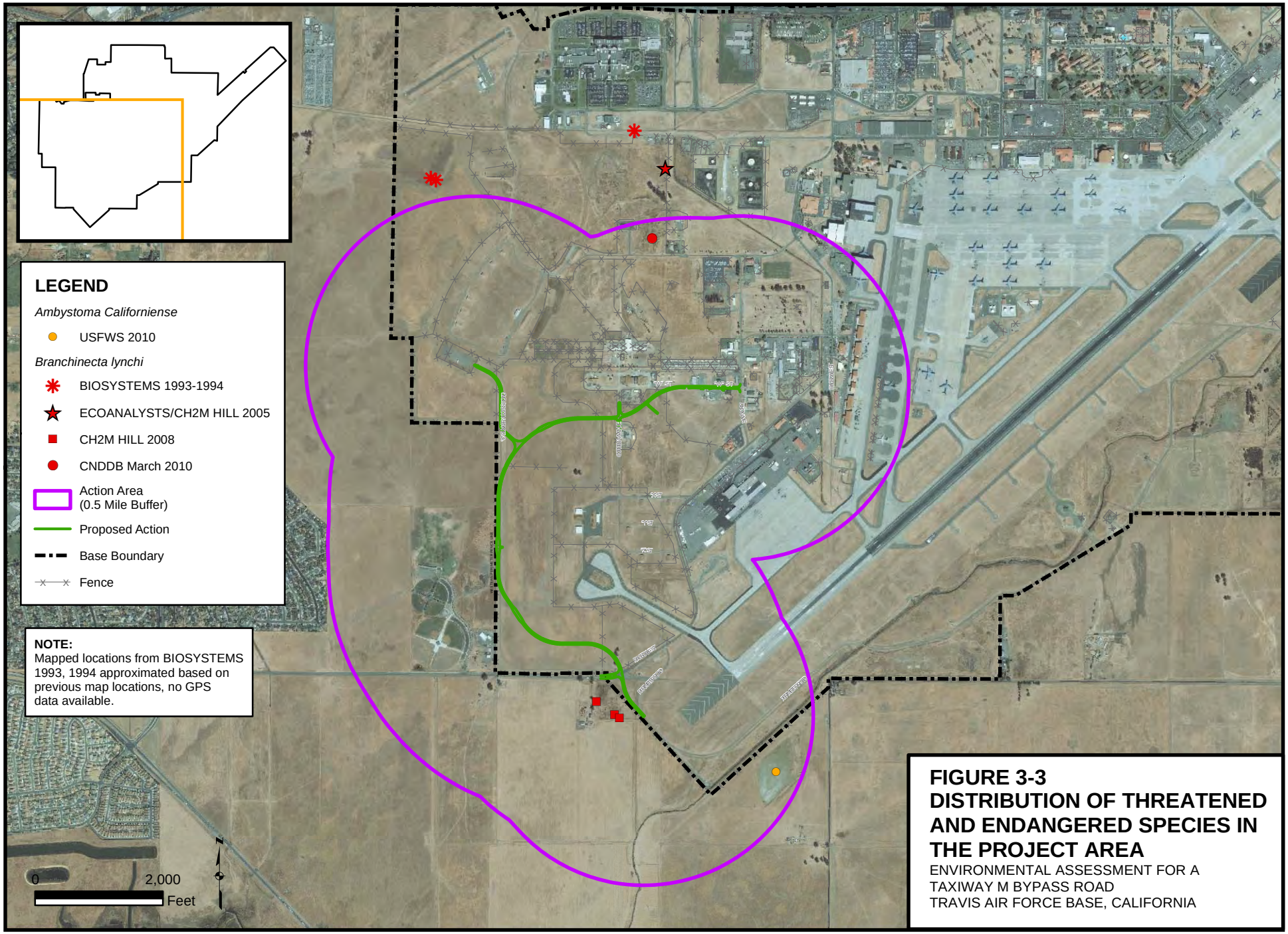

FIGURE 3-3
DISTRIBUTION OF THREATENED AND ENDANGERED SPECIES IN THE PROJECT AREA
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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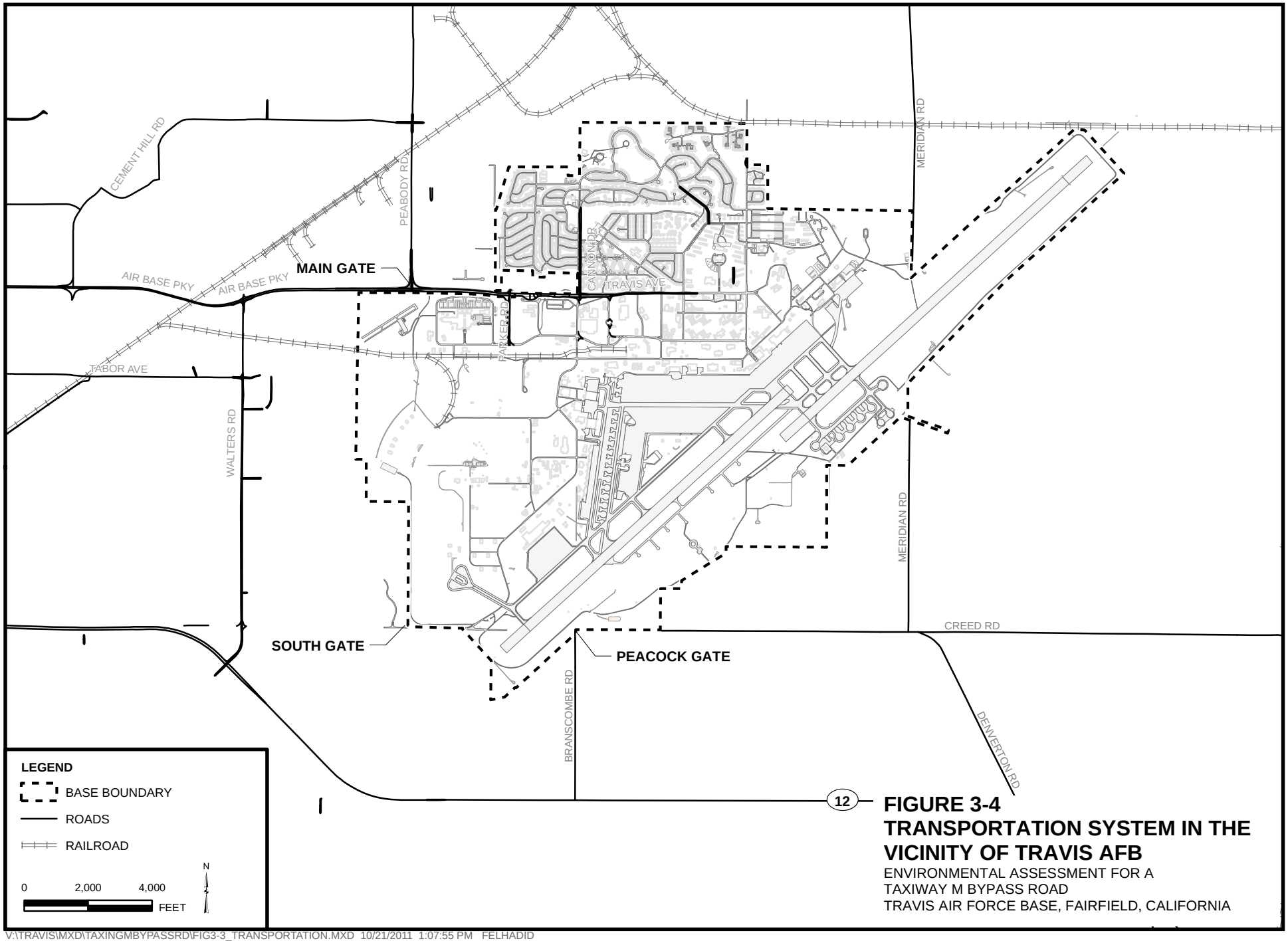
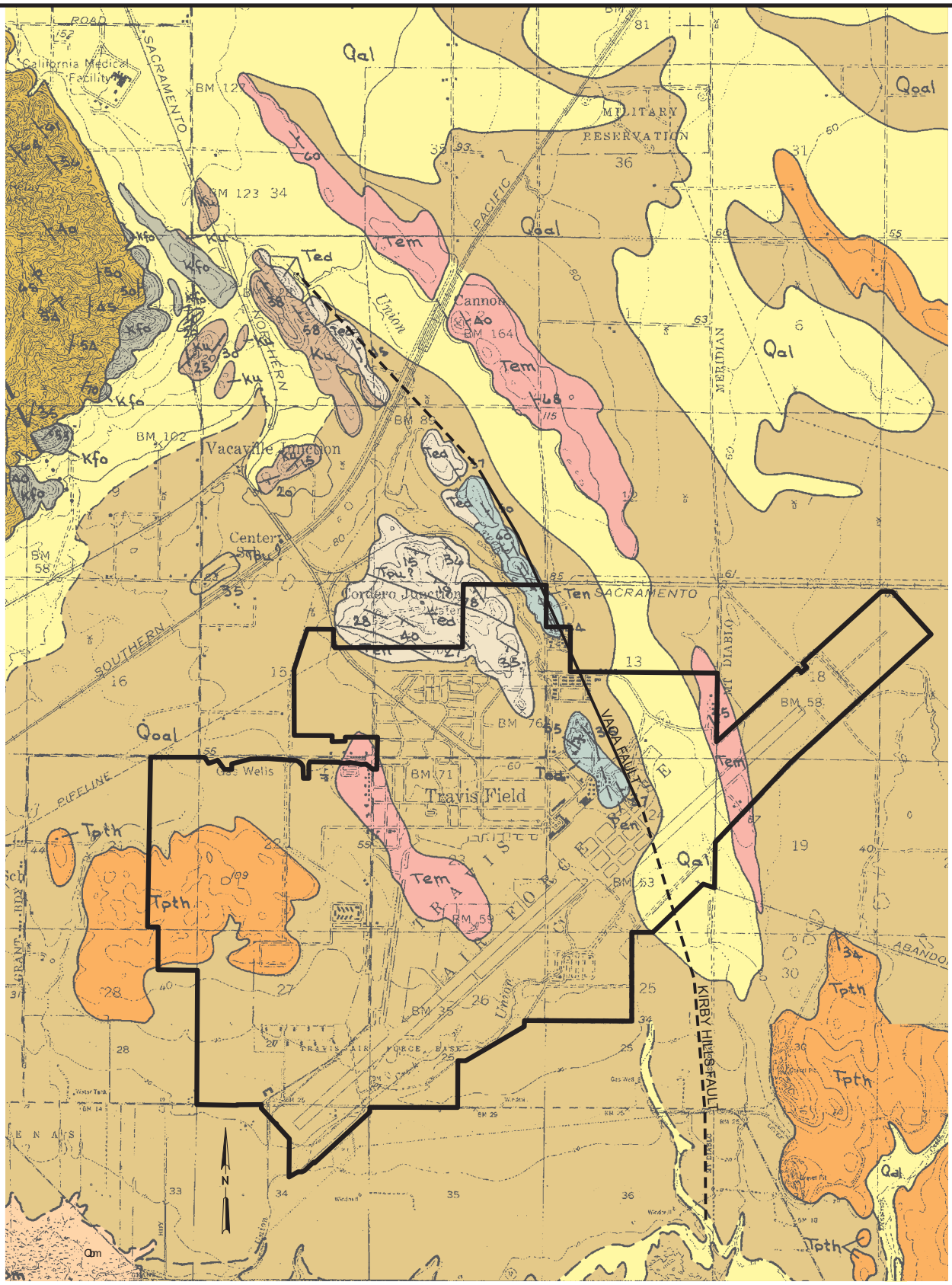


FIGURE 3-4
TRANSPORTATION SYSTEM IN THE VICINITY OF TRAVIS AFB
ENVIRONMENTAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

V:\TRAVIS\MXD\TAXINGMBYPASSRD\FIG3-3_TRANSPORTATION.MXD 10/21/2011 1:07:55 PM FELHADID



LEGEND

- Qal – YOUNGER ALLUVIUM
- Qbm – BAY MUD
- Qoal – OLDER ALLUVIUM
- Tpth – TEHAMA FORMATION
- Tem – MARKLEY SANDSTONE
- Ten – NORTONVILLE SHALE
- Ted – DOMENGINE SANDSTONE
- Tpu – UNNAMED FORMATION
- Kfov – FORBES FORMATION
- Kg – GUINDA FORMATION

FIGURE 3-5
GEOLOGIC MAP OF TRAVIS AFB AND VICINITY
ENVIRONMENTAL ASSESSMENT FOR
A TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

ES081110094230RDD_04 (10/21/11)

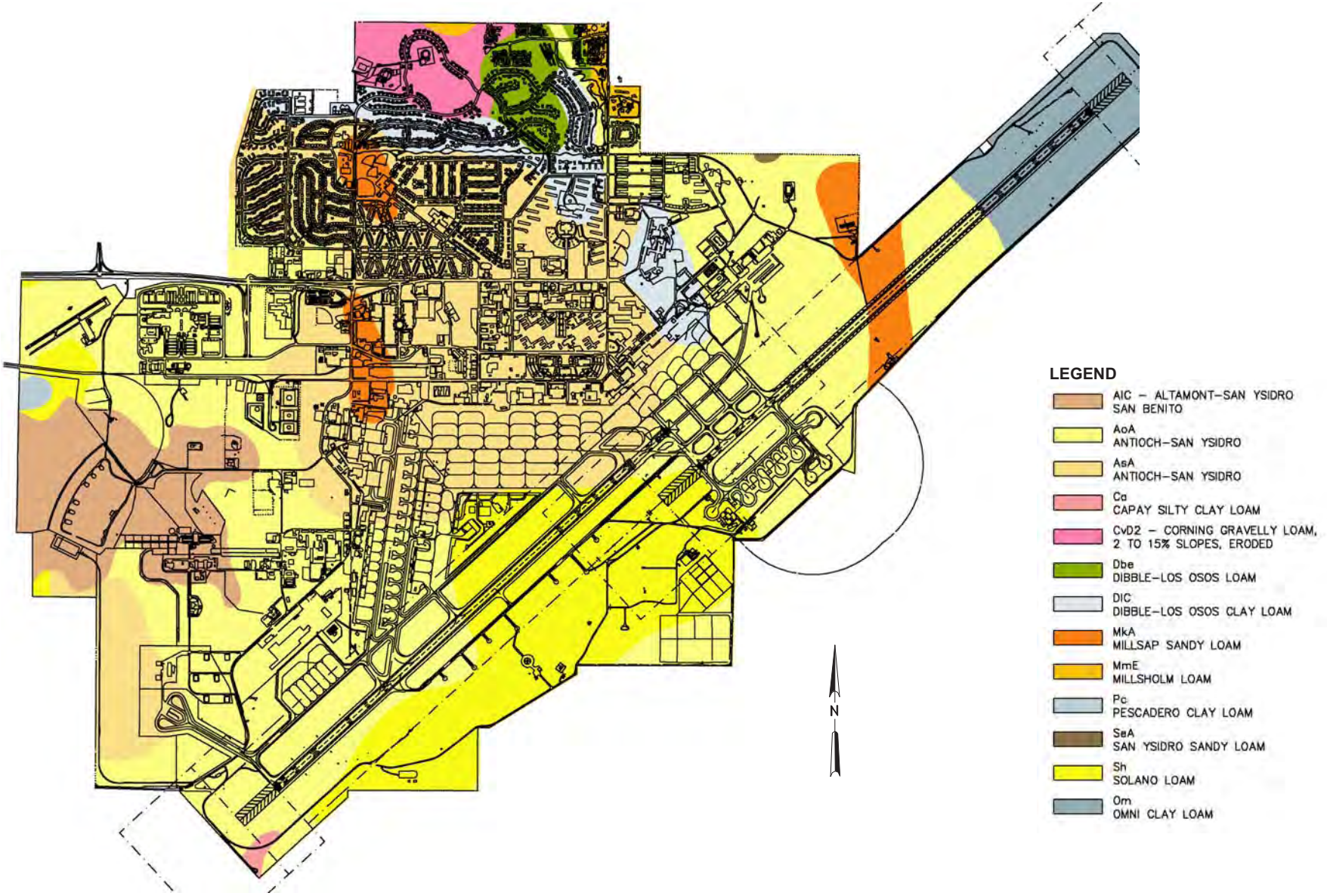


FIGURE 3-6
SOIL TYPES
ENVIRONMENTAL ASSESSMENT FOR
A TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

SOURCE: TRAVIS AFB, 2002

ES081110094230RDD_02 (10/28/11)

SECTION 4

Environmental Consequences

4.1 Introduction

This section provides the regulatory background, as applicable, for the various environmental resource areas and evaluates potential impacts of the alternatives described in Section 2. Potential impacts on the human and natural environments were evaluated by comparing the Proposed Action (Alternative 2) and the Action Alternative (Alternative 3) to the No Action Alternative (Alternative 1). The subsection for each environmental resource or issue assesses the anticipated direct and indirect impacts, considering short- and long-term project effects.

As described in this section, no significant adverse environmental impacts would occur for either Alternative 2 or Alternative 3.

4.2 Air Quality

4.2.1 Laws and Regulations

4.2.1.1 Federal

The U.S. Environmental Protection Agency (EPA) adopted the CAA, as amended in 1977 and 1990. Under the authority of the CAA, EPA established nationwide air quality standards to protect public health and welfare with an adequate margin of safety. The federal standards (NAAQS) represent the maximum allowable atmospheric concentrations for the following seven pollutants:

- CO
- Lead
- Nitrogen dioxide
- Ozone
- PM_{10}
- $PM_{2.5}$
- SO_2

The 1977 CAA amendment required each state to develop and maintain a state implementation plan (SIP) for each criteria pollutant that violates the applicable NAAQS. The SIP serves as a tool to avoid and minimize emissions of pollutants that exceed ambient thresholds and achieve compliance with the NAAQS. In 1990, the CAA was amended to strengthen regulation of stationary and mobile emission sources for criteria pollutants.

Under the conformity provisions of the CAA, no federal agency can approve or undertake a federal action, or "project," unless the project has been demonstrated to conform to the applicable SIP. These conformity provisions were enacted so that federal agencies would contribute to efforts to attain the NAAQS. EPA has issued two conformity regulations:

(1) transportation conformity rules that apply to transportation plans and projects and (2) general conformity rules that apply to all other federal actions. A conformity determination[1] is only required for the alternative that is ultimately selected and approved. The general conformity determination is issued as a written finding after a minimum 30-day public comment period on the draft determination.

Applicable only in areas designated as nonattainment or maintenance for NAAQS, the general conformity rule prohibits any federal action that does not conform to the applicable air quality attainment plan or SIP. General conformity applicability analysis requires quantification of direct and indirect construction and operation emissions for the project, and comparison of those emission levels to baseline emission levels. If the differences in emissions (the net emissions associated with the project) exceed the general conformity de minimis levels for the peak year or any milestone year for attainment of standards, additional general conformity determination is required.

An action is exempt from the conformity rule (the action is presumed to conform) if the total net project-related emissions (construction and operation) are less than the de minimis thresholds established in the conformity rule. An action that produces emissions that exceed conformity thresholds is required to demonstrate conformity with the SIP through mitigation or other accepted practices.

4.2.1.2 California

CARB oversees California air quality policies. The California Clean Air Act, passed in 1988, requires local air districts to develop and implement strategies to attain the CAAQS. The earliest CAAQS were established in 1969, pursuant to the Mulford-Carrell Act. CAAQS are generally more stringent than the NAAQS, and limit four additional pollutants including hydrogen sulfide, sulfates, vinyl chloride, and visibility-reducing particles.

The SIPs required by federal law are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, and permitting), district rules, state regulations, and federal controls. CARB is the lead agency for all purposes related to the SIP. Local air districts and other agencies, such as the Bureau of Automotive Repair, prepare SIP elements and submit them to CARB for review and approval. CARB forwards SIP revisions to EPA for approval and publication in the *Federal Register*.

4.2.1.3 Bay Area Plans and Programs

As previously indicated, CARB is responsible for regulating air quality in California. BAAQMD implements standards and policies established by CARB. BAAQMD rules and regulations apply to all sources of emissions within the 9-county Bay Area region, including western Solano County. The Bay Area air quality plans are regional plans that address how the San Francisco Bay Area will attain NAAQS and CAAQS. The plans and regulations require that new and modified stationary emission sources must apply for air quality permits and, if applicable, implement control measures and install emission-control devices.

[1]A conformity determination is a process that demonstrates how an action would conform to the applicable implementation plan. If the emissions cannot be reduced sufficiently and air dispersion modeling cannot demonstrate conformity, then either a mitigation plan or a plan to offset the emissions would need to be produced.

4.2.1.4 Greenhouse Gas Issues

Climate change has been a concern since at least 1988, as evidenced by establishment of the United Nations and World Meteorological Organization Intergovernmental Panel on Climate Change, and the efforts devoted to greenhouse gas (GHG) emissions reduction and climate change research and policy have increased dramatically in recent years. The following are brief summaries of federal, state, and local regulatory actions under the CAA and in some cases other statutory authorities to address issues related to climate change:

Federal. The following regulatory actions address issues regarding climate change:

- **Final Mandatory GHG Inventory Rule** – In response to the fiscal year (FY) 2008 Consolidated Appropriations Act (House of Representatives [H.R.] 2764; Public Law 110–161), EPA issued the Final Mandatory Reporting of Greenhouse Gases Rule on September 22, 2009. In general, the rule requires suppliers of fossil fuel and industrial GHGs, manufacturers of vehicles and engines outside of the light-duty sector, and facilities that emit 25,000 metric tons or more of GHG each year to submit annual reports to EPA. The rule is intended to collect accurate and timely emissions data to guide future policy decisions regarding climate change.
- **Executive Order 13514 –** Signed on October 5, 2009, EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, introduced new GHG emissions management requirements for the federal government. EO 13514 requires federal agencies to establish percentage reduction targets for GHG emissions in absolute terms by FY 2020. The reduction targets are relative to the FY 2008 baseline condition, and are subject to review and approval by the Office of Management and Budget and the CEQ. EO 13514 requires agencies to develop an inventory of their absolute (total metric tons of carbon dioxide [CO_2] equivalent) GHG emissions for FY 2010 by January 2011. Each year thereafter, agencies must submit an annual inventory for the preceding FY to the Office of Management and Budget and CEQ.
- **Final Endangerment Finding –** On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHG under Section 202(a) of the CAA, finding that six key, well-mixed GHGs constitute a threat to public health and welfare, and that the combined emissions from motor vehicles cause and contribute to climate change.
- **EPA and National Highway Traffic Safety Administration (NHTSA) Regulations to Cut Greenhouse Gas Emissions and Fuel Use for Passenger Cars and Commercial Trucks –** On April 1, 2010, EPA and NHTSA announced a joint final rule establishing a historic national program that will dramatically reduce GHG emissions and improve fuel economy for new cars and light trucks sold in the United States. Building on this successful collaboration, EPA and NHTSA will now begin work on two new joint rulemakings, one to develop the first-ever fuel efficiency and GHG emissions standards for commercial trucks, and another to adopt the second-phase of GHG and fuel economy standards for light-duty vehicles. These actions, as announced by President Obama on May 21, 2010, will reduce GHG emissions and fuel use from both light-duty and heavy-duty vehicles.
- **Final GHG Tailing Rule –** On May 13, 2010, EPA issued a final rule that establishes thresholds for GHG emissions that define when permits under the New Source Review

> Prevention of Significant Deterioration and Title V Operating Permit programs are required for new and existing industrial facilities. This final rule "tailors" the requirements of these CAA permitting programs to limit which facilities will be required to obtain Prevention of Significant Deterioration and Title V permits. Facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources will be subject to permitting requirements under this rule. This includes the nation's largest GHG emitters — power plants, refineries, and cement production facilities. Emissions from small farms, restaurants, and all but the very largest commercial facilities will not be covered by these programs at this time.

State. Recently, California enacted regulations for emissions of GHGs, which contribute to climate change. Efforts devoted to GHG emissions reduction and climate change research and policy have increased dramatically in recent years. With the passage of Assembly Bill (AB) 1493 in 2002, California launched an innovative and proactive approach to dealing with GHG emissions and climate change at the state level. AB 1493 requires the CARB to develop and implement regulations to reduce automobile and light truck GHG emissions. These regulations were to be implemented beginning with the 2009 model year. To implement vehicle emission standards under AB 1493, CARB requested a waiver from EPA to establish emissions standards that are stricter than the federal emissions standards which was granted on July 7, 2009.

In addition, on June 1, 2005, Governor Arnold Schwarzenegger signed EO S-3-05. The goal of EO S-3-05 is to reduce California's GHG emissions to: (1) 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80 percent below the 1990 levels by 2050. In 2006, this goal was reinforced with the passage of AB 32, the Global Warming Solutions Act of 2006. AB 32 sets the same overall GHG emission-reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Furthermore, EO S-20-06 directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team.

Currently, no federal or state agency has adopted a quantitative threshold that can be used to evaluate the significance of an individual project's contribution to GHG emissions in the context of NEPA.

Local. On June 2, 2010, the BAAQMD adopted the proposed thresholds of significance in the updated California Environmental Quality Act (CEQA) Air Quality Guidelines (BAAQMD, 2010). The thresholds include the GHG emission threshold for project operation; there is no threshold for project construction.

4.2.2 Air Quality Impacts

4.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, construction would not occur and air pollutant emissions associated with construction would not be generated. Emissions from vehicle operations would not change from current conditions. No additional air quality impacts are expected from Alternative 1.

4.2.2.2 Alternative 2 – Proposed Action

Construction Emissions Impacts. Construction of the Taxiway M Bypass Road would take approximately 12 months. The total construction footprint under Alternative 2 would be approximately 399,600 ft² (9.17 acres). Construction emissions are expected to occur as a result of engine exhaust from the additional vehicle trips by construction workers and offroad construction equipment. These emissions would primarily consist of CO, nitrogen oxide (NO_x), PM_{10}, $PM_{2.5}$, SO_2, and volatile organic compounds (VOC). In addition, site preparation and grading would result in fugitive dust emissions. The construction equipment and vehicles emissions of CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2, and VOCs were estimated by using the URBEMIS2007 model (CARB, 2007), the projected construction duration, and estimated hours of construction equipment operations. Default settings in URBEMIS2007 were used when project-specific data were not available.

Emissions associated with worker commutes were estimated by using the expected number of vehicle miles traveled by the workers. Emission factors were calculated by using EMFAC2007 (CARB, 2007) for BAAQMD for the year 2011.

The estimated construction emissions under Alternative 2 are shown in Table 4-1. Detailed construction emission calculations are provided in Appendix C.

TABLE 4-1
Estimated Alternative 2 Construction Emissions
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Emission Source	VOC (ton/yr)	CO (ton/yr)	NO_x (ton/yr)	SO_2 (ton/yr)	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	CO_2 (ton/yr)
Equipment Exhaust – Grading	0.090	0.39	0.76	0.00	0.040	0.040	73.0
Equipment Exhaust – Paving	0.080	0.28	0.50	0.00	0.040	0.040	42.8
Fugitive Dust	NA	NA	NA	NA	0.81	0.17	NA
Worker Commutes	0.0031	0.081	0.0087	0.00013	0.0012	0.00056	12.3
Total	0.17	0.86	1.3	0.00013	0.89	0.25	128.1

Note:
NA = not applicable

Alternative 2 would cause temporary, short-term air quality impacts as a result of construction emissions. Construction-related impacts are expected to be local (i.e., confined to the construction site area) and limited to the duration of the construction activities. Project construction would implement the applicable fugitive dust control measures defined in BAAQMD's CEQA Air Quality Guidelines. No significant impact from construction emissions is anticipated under Alternative 2.

Operation Emissions Impacts. Operation emissions from Alternative 2 would be generated by the vehicles traveling on the Taxiway M Bypass Road. There will not be any additional traffic generated by the project. Therefore, operation emissions would not increase compared to current conditions, long-term adverse impacts are not expected, and no further analysis is required. No significant impact from operation emissions is anticipated under Alternative 2.

General Conformity. The CAA established programs and permitting processes designed to protect and improve air quality. Section 176(c) of the CAA Amendment of 1990, 42 USC 7506(c), established a conformity requirement for federal agencies, which has been

implemented by 40 CFR 93, Subpart B. A general conformity applicability analysis for the project has been performed (see Appendix D) and is summarized in this section.

Alternative 2 would be located within the Basin in Solano County, which attains or is unclassified for all except the 8-hour ozone and $PM_{2.5}$ NAAQS. In addition, the urbanized areas of Solano County (which include the area occupied by Travis AFB) are maintenance areas for CO. As a result, CO, $PM_{2.5}$, and ozone precursor emissions (NO_x and VOCs) are subject to general conformity requirements. In accordance with the air conformity requirements of 40 CFR Sections 51.853 and 93.153(b)(1), the de minimis threshold for marginal nonattainment areas is 100 tpy per ozone precursor pollutant (VOCs and NO_x) and $PM_{2.5}$ and SO_2 (a $PM_{2.5}$ precursor), per federal action. The de minimis threshold for a CO maintenance area is 100 tpy per federal action. The annual emission increases associated with Alternative 2 and the comparisons with the de minimis thresholds are shown in Table 4-2. Emissions of CO, NO_x, SO_2, $PM_{2.5}$, and VOCs during construction and operation are below the de minimis thresholds. On the basis of the conformity applicability criteria, the project conforms to the most recent EPA-approved SIP; therefore, the project is exempt from the CAA conformity requirements and does not require a detailed conformity demonstration.

TABLE 4-2
Alternative 2 General Conformity Applicability
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

	Annual Emissions (tpy)				
Activity	**VOC**	**CO**	**NO_x**	**SO_2**	**$PM_{2.5}$**
Construction (2011)	0.17	0.86	1.3	0.00013	0.25
Operation (2011 and after)	0	0	0	0	0
De Minimis Threshold	100	100	100	100	100

4.2.2.3 Alternative 3 – Alternate Route for Taxiway M Bypass Road

Alternative 3 would involve constructing the Taxiway M Bypass Road using an alternate route. The total construction footprint under Alternative 3 would be approximately 323,640 ft² (7.43 acres).

Construction Emissions Impacts. Alternative 2 and Alternative 3 have a similar construction area size and the same construction schedule. Although the construction emissions would be similar, they would be slightly less under Alternative 3 because the area that would be disturbed is slightly less than that of Alternative 2 (a total construction footprint of 399,600 ft² or 9.17 acres). Therefore; construction impacts under Alternative 3 (a total construction footprint of 323,640 ft² [7.43 acres]) would result in slightly less impact than under Alternative 2. No significant impact from construction emissions is anticipated under Alternative 3.

Operation Emissions Impacts. Operation emissions from Alternative 3 would be generated by the vehicles traveling on the Taxiway M Bypass Road. There will not be any additional traffic generated by the project. Therefore, (1) operation emissions would not increase relative to current conditions, (2) long-term adverse impacts are not expected, and (3) no further analysis is required. No significant impact from operation emissions is anticipated under Alternative 3.

General Conformity. The annual emission increases associated with Alternative 3 and the comparisons with the de minimis thresholds are similar to, though slightly less than, those of Alternative 2 (see Table 4-2); the emission increase would be slightly less during construction. Emissions of CO, NO_x, SO_2, $PM_{2.5}$, and VOCs during Alternative 3 construction and operation are below the de minimis thresholds. On the basis of the conformity applicability criteria, the project conforms to the most recent EPA-approved SIP; therefore, the project is exempt from the CAA conformity requirements and does not require a detailed conformity demonstration.

4.3 Noise

This section describes noise impact criteria and discusses potential project-related noise impacts. Potential future noise impacts were determined by analyzing anticipated changes in noise exposure attributable to construction-related activities under the No Action Alternative, Alternative 2, and Alternative 3. After construction, no change in noise levels is anticipated during use of the bypass road under either alternative.

The fundamental measure of sound levels is expressed in dB using a logarithmic scale. Noise is generally defined as sound that is undesirable for the following reasons:

- It is intense enough to damage hearing
- It interferes with speech communication and sleep
- It is annoying

The Federal Interagency Committee on Urban Noise has developed land use compatibility guidelines for noise and provides recommended noise ranges for various land use categories. The Air Force has established land use noise compatibility criteria that are consistent with those published in the *Guidelines for Considering Noise in Land Use Planning and Control* (Federal Interagency Committee on Urban Noise, 1980).

CNEL values of 60 dB and less are generally compatible with all land uses; 60 dB is the incompatibility threshold for residential and other noise-sensitive land uses, including schools, hospitals, and religious facilities. Commercial, industrial, and other types of recreational land uses (e.g., sports arenas, golf courses, and amusements parks) are generally considered compatible with annual CNEL ranges between 70 and 75 dB if measures are incorporated into the design and construction of structures associated with these land uses. Some transportation (e.g., railways and airports) and manufacturing (e.g., mining, nonlivestock agriculture, fishing, and forestry) land uses can tolerate annual CNEL ranges exceeding 85 dB. For comparison, the noise generated by a power lawnmower at 50 feet is 90 dB and the threshold for pain is 120 dB. Figure 4-1 shows some common activities and their corresponding dB levels.

Operations occur throughout the Base and experience noise levels that range from 65 to more than 75 dB. The Alternative 2 site is located in an area that experiences noise levels between 65 and 75 dB. Noise from traffic would occur along the new bypass road; land uses near the proposed bypass are compatible with noise levels generated by commercial traffic. No significant additional noise would be generated by operation of the proposed bypass road.

4.3.1 Alternative 1 – No Action

Implementing Alternative 1 would not result in any construction activities. Therefore, no construction noise would occur. Current operational noise levels would not change.

4.3.2 Alternative 2 – Proposed Action

Typical construction-related noise is expressed in terms of schedule, equipment used, and types of activities. The noise level would vary during the construction period, depending on the type of construction activity. Construction can generally be divided into the following five phases, during which different types of construction equipment are used (Barnes et al., 1977; Miller et al., 1978):

1. Site preparation and excavation
2. Concrete pouring
3. Steel erection
4. Mechanical
5. Cleanup

The EPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from different types of construction equipment and construction sites (Barnes et al., 1977). Use of these data is conservative because the evolution of construction equipment has been toward quieter designs. Since these studies were conducted, public concerns about the adverse effects of noise have resulted in the inclusion of noise controls in construction-equipment design.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 4-3, in dB. The long-term composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table. The composite levels are occasionally lower than the individual levels because the loudest equipment would not be operating continuously throughout the construction phase. Table 4-3 shows the noise levels expected at 50 feet from a typical construction site during different construction phases activities.

TABLE 4-3
Typical Construction Equipment and Composite Site Noise Levels
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Construction Phase	Loudest Construction Equipment	Equipment Noise Level at 50 feet (dB)	Composite Site Noise Level at 50 feet (dB)
Site Preparation and Excavation	Dump truck and backhoe	91 85	89
Concrete Pouring	Truck and concrete mixer	91 85	85

TABLE 4-3
Typical Construction Equipment and Composite Site Noise Levels
Environmental Assessment for a Taxiway M Bypass Road at Travis Air Force Base, California

Construction Phase	Loudest Construction Equipment	Equipment Noise Level at 50 feet (dB)	Composite Site Noise Level at 50 feet (dB)
Steel Erection	Derrick crane and jackhammer	88 88	89
Mechanical	Derrick crane and pneumatic tools	88 86	84
Cleanup	Rock drill and truck	98 91	79

Source: Barnes et al., 1977

Noise naturally dissipates by atmospheric attenuation as it travels through the air. Other factors that can affect the amount of attenuation are ground surface, foliage, topography, and humidity. For each doubling of distance from a noise source, the level can be expected to decrease by approximately 6 dB.

Noise associated with construction activities would be temporary, occur during daytime hours, and vary in levels, depending on the source and the types of activities. Noise associated with flightline activities near the Alternative 2 site is approximately 70 to 75 dB CNEL (Travis AFB, 2006). There are no sensitive receptors within 1,000 feet of the site. Administrative buildings located near the site would experience an elevation in noise levels resulting from construction activities. The buildings located adjacent to the site are within the 65- to 70-dB level noise contours associated with flight operations. The increase in noise from construction of Alternative 2 would be minor and temporary. Because construction noise would not be substantially higher than background levels, no significant construction-related noise impacts on the adjacent buildings would result.

W Street currently is not a through street and existing noise from traffic is minimal. W Street would become a through street with implementation of Alternative 2, and noise from commercial traffic would increase as a result of traffic using the bypass road. The administrative buildings located along W Street are within the 65- to 70-dB level noise contours associated with flight operations; the increase in noise from operation of the bypass road would be minor in comparison to nearby flight operations. Any increase in noise would be offset by the noise control measures for ambient background noise that are currently in place; therefore, adverse long-term noise impacts on adjacent buildings are anticipated to be less than significant for operation of the proposed bypass road.

No buildings are located along the C Bunker Access Road.

No significant impact from noise is anticipated under Alternative 2.

4.3.3 Alternative 3 – Alternate Route for Taxiway M Bypass Road

Noise generated during construction and operation with implementation of Alternative 3 would be similar to that under the Alternative 2 because both alternatives would require approximately 12 months of construction, and the area of construction is similar. In addition, operation of both alternatives would result in the same volume of traffic flow.

Adverse impacts resulting from noise caused by the construction or operation of the bypass road and noise control measures under Alternative 3 would be similar to those described for Alternative 2; therefore, impacts resulting from implementation of Alternative 3 are anticipated to be less than significant. No significant impact from noise is anticipated under Alternative 3.

4.4 Hazardous Materials, Wastes, Environmental Restoration Program Sites, and Stored Fuels

The U.S. Congress passed RCRA in 1976 to protect both human health and the environment from the mishandling of solid and hazardous waste and to encourage the conservation of natural resources. RCRA requires a system for managing hazardous and universal wastes. Regulations adopted by EPA in 40 CFR 260 – 279 carry out RCRA's mandate. Regulations in Title 22 of the Code of California Regulations, Article 4.5 closely mirror those contained in the RCRA regulations (URS Corporation, 2004).

Travis AFB has procedures in place for handling and disposing of wastes, hazardous materials, and fuels. The procedures are detailed in the following guidelines:

- Air Force Instruction 32-7086, *Hazardous Materials Management* (Air Force, 1997)
- Air Force Instruction 32-7042, *Solid and Hazardous Waste Compliance* (Air Force, 1994a)
- *Travis AFB Hazardous Waste Management Plan* (Travis AFB, 2005)
- *Travis AFB Environmental Flight Specifications 01560* (Travis AFB, 2007)

All project alternatives would comply with these procedures. Compliance with waste management procedures would minimize potential impacts. Alternative 2 and Alternative 3 sites are not located on or near any stored-fuel locations; therefore, impacts on stored-fuel locations are not anticipated.

All project alternatives within WABOU and NEWIOU would comply with selected remedies stated in soil and groundwater RODs regarding contaminated sites. Alternative 2 and Alternative 3 sites are located on ERP Site SD033, in the western portion of the NEWIOU.

4.4.1 Alternative 1 – No Action

Implementation of the No Action Alternative would not result in changes to current hazardous waste production or waste management practices.

4.4.2 Alternative 2 – Proposed Action

Alternative 2 would not involve any new activities that would generate hazardous waste. Construction activities would comply with waste management procedures.

Construction activities under Alternative 2 would comply with selected remedies stated in soil and groundwater RODs regarding SD033. The following steps shall be taken within the boundary of that portion of SD033 within the project area:

- Consult with the Base Remediation Program Manager (BRPM) prior to construction.

- Obtain a dig permit (60 AMW Form 55).
- Prepare a contingency plan outlining steps to be taken in case soil discoloration or hydrocarbon vapors are detected or groundwater is encountered during construction. The contingency plan would be reviewed by the BRPM prior to construction.

If contaminated materials are encountered during construction, protective measures would be implemented under direction from the BRPM, and potential impacts on human health and the environment from the existing contamination would be less than significant.

No significant impact from hazardous materials, wastes, ERP sites or stored fuels is anticipated under Alternative 2.

4.4.3 Alternative 3 – Alternate Route for Taxiway M Bypass Road

Construction activities under Alternative 3 would comply with selected remedies stated in soil and groundwater RODs regarding contaminated sites at SD033. The following steps shall be taken within the boundary of that portion of SD033 within the project area:

- Consult the BRPM prior to construction
- Obtain a dig permit (60 AMW Form 55)
- Prepare a contingency plan outlining steps to be taken in case soil discoloration or hydrocarbon vapors are detected or groundwater is encountered during construction (the contingency plan would be reviewed by the BRPM prior to construction)

If contaminated materials are encountered during construction, protective measures would be implemented under direction from the BRPM, and potential impacts on human health and the environment from the existing contamination would be less than significant.

No significant impact from hazardous materials, wastes, ERP sites, or stored fuels is anticipated under Alternative 3.

4.5 Water Resources, Floodplains, and Wastewater

The following analysis is based on a review of the available literature and professional judgment. Neither of the alternatives is located within the 100-year floodplain (Travis AFB, 2006 and 2003a; CH2M HILL, 2003). The alternatives would not use groundwater or release water in a way that could impact groundwater. No significant impacts on floodplains or groundwater are expected from Alternative 2 or Alternative 3.

4.5.1 Alternative 1 – No Action

If Alternative 1 were selected, no changes to the stormwater drainage system would occur.

4.5.2 Alternative 2 – Proposed Action

The Alternative 2 site is in an open field or in existing paved roads (W Street and C Bunker Access Road). As shown on Figure 3-1, water resources located on and adjacent to the site are unlined drainage channels that are part of the Base stormwater drainage system (Travis AFB, 2002b and 2003a; CH2M HILL, 2003). The northern portion of this alternative

would cross three excavated drainage features. These excavated channels are characterized by upland vegetation and appear to convey flows only in response to major storm events.

The Alternative 2 site is located in Drainage Basins VI and XW, as depicted on Figure 3-2.

4.5.2.1 Water Quality

The drainage ditches on and adjacent to the Alternative 2 site connect to the stormwater drainage system that conveys stormwater to Union Creek via outflow VI. Pollutants introduced to the drainage ditches could cause a significant impact on the water quality of Union Creek. Erosion during earth-moving activities would potentially cause short-term impacts on drainages and ultimately to Union Creek. Construction of Alternative 2 could result in indirect impacts on vernal pools located near the roadway as a result of altered surface runoff into the pools (see Section 4.6). The Base currently has a stormwater permit and a stormwater pollution prevention plan (SWPP). Stormwater discharges at the Base are regulated under the *Travis AFB Industrial Activities Storm Water Discharge Permit* (Travis AFB, 2002). A dig permit (60 AMW Form 55) would be acquired prior to construction. Alternative 2 would comply with all applicable restrictions set forth in the stormwater permit, the SWPP, and the dig permit. Best management practices would be implemented to control runoff, and sedimentation required by the construction SWPP would include regular and documented site inspections, the use of silt fences, minimization of earth-moving activities during wet weather, and revegetation of disturbed areas. Compliance with the relevant permits and implementation of best management practices would reduce potential impacts from construction activities or stormwater discharges to Union Creek to less than significant levels. No significant impact on water quality is anticipated under Alternative 2.

4.5.2.2 Flooding

According to the FEMA map (FEMA, 2009a), almost the entire Base, including the Alternative 2 site, is within a 500-year floodplain (i.e., has a 0.2 percent annual chance of flooding). Construction of the bypass road would increase the amount of impervious (paved) surface at the site, decreasing stormwater infiltration rates and increasing the quantity of stormwater runoff in the immediate area. Alternative 2 would increase the paved area onbase by approximately 320,040 ft^2 (7.34 acre or 0.23 percent). This increase would be considered less than significant.

The storm drain system on Travis AFB consists of a series of underground storm drains and open ditches. The stormwater drainage system is designed to accommodate a 10-year, 24-hour storm (Travis AFB, 2002b). The proposed drainage system for Alternative 2 would consist of swales and pipes that carry water under the roadway to the existing stormwater drainage system (TetraTech EMI, 2010). Therefore the bypass road under Alternative 2 is not expected to contribute significantly to flooding.

No significant impact on flooding is anticipated under Alternative 2.

4.5.3 Alternative 3 – Alternate Route for Taxiway M Bypass Road

Alternative 3 would increase the paved area onbase by approximately 195,840 ft^2 (4.49 acre or 0.14 percent), which is less than the estimate for Alternative 2; therefore, impacts under

Alternative 3 would be less than those described for Alternative 2. Impacts on water resources under Alternative 3 would be similar to those under Alternative 2, and, therefore, would be less than significant. No significant impact on water resources is anticipated under Alternative 3.

4.6 Biological Resources – Wetlands and Special-status Species

This section analyzes the potential for adverse impacts on biological resources, such as habitat loss, from implementation of the No Action Alternative, Alternative 2, and Alternative 3.

CH2M HILL prepared a biological assessment in January 2011 for the proposed project, and USFWS issued a Biological Opinion on August 11, 2011 (see Appendix F).

4.6.1 Alternative 1 – No Action

Under the No Action Alternative, the construction of the Taxiway M bypass road would not occur. The No Action Alternative would not result in any construction or other changes to the physical environment.

4.6.2 Alternative 2 – Proposed Action

The proposed action was designed to avoid and minimize impacts to known special-status plant and animal species and wetlands to the extent feasible. Implementation of this alternative could result in permanent and temporary direct and indirect impacts to biological resources that are known to occur within the area of the proposed action. For the purposes of this EA, permanent impacts are defined as impacts that result in the loss of habitat for 1 year or more, while temporary impacts result in the loss of habitat for less than 1 year.

4.6.2.1 California Tiger Salamander

The Proposed Action is within upland habitat for CTS. Construction activities would result in approximately 14.3 acres of temporary disturbance and approximately 10.87 acres of permanent disturbance to upland habitat. Permanent disturbances would result from the placement of pavement and creation of road shoulders. No significant impacts to CTS upland habitat are expected as a result of the proposed project.

The January 2011 Biological Assessment for this project indicated that the grassland habitat in the project area would be considered CTS upland habitat because it is located within 1.3 miles of a known breeding pond. Formal consultation with the USFWS under the ESA regarding these expected impacts is complete, and a Biological Opinion (81420-2011-F-0370-1) was issued for the project on August 11, 2011.

The Biological Opinion and incidental take permit for the proposed action stipulate conditions to minimize adverse effects on CTS habitat. The Air Force is required to protect 32.61 acres of upland habitat by purchasing Central California CTS compensation credits at an existing USFWS-approved bank or banks in Solano County, as appropriate for the

species. The Air Force intends to purchase 32.61 acres of CTS upland habitat compensation credits at an existing USFWS-approved bank on the timeline set in the Biological Opinion.

4.6.2.2 Vernal Pool Crustaceans

Although direct impacts to vernal pool habitat would be avoided, there is the potential for indirect impacts to 1.73 acres of vernal pool branchiopod habitat within the Proposed Action area during construction. The Biological Opinion and incidental take permit for the proposed action stipulate conditions to minimize adverse effects on vernal pool habitat. The Air Force is required to protect 6.92 acres of vernal pool habitat by purchasing vernal pool fairy shrimp and vernal pool tadpole shrimp compensation credits at an existing USFWS-approved bank or banks in Solano County, as appropriate for the species. The Air Force intends to purchase 6.92 acres of vernal pool branchiopod compensation credits at an existing USFWS-approved bank on the timeline set in the Biological Opinion.

Alternative 2 would result in the temporary loss of 14.3 acres and permanent loss of 10.87 acres of CTS upland habitat and 1.73 acres of indirect impacts (impacts within 250 feet) of potential vernal pool branchiopod habitat. Implementing the Conservation Measures set forth in the Biological Opinion, including compensation through purchasing credits at a USFWS-approved mitigation bank and implementation of best management practices to minimize erosion and sedimentation would mitigate impacts on CTS upland habitat and vernal pool branchiopod habitat to less than significant levels. Construction of the bypass road would eliminate a portion of the current vegetation (i.e., grass and other herbaceous plants) currently used by wildlife for foraging and hunting. However, adjacent areas along the roadway would remain open and are restricted from additional development because they are within an explosives safety area. Therefore, the areas remain available for use by wildlife, and impacts on vegetation and wildlife from Alternative 2 would be less than significant. No significant impact on vernal pool crustaceans is anticipated under Alternative 2.

4.6.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

Impacts on biological resources associated with Alternative 3 would be similar to those described for Alternative 2. The southern portion of the alignment of Alternative 3 is the same as for Alternative 2. However, under Alternative 3 the section of the alignment off Ragsdale Road would result in direct impacts on wetlands and an existing drainage channel that runs parallel to Ragsdale Road. The northern portion of Alternative 3 would cross three additional excavated channels. These excavated channels are largely characterized by upland vegetation and appear to convey only stormwater flows during major storm events. Impacts on seasonal wetlands would be greater under this alternative because of the location of the new entrance that would be constructed on Ragsdale Road. This entrance would result in temporary construction impacts on two large seasonal vernal pools adjacent, one on each side of the road. As with Alternative 2, potential impacts on wetland resources would be less than significant with implementation of mitigation measures. No significant impact on wetland resources is anticipated under Alternative 3 with implementation of mitigation measures.

Alternative 3 would result in similar impacts on vernal pool branchiopod habitat and CTS upland habitat. Construction of this bypass road alternative would remove less vegetation

(i.e., grass and other herbaceous plants) currently used by wildlife for foraging and hunting than would Alternative 2. Adjacent areas along the roadway would remain open and are restricted from additional development because they are within an explosives safety area. Therefore, the areas would remain available for use by wildlife, and impacts on vegetation and wildlife would be less than significant. No significant impact on vegetation or wildlife is anticipated under Alternative 3.

4.7 Socioeconomic Resources

The socioeconomic conditions of the region could be affected if implementation of the No Action Alternative, Alternative 2, or Alternative 3 caused changes in the rate of population growth, the demographic characteristics of the Base or Solano County, employment, or economic activity onbase or in the county. This section evaluates potential impacts on socioeconomic resources. Alternative 2 and Alternative 3 would result in short-term, beneficial impacts.

4.7.1 Alternative 1 – No Action

Selection of the No Action Alternative would have no effect on socioeconomic resources on the Base or in Solano County because construction of the bypass road would not occur.

4.7.2 Alternative 2 – Proposed Action

Implementation of Alternative 2 would have a short-term beneficial impact on socio-economic resources because it would require a temporary increase in civilian contract employees (construction workers) at the Base during construction of the bypass road. Given the ample supply of construction labor in the region, it is anticipated that construction workers would commute to the work site and would not require temporary housing. However, there would be minor, short-term economic benefits to local convenience businesses from construction workers purchasing meals, gasoline, and other commodities near the Base. The impacts on socioeconomic conditions from temporary employment would be beneficial but negligible compared with the Base or the county economy.

Alternative 2 would not result in a long-term change in socioeconomic conditions because traffic volume is not anticipated to increase with operation of the bypass road.

No significant impact on socioeconomic resources is anticipated under Alternative 2.

4.7.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

The impacts under Alternative 3 would be the same as those described for Alternative 2. Implementation of Alternative 3 would also require a temporary increase in civilian contract employees (construction workers) at the Base during construction of the bypass road. This would have a short-term beneficial impact on socioeconomic resources. No significant impact on socioeconomic resources is anticipated under Alternative 3.

4.8 Cultural Resources

The primary statutes requiring federal agencies to protect cultural resources are the National Historic Preservation Act, EO 11593, the Archaeological and Historic Data Preservation Act, and the Archaeological Resources Protection Act (URS Corporation, 2004). The Base Cultural Resources Manager, under the supervision of the Environmental Flight Chief, is responsible for managing natural and cultural resources at Travis AFB.

4.8.1 Alternative 1 – No Action

Under the No Action Alternative, current practices would continue and construction would not occur. Therefore, no change to cultural resources would occur under the No Action Alternative.

4.8.2 Alternative 2 – Proposed Action

No known archeological sites, historical buildings, or other culturally sensitive areas exist at the proposed site for Alternative 2. However, several buildings potentially eligible for inclusion in the National Register of Historic Places are located along W Street (see Figure 3-1). Construction of Alternative 2 is not anticipated to result in impacts on historical buildings near the site because no historical buildings would be disturbed during construction of the bypass road.

If cultural or archaeological resources were disturbed during construction, the impact would be considered significant. Therefore, prior to construction, a dig permit (60 AMW Form 55) would be acquired from 60 CES/CEA. A contingency plan would require the following:

- All activities would take place in compliance with the *Integrated Cultural Resources Management Plan* (Travis AFB, 2003b).
- If human remains or archaeological or cultural artifacts were discovered during construction, work would cease and the cultural resources manager would be contacted.

Adherence to the dig permit and implementation of the contingency plan would reduce the potentially significant impact to less than significant levels. No significant impact on cultural resources is anticipated under Alternative 2.

4.8.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

There are no known archeological sites, historical buildings, or other known culturally sensitive areas at the proposed site for Alternative 3. However, several buildings that are potentially eligible for inclusion in the National Register of Historic Places are located along W Street (see Figure 3-1).

Construction of Alternative 3 is not anticipated to result in impacts on historical buildings near the site because no historical buildings would be disturbed during construction of the bypass road. Prior to construction, a dig permit (60 AMW Form 55) would be acquired from 60 CES/CEA. A contingency plan, as discussed for Alternative 2, would be implemented that would reduce potentially significant impacts on previously unknown cultural or

archaeological resources to less than significant levels. No significant impact on cultural resources is anticipated under Alternative 3.

4.9 Land Use

This section discusses the potential effects to land use from either of the project alternatives. Land use at Travis AFB is described in the Travis AFB General Plan.

4.9.1 Alternative 1 – No Action

Under the No Action Alternative, construction of the bypass road would not occur, and there would be no change to the existing land use.

4.9.2 Alternative 2 – Proposed Action

According to the Travis AFB General Plan land use maps, the existing and future land use designation for the Alternative 2 site is open space (Travis AFB, 2006). No change in land use would be required with implementation of Alternative 2; therefore, Alternative 2 would be consistent with the Travis AFB General Plan. No significant impact on land use is anticipated under Alternative 2.

4.9.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

The impacts under Alternative 3 would be the same as those described for Alternative 2 because the existing and future land use designation for the Alternative 3 site is open space, and no change in land use would be required; therefore, Alternative 3 would be consistent with the Travis AFB General Plan. No significant impact on land use is anticipated under Alternative 3.

4.10 Transportation System

The Travis AFB General Plan identifies a transportation improvement project for truck traffic that links the Perimeter Road from the South Gate to Dixon Road and continues to Ragsdale Street (Travis AFB, 2006). Alternative 2 and Alternative 3 would both fulfill the requirements of the improvement identified in the Travis AFB General Plan.

The bypass road would be constructed from the South Gate, moving north, to Dixon Avenue. The maximum design capacity of onbase roads is 14,000 pounds (Highway Class). The maximum design capacity of the bypass road would also be 14,000 pounds.

Construction of the bypass road would require base course and asphalt materials to be transported from offbase facilities to the project site. Travis AFB would acquire these materials from one of two local recycling facilities, located on either Peabody Road or Cement Hill Road, within the city of Fairfield. Air Base Parkway, Walters Road, and Scandia Road are the main offbase roads that would be used to access Travis AFB via the South Gate.

4.10.1 Alternative 1 – No Action

The No Action Alternative assumes that the construction of the bypass road would not occur and that existing roads and transportation routes would continue to be used. Current traffic levels and patterns on Ragsdale Street would continue. Construction would not be required under the No Action Alternative and construction-related traffic increases would not occur.

4.10.2 Alternative 2 – Proposed Action

Impacts on roadways resulting from travel by construction workers in their personal vehicles to the construction site would occur on the main Base thoroughfares, Dixon Avenue and Ragsdale Street. According to the Travis AFB General Plan, there are no transportation or parking issues associated with either Dixon Avenue or Ragsdale Street (Travis AFB, 2006).

Alternative 2 would involve construction of a bypass road on previously undeveloped land. The location of the bypass road construction activities would not affect onbase traffic; the existing route would continue to be used until the new bypass road is completed. A short-term adverse impact on truck traffic accessing the C Bunker Parking Lot would occur while the bypass road and parking lot access are under construction.

In addition, there would be a temporary impact on traffic flow on W Street and Cordelia Avenue during construction. Traffic impacts resulting from the proposed construction would be temporary and, therefore, less than significant.

The current traffic-control procedure on Ragsdale Street during Taxiway M operations would no longer be necessary with implementation of Alternative 2. Travis AFB personnel are currently needed to control traffic and temporary barriers are used to prevent traffic from entering Taxiway M during operations. Implementation of Alternative 2 would eliminate the need for traffic control personnel and temporary barriers during Taxiway M operations. In addition, Alternative 2 would allow installation of permanent barriers on both sides of Taxiway M, preventing unauthorized access to the taxiway. This would improve safety and AT/FP. Traffic entering and exiting the South Gate would not be delayed during Taxiway M operations; therefore, there would be a beneficial effect to transportation.

Operations under Alternative 2 would not increase vehicle traffic at Travis AFB. Traffic entering the Base from the South Gate would drive a different route to access Dixon Avenue and Ragsdale Street. Under Alternative 2, the bypass road would be approximately 0.6 mile longer than the existing route (as measured from the proposed start of the bypass road on the south end to the intersection of Dixon Avenue and Ragsdale Street, north of Taxiway M).

Offbase roads west of the installation are currently used to access the South Gate. Air Base Parkway and Walters Road are four-lane roads. Scandia Road, to the west of the South Gate, is a two-lane road and is not frequently traveled by the general public. Construction traffic effects would be temporary and, therefore, access by construction traffic using offbase roads would result in a less than significant impact on transportation systems.

No significant impact on the transportation systems is anticipated under Alternative 2.

4.10.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

Under Alternative 3, impacts on the transportation system would be similar to those described for Alternative 2 and, therefore, would result in a less than significant impact. No significant impact on the transportation systems is anticipated under Alternative 3.

4.11 Airspace/Airfield Operations

4.11.1 Alternative 1 – No Action

No change in operations of the airspace/airfield would result from implementing the No Action Alternative.

4.11.2 Alternative 2 – Proposed Action

Under Alternative 2, the bypass road would be located outside of airspace/airfield operations areas, but within the Clear Zone of the runway. The bypass road would be constructed in an area that complies with UFC 3-260-01 standards for location with respect to the runway centerline and apron clearance. The C Bunker Access Road is currently located within the Clear Zone of the runway. The location of the C Bunker Access Road would not change under Alternative 2.

Operation of Taxiway M would not change under Alternative 2, although improvement to security at the taxiway would result in a beneficial effect because commercial vehicles would no longer use the Ragsdale Street crossing at Taxiway M. Construction of the bypass road and improvements to C Bunker Access Road would not result in impacts on airspace or airfield operations. No significant impact on airspace/airfield operations is anticipated under Alternative 2.

4.11.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

The impacts under Alternative 3 would be similar to those described for Alternative 2 because the bypass road would be constructed in an area that complies with Unified Facilities Criteria (UFC) 3-260-01 standards for location with respect to the runway centerline and apron clearance. Improvement in security would result in a beneficial effect because commercial vehicles would no longer use the Ragsdale Street crossing at Taxiway M, and construction of the bypass road would not result in impacts on airspace or airfield operations. No significant impact on airspace/airfield operations is anticipated under Alternative 3.

4.12 Safety and Occupation Health

4.12.1 Alternative 1 – No Action

Implementing the No Action Alternative would not change health or safety conditions. Construction would not be required under this alternative; therefore, ongoing safety and occupational health practices would not be affected.

4.12.2 Alternative 2 – Proposed Action

Implementing Alternative 2 would require the construction of paved areas, involving military and civilian personnel. Implementation of Alternative 2 would follow all applicable rules and regulations regarding safety and occupational health. A health and safety plan for construction would be prepared that would include requirements such as shoring for excavations. Construction areas would be secured to prevent unauthorized personnel from entering the work sites or excavations.

In accordance with the Occupational Safety and Health Act, all workers would be provided with appropriate personal protective equipment. Personal protective equipment would include, but not be limited to, approved hard hats, safety shoes, gloves, goggles, eye/face protection, safety belts, harnesses, respirators, hearing protection, and traffic safety vests. The potential for adverse impacts on safety and occupational health is expected to be minor and limited to the duration of construction.

The road design would comply with applicable codes, and all activities performed in and around the roads would follow standard operating procedures. The bypass road and C Bunker Access Road improvements would provide routes that are safer than the roads currently used, resulting in a small beneficial impact during operation.

Building 961 is located south and east of the Alternative 2 site (see Figure 2-1). Construction of Alternative 2 would continue to violate the minimum setback requirement. To avoid this violation, Travis AFB would implement a compensatory measure that would restrict the back (west) 70 feet of Building 961 from munitions storage, and the required minimum separation would be met (Travis AFB, Undated).

No significant impact on safety and occupational health is anticipated under Alternative 2.

4.12.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

The impacts under Alternative 3 would be similar to those described for Alternative 2. No significant impact on safety and occupational health is anticipated under Alternative 3.

4.13 Environmental Management (Including Geology, Soils, and Pollution Prevention)

4.13.1 Alternative 1 – No Action

There would be no change to geology or soils under the No Action Alternative.

4.13.2 Alternative 2 – Proposed Action

No important geological or soil resources are present in the area of Alternative 2. Construction of Alternative 2 would disturb surface soils and permanently alter the ground surface from a soil surface to a paved surface. Approximately 320,040 ft^2 of currently unpaved area would be disturbed during construction, including access and staging areas. This disturbance represents 0.14 percent of the Base's total area. Potential impacts on geology or soils associated with Alternative 2 would be less than significant.

Implementation of Alternative 2 would comply with the overall objectives of the pollution prevention program at Travis AFB. Construction of Alternative 2 would produce waste in the form of construction debris. All wastes generated during the construction phase of the project would be removed from the site and recycled. If recycling is not possible or feasible, the waste will be disposed of in accordance with all applicable regulations and policies. The Potrero Hill Landfill is used for waste disposal. Generating and managing waste during construction is expected to meet the pollution prevention goals in the *Pollution Prevention Management Plan* (Travis AFB, 2004). Alternative 2 is not expected to result in any impacts on waste production or pollution prevention management.

No significant impact under environmental management is anticipated under Alternative 2.

4.13.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

Approximately 195,840 ft^2 of currently unpaved area would be disturbed during construction, including access and staging areas. This disturbance represents 0.08 percent of the Base's total area. The impacts under Alternative 3 would be similar as those described for Alternative 2. No significant impact on environmental management is anticipated under Alternative 3.

4.14 Environmental Justice and Protection of Children

4.14.1 Alternative 1 – No Action

The No Action Alternative would not affect children or any minority or low-income populations.

4.14.2 Alternative 2 – Proposed Action

No minority or low-income populations in the surrounding area would be affected by the construction of Alternative 2; therefore, no impacts would occur.

Construction sites can be attractive to children and, therefore, dangerous. However, this alternative site is not located near onbase or offbase family housing areas or schools. The construction site, excavations, and materials would be properly secured during construction.

There would not be any additional traffic generated within Travis AFB. Therefore, operation emissions would not increase compared to current conditions, and long-term adverse impacts are not expected. Hazardous wastes produced at the site during construction would be managed and disposed of in accordance with applicable regulations and the *Base Hazardous Waste Management Plan* (Travis AFB, 2005) and would, therefore, not pose a disproportionate risk to minority populations.

Implementation of Alternative 2 would not affect children or any minority or low-income populations. No significant impact on environmental justice and protection of children is anticipated under Alternative 2.

4.14.3 Alternative 3 – Alternative Route for Taxiway M Bypass Road

The impacts under Alternative 3 would be the same as those described for Alternative 2 because no minority or low-income populations in the surrounding area would be affected by the construction of Alternative 3; therefore, no impacts would occur. Implementation of Alternative 3 would not affect children or any minority or low-income populations. No significant impact on environmental justice and protection of children is anticipated under Alternative 3.

4.15 Indirect and Cumulative Impacts

Indirect impacts are defined by the CEQ in 40 CFR 1508.8 as those "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." Indirect effects may include growth-inducing effects and other effects related to induced changes in land use patterns, population density, or growth rate. Indirect effects may also include growth-related effects on air, water, or other natural systems, including ecosystems.

Indirect impacts under Alternatives 2 and 3 have been addressed in the preceding resource-specific analyses. Implementing either of the alternatives is expected to result in less than significant indirect impacts on environmental and socioeconomic resources. The alternatives would not result in significant growth-inducing effects, induced changes in population, or related effects. Potential impacts on health and safety would be beneficial.

Cumulative impacts are defined by the CEQ in 40 CFR 1508.7 as "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."

Projects considered for the cumulative impacts assessment have been recently completed, are ongoing, or are planned to begin within the next 2 years. Projects that are under consideration by the Base that would occur beyond 3 years are too uncertain to be evaluated. The following actions, organized by fiscal year, are the foreseeable future actions that could occur at Travis AFB:

- **Fiscal Year 2011**
  - Completed Contingency Response Wing Global Support Squadron Facility
  - Completed C-17 Two-Bay Hangar
  - Completed South Gate Improvement Project
  - Completed Georgetown Perimeter Fence Project
- **Fiscal Year 2012**
  - Construct KC-10 Combat Load Trainer
  - Construct Fire Station
  - Construct C-5 Reserves Squad Operations Facility
  - Construct Runway Repair
  - Construct C-17 Southwest Landing Zone
  - Construct Military Working Dog Kennels

- Fiscal Year 2013
  - Construct New School Age Facility
  - Construct New 144 Room Dormitory

Potential cumulative impacts on the resource areas caused by the implementation of Alternatives 2 and 3 are discussed in the following sections.

4.15.1 Air Quality

Cumulative impacts on air quality could result from multiple simultaneous construction projects; however, not all of the previously listed projects would be constructed simultaneously. Potential impacts on air quality from construction are discussed in Sections 3.2 and 4.2. Alternatives 2 and 3 would conform to the SIP and would not be regionally significant. After construction, neither alternative would contribute to long-term cumulative impacts on air quality because there would be no increase in traffic. No significant indirect or cumulative impacts on air quality are anticipated with implementation of either Alternative 2 or Alternative 3.

4.15.2 Floodplains

The increase in impervious surface in conjunction with other planned future projects could increase the amount of stormwater runoff from Travis AFB. The Base has a basewide stormwater permit and a basewide SWPP, and these would address impacts caused by multiple projects. No significant indirect or cumulative impacts on floodplains are anticipated with implementation of either Alternative 2 or Alternative 3.

4.15.3 Biological Resources – Wetlands and Special-status Species

Potential cumulative impacts on biological resources could occur as a result of temporary or permanent, and direct or indirect impacts on wetlands or Waters of the United States. The South Gate Improvement project, completed in July 2011, created a commercial truck entrance for access at the South Gate of Travis AFB. Construction of the project resulted in 0.23 acre of permanent impact on a drainage ditch (Waters of the United States) that is parallel to Petersen Road, near the South Gate. Construction of the project resulted in a temporary impact on the drainage ditch (0.08 acre); however, contours were restored to pre-project conditions, which restored the hydrology of the drainage ditch.

Construction of Alternative 2 would result in direct impacts on excavated drainage channels. Implementation of Alternative 2 would also result in indirect impacts, such as altered surface runoff into seasonal vernal pools including 1.73 acres of vernal pool branchiopod habitat (see Section 4.6.2). Construction of Alternative 3 would result in direct impacts on wetlands and an existing drainage channel that runs parallel to Ragsdale Road. Implementation of Alternative 3 would also result in temporary construction impacts on two large seasonal vernal pools, one on each side of Ragsdale Road. Impacts on seasonal wetlands would be greater under Alternative 3 because of the location of the entrance on Ragsdale Road (see Section 4.6.3).

Under Alternatives 2 and 3, potential impacts on wetland resources would be less than significant with implementation of mitigation measures and best management practices to minimize erosion and sedimentation in adjacent wetlands. Therefore, cumulative impacts

on wetlands and Waters of the United States would be considered less than significant. No significant indirect or cumulative impact on biological resources is anticipated with implementation of either Alternative 2 or Alternative 3.

4.16 Unavoidable Adverse Impacts

As described in the preceding resource-specific analyses, no significant unavoidable adverse impacts are expected from the construction or operation of the bypass road under the Proposed Action. Adverse impacts resulting from construction of the bypass road are anticipated to be minor and brief in duration and would not result in significant adverse impacts on environmental or socioeconomic resources.

4.17 Relationship between Short-term Uses and Enhancement of Long-term Productivity

The purpose of the Proposed Action is to construct a bypass road to route traffic around Taxiway M. Construction of the bypass road would reduce the potential for accidents in the vicinity of the existing Ragsdale Avenue crossing with Taxiway M. The bypass road would also improve security by reducing the potential for unauthorized personnel to access the runway. Long-term productivity would be enhanced by implementing Alternative 2 or Alternative 3 because the inefficiencies resulting from use of the current Ragsdale Avenue crossing of Taxiway M would be remedied.

4.18 Irreversible and Irretrievable Commitment of Resources

Implementation of the Proposed Action or Action Alternative 3 would require a commitment of materials (such as rock and aggregate) and energy (such as fossil fuels) for construction, and a commitment of land for the Bypass Road and C Bunker Access Road improvements. Use of raw building materials for construction would be an irretrievable commitment of resources. Energy consumed for project construction and water used for dust abatement during construction activities would be irreversible. Travis AFB would benefit from the improved quality of the transportation system in the southwest portion of the Base. The benefits would outweigh the commitment of resources required for construction of the project.

There are no anticipated irreversible or irretrievable commitments of resources that would occur during operation of the Proposed Action or Action Alternative 3, because operation of the bypass road would not consume energy.

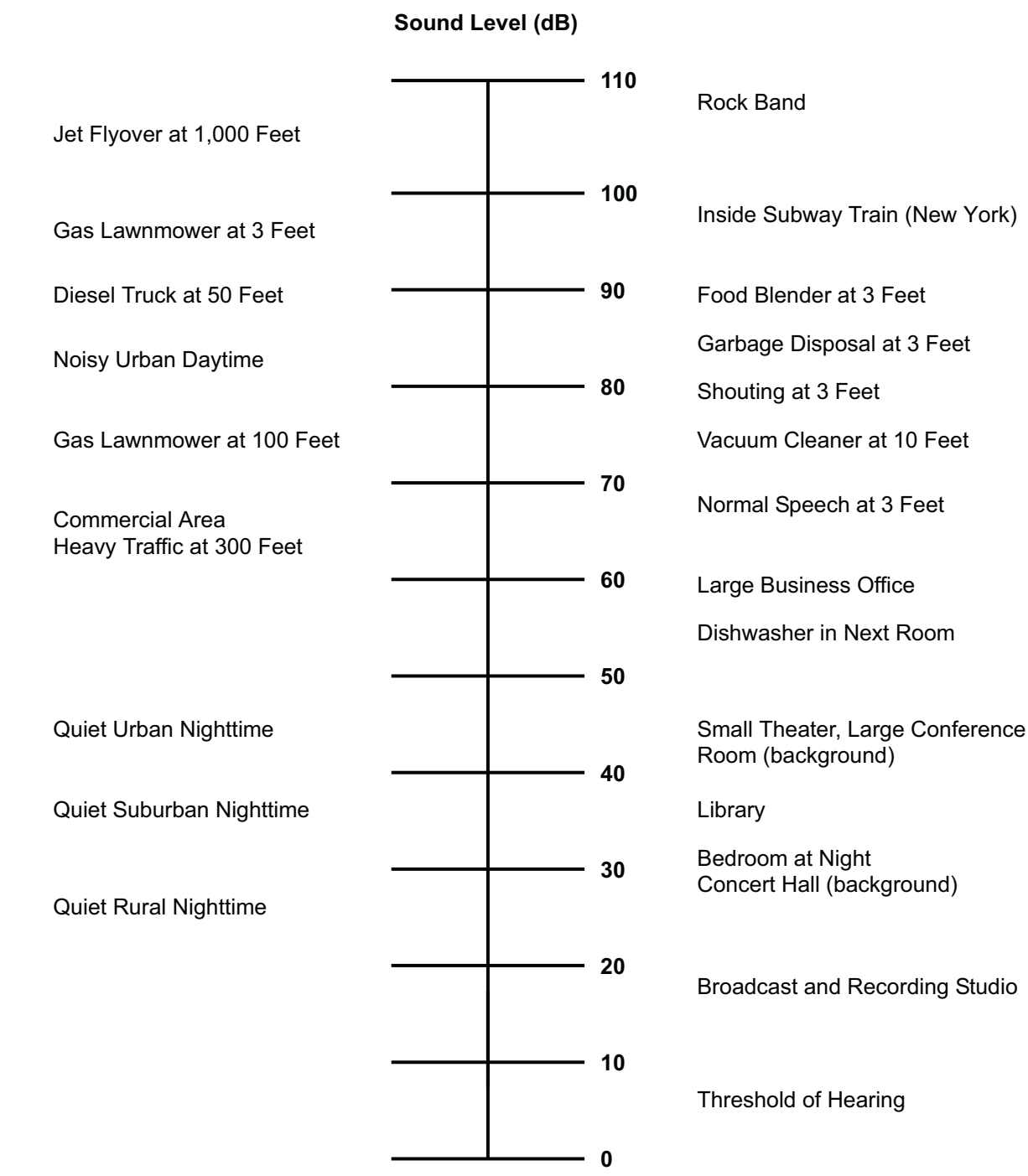


FIGURE 4-1
COMPARATIVE SOUND LEVELS
ENVIRONMENTAL ASSESSMENT FOR
A TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

ES081110094230RDD_03 (10/28/11)

SECTION 5

List of Preparers

Name	Education	Experience	Role
Marjorie Eisert	B.S., Wildlife and Fisheries Biology	20 years	Project Manager
Karin Lilienbecker	M.S., Biology	17 years	Senior Consultant
Russell Huddleston	M.S., Ecology	12 years	Biologist, Wetland Scientist
Julie Petersen	B.S., Biology	8 years	Environmental Scientist
Hong Zhuang	M.S., Environmental Science and Engineering	10 years	Air Quality Engineer
Alfred Farber	M.A., Anthropology	31 years	Technical Publications Specialist

SECTION 6

List of Agencies and People Consulted or Provided Copies

The following people were consulted during preparation of this EA:

- Rodolfo Pontemayor, CES/CEAO
- Josh Bass, CES/CEC
- Sara Underwood, CES/CEPD
- Paul Salecina, CES/CEPM2
- Lauren Parker, 60 CEAN
- Richard Potter, MSgt AMW/SEW
- William Weber, TSgt AMW/SEG

Travis AFB coordinated distribution of this EA to the following public and regulatory agencies and libraries:

- **Federal**

  U.S. Environmental Protection Agency, Region 9
  Director, Officer of Federal Activities
  75 Hawthorne Street
  San Francisco, California 94105

  U.S. Department of the Interior
  U.S. Fish and Wildlife Service
  California/Nevada Operations Office
  2800 Cottage Way, Room W-2606
  Sacramento, California 95825

- **U.S. Air Force**

  Department of the Air Force
  Air Mobility Command
  Attn: Mr. Doug Allbright, HQ AMC/A7PC
  507 Symington Drive
  Scott Air Force Base, Illinois 62225

  Air Force Western Regional Environmental Office
  Attn: Mr. Gary Munsterman
  AFCEE/CCR-S
  333 Market Street, Suite 600
  San Francisco, California 94105

- **State**

  California Air Resources Board
  Air Quality and Transportation Division
  1001 "I" Street
  P.O. Box 2815
  Sacramento, California 95812

  California Department of Fish and Game
  P.O. Box 944209
  Sacramento, California 94299-2090

  Mr. Milford Wayne Donaldson, FAIA
  State Historic Preservation Officer
  Department of Parks and Recreation
  P.O. Box 942896
  Sacramento, California 94296-0001

- **City**

  City of Fairfield
  Community Development Department
  1000 Webster Street
  Fairfield, California 94533

  City of Vacaville
  Community Development Department
  650 Merchant Street
  Vacaville, California 95688

  Suisun City
  Community Development Department
  701 Civic Center Boulevard
  Suisun, California 94588

- **Libraries**

  Fairfield-Suisun Community Library
  1150 Kentucky Avenue
  Fairfield, California 94533

  Suisun City Library
  333 Sunset Avenue
  Suisun City, California 94585

  Mitchell Memorial Library
  510 Travis Avenue (Building 436)
  Travis Air Force Base, California 94535

  Vacaville Public Library
  1020 Ulatis Drive
  Vacaville, California 95687

Proof of publication will be included in Appendix G of the final version of this EA.

SECTION 7

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Appendix A
Air Force Form 813

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol RCS: 07-197

INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on seperate sheets as necessary. Reference appropriate item number(s).*

SECTION I - PROPONENT INFORMATION

1. TO *(Environmental Planning Function)*	2. FROM *(Proponent organization and functional address symbol)*	2a. TELEPHONE NO.
60 CEC/CECP	60 CEC/CECC-1, PAUL SALECINA	4-0885

3. TITLE OF PROPOSED ACTION

CONSTRUCT TAXIWAY M BYPASS ROAD

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*

The purpose is to construct a Bypass Road SW of Travis AFB to divert commercial traffic away from Taxiway M. South Ragsdale Rd which is currently used for commercial deliveries to Travis, crosses Taxiway M which creates a very risky situation for AT/FP.

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*

The proposed action is to improve the existing south perimeter road to accommodate commerical traffic and construction of a new road segment north of the bunkers to reconnect with Ragsdale Rd by Bldg 977. The other alternative is not to construct the project

6. PROPONENT APPROVAL *(Name and Grade)*	6a. SIGNATURE	6b. DATE
PAUL SALECINA, YD-02		20071017

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U= unknown effect)*	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*	☐	☐	☐	☐
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)* see comment. Air conformity determination is not required IAW 40 CFR 93.253(c)(1).	☐	☐	☐	☐
9. WATER RESOURCES *(Quality, quantity, source, etc.)* See comments	☐	☐	☐	☐
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*	☐	☐	☐	☐
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)* Please ensure the contractor compiles w/the encl Chap 5 of the TAFB HWMP.	☐	☐	☐	☐
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*	☐	☐	☐	☐
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*	☐	☐	☐	☐
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, installation Restoration Program, seismicity, etc.)* SEE REMARKS IN BLOCK 18 BELOW	☐	☐	☐	☐
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)* An Environmental Assessment is required, do not award without an approved FONSI or ROD.	☐	☐	☐	☐
16. OTHER *(Potential impacts not addressed above.)*	☐	☐	☐	☐

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. ☐ PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR

☒ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

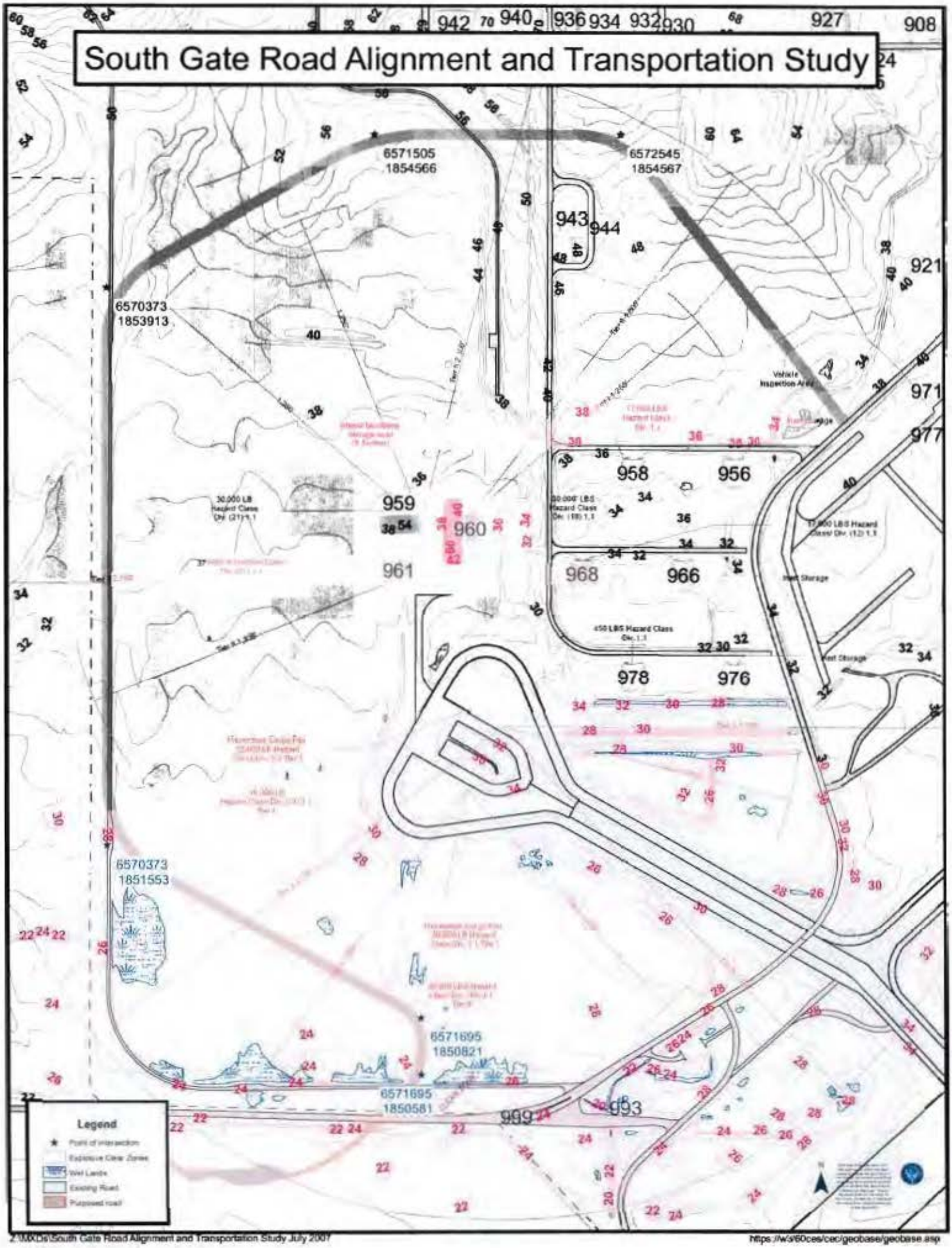
18. REMARKS PLEASE USE CAUTION TO NOT DISTURB CONTAMINATED GROUNDWATER MONITORING WELLS IN THE PROJECT AREA. SEE ATTACHED NOTE TO DIG PERMIT REQUESTER AND MAP

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)*	19a. SIGNATURE	19b. DATE
DAVID H. MUSSELWHITE, YF-02, DAF Chief, Environmental Flight		5 NOV 07

Block 4: The proximity of Ragsdale Rd to the southern section of the runway creates a vulnerable situation for flight operations in the event of a major catastrophe, e.g. terrorist actions, hazmat incidents or spills. To minimize these effects to flight operations, it is proposed to construct a bypass road by modifying the existing road from the South Gate and constructing a completely new road segment passing north of the bunkers and connecting to "W" St. "W" St will be rebuilt to conform to new design standards. Option 1 is constructing a parallel segment (to "W" St) north of the 900 buildings.

Block 5: which creates risky and vulnerable situations for flight operations, in violation of AT/FP requirements.


Option 1
Proposed
Bypass Rd
Legend
Buildings
Facility Numbers
Travis Roads
Travis Road Names
Base Boundary
County Roads
Railroad
Stream Channels
Surface Water
Wetlands
Airfield Surface Area
ACCESS RAMP
APRON
HELIPAD
RAMP
RUNWAY
SHOULDER OVERRUN
TAXIWAY
Aerial Photo, 6" 2004
Project: Proposed Txwy M Bypass Rd
AF813 #07-197


South Gate Road Alignment and Transportation Study
6571505
1854566
6572545
1854567
6570373
1853913
6570373
1851553
6571695
1850821
6571695
1850581
Legend
Point of intersection
Explosive Clear Zones
Wet Lands
Existing Road
Proposed road
Vehicle Inspection Area
Wet Storage
959
960
961
958
956
968
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978
976
943
944
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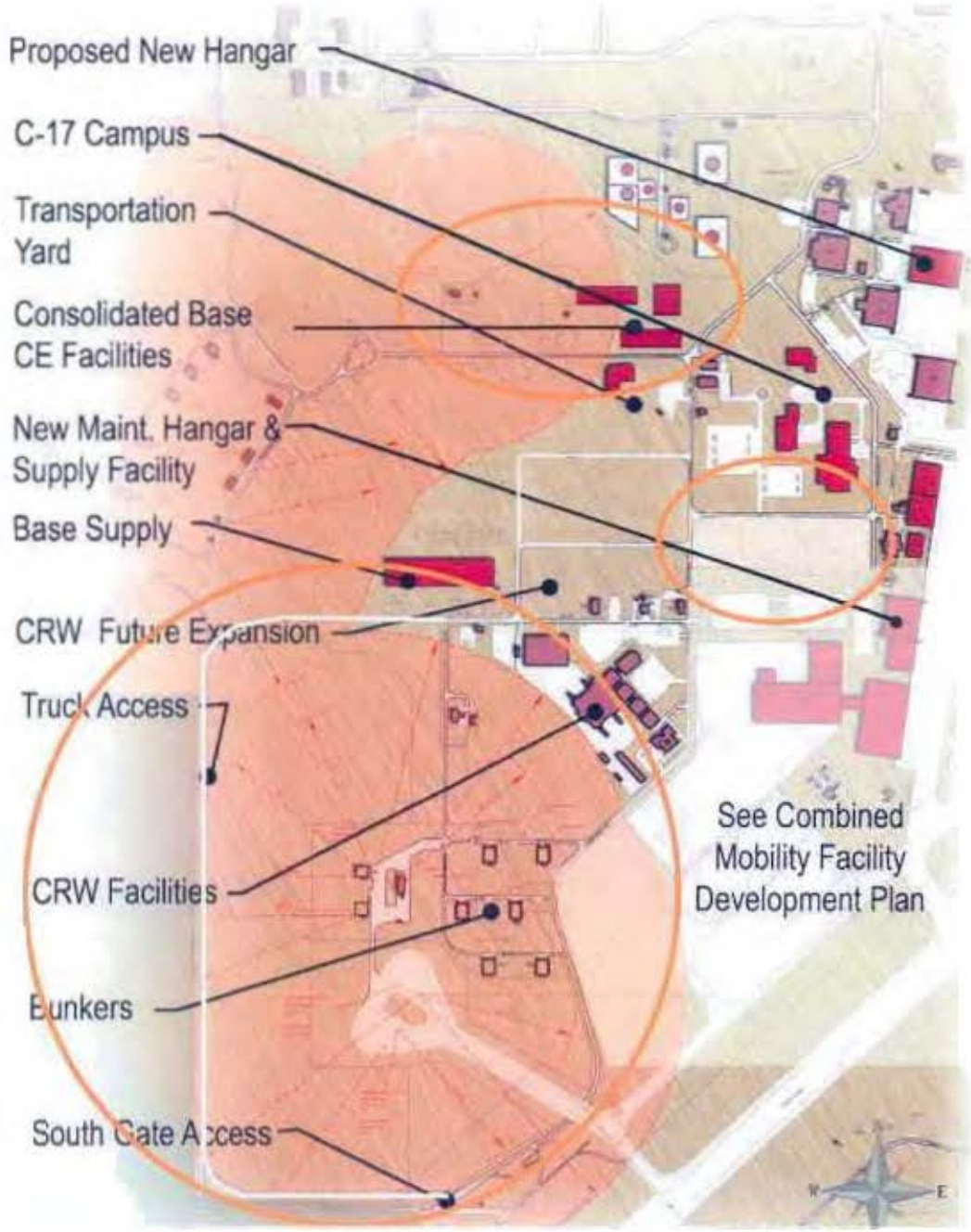
971
977
999
993


Proposed New Hangar
C-17 Campus
Transportation Yard
Consolidated Base CE Facilities
New Maint. Hangar & Supply Facility
Base Supply
CRW Future Expansion
Truck Access
CRW Facilities
Bunkers
South Gate Access
See Combined Mobility Facility Development Plan

ENGINEERING REVIEW COMMENTS

PAGE 1 OF 1 PAGES
DATE: 22 October 2007

☐ CONCEPT DESIGN ☐ SERVICE CONTRACTS

☐ % DESIGN SUBMITTAL ☐ OTHER AF FORM 813

PROJECT DESCRIPTION
Construct Taxiway M Bypass Road

LOCATION

REVIEWED BY
Mr. Lieu (4-5103)

☐ ARCHITECTURAL ☐ ELECTRICAL ☐ CEO/OPERATIONS ☐ SABER

☐ CIVIL & STRUCTURAL ☐ PROGRAMMING ☐ CER ☐ OTHER

☐ MECHANICAL ☐ CONSTRUCTION MGT ☑ CEV/ENVIRONMENTAL MGT

DRAWING NO. OR PARA NO.	ITEM NO.	COMMENTS	ACTION
		Project manager shall ensure that activities are in compliance with the following requirements:	
		1. Contractor's portable equipment rated greater than 50 hp shall be permitted with the Bay Area Air Quality Management District (BAAQMD) or registered with the California Air Resources Board (ARB).	
		2. BAAQMD and ARB permits and recordkeeping such as daily logs shall be posted on or near the site and shall be readily available upon request.	
		3. BAAQMD Regulation 6 for dust control requirements. There shall be no visible emissions.	

ENGINEERING REVIEW COMMENTS			PAGE 1 OF 2 PAGES DATE: 22 Oct 2007
☐ CONCEPT DESIGN ☐ _% DESIGN SUBMITTAL	☐ SERVICE CONTRACTS X OTHER, AF FORM 813	PROJECT DESCRIPTION Construct Taxiway M Bypass Rd.	
LOCATION Travis AFB		REVIEWED BY Julia Tseng, 60 CES/CEV, 4-3885	
☐ ARCHITECTURAL ☐ CIVIL & STRUCTURAL ☐ MECHANICAL	☐ ELECTRICAL ☐ PROGRAMMING ☐ CONSTRUCTION MGT	☐ CEO/OPERATIONS ☐ CER ☒ CEV/ENVIRONMENTAL MGT	☐ SABER ☐ OTHER

DRAWING NO. OR PARA NO.	ITEM NO.	COMMENTS	ACTION
		If bulk storage containers of 55 gallons or more for petroleum, oil and lubricant are used for this project, ensure full compliance with the following requirements.	
		1. A spill prevention and response (SPCC) plan is required in accordance with 60 AMW Integrated Contingency Plan and 40 CFR 112.3. In addition, 40 CFR 112.7(a)(3) requires that the Plan addresses each of the followings: (i) For each container, type of oil and storage capacity (ii) Discharge prevention measures, including procedure for routine handling of product (iii) Discharge or drainage controls, such as secondary containment around containers, and other structure, equipment, and procedures for the control of discharge (iv) Countermeasures for discharges discovery, response, and cleanup (v) Methods of disposal of recovered materials in accordance with applicable legal requirements (vi) Contact list and phone numbers for the facility response coordinator.	
		2. The annual training record of SPCC for oil handling personnel is kept on site in accordance with 40 CFR 112.7(f). 40 CFR 112.7(f)(1) requires that the training addresses each of the followings: (i) operation and maintenance of discharge prevention equipment; (ii) discharge procedure protocols; (iii) general facility operations; (iv) applicable pollution control laws, rules and regulations; (v) contents of SPCC plans.	
		3. A double-walled container or a secondary	

		containment to hold capacity of largest container and sufficient freeboard for precipitation is required in accordance with 40 CFR 112.8(c)(2)	
		4. Provide appropriate containment or preventive system to prevent a discharge from entering a navigable water in accordance with 40 CFR 112.7(c).	
		5. Provide security measures to prevent discharge via malfunctioned valves, caps, pumps and vandalism in accordance with 40 CFR 112.7(g).	
		6. Provide visible signage of contents and "No Smoking" on all accessible sides of the container in accordance with AFI 23-204.6.	

ENGINEERING REVIEW COMMENTS

PAGE 1 OF 1 PAGES
DATE: 22 Oct 07

☐ CONCEPT DESIGN ☐ SERVICE CONTRACTS

☐ % DESIGN SUBMITTAL ☐ OTHER AF FORM 813

PROJECT DESCRIPTION
Construct Taxiway M Bypass Road

LOCATION

REVIEWED BY
Arvey Andrews

☐ ARCHITECTURAL ☐ ELECTRICAL ☐ CEO/OPERATIONS ☐ SABER

☐ CIVIL & STRUCTURAL ☐ PROGRAMMING ☐ CER ☐ OTHER

☐ MECHANICAL ☐ CONSTRUCTION MGT ☑ CEV/ENVIRONMENTAL MGT

DRAWING NO. OR PARA NO.	ITEM NO.	COMMENTS	ACTION
		Please add the following:	
		1. Ensure that all hazardous material use is authorized, tracked, and managed in accordance with AFI 32-7086, AMC Supplement 1, 2.5.5.	

This Dig Permit attachment is not valid unless the digging permit application (60 AMW Form 55) has been approved and signed by an authorized CEV representative. This form, by itself, is not an approval document for any action and does not constitute Environmental Flight (CEV) coordination or approval. It must be considered only as an attachment to the document stated in the first paragraph (below).

TO: DIG PERMIT REQUESTER

FROM: 60 CES/CEV - Base Environmental Management

The following marked procedure(s) must be followed for Dig Permit #_____, AF Form 332 (Work Order) #_____, AF Form 813# 07-197 Other_____.

[ ] Soil at this site is contaminated. Use proper safety procedures when handling. Disposal of ANY soil from this site must be coordinated with the Environmental Flight, Environmental Compliance (CEVC) 4-7516.

[ ] Site contains contaminated groundwater. If crews encounter any groundwater, contact Environmental Flight, Environmental Compliance (CEVC) 4-7516.

[ ] Site contains reclaimed water sprinkler system and/or reclaimed water lines/eductor supply lines. SEE ATTACHED MAP(S). If crews damage or have any questions, contact Environmental Specialist Lonnie Duke at 424-7520, Fax 424-0833.

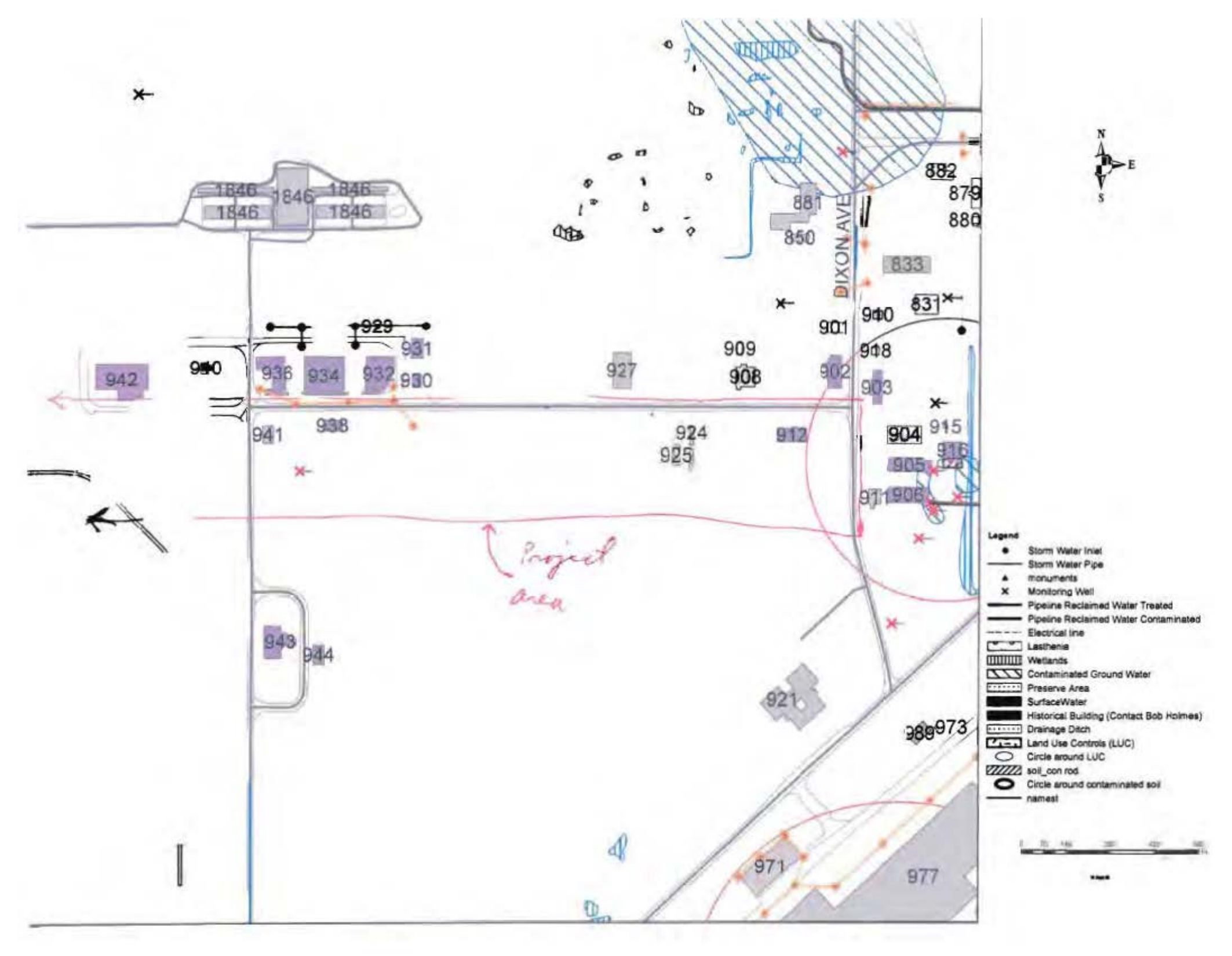
[ ] Dig site encroaches on or is in close PROXIMITY TO VERNAL POOL AREA(S) containing endangered species of plants or animals. DO NOT START ANY OPERATIONS IN THE AREA. Contact Environmental Flight at 424-3739, Fax 424-5105.

[ ] Disposal of ANY LEFTOVER SOILS as a result of your operations must be coordinated with Environmental Flight, Environmental Compliance (CEVC) 4-7516. Coordination must take place 5 working days prior to actual movement/disposal.

[ ] Disposal of ANY ASPHALT OR CONCRETE: must be recycled at an off base recycling facility (for example CON CRUSH). Total amount of tons must be identified on manifest, copy forwarded to Environmental Flight Recycling Manager Dolores Tiburcio. May be faxed to: (707) 424-5105; attention: Dolores. Reporting must take place within 5 working days after actual movement/disposal.

[X] MONITORING WELLS are in or near this site: These monitoring wells are not to be disturbed. Before any monitoring well can be disturbed, permission to do so must be received from Environmental Flight, Environmental Specialist, Lonnie Duke at 424-7520 Cell Phone (707) 290-8458, Fax 424-0833.

This Dig Permit attachment is not valid unless the digging permit application (60 AMW Form 55) has been approved and signed by an authorized CEV representative. This form, by itself, is not an approval document for any action and does not constitute Environmental Flight (CEV) coordination or approval. It must be considered only as an attachment to the document stated in the first paragraph (above).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906
Project area
943
944
921
973
971
977
N
E
S
Legend
Storm Water Inlet
Storm Water Pipe
monuments
Monitoring Well
Pipeline Reclaimed Water Treated
Pipeline Reclaimed Water Contaminated
Electrical line
Lasthenia
Wetlands
Contaminated Ground Water
Preserve Area
SurfaceWater
Historical Building (Contact Bob Holmes)
Drainage Ditch
Land Use Controls (LUC)
Circle around LUC
soil_con rod
Circle around contaminated soil
namest

60 CES/CEVC Water Program Checklist

Project Title Construct Taxiway M Bypass Rd

XDAT _____ 07-197

Reviewed by Chris Krettecos CJK Date 10/29/07

[✓] Project qualifies as construction of 1 acre or more, or is part of a larger plan totaling 1 acre or more. Contractor must complete a Notice of Intent, SWPPP, and fee and submit it to 60 CES/CEVC prior to construction. (see attachments 1, 2, and 3) and complete and submit an Annual Site Compliance Report by July 1 of each year (see attachment 4).

[ ] Project qualifies as construction of a sensitive nature less than 1 acre. Contractor must complete the Travis AFB Storm Water Pollution Prevention Plan for Construction Activities Less than 1 Acre (attachment 1) and submit it to Chris Krettecos in 60 CES/CEVC, Bldg 570, prior to construction. Phone 424-3587 if you have any questions.

[ ] Project qualifies as maintenance or ground disturbing activity of a sensitive nature. Contractor must complete the Travis AFB Storm Water Pollution Prevention Plan for Construction Activities Less Than 1 Acre and submit it to 60 CES/CEVC prior to construction (Attachment 1)

[✓] Construction and demolition debris must be managed and protected to prevent it from entering the storm sewer system or blowing or running off the site.

[✓] Handle soil in a manner that will prevent it from entering storm drains or blowing or running off site. Use appropriate industry standard Best Management Practices as required

[✓] Uncontaminated water from excavations can be dewatered to nearby grass or soil in a manner that will not cause erosion. Contact 60 CES/CEVN prior to dewatering to soil or grass to assure proposed discharge location does not threaten vernal pools or other environmentally sensitive areas. Do not discharge to storm drains, gutters or sanitary sewer.

[ ] High pressure water wash used to clean buildings of dirt and loose paint should be kept out of storm drains. Channel flow through filter rolls or similar to catch paint chips and debris and allow to flow to permeable area such as soil or grass. Collect waste and dispose of properly. Control flow to prevent erosion. Contact 60 CES/CEVN prior to dewatering to soil or grass to assure proposed discharge location does not threaten vernal pools or other environmentally sensitive areas. Flow may be channeled to large impervious area with no drains and allowed to evaporate. . Be sure to collect paint chips from all ground surfaces after blasting and dispose of properly. For lead based paint, follow Travis AFB lead based paint management plan.

[ ] Keep all paint products and wastes away storm drains, gutters and streets. Liquid residue from oil based paints, thinners, solvents, glues and cleaning fluids may be hazardous and must be disposed of properly.

[ ] For oil-based paints, "paint out" brushes to the maximum extent possible and dispose of all wastes according to proper procedures.

[ ] For water-based paints, "paint out" brushes to the maximum extent possible and rinse brushes to the sanitary sewer. Use plenty of water. Never pour paint down the drain.

[✓] Fairfield-Suisun Sewer District permit regulates discharges to the sanitary sewer. Do not discharge wastewater or storm water associated with construction or industrial activity to the sanitary sewer without approval from 60 CES/CEVC and a permit from the Fairfield-Suisun Sewer District.

[✓] Cleanup after concrete, stucco, mortar and asphalt work can cause storm water contamination. Uncured concrete, stucco and mortar should be returned to point of origin, or establish a permeable area away from drains, ditches, gutters and roadways to deposit until cured. When cured, remove and dispose properly. Return mixing equipment to point of origin for cleaning when possible. Otherwise, wash water and slurry should be dumped to a permeable area where it can be contained until dry. Hardened slurry should be removed and disposed of. Contact 60 CES/CEVN prior to dewatering to soil or grass to assure proposed discharge location does not threaten vernal pools or other environmentally sensitive areas.

[✓] Surface cleaning solutions, including rinse water, must be collected and disposed of properly. Grease, oil, trisodium phosphate, sodium hypochlorite, hydrochloric acid and similar cleaning solutions are not authorized storm water discharges and are not legal to discharge down sanitary sewers.

[✓] Saw cut slurry is a contaminant. Use sand/gravel bags or inlet filters in and/or around storm drain inlets to catch slurry. Vacuum or otherwise remove slurry and runoff as soon as possible and dispose of properly.

Other CONTROL EROSION & STORMWATER RUNOFF. PROTECT DRAINS. FOLLOW CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD'S "EROSION & SEDIMENT CONTROL FIELD MANUAL".

Appendix B
Air Force Form 1391

1. COMPONENT	FY 2010 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
AIR FORCE	(computer generated)	

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
TRAVIS AIR FORCE BASE, CALIFORNIA	CONSTRUCT SOUTH GATE BYPASS ROAD

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
91211	851-147	XDAT063010	4,600

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITIES				2,115
ROAD PAVEMENT & BASE COURSE	SM	30,260	69	(2,095)
AT/FP	LS			(20)
SUPPORTING FACILITIES				2,026
PAVEMENT DEMOLITION	SM	24,000	24	(573)
SITE WORK & LANDSCAPING	LS			(127)
ENVIRONMENTAL RESTORATION	LS			(420)
RELOCATE UTILITIES	LS			(348)
NEW STORM SEWER & CULVERTS	LS			(558)
SUBTOTAL				4,141
CONTINGENCY (5.0%)				207
TOTAL CONTRACT COST				4,348
SUPERVISION, INSPECTION AND OVERHEAD (5.7%)				248
TOTAL REQUEST				4,596
TOTAL REQUEST (ROUNDED)				4,600

10. Description of Proposed Construction: Construct 2-lane asphalt roads to include 32' X 7,900', 20' X 1,000', and 24' X 2,200' including all drainage, curbing, shoulders, base course and all utilities as required to complete a usable 2-lane truck route.

11. Requirement: 30260 SM Adequate: SM Substandard: 24000 SM

PROJECT: Construct new 2-lane asphalt by-pass road.

REQUIREMENT: Construct new 2-lane asphalt South Gate Bypass Road from south gate Ragsdale Street to munitions in an arc back to "W" Street intersecting again with Ragsdale Street. Construct road from new by-pass road to munitions truck parking ramp replacing old one lane road.

CURRENT SITUATION: Current entrance for truck delivery route to facilities on Travis AFB is via South Suisun Gate. This route follows Ragsdale Street across Taxiway M, which is the entrance to the munitions hazardous cargo pad for loading and unloading munitions. Taxiway M is only protected by plastic barriers on either side of Ragsdale Street and is a constant concern for safety and security issues. Antiterrorism Force Protection (AT/FP) risk is a constant concern of unauthorized personnel inadvertently turning onto Taxiway M and ending up on parking ramps or on active runway 03L 21R. Traffic is halted for minimum periods of one hour twice weekly when taxiway is in use, disrupting commercial vehicle deliveries and requiring the use of additional man power for directing traffic. The current detection system for this area was deactivated when the new air traffic control tower was constructed, resulting in additional safety and security issues which could be alleviated by constructing a new bypass road.

IMPACT IF NOT PROVIDED: Commercial vehicle traffic to facilities on Travis AFB will continue to be a safety and security problem due to crossing Taxiway M. This will continue to be a problem for commercial vehicles entering and leaving Travis AFB when taxiway is in use. There will always be continued AT/FP and safety problems for aircraft that utilize this taxiway hauling munitions coming in close vicinity of private commercial vehicles.

1. COMPONENT AIR FORCE	FY 2010 MILITARY CONSTRUCTION PROJECT DATA (computer generated)	2. DATE

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
TRAVIS AIR FORCE BASE, CALIFORNIA	CONSTRUCT SOUTH GATE BYPASS ROAD

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
91211	851-147	XDAT063010	4,600

ADDITIONAL: Conversion: 1 SM = 10.76 SF
This project meets the criteria/scope specified in Air Force Handbook 32-1084, Facility Requirements. A preliminary economic analysis has been prepared comparing the alternatives of maintaining the status quo upgrading an existing facility, or new construction. Based on the net present values and benefits of the respective alternatives, new construction was not found to be the most cost efficient over the life of the project however, the safety and AT/FP issues concerning this bypass road is a determining factor in routing traffic around rather than over an active taxiway. An Environmental Analysis has been accomplished to determine environmental conditions in specified construction area and consider most feasible site for road construction. A certificate of exception is being prepared for this project. Base Civil Engineer: Lt Col C.S. Hoover, 707-424-2492.

JOINT USE CERTIFICATION: This is an installation utility/infrastructure project, and does not qualify for joint use at this location. However, all tenants on this installation are benefited by this project.

1. COMPONENT	FY 2010 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
AIR FORCE	(computer generated)	

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
TRAVIS AIR FORCE BASE, CALIFORNIA	CONSTRUCT SOUTH GATE BYPASS ROAD

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
91211	851-147	XDAT063010	4,600

12. SUPPLEMENTAL DATA:

a. Estimated Design Data:

(1) Status:

(a) Date Design Started	
(b) Parametric Cost Estimates used to develop costs	YES
* (c) Percent Complete as of 01 JAN 2009	
* (d) Date 35% Designed	
(e) Date Design Complete	
(f) Energy Study/Life-Cycle analysis was/will be performed	NO

(2) Basis:

(a) Standard or Definitive Design -	NO
(b) Where Design Was Most Recently Used	

(3) Total Cost (c) = (a) + (b) or (d) + (e):

	($000)
(a) Production of Plans and Specifications	0
(b) All Other Design Costs	0
(c) Total	0
(d) Contract	0
(e) In-house	0

(4) Construction Contract Award

(5) Construction Start

(6) Construction Completion

*** Indicates completion of Project Definition with Parametric Cost Estimate which is comparable to traditional 35% design to ensure valid scope, cost and executability.**

b. Equipment associated with this project provided from other appropriations:
N/A

Appendix C
Air Emission Calculations

APPENDIX C

Air Emission Calculations

C.1 Construction Equipment and Fugitive Dust Emissions

The construction equipment and vehicles emissions of carbon monoxide, nitrogen oxide, particulate matter less than 2.5 microns ($PM_{2.5}$), particulate matter less than 10 microns (PM_{10}), sulfur dioxide, and volatile organic compounds (VOC) were estimated by using the California Air Resources Board (CARB) URBEMIS2007 model (URBEMIS, 2007). The model used the projected construction duration and estimated hours of construction equipment operations. Construction of the Taxiway M Bypass Road would take approximately 3 months and would occur in 2011. Approximately 10 acres would be disturbed.

Default settings in URBEMIS2007 were used when project-specific data were not available. Fugitive dust emissions were estimated by using a default emissions factor of 10 pounds per acre. Other default settings used in the URBEMIS model for the 10-acre construction site include the following:

- For site grading:
  - Maximum daily disturbed area: 2.5 acres
  - One grader (174 horsepower [hp]) operating at 61 percent load for 6 hours/day
  - One rubber-tired dozer (357 hp) operating at 59 percent load for 6 hours/day
  - One tractor/loader/backhoe (108 hp) operating at 55 percent load for 7 hours/day
  - One water truck (189 hp) operating at 50 percent load for 8 hours/day
- For paving:
  - Total area to be paved: 10 acres
  - Four cement and mortar mixers (10 hp) operating at 56 percent load for 6 hours/day
  - One paver (100 hp) operating at 62 percent load for 7 hours/day
  - Two paving equipment (104 hp) operating at 53 percent load for 6 hours/day
  - One roller (95 hp) operating at 56 percent load for 7 hours/day

A summary of the emissions from onsite construction equipment and fugitive dust are shown in Table C-1

C.1.1 Workers Commute Emissions

Emissions associated with worker commutes were determined by using the estimated number of trips and vehicle miles traveled by the workers. Emission factors were calculated by using EMFAC2007 (CARB, 2007) for the Bay Area Air Quality Management District for the year 2011. The number of workers commuting to the construction site was assumed to be 15 per day, based on the equipment used for grading and paving. The average round trip distance for each worker was assumed to be 40 miles. The EMFAC2007 emission factors for passenger cars and the estimated worker commute emissions are shown in Table C-2.

TABLE C-1
Alternative 2 Estimated Construction Equipment and Fugitive Dust Emissions
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Air Emission Calculations

	CO (tpy)	CO_2 (tpy)	NOx (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)
Equipment Exhaust – Grading	0.39	73.0	0.76	0.040	0.040	0.00	0.090
Equipment Exhaust – Paving	0.28	42.8	0.50	0.040	0.040	0.00	0.080
Fugitive Dust	NA	NA	NA	0.17	0.81	NA	NA

Notes:

Emission data estimated by using URBEMIS2007.

NA = not applicable
CO = carbon monoxide
NO_x = nitrogen oxide
SO_2 = sulfur dioxide
tpy = ton per year

TABLE C-2
Alternative 2 Estimated Workers Commute Emissions
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Air Emission Calculations

	CO	CO_2	NOx	$PM_{2.5}$	PM_{10}	SO_2	VOC
Emission factor (pounds per mile)	0.0041	0.633	0.00045	0.000029	0.000062	0.0000066	0.00016
Workers Commute Emissions (tpy)	0.081	12.3	0.0087	0.00056	0.0012	0.00013	0.0031

Note:

Emission factors estimated by using EMFAC2007 for BAAQMD for 2011.

C.1.2 Total Construction Emissions

Table C-3 presents the total of the construction emissions.

TABLE C-3
Summary of Construction Emissions – Total
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Air Emission Calculations

Emission Type	CO (tpy)	CO_2 (tpy)	NOx (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)
Equipment Exhaust – Grading	0.39	73.0	0.76	0.040	0.040	0.00	0.090
Equipment Exhaust – Paving	0.28	42.8	0.50	0.040	0.040	0.00	0.080
Fugitive Dust	NA	NA	NA	0.17	0.81	NA	NA
Worker Commute	0.081	12.3	0.0087	0.00056	0.0012	0.00013	0.0031
Total Emissions	**0.86**	**128.1**	**1.3**	**0.25**	**0.89**	**0.00013**	**0.17**

Note:

NA = not applicable

C.2 Works Cited

California Air Resources Board (CARB). 2007. *EMFAC2007 Release*. Available at: http://www.arb.ca.gov/msei/onroad/latest_version.htm. Accessed August 13, 2008.

URBEMIS. 2007. URBEMIS 2007 for Windows, Version 9.2. Available at: www.urbemis.com/software/Urbemis2007v9_2.html. Accessed June 2007.

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Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\My Documents\files from 09 computer\Projects\Travis\Taxiway\2010 July revision\Travis taxiway.urb924

Project Name: Travis Helipad

Project Location: California State-wide

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2011	0.19	1.27	0.77	0.00	0.81	0.08	0.89	0.17	0.07	0.24	125.76
Asphalt 04/01/2011-06/30/2011	0.09	0.50	0.35	0.00	0.00	0.04	0.04	0.00	0.04	0.04	49.40
Paving Off-Gas	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.08	0.46	0.27	0.00	0.00	0.04	0.04	0.00	0.04	0.04	36.79
Paving On Road Diesel	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.97
Paving Worker Trips	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.64
Fine Grading 04/01/2011-06/30/2011	0.09	0.76	0.42	0.00	0.81	0.04	0.85	0.17	0.04	0.20	76.36
Fine Grading Dust	0.00	0.00	0.00	0.00	0.81	0.00	0.81	0.17	0.00	0.17	0.00
Fine Grading Off Road Diesel	0.09	0.76	0.39	0.00	0.00	0.04	0.04	0.00	0.04	0.04	73.04
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.32

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Phase Assumptions

Phase: Fine Grading 4/1/2011 - 6/30/2011 - grading

Total Acres Disturbed: 10

Maximum Daily Acreage Disturbed: 2.5

Fugitive Dust Level of Detail: Default

10 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Paving 4/1/2011 - 6/30/2011 - paving

Acres to be Paved: 10

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 6 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day

Appendix D
Clean Air Act Conformity Applicability Analysis

APPENDIX D

Clean Air Act Conformity Applicability Analysis for a Taxiway M Bypass Road at Travis Air Force Base

D.1 Purpose

The U.S. Air Force is required to perform a general conformity applicability analysis to determine whether the Taxiway M Bypass Road Project at Travis Air Force Base (Travis AFB), California, will comply with the U.S. Environmental Protection Agency's (EPA) Final Conformity Rule, 40 Code of Federal Regulations (CFR) 93, Subpart B (for federal agencies), and 40 CFR 51, Subpart W (for state requirements), of the amended Clean Air Act (CAA).

D.2 Background

EPA has issued regulations addressing the applicability and procedures so that federal activities comply with the amended CAA. The EPA Final Conformity Rule implements Section 176(c) of the CAA, as amended in 42 United States Code 7506(c). This rule was published in the *Federal Register* on November 30, 1993, and took effect on January 31, 1994. In March 2010, EPA revised the general conformity rule, which was published in Federal Registry in April 2010. The revised rule improves the process federal entities use to demonstrate that their actions will not contribute to a violation of a national air quality standard. The revised rule became effective in July 2010. The analysis presented in this document follows the new requirements in the 2010 version of the rule, which covers the comparison of project emissions to the de minimis levels. The regional significance analysis is not required after July 2010.

The EPA Final Conformity Rule requires all federal agencies to ensure that any federal action resulting in nonattainment or maintenance criteria pollutant emissions must conform with an approved or promulgated state or federal implementation plan. Conformity means compliance with the purpose of attaining or maintaining the National Ambient Air Quality Standards (NAAQS). Specifically, this means the federal action will not: (1) cause a new violation of the NAAQS, (2) contribute to any increase in the frequency or severity of violations of existing NAAQS, or (3) delay the timely attainment of any NAAQS interim or other attainment milestones.

The General Conformity Rule applies only to federal actions in NAAQS nonattainment or maintenance areas.

D.3 Summary of Air Pollutant Emissions and Regulatory Standards

The proposed project would be implemented in Solano County, California, under the jurisdiction of the California Air Resources Board (CARB), the Bay Area Air Quality Management District (BAAQMD), and EPA Region 9. The area is designated as non-attainment (marginal) for 8-hour ozone and particulate matter less than 2.5 micrometers ($PM_{2.5}$) NAAQS. In addition, the urbanized areas of Solano County, which include Travis AFB, are maintenance areas for carbon monoxide under the *2004 Revision to the California State implementation Plan for Carbon Monoxide, Updated Maintenance Plan for Ten Federal Planning Areas* (CARB, 2004). The county is in attainment of NAAQS for all other criteria pollutants.

The EPA Final Conformity Rule requires that total direct and indirect emissions of non-attainment and maintenance criteria pollutants, including ozone precursors (volatile organic compounds [VOC] and nitrogen oxides), be considered in determining conformity. The rule does not apply to actions where the total direct and indirect emission of nonattainment and maintenance criteria pollutants do not exceed threshold levels for criteria pollutants established in 40 CFR 93.153(b). Tables D-1 and D-2 present the de minimis threshold levels for nonattainment and maintenance areas, respectively. If a federal action meets de minimis requirements, detailed conformity analyses are not required pursuant to 40 CFR 93.153(c). The applicable de minimis levels for the proposed project are 100 tons per year (tpy) for emissions of ozone precursors (VOCs and nitrogen oxides), $PM_{2.5}$, sulfur dioxide (a precursor of $PM_{2.5}$), and carbon monoxide.

TABLE D-1
De Minimis Thresholds in Nonattainment Areas
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Clean Air Act Conformity Applicability Analysis for a Taxiway M Bypass Road at Travis Air Force Base

Pollutant	Degree of Nonattainment	De Minimis Threshold[a] (tpy)
CO	All	100
O_3 (NO_X)	Marginal and moderate – inside an O_3 transport region	100
O_3 (VOCs)	Marginal and moderate – inside an O_3 transport region	50
O_3 (VOCs and NO_X)	Serious	50
	Severe	25
	Extreme	10
	Other ozone – outside an O_3 transport region	**100**
Pb	All	25
PM_{10}	Moderate	100
	Serious	70
$PM_{2.5}$	Direct emissions	**100**
	NOx	**100**
	SO_2	**100**
	VOC or ammonia	100
SO_2 or NO_2	All	100

[a]The bold numbers are de minimis threshold used in this analysis.

TABLE D-1
De Minimis Thresholds in Nonattainment Areas
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Clean Air Act Conformity Applicability Analysis for a Taxiway M Bypass Road at Travis Air Force Base

Pollutant	Degree of Nonattainment	De Minimis Threshold[a] (tpy)

Source: 40 CFR 93.153(b)

Notes:

CO = carbon monoxide
NO_2 = nitrogen dioxide
NO_x = nitrogen oxide
O_3 = ozone
Pb = lead
PM_{10} = particulate matter (10-micron maximum diameter)
$PM_{2.5}$ = particulate matter (2.5-micron maximum diameter)
SO_2 = sulfur dioxide

TABLE D-2
De Minimis Thresholds in Maintenance Areas
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Clean Air Act Conformity Applicability Analysis for a Taxiway M Bypass Road at Travis Air Force Base

Pollutant	Maintenance Area	De Minimis Threshold[a] (tpy)
CO	All	**100**
O_3 (NO_X)	All	100
O_3 (VOCs)	Inside an O_3 transport region	50
	Outside an O_3 transport region	100
Pb	All	25
$PM_{2.5}$	Direct emissions	100
	NOx	100
	SO_2	100
	VOC or ammonia	100
PM_{10}	All	100
SO_2 or NO_2	All	100

[a]The bold value is the de minimis threshold used in this analysis.
Source: 40 CFR 93.153(b)

D.4 Emission Calculations

Construction of the Taxiway M Bypass Road would take approximately 3 months. Construction emissions are expected to occur as a result of engine exhaust from construction worker vehicles and offroad construction equipment including earth-moving equipment and trucks. These emissions would primarily consist of nitrogen oxide, sulfur dioxide, particulate matter, carbon monoxide, and VOCs. In addition, site preparation and grading would result in fugitive dust emissions. The construction emissions of VOCs, nitrogen oxide, carbon monoxide, sulfur dioxide and $PM_{2.5}$ were estimated by using the URBEMIS2007 model (URBEMIS, 2007). The estimates are based on the projected size of the

construction area, the duration of construction duration, and the estimated number of hours the construction equipment would be operated. Default settings in URBEMIS2007 were used when project specific data were not available.

Emissions associated with worker commutes were estimated by using the vehicle miles traveled by the workers. Emission factors were calculated by using EMFAC2007 (CARB 2007) for BAAQMD for the year 2011.

Because both of the build alternatives, Alternative 2 and Alternative 3, have a similar construction area size and the same construction schedule, it was assumed that the emissions from Alternatives 2 and 3 would be the same.

D.4.1 Operation Emissions

Operation emissions from the project would be generated by the vehicles traveling on the newly constructed Taxiway M Bypass Road. However, there will be no additional traffic generated by the project. Therefore, operation emissions would not increase compared to current conditions, and no further analysis is required.

D.4.2 Emissions Summary and Comparison to De Minimis Levels

The annual emission increases associated with the project and the comparisons with the de minimis thresholds are shown in Table D-3. Emissions of carbon monoxide, nitrogen oxide, $PM_{2.5}$, sulfur dioxide, and VOCs during the construction of the project are all far below the de minimis thresholds for each of the applicable pollutants. On the basis of the conformity applicability criteria, the project conforms to the most recent EPA-approved SIP; therefore, the project is exempt from the CAA conformity requirements and does not require a detailed conformity demonstration.

TABLE D-3
General Conformity Analysis for Alternative 2 and Alternative 3
Environmental Assessment for a Taxiway M Bypass Road, Travis Air Force Base, California – Clean Air Act Conformity Applicability Analysis for a Taxiway M Bypass Road at Travis Air Force Base

Activity	VOC (tpy)	CO (tpy)	NO_x (tpy)	SO_2 (tpy)	$PM_{2.5}$ (tpy)
Construction (2011)	0.17	0.86	1.3	0.00013	0.25
Operation (2011 and after)	0	0	0	0	0
De Minimis Threshold	100	100	100	100	100

D.5 Works Cited

California Air Resources Board (CARB). 2007. *EMFAC2007 Release*. Available at: http://www.arb.ca.gov/msei/onroad/latest_version.htm. Accessed August 13, 2008.

California Air Resources Board (CARB). 2004. *2004 Revision to the California State implementation Plan for Carbon Monoxide, Updated Maintenance Plan For Ten Federal Planning Areas.*

URBEMIS. 2007. *URBEMIS 2007 for Windows, Version 9.2*. Available at: www.urbemis.com/software/Urbemis2007v9_2.html. June.

Appendix E
Biological Assessment

Draft Environmental Assessment for a
Taxiway M Bypass Road
Appendix E

Biological Assessment Taxiway M Bypass Road Travis Air Force Base, Solano County, California

Prepared for

Department of the Air Force
Air Mobility Wing

Travis Air Force Base, California

October 2010

CH2MHILL
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833

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A USFWS Species List and Official Letter, Travis Air Force Base, Solano County, California

B CNDDB - Solano County Federally Endangered, Threatened, Proposed, Candidate, and Delisted Species

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4-3 Species List Obtained from USFWS Sacramento Ecological Services Field Office, Current Distribution, and Status within the Action Area

Acronyms and Abbreviations

AFB	Air Force Base
BA	Biological Assessment
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
ESA	Endangered Species Act
MHCP	Multispecies Habitat Conservation Plan
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

SECTION 1

Introduction

1.1 Purpose and Need of the Proposed Action

The U.S. Air Force Air Mobility Wing at Travis Air Force Base (Travis AFB or Base) in Fairfield, California, proposes to construct a bypass road in the southwest portion of Travis AFB to divert commercial traffic away from Taxiway M (Figure 1-1). The proposed bypass road will be constructed west of Peterson Road and will provide a route around Taxiway M for traffic entering and exiting the Base from the South Gate. Currently, Ragsdale Street is used by commercial vehicles to access Travis AFB via the South Gate. Ragsdale Street crosses Taxiway M, which leads to a munitions hazardous cargo pad where aircraft load and unload munitions. Ragsdale Street and Taxiway M are close to an active runway.

Travis AFB proposes to route commercial vehicles around Taxiway M to alleviate safety, security, and accessibility concerns. Safety concerns include (1) vehicle traffic entering the Base via Ragsdale Street must cross Taxiway M, (2) vehicle traffic comes close to the entrance of the munitions hazardous cargo pad, and (3) commercial vehicle traffic and aircraft share space at the intersection of Ragsdale Street and Taxiway M. The risk of unauthorized access to Taxiway M, the munitions hazardous cargo pad, parking ramps, and the runway creates an anti-terrorism/force protection (AT/FP) security concern. In addition, the proximity of Ragsdale Street to the runway creates a vulnerable situation for flight operations; a catastrophic event (e.g., terrorist action or a hazardous material incident) could disrupt runway operations and the delivery of supplies to the Base. Accessibility concerns exist because commercial vehicle traffic is stopped two times every week for a minimum of 1 hour when the taxiway is in use. This disrupts deliveries to the Base and requires personnel to direct traffic.

1.2 Section 7 Endangered Species Act Consultation

In accordance with 50 Code of Federal Regulations (CFR) 402.12(c), a species list was obtained from the U.S. Fish and Wildlife Service (USFWS) Sacramento Ecological Services Field Office (via an online query system) on July 20, 2010 (Appendix A).

Consultation with USFWS regarding the Taxiway M Bypass Road Project included the following meetings:

- Meeting between Dave Musselwhite from Travis AFB and Michelle Tovar from USFWS on December 3, 2008.
- Meetings between Brian Sassaman from Travis AFB and Michelle Tovar from USFWS on June 2, 2010, and on August 25, 2010.

This Biological Assessment (BA) considers how the Proposed Action (described in Section 2) may affect listed species populations, habitat, and recovery efforts within the action area

(described in Section 3). Section 4 discusses the federally threatened and endangered species associated with the action area. Section 5 includes an analysis of the direct and indirect effects of the Proposed Action on species or critical habitat, along with descriptions of conservation measures designed to reduce these effects. Section 6 lists the references used to assess effects of the Proposed Action on listed species.

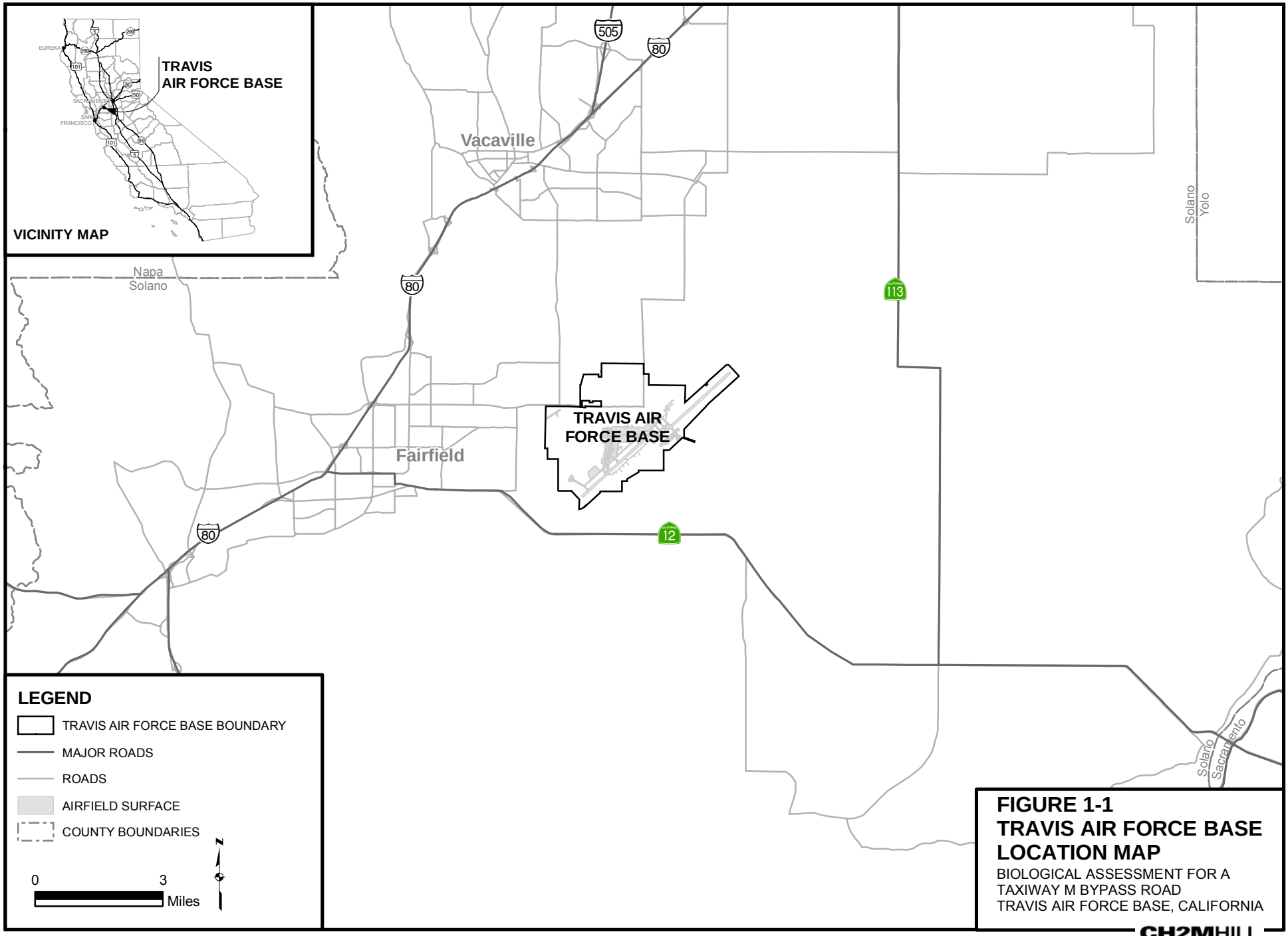

FIGURE 1-1
TRAVIS AIR FORCE BASE
LOCATION MAP
BIOLOGICAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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SECTION 2

Description of the Proposed Action

The Proposed Action includes constructing a bypass road to route traffic around Taxiway M and improving the access road to the C Bunker parking lot and the eastern portion of W Street. The Proposed Action includes a bypass road from the South Gate, passing west of the munitions bunkers (Buildings 959, 960, and 961) and C Bunker access road, across Cordelia Avenue and connecting to W Street. Under the Proposed Action, a portion of W Street and the road leading to the C Bunker parking lot will be improved. A new road will be constructed south of Ragsdale Street to connect the bypass road to Perimeter Road. The end of Ragsdale Street, toward the beginning of the new intersection of the bypass road, will be demolished. Figure 2-1 shows the construction area for the Proposed Action.

The bypass road will be constructed for commercial vehicle transportation from the South Gate and will accommodate vehicles up to 45 feet long and 12 feet wide. The bypass will be a two-lane, 36-foot-wide asphalt road, with three emergency stops (48 feet wide by 180 feet long). The total construction footprint under the Proposed Action will be approximately 399,600 square feet (9.17 acres). The new road and W Street will be used to route traffic around Taxiway M, and the improved C Bunker access road will continue to provide access to the C Bunker parking lot.

The C Bunker parking lot (see Figure 2-1) is a secured area used by vehicles (generally, large trucks) that contain shipments of hazardous materials entering the Base after hours. Operations at the parking lot will not change as a result of road improvements. The C Bunker access road improvements will allow safe truck access to the C Bunker parking area. The existing road is narrow and deteriorating (cracked asphalt with vegetation growing in the center and on the edges of road).

The Proposed Action includes the following four components:

1. Construct a new road from south Ragsdale Street to W Street. The road will pass southwest of Taxiway M, cross Cordelia Avenue, and intersect W Street (see Figure 2-1).

2. Construct improvements to W Street. W Street is a one-way street north of the munitions buildings and northwest of Taxiway M. W Street currently consists of an asphalt road, lined on either side by buildings. W Street connects on the east end with Dixon Avenue. The new road will intersect with W Street. The eastern end of W Street will be widened to 36 feet and repaved. Improvements also include converting W Street into a two-lane, two-way street.

3. Construct a new road from Ragsdale Street to Perimeter Road (see Figure 2-1).

4. Construct improvements to the C Bunker access road. The existing access road leading from south Ragsdale Street to C Bunker consists of a one-lane asphalt road used by commercial vehicles to access the C Bunker parking lot. The new access road to the C Bunker parking lot will join the proposed bypass road near the western boundary of the

Base. A stop sign for traffic from the C Bunker parking lot will be placed at the intersection with the new bypass road.

The Proposed Action will take approximately 12 months to construct. Staging of equipment used during construction will occur on existing paved areas near the new bypass road and C Bunker access road. Staging will also occur at the C Bunker parking lot. Typical construction equipment that will be used includes a dump truck, backhoe, and truck concrete mixer. Construction is scheduled to begin between April and June 2011.

Conservation Measures

Conservation measures included in the Proposed Action are designed to avoid and minimize adverse effects to listed species. In addition, the conservation measures correspond to recommended actions outlined in USFWS recovery plans for listed species and vernal pool habitat (USFWS, 2005). Conservation measures are discussed in Section 5.4.

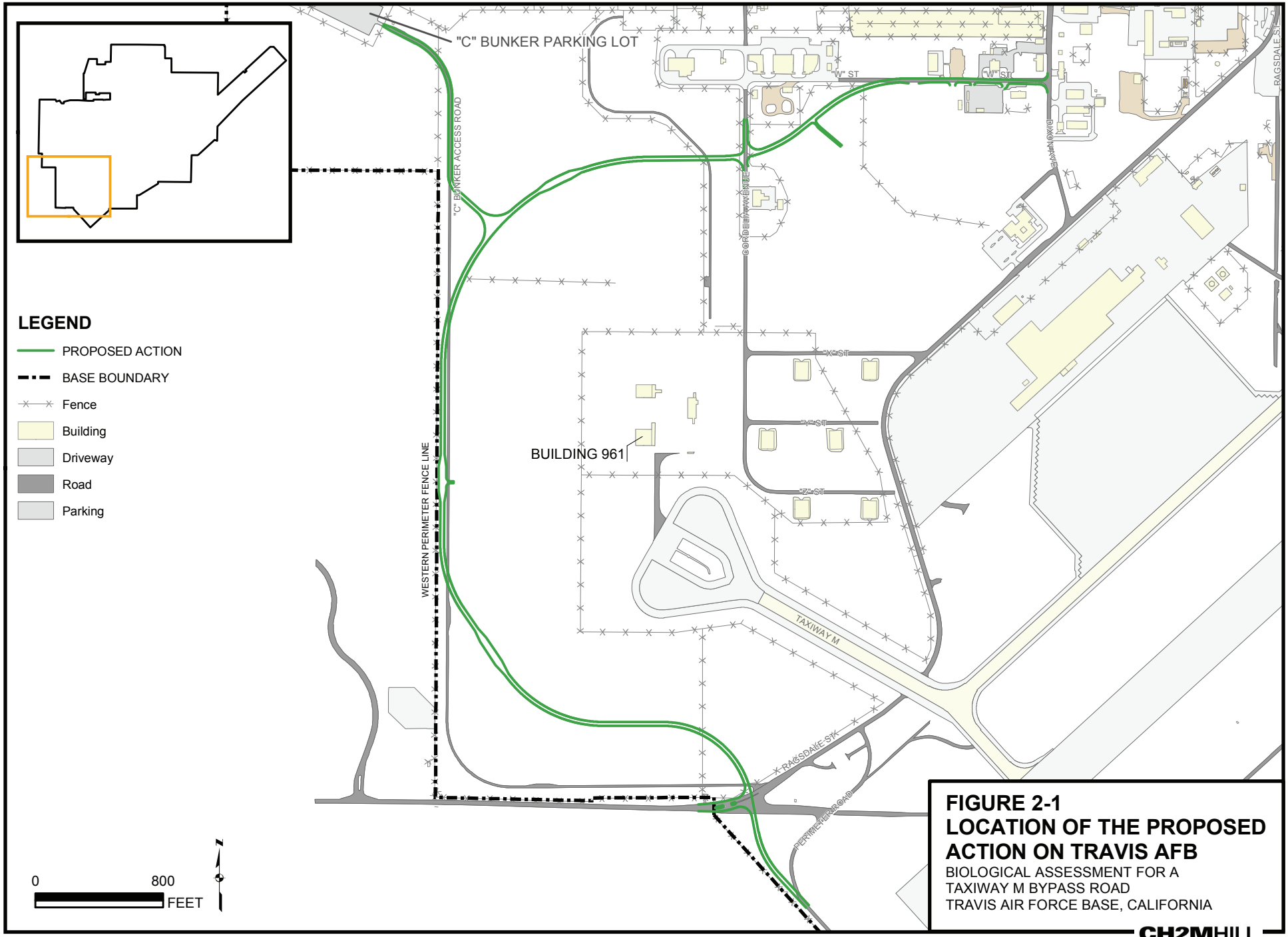

FIGURE 2-1
LOCATION OF THE PROPOSED ACTION ON TRAVIS AFB
BIOLOGICAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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SECTION 3

Description of the Action Area

The action area is the combined area of direct and indirect effects to federally listed species. This section describes the action area subject to direct effects that could occur during construction (site grading and paving) and operation, as well as indirect effects caused by or resulting from the project that are reasonably certain to occur later in time. Direct and indirect effects are discussed further in Sections 5.1 and 5.2, respectively.

No federally listed species or habitats were identified within the areas of permanent and temporary construction-related disturbance. Direct and indirect construction and operation-related changes to hydrology, water quality, air quality, lighting, and noise beyond the area of ground disturbance may affect, but are not likely to adversely affect, several federally listed species associated with nearby vernal swales and seasonal wetlands. With the implementation of conservation measures discussed in Section 5.4, direct and indirect effects will be limited to within one-half mile from the area of construction-related disturbance; therefore, the action area includes vernal pools within one-half mile of the limit of permanent and temporary construction-related disturbance (Figure 3-1).

The action area is currently an open grassland area, much of which is leased for cattle grazing. As shown in Figure 2-1, the project has been designed to avoid and minimize impacts to wetland resources in the vicinity. Construction could indirectly affect vernal pools near the roadway as a result of altered surface runoff into the pools. Weakly expressed vernal swales that lack well-defined depressional topography and appear to be shallow were identified near the proposed roadway; however, these areas will not be affected during construction. These areas are characterized by a mixture of annual grassland and wetland plants including species typical of vernal pools, such as stalked popcorn flower (*Plagiobothrys stipitatus*), coyote-thistle (*Eryngium* sp), annual hairgrass (*Deschampsia danthonioides*), spotted-throat downingia (*Downingia concolor*), and Mediterranean barley (*Hordeum marinum*). Wetland hydrology appears to be marginal in these areas because they likely support only short-duration inundation relative to the larger and more defined wetlands near the project area. The Proposed Action has been designed to avoid wetlands to the extent possible by routing the bypass road around known wetland features.

The Solano County Multispecies Habitat Conservation Plan (MHCP) identifies vegetation in the action area as valley floor and vernal pool grasslands. The valley floor vernal pool grassland association is characterized by large expanses of seasonal wetlands that form in soil types where the downward movement or infiltration of water is impeded by dense clays or pans below the soil surface. Within this broad vernal pool habitat type, the true wetland vernal pool and swale plant communities typically only compose a minor component (5 to 50 percent) of a broader grassland matrix.

Vernal pool habitats have become rare because they are often found in landscapes that favor agriculture. In the last 150 years, the total area of vernal pools in the Central Valley has been reduced by 75 percent and the loss between 1994 and 1997 continued at 1.5 percent per year (Solano County Farmlands and Open Space Foundation, 2001). In Solano County,

historically, there was an estimated 118,227 acres of potential vernal pool grassland. Currently, there is an estimated 50,762 acres of potential vernal pool grassland remaining (43 percent of the historical potential), although much of the remaining vernal pool habitats have been altered through land use activities (LSA Associates, Inc., 2004). Undeveloped portions of the action area beyond the Travis AFB boundary are within the Solano County MHCP high- and medium-value vernal pool conservation areas.

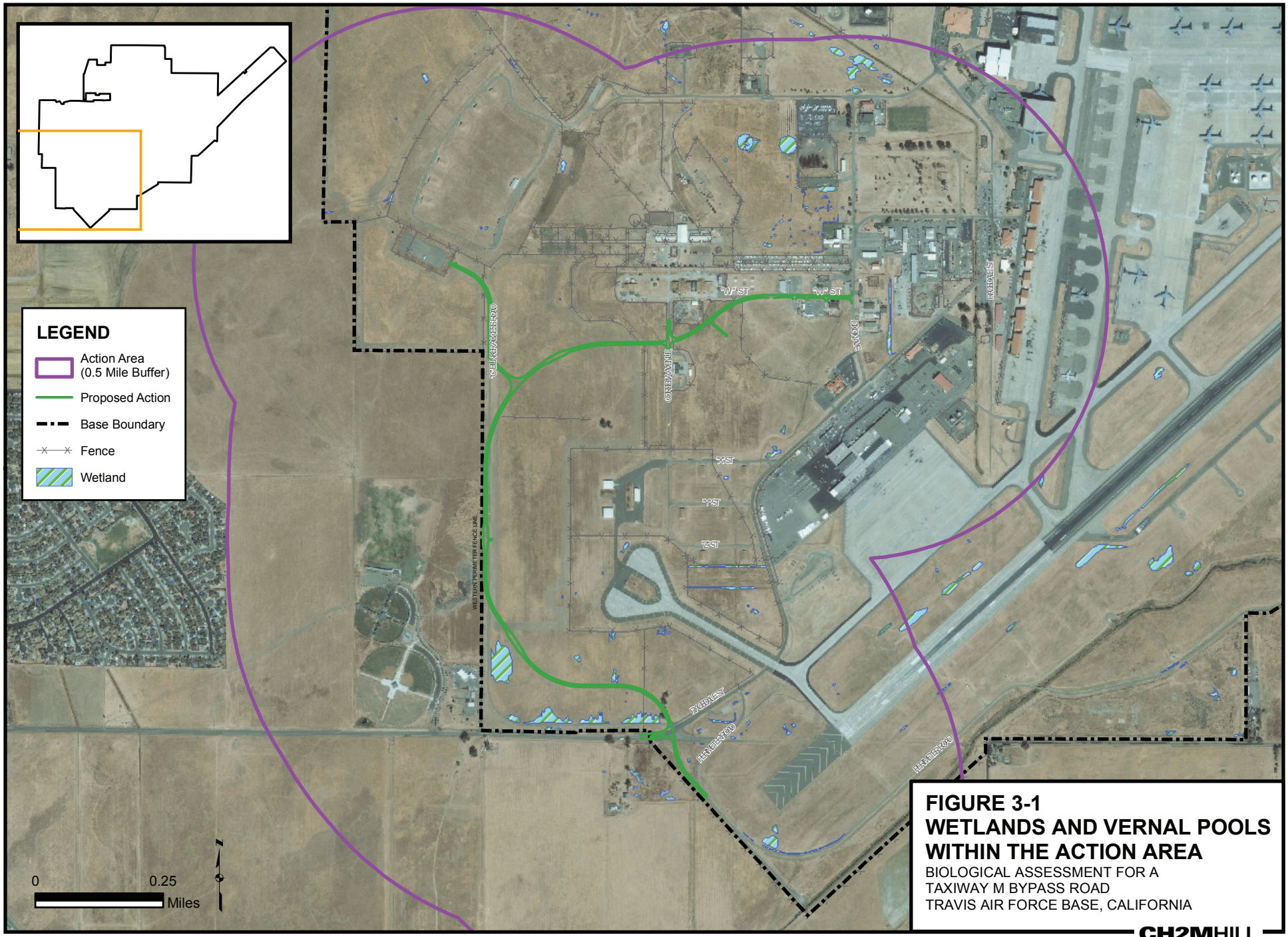

FIGURE 3-1
WETLANDS AND VERNAL POOLS WITHIN THE ACTION AREA
BIOLOGICAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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SECTION 4

Status of Species in the Action Area

4.1 Technical Support Studies Relevant to the Proposed Action

Technical support studies, literature review, California Natural Diversity Database (CNDDB) queries, USFWS Ecological Services Field Office online queries, and distribution data available from USFWS recovery plans were used to identify potential listed species and listed species habitat within the action area. The technical support studies are listed in Table 4-1.

Several studies have been conducted to determine the status of listed species and listed species habitat at the project site. These studies include a preliminary delineation of wetlands and other waters, an assessment of California tiger salamander habitat, a general reconnaissance survey, and vernal pool invertebrate surveys.

TABLE 4-1
Technical Support Studies within the Action Area

Study name	Date of Study	Study Area	Species of interest	Summary of findings
Conservation and Management of California Tiger Salamanders *(Ambystoma californiense*) at Travis Air Force Base (Johnson and Shaffer, in press)	2010	Travis AFB (Base-wide)	California tiger salamander	Evaluation of suitable breeding habitat. No suitable breeding habitat identified within the action area.
Summary of Rare, Threatened, and Endangered Species Associated with Seasonal Wetlands (CH2M HILL, 2006)	2006	Travis AFB (Base-wide)	Special-status species	Current distributions of special-status species.
Results of Special Status Vernal Pool Invertebrate Surveys at Travis Air Force Base (EcoAnalysts, 2006)	Wet season, 2005 – 2006	Travis AFB (Base-wide)	Delta green ground beetle Ricksecker's hydrochara	Only vernal pool fairy shrimp and vernal pool tadpole shrimp were found on the Base. No vernal pool fairy shrimp or vernal pool tadpole shrimp were identified within the action area.
Results of Special Status Vernal Pool Invertebrate Surveys at Travis Air Force Base (EcoAnalysts, 2005)	Wet season, 2004 – 2005	Travis AFB (Base-wide)	Vernal pool fairy shrimp Vernal pool tadpole shrimp Conservancy fairy shrimp	
Vernal Pool Resources at Travis AFB (Biosystems Analysis, 1994)	1994	Travis AFB (Base-wide)	Special-status species	Wetlands inventory and rare plant survey.
Assessment of Special Status Plant and Animal Species at Travis AFB, Solano County, California, Phase II Survey (Biosystems Analysis, 1993)	1993	Travis AFB (Base-wide)	Special-status species	Wetlands inventory and rare plant survey.

4.1.1 Wetland Delineation

A formal wetland delineation has not been conducted for the project area, but numerous wetland resource areas near the proposed Taxiway M bypass road have been characterized and mapped. The Proposed Action has been designed to avoid and minimize impacts to these wetland areas (see Figure 3-1).

4.1.2 California Tiger Salamander Habitat Assessment

A habitat assessment for California tiger salamander was conducted during the wet season of January to April 2005 (Jennings, 2005). The assessment concluded that California tiger salamander is not likely to use the action area because the action area does not provide the hydrology necessary to support breeding habitat and there are significant barriers to migration between the nearest breeding site and the upland habitat at the project site.

The habitat assessment identified vernal pools within a few hundred feet of the project site north of Petersen Road, which hold water for longer than 90 days; however, these vernal pools provide unsuitable breeding habitat for California tiger salamander because of the presence of fish and low food resource availability (Marty, 2005).

UC Davis conducted a spring survey of four potential breeding pools within the Taxiway M Bypass Road Project action area during April 2010 and found the aquatic habitat in this area was not conducive for continuous inundation for successful larval metamorphosis (Shaffer and Trenham 2005), and so most of these wetlands are probably not breeding habitat at the present time (Johnson and Shaffer In Press).

4.1.3 General Biological Resource Survey

A general biological resource survey was conducted on November 7, 2008, and January 27, 2010. The site visits were performed to verify the location of wetlands and to identify plant species in the project area. Table 4-2 lists the plant species observed at the site.

TABLE 4-2
Plant Species Observed at the Taxiway M Bypass Road Project Site

Scientific Name	Common Name
Apiaceae	
Eryngium sp.	Coyote-thistle
Foeniculum vulgare	Fennel
Asclepiadaceae	
Asclepias spp.	Milkweed
Asteraceae	
Achyrachaena mollis	Blow-wives
Baccharis pilularis	Coyote brush
Carduus pycnocephalus	Italian thistle
Centaurea calcitrapa	Purple star-thistle
Centaurea solstitialis	Yellow star-thistle
Cichorium intybus	Chicory
Cotula coronopifolia	Brass-buttons
Grindelia sp.	Gumweed

TABLE 4-2
Plant Species Observed at the Taxiway M Bypass Road Project Site

Scientific Name	Common Name
Hemizonia pungens	Spikeweed
Hypochaeris glabra	Smooth cat's-ear
Lactuca serriola	Prickly lettuce
Lasthenia conjugens[a]	Contra Costa goldfields
Lasthenia glaberrima	Smooth goldfields
Picris echioides	Bristly ox-tongue
Psilocarphus brevissimus	Dwarf woolly-heads
Senecio vulgaris	Common groundsel
Silybum marianum	Milk thistle
Sonchus asper	Prickly sow thistle
Xanthium spinosum	Spiny cocklebur
Boraginaceae	
Plagiobothrys greenei	Greene's popcorn flower
Plagiobothrys stipitatus	Stalked popcorn flower
Brassicaceae	
Capsella bursa-pastoris	Shepherd's purse
Hirschfeldia incana	Shortpod mustard
Lepidium latifolium	Perennial peppergrass
Raphanus sativus	Radish
Campanulaceae	
Downingia concolor	Spotted-throat downingia
Caryophyllaceae	
Cerastium glomeratum	Mouse-ear chickweed
Silene gallica	Windmill pink
Spergula arvensis	Stickwort
Stellaria media	Common chickweed
Convolvulaceae	
Convolvulus arvensis	Bindweed
Crassulaceae	
Crassula aquatic	Aquatic pigmy-weed
Cyperaceae	
Carex sp.	Sedge
Cyperus eragrostis	Tall nutsedge
Eleocharis macrostachya	Creeping spikerush
Fabaceae	
Lotus humistratus	Hill lotus
Lupinus bicolor	Miniature lupine
Medicago polymorpha	California burclover
Trifolium cyathiferum	Cup clover
Trifolium depauperatum	Dwarf bladder clover
Trifolium dubium	Little hop clover

TABLE 4-2
Plant Species Observed at the Taxiway M Bypass Road Project Site

Scientific Name	Common Name
Trifolium fragiferum	Strawberry clover
Trifolium hirtum	Rose clover
Trifolium subterraneum	Subterranean clover
Trifolium variegatum	White-tip clover
Vicia sativa	Common vetch
Vicia villosa	Hairy vetch
Geraniaceae	
Erodium botrys	Broadleaf filaree
Erodium cicutarium	Red-stemmed filaree
Geranium dissectum	Cut-leaf geranium
Iridaceae	
Sisyrinchium bellum	Blue-eyed-grass
Juncaceae	
Juncus bufonius	Toad rush
Juncus mexicanus	Mexican rush
Liliaceae	
Dichelostemma capitatum	Blue dicks
Malvaceae	
Malva nicaeensis	Bull mallow
Malva parviflora	Cheeseweed
Myrtaceae	
Eucalyptus globules	Blue gum
Oxalidaceae	
Oxalis pes-caprae	Bermuda buttercup
Papaveraceae	
Eschscholzia californica	California poppy
Plantaginaceae	
Plantago lanceolata	English plantain
Poaceae	
Aira caryophyllea	Silver hairgrass
Avena barbata	Slender wild oat
Briza minor	Small quaking grass
Bromus diandrus	Ripgut grass
Bromus hordeaceus	Soft chess
Cynodon dactylon	Bermuda grass
Deschampsia danthonioides	Annual hairgrass
Glyceria occidentalis	Western mannagrass
Hordeum brachyantherum	Meadow barley
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley
Hordeum murinum ssp. *leporinum*	Farmer's foxtail
Lolium multiflorum	Italian ryegrass

TABLE 4-2
Plant Species Observed at the Taxiway M Bypass Road Project Site

Scientific Name	Common Name
Phalaris aquatic	Harding grass
Poa annua	Annual bluegrass
Polypogon maritimus	Mediterranean rabbitsfoot grass
Taeniatherum caput-medusae	Medusa head
Vulpia bromoides	Six-week's fescue
Vulpia myuros	Rattail fescue
Polygonaceae	
Polygonum aviculare	Prostrate knotweed
Rumex acetosella	Sheep sorrel
Rumex crispus	Curly dock
Portulacaceae	
Montia Fontana	Water chickweed
Primulaceae	
Anagallis arvensis	Scarlet pimpernel
Ranunculaceae	
Ranunculus muricatus	Spiny buttercup
Scrophulariaceae	
Castilleja attenuate	Valley tassels
Triphysaria eriantha	Butter-and-eggs
Veronica anagallis-aquatica	Water speedwell
Veronica peregrine	Purslane speedwell

[a] Federally listed endangered plant species.

Vernal Pool Invertebrate Surveys

Protocol-level surveys for vernal pool branchiopods of the seasonal wetlands within the project area were conducted as part of base-wide vernal pool surveys in 2005 and 2006 (EcoAnalysts, 2005, 2006). Invertebrate surveys verified the presence of the federally threatened vernal pool fairy shrimp *(Branchinecta lynchi*) and federally endangered Contra Costa goldfields (*Lasthenia conjugens*) in vernal pools south of the project area. Vernal pool fairy shrimp were not observed in the agriculture ditch within the project site, and the surveys determined that the ditch does not hold water for a sufficient duration to allow propagation of listed vernal pool branchiopods. No other invertebrate species (such as seed shrimp, clam shrimp, copepod, or water fleas) were observed in the ditch during this survey.

4.2 Species Considered for Analysis

A species list was obtained from the USFWS Sacramento Ecological Services Field Office via an online query system indexed to 7.5-minute U.S. Geological Survey (USGS) quadrangles (Appendix A). This list functions as the official species list issued by USFWS pursuant to 50 CFR 402.12(e). Nine USGS quadrangles (Mt. Vaca, Allendale, Dixon, Fairfield North,

Elmira, Dozier, Fairfield South, Denverton, and Birds Landing) that cover the action area, the Base, and surrounding areas were submitted. The CNDDB was queried for the same nine quadrangles (Appendix B). Table 4-3 lists federally threatened and endangered species that correspond to these USGS quadrangles and the results of CNDDB queries for species occurrences.

Four of the 26 federally threatened and endangered species listed in Table 4-3 may be affected by the Proposed Action. Inclusion of these species was not dependent on the confirmed presence of species or habitat within the action area. These four species are listed below and further described in Section 4.3:

- Vernal pool fairy shrimp (*Branchinecta lynchi*) (Threatened)
- Conservancy fairy shrimp (*Branchinecta conservatio*) (Endangered)
- Vernal pool tadpole shrimp (*Lepidurus packardi*) (Threatened)
- California tiger salamander (*Ambystoma californiense*) (Threatened)

Figure 4-1 shows the known distributions of California tiger salamanders within the vicinity of the action area. Known distributions of federally threatened and endangered invertebrate species are shown in Figure 4-2.

4.2.1 California Tiger Salamander - *Ambystoma californiense*

Species Description and Listing Status

The California tiger salamander was listed, as threatened throughout its range on August 4, 2004 (69 CFR 47211-47248). The USFWS decision to downlist the Sonoma and Santa Barbara populations from endangered to threatened was reversed in U.S. District Court on August 19, 2005. Therefore, the Sonoma and Santa Barbara populations are listed as endangered. On August 23, 2005, critical habitat was designated in 19 counties for the central population, totaling 199,109 acres (70 CFR 49379).

The California tiger salamander is an amphibian in the family Ambystomatidae, endemic to California and native to Solano County. This large terrestrial salamander has a broad, rounded snout and white or pale yellow spots or bars on a black background on its back and sides. The belly varies from almost uniform white or pale yellow to a variegated pattern of white or pale yellow and black. The salamander's small eyes protrude from its head and have black irises (Jennings and Hayes, 1994). Males can be distinguished from females, especially during the breeding season, by their swollen cloacae, a common chamber into which the intestinal, urinary, and reproductive canals discharge. They also have more developed tail fins. Adult males are slightly larger than females (8 inches and less than 7 inches, respectively) (Stebbins, 1951). Juvenile salamanders are 1.7 to 2.8 inches from the tip of the snout to the rear of the vent and have the same coloration patterns as adults (as cited in Jennings, 2005). Larval salamanders range from 0.4 to 6.6 inches long with a pale-yellow, tan, or dark colored belly (Anderson, 1968). After 2 weeks from emergence, a larval salamander will have prominent external gills and legs (Storer, 1925). Eggs measure 0.13 to 0.21 inch (Storer, 1925).

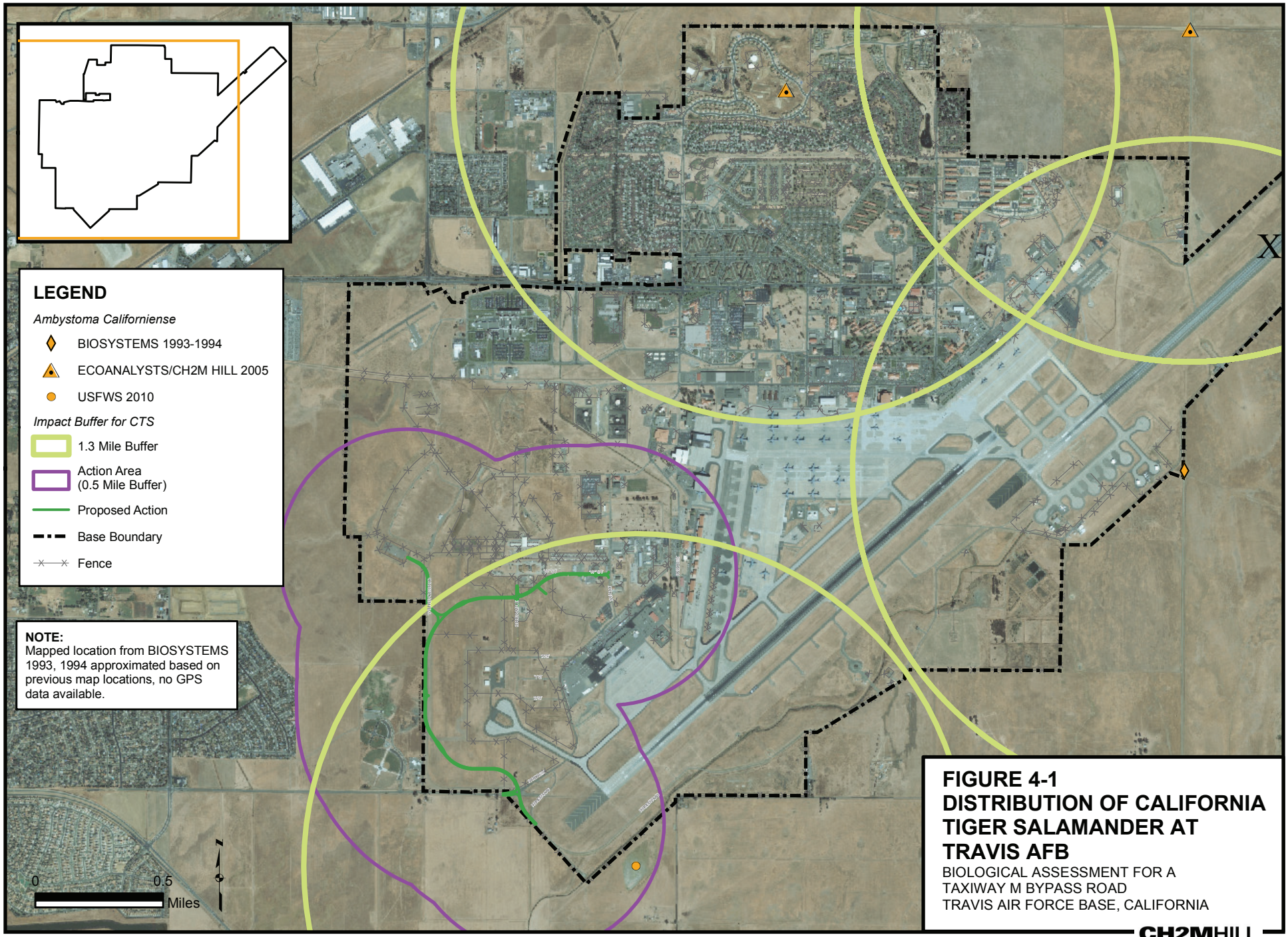

FIGURE 4-1
DISTRIBUTION OF CALIFORNIA TIGER SALAMANDER AT TRAVIS AFB
BIOLOGICAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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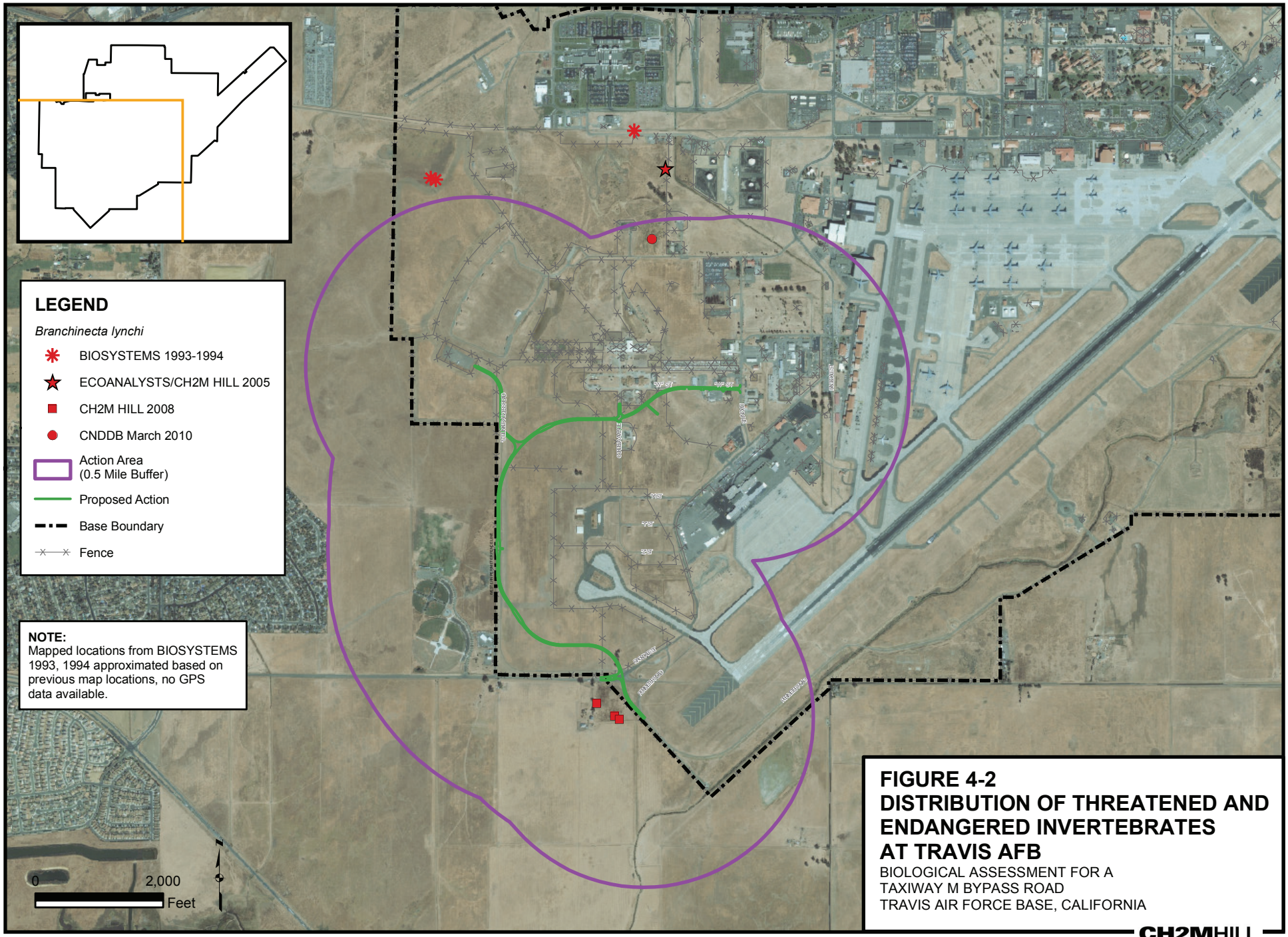

FIGURE 4-2
DISTRIBUTION OF THREATENED AND ENDANGERED INVERTEBRATES AT TRAVIS AFB
BIOLOGICAL ASSESSMENT FOR A
TAXIWAY M BYPASS ROAD
TRAVIS AIR FORCE BASE, CALIFORNIA

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TABLE 4-3
Species List Obtained from USFWS Sacramento Ecological Services Field Office, Current Distribution, and Status within the Action Area

	Common Name	Scientific Name	Status	Solano County Occurrences[a]	Travis AFB Occurrences[a]	Habitat Present or Known Occurrence within Action Area	Critical Habitat on or Adjacent to Action Area
Plants	Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum, PX*	Endangered	3	0	No	No
	Soft bird's-beak	*Cordylanthus mollis mollis, PX*	Endangered	15	0	No	No
	Contra Costa goldfields Contra Costa goldfields critical habitat	*Lasthenia conjugens*	Endangered	13	Concentrations on west side of base	No	No
	Colusa grass	*Neostapfia colusana*	Threatened	2	0	No	No
	San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	Threatened	1	0	No	No
	Solano grass	*Tuctoria mucronata*	Endangered	2	0	No	No
Invertebrates	Conservancy fairy shrimp Conservancy fairy shrimp critical habitat	*Branchinecta conservatio*	Endangered	13	0	Habitat present. Species occurs 3.5 miles northeast on Wilcox Ranch. Species not found in vernal pools on the Base (CH2M HILL, 2006).	No
	Vernal pool fairy shrimp Vernal pool fairy shrimp critical habitat	*Branchinecta lynchi*	Threatened	23	3	Habitat present. Species occurs on the Base including vernal pools in the action area (CH2M HILL, 2006).	No
	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Threatened	9	0	No	No
	Delta green ground beetle Delta green ground beetle critical habitat	*Elaphrus viridis*	Threatened	7	0	No	No
	Vernal pool tadpole shrimp Vernal pool tadpole shrimp critical habitat	*Lepidurus packardi*	Endangered	31	0	Habitat present. Species may occur on the Base and does occur on adjacent Wilcox Ranch. Species found in vernal pools in the action area (CH2M HILL, 2006).	Yes

TABLE 4-3
Species List Obtained from USFWS Sacramento Ecological Services Field Office, Current Distribution, and Status within the Action Area

	Common Name	Scientific Name	Status	Solano County Occurrences[a]	Travis AFB Occurrences[a]	Habitat Present or Known Occurrence within Action Area	Critical Habitat on or Adjacent to Action Area
	Callippe silverspot butterfly	*Speyeria callippe callippe*	Endangered	0	0	No	No
	California freshwater shrimp	*Syncaris pacifica*	Endangered	0	0	No	No
Fishes	Green sturgeon	*Acipener medirostris*	Threatened	0	0	No	No
	Delta smelt	*Hypomesus transpacificus*	Threatened	5	0	No	No
	Delta smelt critical habitat						
	Central Valley spring-run chinook salmon	*Oncorhynchus tshawytscha*	Threatened	0	0	No	No
	Central Valley spring-run chinook salmon critical habitat						
	Winter-run chinook salmon, Sacramento River	*Oncorhynchus tshawytscha*	Endangered	0	0	No	No
	Winter-run chinook salmon, Sacramento River critical habitat						
	Central Valley steelhead	*Oncorhynchus mykiss*	Threatened	0	0	No	No
	Central Valley steelhead critical habitat						
Amphibians	California tiger salamander	*Ambystoma californiense*	Threatened	26	1	Upland habitat present; potential breeding habitat in vernal pools in the action area (CH2M HILL, 2006).	Yes
	California tiger salamander critical habitat						
	California red-legged frog	*Rana aurora draytonii*	Threatened	13	0	No	No
	California red-legged frog critical habitat						
Reptiles	Giant garter snake	*Thamnophis gigas*	Threatened	3	0	No	No
	California brown pelican	*Pelecanus occidentalis californicus*	Endangered				
Birds	California clapper rail	*Rallus longirostris obsoletus*	Endangered	22	0	No	No

TABLE 4-3
Species List Obtained from USFWS Sacramento Ecological Services Field Office, Current Distribution, and Status within the Action Area

	Common Name	Scientific Name	Status	Solano County Occurrences[a]	Travis AFB Occurrences[a]	Habitat Present or Known Occurrence within Action Area	Critical Habitat on or Adjacent to Action Area
	California least tern	*Sternula antillarum (=Sterna, =albifrons) browni*	Endangered	1	0	No	No
	Northern spotted owl	*Strix occidentalis caurina*	Threatened	0	0	No	No
Mammals	Salt marsh harvest mouse	*Reithrodontomys raviventris*	Endangered	56	0	No	No

[a]Current distribution (based on CNDDB January 2010 query results and recent surveys)

Life History and Ecology

Breeding of California tiger salamanders has been observed following the onset of warm rains (November through late December) (Storer, 1925; Barry and Schaffer, 1994). Based on observations in the 1990s, unseasonably cold rains or drought periods in the wet season may inhibit breeding activity (as cited in Jennings, 2005). Males and females nocturnally migrate up to 1 mile or more from subterranean refugia to egg deposition sites, which include vernal pools with substantial hydroperiods (Austin and Schaffer, 1992; Loredo, et al., 1996; Twitty, 1941; Anderson, 1968).

Males generally precede females during the breeding season by 1 or 2 weeks (Loredo, et al., 1996). Females normally deposit eggs on vegetation or detritus in shallow margins of pools (Storer, 1925), which may number up to 350 eggs per season, although Jennings (2005) reports that 100 to 200 eggs are more typical. Soon after spawning, adult salamanders will return to aestivation habitats (small mammal burrows), where they spend approximately 9 to 10 months until the next winter rains (Barry and Schaffer, 1994; Loredo, et al., 1996; Jennings, 2005). Associated upland habitat containing underground refugia is essential for the survival of adult California tiger salamanders and juveniles that have recently undergone metamorphosis. For the majority of their life cycle, California tiger salamanders depend on upland habitats in these underground (or covered and concealed) refugia where they are less susceptible to desiccation. The ability of California tiger salamanders to move freely across the landscape in search of breeding ponds is essential in maintaining gene flow and recolonization of sites that are temporally extirpated and is essential in preserving the California tiger salamander's population structure.

Salamander embryos hatch approximately 2 to 4 weeks after egg deposition, and the aquatic larvae require a 10- to 12-week metamorphosis period before developing into the juvenile form. Following metamorphosis (normally early May through July), juveniles emigrate from drying breeding ponds in mass group migrations (Holland, et al., 1990).

Larvae require significantly more time to transform into juvenile adults than other amphibians, such as the western spadefoot toad (*Scaphiopus hammondii*) and the Pacific tree frog (*Pseudacris regilla*). Sexual maturity is reached typically after 2 years, although longer periods may be required when juvenile salamanders experience stress through drought or seasonal rainfall (Shaffer, et al., 1993).

Distribution and Threats

The species is restricted to grasslands and low (under 1,500 feet above mean sea level) foothill regions where lowland aquatic sites are available for breeding. They prefer natural ephemeral pools, ponds that mimic them (stock ponds that are allowed to go dry), or ponds that are specifically managed under a moist soil management regime (wet season flooding and dry season drawdowns).

This species is restricted to California and does not overlap with other species of tiger salamander. California tiger salamanders are restricted to vernal pools and seasonal ponds, including many constructed stockponds, in grassland and oak savannah plant communities from sea level to about 1,500 feet above mean sea level in central California. In the Coastal region, populations are scattered from Sonoma County to Santa Barbara County, and in the Central Valley and Sierra Nevada foothills from Yolo to Kern Counties. The Sonoma

population appears to have been geographically isolated from the remainder of the California tiger salamander population by distance, mountains, and major waterway barriers for more than 700,000 years.

The primary cause of the decline of California tiger salamander populations is the loss and fragmentation of habitat from human activities and the encroachment of non-native predators. Federal, state, and local laws have not prevented past and ongoing losses of habitat. The estimated seven genetic populations of this species have been significantly reduced because of urban and agricultural development, land conversion, and other human-caused factors.

Reduction of ground squirrel populations to low levels through widespread rodent control programs may reduce availability of burrows and adversely affect the California tiger salamander. Poison typically used on ground squirrels is likely to have a disproportionately adverse effect on California tiger salamanders, which are smaller than the target species and have permeable skins. Use of pesticides, such as methoprene, in mosquito abatement may have an indirect adverse effect on the California tiger salamander by reducing the availability of prey. Non-native subspecies of the tiger salamander have been imported into California for use as fish bait. The introduced salamanders may out-compete the California tiger salamanders, or interbreed with them to create hybrids that may be less adapted to the California climate or are not reproductively viable past the first or second generations. Automobiles and off-road vehicles kill migrating California tiger salamanders, and contaminated runoff from roads, highways, and agriculture may adversely affect them.

Status within the Action Area

Surveys conducted within vernal pools at the project site in spring 2010 did not identify the presence of California tiger salamander larvae and determined that suitable breeding habitat is absent in the action area (Johnson and Shaffer, in press). A potential breeding pond is within migration range of the action area outside the Base boundary southwest of the action area. The accepted range for an area to be considered upland habitat is 1.3 miles from a breeding pond. Based on life-cycle descriptions of this species, the California tiger salamander can migrate from this potential breeding pond southwest of the action area. The annual grassland vegetation within the action area meets the requirements of upland habitat for this species; therefore, this species has the potential to be present within the action area and may be affected by the Proposed Action. Reported occurrences of California tiger salamanders on Base and adjacent properties are shown in Figure 4-1.

4.2.2 Conservancy Fairy Shrimp – *Branchinecta conservation*

Species Description and Listing Status

The Conservancy fairy shrimp (*Branchinecta conservatio*) was listed as endangered on September 19, 1994 (59 CFR 48136). Critical habitat was designated on August 6, 2003 (68 CFR 46683), and subsequently revised with critical habitat unit designations on February 10, 2006 (71 CFR 7117). USFWS' *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* includes this species (USFWS, 2005).

The Conservancy fairy shrimp is a small crustacean in the Branchinectidae family. Fairy shrimp are aquatic species in the order Anostraca. They have delicate elongate bodies, large

stalked compound eyes, no carapaces, and 11 pairs of swimming legs. Males range from 0.6 to 1.1 inches long, with females measuring slightly smaller between 0.6 and 0.9 inch (USFWS, 2005). Fairy shrimp glide gracefully upside down, swimming by beating their legs in a complex, wavelike movement that passes from front to back. They feed on algae, bacteria, protozoa, rotifers, and bits of detritus.

Distribution and Threats

The CNDDB reports 13 occurrences of Conservancy fairy shrimp in Solano County (CNDDB, 2010). Of these occurrences, none are reported at the Base.

In the Solano-Colusa Vernal Pool Region, Conservancy fairy shrimp are reported on the greater Jepson Prairie, which includes the Wilcox Ranch. The historical distribution of this species is not known (USFWS, 2005); however, the distribution of vernal pool habitats in the areas where this species is known to occur was once more continuous and larger than it is today (Holland, 1998). Conservancy fairy shrimp likely once occupied vernal pool habitats throughout a large portion of the Central Valley and southern coastal regions of California (USFWS, 2005).

In the Solano-Colusa Vernal Pool Region, populations of this species are threatened by land development, particularly near Fairfield and Vacaville, as well as invasive predator fish introductions. This species is also subject to general threats of vernal pool impacts discussed in Section 3.

Life History and Ecology

Conservancy fairy shrimp are adapted to ephemeral conditions characterized by vernal pool habitats. Helm (1998) determined that this species reaches sexual maturity in an average of 46 days and lives as long as 154 days, although growth rates depend on water temperature, which can vary greatly. Conservancy fairy shrimp produce one large cohort of offspring each wet season (Eriksen and Belk, 1999). Conservancy fairy shrimp co-occur with other vernal pool crustacean species, including vernal pool fairy shrimp and vernal pool tadpole shrimp (USFWS, 2005). Conservancy fairy shrimp are filter feeders, and their wavelike leg movements strain small particles from the water.

Status within the Action Area

Vernal pools within the action area may support suitable habitat for Conservancy fairy shrimp. Surveys for special-status invertebrates did not detect this species within the action area on Base (CH2M HILL, 2006). Presence of this species has been documented off Base on the Muzzy Ranch (LSA Associates, Inc., 2004) and Wilcox Ranch (CNDDB, 2010). The nearest occurrence was reported in 2002 on Wilcox Ranch, more than 3.5 miles northeast of the action area.

4.2.3 Vernal Pool Fairy Shrimp – *Branchinecta lynchi*

Description and Listing Status

The vernal pool fairy shrimp (*Branchinecta lynchi)* was listed as endangered on September 19, 1994 (59 CFR 48136). Critical habitat was designated on August 6, 2003 (68 CFR 46683), and subsequently revised with critical habitat unit designations on

February 10, 2006 (71 CFR 7117). USFWS' *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* includes this species (USFWS, 2005).

The vernal pool fairy shrimp is a small crustacean in the Branchinectidae family. Fairy shrimp are aquatic species in the order Anostraca. They are characterized by the presence and size of several mounds on the male's second antennae and by the female's short, pyriform brood pouch (USFWS, 2005). The species range from 0.4 to 1.0 inch (Eng, et al., 1990; USFWS, 2005). Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus.

Distribution and Threats

The CNDDB reports 23 occurrences of vernal pool fairy shrimp in Solano County (CNDDB, 2010). In 1994, Biosystems Analysis identified adult vernal pool fairy shrimp at three locations and fairy shrimp cysts at two locations in the Landfill 2 area. Adult fairy shrimp were identified at one location in the Travis AFB fire training area. Adult fairy shrimp and cysts were also found at two locations in the grazing area south of the former Aero Club. The fairy shrimp cysts were keyed only to genus but were assumed to be vernal pool fairy shrimp (Biosystems Analysis, 1994). During the abbreviated 1994 wet season surveys, Biosystems found adult vernal pool fairy shrimp in a drainage channel along the abandoned railroad track on the north side of Hangar Avenue.

During the 2004-2005 protocol-level surveys conducted by EcoAnalysts, vernal pool fairy shrimp were identified at eight locations on the Base (EcoAnalysts, 2005). Most occurrences were on the west side of the Base. Low numbers of adult vernal pool fairy shrimp were observed in five vernal pools west of Union Creek. Two large populations were observed in a roadside pool and a drainage ditch along the abandoned railroad tracks on the north side of Hangar Avenue, east of Union Creek. A few adults were also observed in a wet depression along the railroad right-of-way at Meridian Road and in one pool north of runway 03R/21L.

In the Solano-Colusa Vernal Pool Region, vernal pool fairy shrimp are reported on the greater Jepson Prairie, which includes the Wilcox Ranch, as well as near Vacaville and Dixon in Solano County. The historical distribution of this species is not known (USFWS, 2005); however, the distribution of vernal pool habitats in the areas where this species is known to occur was once more continuous and larger than it is today (Holland, 1998). Vernal pool fairy shrimp likely once occupied vernal pool habitats throughout a large portion of the Central Valley and southern coastal regions of California (USFWS, 2005). Holland (1978) estimated that nearly 4 million acres of vernal pool habitat existed in the Central Valley prior to intensive land use practices of the mid-1800s.

In the Solano-Colusa Vernal Pool Region, populations of this species are threatened by land development, particularly near Fairfield and Vacaville, as well as invasive predator fish introductions. This species is also subject to general threats of vernal pool impacts discussed in Section 3.

Life History and Ecology

Vernal pool fairy shrimp are adapted to ephemeral conditions characterized by vernal pool habitats. Helm (1998) determined that this species reaches sexual maturity in an average of

41 days, but in as few as 18 days at optimal conditions. Life cycles range from 63 to 147 days, demonstrating that growth rates depend on water temperature, which can vary greatly. Vernal pool fairy shrimp co-occur with other vernal pool crustacean species, including Conservancy fairy shrimp and vernal pool tadpole shrimp (USFWS, 2005).

Status within the Action Area

Vernal pools within the action area are known to support suitable habitat for vernal pool fairy shrimp. Surveys for special-status invertebrates have not detected this species within the action area on Base (CH2M HILL, 2006). Known occurrences of vernal pool fairy shrimp are shown in Figure 4-2.

4.2.4 Vernal Pool Tadpole Shrimp - *Lepidurus packardi*

Description and Listing Status

The vernal pool tadpole shrimp (*Lepidurus packardi)* was listed as endangered on September 19, 1994 (59 CFR 48136). Critical habitat was designated on August 6, 2003 (68 CFR 46683), and subsequently revised with critical habitat unit designations on February 10, 2006 (71 CFR 7117). USFWS' *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* includes this species (USFWS, 2005).

The vernal pool tadpole shrimp is a small crustacean in the Triopsidae family. Tadpole shrimp are aquatic species in the order Notostraca. Members of order Notostraca are known as "living fossils" because of their morphological continuity in the fossil record over the past 2 million years (Longhurst, 1955). Vernal pool tadpole shrimp are distinguished by a large, shield-like carapace that covers the anterior side of the body. The adult form of this species measures 0.6 to 3.3 inches long.

Distribution and Threats

The CNDDB reports 31 extant occurrences of vernal pool tadpole shrimp within Solano County (CNDDB, 2010). Vernal pool tadpole shrimp have not been found within the boundaries of the Base (CH2M HILL 2006; EcoAnalysts, 2005). However, they have been found along the railroad right-of-way and in one pool near the southern boundary of the Base. In 1994, Biosystems found vernal pool tadpole shrimp in one pool approximately 40 feet from the perimeter fence near the proposed Meridian Gate (Biosystems Analysis, 1994). This species was also observed at eight locations along the railroad right-of-way by EcoAnalysts during the 2004-2005 protocol-level surveys (EcoAnalysts, 2005).

In the Solano-Colusa Vernal Pool Region, vernal pool tadpole shrimp are reported on the greater Jepson Prairie, which includes the Wilcox Ranch, as well as on the Base, near Montezuma, and on Sacramento National Wildlife Refuge. The historical distribution of this species is not known (USFWS, 2005); however, the distribution of vernal pool habitats in the areas where this species is known to occur was once more continuous and larger than it is today (Holland, 1998). Vernal pool tadpole shrimp likely once occupied vernal pool habitats throughout a large portion of the Central Valley and southern coastal regions of California (USFWS, 2005). Holland (1978) estimated that nearly 4 million acres of vernal pool habitat existed in the Central Valley prior to intensive land use practices of the mid-1800s.

In the Solano-Colusa Vernal Pool Region, populations of this species are threatened by land development, particularly near Fairfield and Vacaville, as well as invasive predator fish introductions. This species is also subject to general threats of vernal pool impacts discussed in Section 3.

Life History and Ecology

Vernal pool tadpole shrimp are adapted to ephemeral conditions characterized by vernal pool habitats. Helm (1998) determined that this species reaches sexual maturity in an average of 54 days. Life cycles are reported to last longer than other vernal pool crustaceans and have relatively higher reproduction rates. After winter rains fill a vernal pool, dormant tadpole shrimp cysts may hatch within 4 days (USFWS, 2005) and will emerge from cysts as metanauplii, a short stage that lasts 1.5 to 2 hours before molting into a larval form. Vernal pool tadpole shrimp co-occur with other vernal pool crustacean species, including Conservancy fairy shrimp and vernal pool fairy shrimp (USFWS, 2005).

Status within the Action Area

Vernal pools within the action area may support suitable habitat for vernal pool tadpole shrimp. Occurrences are reported off Base approximately 3 miles northeast of the action area but not within the action area.

SECTION 5

Effects of the Proposed Action on Listed Species

5.1 Direct Effects

Direct effects occur at the time of a Proposed Action (USFWS, 1998). A Proposed Action may cause a temporary effect or a permanent effect, depending on the action. For this project, direct effects are limited to activities resulting from construction of the Taxiway M bypass road. Because suitable habitat for vernal pool fairy shrimp, Conservancy fairy shrimp, vernal pool tadpole shrimp, and California tiger salamander occur within the project area, potential habitat for these species may be directly affected.

Based on the description of the Proposed Action in Section 2, the amount of vernal pool branchiopod habitat subject to disturbance is 1.73 acres and the amount of California tiger salamander upland habitat subject to disturbance is to 27.8 acres. Sections 5.1.1 and 5.1.2 discuss project activities in relation to the expected effect duration. Areas subject to direct effects within the project boundary are depicted in Figure 3-1.

5.1.1 Temporary Direct Effects

For the purposes of this BA, temporary direct effects are defined as direct effects that will disturb federally listed species habitat for less than 1 year. Approximately 14.3 acres of California tiger salamander habitat within the action area are subject to disturbance for less than 1 year; therefore, this area will be treated as temporarily removed from the habitat available to this species. Approximately 1.73 acres of vernal pool branchiopod habitat are within the 250-foot buffer of the project alignment and may be subject to temporary disturbance during construction.

Permanent Direct Effects

For the purposes of this BA, permanent direct effects are defined as direct effects that will disturb federally listed species habitat for more than 1 year. All potential vernal pool branchipod habitat will be avoided from direct effects due to avoidance of these features. Approximately 13.5 acres of California tiger salamander upland habitat within the action area are subject to disturbance for more than 1 year; therefore, this area will be treated as permanently removed from the habitat available to this species. Permanent direct effects consist of the placement of the pavement and road shoulders.

5.2 Indirect Effects

Indirect effects are defined by the Endangered Species Act (ESA) as "…those effects that are caused by, or will result from the Proposed Action later in time, but are still reasonably certain to occur…." (50 CFR 402.02). Construction of the bypass road will increase the

amount of impervious surface at the site, decreasing stormwater infiltration rates and increasing the quantity of stormwater runoff in the immediate area. The Proposed Action will increase the Base's total impermeable surface by approximately 320,040 square feet (7.34 acres or 0.14 percent). The increase in impervious surface could increase the amount of stormwater runoff from the Base, but is not expected to affect the hydrology of the wetlands within the action area.

5.3 Cumulative Effects Analysis

Cumulative effects are defined by the ESA as are "those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the area of the federal action subject to consultation" (50 CFR 402.02). Construction of the Travis AFB South Gate Improvement project began in late 2010. The South Gate Improvement project will affect approximately 4.44 acres of California tiger salamander upland habitat, but is not expected to adversely affect listed species and species habitat within the action area.

5.4 Conservation Measures to Offset Direct and Indirect Effects

5.4.1 Compensatory Mitigation

The Proposed Action includes compensatory mitigation options, such as purchase of conservation easements or mitigation bank credit purchases to offset direct effects associated with the removal of potential upland habitat for the California tiger salamander and indirect effects to vernal pool branchiopod habitat.

5.4.2 Minimization Measures During Construction

The Proposed Action includes compensatory mitigation options, such as purchase of conservation easements or mitigation bank credit purchases to offset direct effects associated with the removal of potential upland habitat for the California tiger salamander and indirect effects to vernal pool branchiopod habitat. Measures during construction will be implemented to minimize both direct and indirect effects on the California tiger salamander and vernal pool branchiopod habitat. These measures include:

- Best management practices (BMP) to control runoff and sedimentation, the use of silt fences, minimization of earth-moving activities during wet weather, and revegetation of disturbed areas.
- Installation of exclusion fencing/high-visibility fencing around seasonal wetlands within 250-feet of the limits of construction.
- Restriction of project-related vehicle traffic to established roads, construction areas, and other designated areas to minimize temporary disturbances.
- An onsite biologist to perform a clearance survey immediately prior to the initial ground disturbance and monitor the initial ground disturbance activities.

5.4.3 Programmatic Agreements and Base Planning

The Base is in the preliminary scoping stages for developing a California tiger salamander programmatic agreement with the USFWS Sacramento Ecological Services Field Office. To implement a comprehensive strategy for management of California tiger salamander populations and habitat on the Base, the conservation measures that arise from the consultation process for the Proposed Action will be integrated into the programmatic agreement. Other Base-wide natural resource planning documents will include the conservation measures included in this BA, such as annual updates to the Integrated Natural Resources Management Program.

SECTION 6

Conclusion

Effects of the Proposed Action on listed species were evaluated based on the following definitions (50 CFR 402.02):

- **No effect** – the appropriate conclusion where the Proposed Action will not affect listed species or critical habitat.
- **Not likely to adversely affect** – the appropriate conclusion when effects on listed species are expected to be beneficial, insignificant, or discountable. Beneficial effects are contemporaneous positive effects without adverse effects to the species. Insignificant effects relate to the size of the impact and should not reach the scale where take occurs. Discountable effects are those effects unlikely to occur.
- **Likely to adversely affect** – the appropriate conclusion if an adverse effect to listed species may occur as a direct or indirect result of the Proposed Action (including interdependent and interrelated actions), and the effect is not discountable or insignificant.
- **Jeopardize proposed species / adversely modify critical habitat** – the appropriate conclusion if an action will reasonably be expected to directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species by reducing the reproduction, numbers, or distribution of that species, or by modifying critical habitat to the point of preventing the recovery of a listed species.

Based on the above definitions and on the species status descriptions relative to the Proposed Action, this BA concludes the following:

- The Proposed Action is not likely to adversely affect vernal pool fairy shrimp, Conservancy fairy shrimp, and vernal pool tadpole shrimp because suitable habitat within 250 feet of the construction footprint will be avoided. Approximately 1.73 acres of potential vernal pool branchiopod habitat is within 250 feet of the construction footprint, but is outside the limits of grading and construction.
- The Proposed Action is likely to adversely affect the California tiger salamander by temporarily disturbing 14.3 acres and permanently removing 13.5 acres of upland habitat. This removal does not represent an adverse modification of habitat essential for recovery of this species. Conservation measures that will reduce the adverse effects associated with habitat removal are included in the Proposed Action.

SECTION 7

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Attachment A
USFWS Species List and Official Letter, Travis Air Force Base, Solano County, California

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

July 21, 2010

Document Number: 100721125806

Marjorie Eisert
CH2M HILL
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833

Subject: Species List for Taxiway M Bypass Road, Travis AFB, California

Dear: Ms. Eisert

We are sending this official species list in response to your July 21, 2010 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

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 October 19, 2010.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

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: 100721125806

Database Last Updated: April 29, 2010

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

- Conservancy fairy shrimp (E)
- Critical habitat, Conservancy fairy shrimp (X)

Branchinecta lynchi

- Critical habitat, vernal pool fairy shrimp (X)
- vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

- valley elderberry longhorn beetle (T)

Elaphrus viridis

- Critical habitat, delta green ground beetle (X)
- delta green ground beetle (T)

Lepidurus packardi

- Critical habitat, vernal pool tadpole shrimp (X)
- vernal pool tadpole shrimp (E)

Speyeria callippe callippe

- callippe silverspot butterfly (E)

Syncaris pacifica

- California freshwater shrimp (E)

Fish

Acipenser medirostris

- green sturgeon (T) (NMFS)

Hypomesus transpacificus

- Critical habitat, delta smelt (X)
- delta smelt (T)

Oncorhynchus mykiss

- Central Valley steelhead (T) (NMFS)
- Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

- Central Valley spring-run chinook salmon (T) (NMFS)
- Critical Habitat, Central Valley spring-run chinook (X) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)
winter-run chinook salmon, Sacramento River (E) (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)
Critical habitat, California red-legged frog (X)

Reptiles

Thamnophis gigas
giant garter snake (T)

Birds

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Strix occidentalis caurina
northern spotted owl (T)

Mammals

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Plants

Cirsium hydrophilum var. hydrophilum
Suisun thistle (E)

Cordylanthus mollis ssp. mollis
soft bird's-beak (E)

Lasthenia conjugens
Contra Costa goldfields (E)
Critical habitat, Contra Costa goldfields (X)

Neostapfia colusana
Colusa grass (T)

Orcuttia inaequalis
San Joaquin Valley Orcutt grass (T)

Sidalcea keckii
Keck's checker-mallow (=checkerbloom) (E)

Tuctoria mucronata
Solano grass (=Crampton's tuctoria) (E)

Proposed Species

Amphibians

Rana draytonii

Critical habitat, California red-legged frog (PX)

Plants

Cirsium hydrophilum var. hydrophilum

Critical habitat, Suisun thistle (PX)

Cordylanthus mollis ssp. mollis

Critical habitat, soft bird's-beak (PX)

Quads Containing Listed, Proposed or Candidate Species:

BIRDS LANDING (481A)
DENVERTON (481B)
FAIRFIELD SOUTH (482A)
DIXON (498A)
ALLENDALE (498B)
ELMIRA (498C)
DOZIER (498D)
MT. VACA (499A)

County Lists

Solano County

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)
Critical habitat, Conservancy fairy shrimp (X)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Elaphrus viridis

Critical habitat, delta green ground beetle (X)
delta green ground beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Speyeria callippe callippe

callippe silverspot butterfly (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

Critical habitat, delta smelt (X)

delta smelt (T)

Oncorhynchus kisutch

coho salmon - central CA coast (E) (NMFS)

Oncorhynchus mykiss

Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)

Critical habitat, Central California coastal steelhead (X) (NMFS)

Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical Habitat, Central Valley spring-run chinook (X) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (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)

Critical habitat, California red-legged frog (X)

Reptiles

Masticophis lateralis euryxanthus

Alameda whipsnake [=striped racer] (T)

Thamnophis gigas

giant garter snake (T)

Birds

Charadrius alexandrinus nivosus

western snowy plover (T)

Pelecanus occidentalis californicus

California brown pelican (E)

Rallus longirostris obsoletus
California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Plants

Cirsium hydrophilum var. hydrophilum
Suisun thistle (E)

Cordylanthus mollis ssp. mollis
soft bird's-beak (E)

Lasthenia conjugens
Contra Costa goldfields (E)
Critical habitat, Contra Costa goldfields (X)

Neostapfia colusana
Colusa grass (T)

Tuctoria mucronata
Solano grass (=Crampton's tuctoria) (E)

Proposed Species

Amphibians

Rana draytonii
Critical habitat, California red-legged frog (PX)

Plants

Cirsium hydrophilum var. hydrophilum
Critical habitat, Suisun thistle (PX)

Cordylanthus mollis ssp. mollis
Critical habitat, soft bird's-beak (PX)

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) 414-6580.

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 October 19, 2010.

Attachment B
CNDDB - Solano County Federally Endangered, Threatened, Proposed, Candidate, and Delisted Species

California Department of Fish and Game
Natural Diversity Database
Selected Elements by Element Code - Portrait

	Element Code	Scientific Name/Common Name	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	AAAAA01180	*Ambystoma californiense* California tiger salamander	Threatened	Threatened	G2G3	S2S3	SC
2	AAABH01022	*Rana draytonii* California red-legged frog	Threatened		G4T2T3	S2S3	SC
3	AAABH01050	*Rana boylii* foothill yellow-legged frog			G3	S2S3	SC
4	ABNGA04040	*Ardea alba* great egret			G5	S4	
5	ABNKC06010	*Elanus leucurus* white-tailed kite			G5	S3	
6	ABNKC11010	*Circus cyaneus* northern harrier			G5	S3	SC
7	ABNKC19070	*Buteo swainsoni* Swainson's hawk		Threatened	G5	S2	
8	ABNKC19120	*Buteo regalis* ferruginous hawk			G4	S3S4	
9	ABNKC22010	*Aquila chrysaetos* golden eagle			G5	S3	
10	ABNME03041	*Laterallus jamaicensis coturniculus* California black rail		Threatened	G4T1	S1	
11	ABNME05016	*Rallus longirostris obsoletus* California clapper rail	Endangered	Endangered	G5T1	S1	
12	ABNNB03100	*Charadrius montanus* mountain plover	Proposed Threatened		G2	S2?	SC
13	ABNSB10010	*Athene cunicularia* burrowing owl			G4	S2	SC
14	ABNSB13040	*Asio flammeus* short-eared owl			G5	S3	SC
15	ABPBX1201A	*Geothlypis trichas sinuosa* saltmarsh common yellowthroat			G5T2	S2	SC
16	ABPBXA301K	*Melospiza melodia maxillaris* Suisun song sparrow			G5T2	S2	SC
17	ABPBXB0020	*Agelaius tricolor* tricolored blackbird			G2G3	S2	SC
18	AFCJB34020	*Pogonichthys macrolepidotus* Sacramento splittail			G2	S2	SC
19	AMABA01103	*Sorex ornatus sinuosus* Suisun shrew			G5T1	S1	SC
20	AMACC05030	*Lasiurus cinereus* hoary bat			G5	S4?	
21	AMACC05060	*Lasiurus blossevillii* western red bat			G5	S3?	SC
22	AMAFF02040	*Reithrodontomys raviventris* salt-marsh harvest mouse	Endangered	Endangered	G1G2	S1S2	
23	ARAAD02030	*Emys marmorata* western pond turtle			G3G4	S3	SC

	Element Code	Scientific Name/Common Name	Federal Status	State Status	GRank	SRank	CDFG or CNPS
24	CTT42110CA	*Valley Needlegrass Grassland*			G1	S3.1	
25	CTT44120CA	*Northern Claypan Vernal Pool*			G1	S1.1	
26	CTT52200CA	*Coastal Brackish Marsh*			G2	S2.1	
27	CTT52410CA	*Coastal and Valley Freshwater Marsh*			G3	S2.1	
28	ICBRA03010	*Branchinecta conservatio* Conservancy fairy shrimp	Endangered		G1	S1	
29	ICBRA03030	*Branchinecta lynchi* vernal pool fairy shrimp	Threatened		G3	S2S3	
30	ICBRA03150	*Branchinecta mesovallensis* midvalley fairy shrimp			G2	S2	
31	ICBRA06010	*Linderiella occidentalis* California linderiella			G3	S2S3	
32	ICBRA10010	*Lepidurus packardi* vernal pool tadpole shrimp	Endangered		G3	S2S3	
33	ICBRA23010	*Dumontia oregonensis* hairy water flea			G1G3	S1	
34	IICOL36010	*Elaphrus viridis* Delta green ground beetle	Threatened		G1	S1	
35	IICOL48011	*Desmocerus californicus dimorphus* valley elderberry longhorn beetle	Threatened		G3T2	S2	
36	IICOL5V010	*Hydrochara ricksecker*i Ricksecker's water scavenger beetle			G1G2	S1S2	
37	IIHEM07010	*Saldula usingeri* Wilbur Springs shorebug			G1	S1	
38	IIHYM35030	*Andrena blennospermatis* Blennosperma vernal pool andrenid bee			G2	S2	
39	IILEPP2010	*Danaus plexippus* monarch butterfly			G5	S3	
40	PDAPI0M051	*Cicuta maculata var. bolanderi* Bolander's water-hemlock			G5T3T4	S2	2.1
41	PDAPI19030	*Lilaeopsis masonii* Mason's lilaeopsis		Rare	G2	S2	1B.1
42	PDAST2E1G1	*Cirsium hydrophilum var. hydrophilum* Suisun thistle	Endangered		G1T1	S1.1	1B.1
43	PDAST4R0P2	*Centromadia parryi ssp. parryi* pappose tarplant			G4T2	S2.2	1B.2
44	PDAST57050	*Isocoma arguta* Carquinez goldenbush			G1	S1.1	1B.1
45	PDAST5L040	*Lasthenia conjugens* Contra Costa goldfields	Endangered		G1	S1.1	1B.1
46	PDASTE8470	*Symphyotrichum lentum* Suisun Marsh aster			G2	S2	1B.2
47	PDBOR0V0H0	*Plagiobothrys hystriculus* bearded popcorn-flower			G1	S1.1	1B.1
48	PDBRA1M0K1	*Lepidium latipes var. heckardii* Heckard's pepper-grass			G4T1	S1.2	1B.2

	Element Code	Scientific Name/Common Name	Federal Status	State Status	GRank	SRank	CDFG or CNPS
49	PDCAM060C0	*Downingia pusilla* dwarf downingia			G3	S3.1	2.2
50	PDCAM0C010	*Legenere limosa* legenere			G2	S2.2	1B.1
51	PDCHE040B0	*Atriplex cordulata* heartscale			G2?	S2.2?	1B.2
52	PDCHE041F3	*Atriplex joaquiniana* San Joaquin spearscale			G2	S2	1B.2
53	PDCHE042L0	*Atriplex depressa* brittlescale			G2Q	S2.2	1B.2
54	PDCHE042P0	*Atriplex persistens* vernal pool smallscale			G2	S2.2	1B.2
55	PDFAB0F8R1	*Astragalus tener var. tener* alkali milk-vetch			G1T1	S1.1	1B.2
56	PDFAB0F8R3	*Astragalus tener var. ferrisiae* Ferris' milk-vetch			G1T1	S1.1	1B.1
57	PDFAB250D2	*Lathyrus jepsonii var. jepsonii* Delta tule pea			G5T2	S2.2	1B.2
58	PDFAB40040	*Trifolium amoenum* showy rancheria clover	Endangered		G1	S1.1	1B.1
59	PDFAB400R5	*Trifolium hydrophilum* saline clover			G2?	S2.2?	1B.2
60	PDLIN01030	*Hesperolinon breweri* Brewer's western flax			G2	S2.2	1B.2
61	PDMAL110D0	*Sidalcea keckii* Keck's checkerbloom	Endangered		G1	S1.1	1B.1
62	PDPGN085Z0	*Eriogonum truncatum* Mt. Diablo buckwheat			G1	S1.1	1B.1
63	PDPLM0C0E1	*Navarretia leucocephala ssp. bakeri* Baker's navarretia			G4T2	S2.1	1B.1
64	PDRAN0B1J0	*Delphinium recurvatum* recurved larkspur			G2	S2.2	1B.2
65	PDSCR0J0D1	*Cordylanthus mollis ssp. hispidus* hispid bird's-beak			G2T2	S2.1	1B.1
66	PDSCR0J0D2	*Cordylanthus mollis ssp. mollis* soft bird's-beak	Endangered	Rare	G2T1	S1.1	1B.2
67	PDSCR0R060	*Gratiola heterosepala* Boggs Lake hedge-hyssop		Endangered	G3	S3.1	1B.2
68	PDSCR10050	*Limosella subulata* Delta mudwort			G4?Q	S2.1	2.1
69	PMLIL0V0C0	*Fritillaria liliacea* fragrant fritillary			G2	S2.2	1B.2
70	PMLIL0V0F0	*Fritillaria pluriflora* adobe-lily			G3	S3	1B.2
71	PMPOA4C010	*Neostapfia colusana* Colusa grass	Threatened	Endangered	G2	S2	1B.1

	Element Code	Scientific Name/Common Name	Federal Status	State Status	GRank	SRank	CDFG or CNPS
72	PMPOA4G060	*Orcuttia inaequalis* San Joaquin Valley Orcutt grass	Threatened	Endangered	G2	S2.1	1B.1
73	PMPOA6N020	*Tuctoria mucronata* Crampton's tuctoria or Solano grass	Endangered	Endangered	G1	S1.1	1B.1
74	PMPOT03090	*Stuckenia filiformis* slender-leaved pondweed			G5	S1S2	2.2

Appendix F
Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2011-F-0370-1

AUG 11 2011

Mr. David H. Musselwhite
Department of the Air Force
60th Civil Engineer Squadron
411 Airmen Drive
Travis Air Force Base, California 94535

Subject: Biological Opinion for the Proposed Travis Air Force Base Taxiway M Bypass Road Project, Solano County, California

Dear Mr. Musselwhite:

This letter is in response to your January 24, 2011, request for formal consultation on the proposed Travis Air Force Base (Travis AFB) Taxiway M Bypass Road Project (proposed project), in Solano County, California. You requested formal consultation for adverse effects to the federally-listed as threatened vernal pool fairy shrimp (*Branchinecta lynchi),* endangered vernal pool tadpole shrimp (*Lepidurus packardi*) (collectively vernal pool crustaceans), and threatened Central California distinct population segment (DPS) of the California tiger salamander (*Ambystoma californiense*) (Central California tiger salamander). The U.S. Fish and Wildlife Service (Service) received your request on January 26, 2011.

The proposed project is not located in proposed or designated critical habitat for any federally-listed species. This response is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act) and represents the Service's biological opinion on the effects of the proposed project on the Central California tiger salamander and vernal pool crustaceans.

This biological opinion is based on information provided in the following: (1) the October 2010, *Biological Assessment, Taxiway M Bypass Road, Travis Air Force Base, Solano County, California* (BA); (2) three meetings regarding the proposed project between the Service and Travis AFB personnel; (3) references cited in this biological opinion; and (4) other information available to the Service.

CONSULTATION HISTORY

December 3, 2008: The Service met with Travis AFB to discuss the proposed project and impending future Travis AFB project consultations.

August 5, 2010: The Service met with Travis AFB to discuss the proposed project and impending future Travis AFB project consultations. There was also a visit to the proposed project site.

January 26, 2011: The Service received a request for formal consultation from the Air Force on the proposed project which included the *Biological Assessment, Taxiway M Bypass Road Project, Travis Air Force Base, Solano County, California*, (BA) prepared by CH2MHILL.

February 22, 2011: The Service met with Travis AFB to discuss the proposed project and impending future Travis AFB project consultations.

BIOLOGICAL OPINION

Description of Proposed Action

Travis AFB occupies approximately 6,883 acres of fee-owned land in northern California near the City of Fairfield in Solano County. Travis AFB is bordered on the east, north and south by agricultural land and open space and bordered on the west by mixed urban uses. The proposed project area lies near the southwestern portion of Travis AFB. The total construction footprint for the proposed project will be approximately 9.17 acres.

Travis AFB proposes to construct a new bypass road in the southwest portion of Travis AFB to route commercial traffic away from Taxiway M in order to alleviate safety, security, and accessibility concerns. Taxiway M is a taxiway connected to runway 03R/21L, which is the primary instrument approach runway for Travis AFB and is currently heavily utilized. The proposed project includes a new bypass road from the South Gate, passing west of the munitions bunkers (Buildings 959, 960, and 961, immediately north of Taxiway M) and C Bunker access road, across Cordelia Avenue and connecting to W Street. A portion of W Street and the road leading to the C Bunker parking lot will also be demolished and improved. A new road will also be constructed south of Ragsdale Street to connect the bypass road to Perimeter Road. The end of Ragsdale Street, toward the beginning of the new intersection of the bypass road with Ragsdale Street, will be demolished.

The bypass road will be constructed for commercial vehicle transportation from the South Gate and will accommodate vehicles up to 45 feet long and 12 feet wide. The bypass road will be a two-lane, 36-foot-wide asphalt road, with three emergency stops for a vehicle to pull over along the roadway which will consist of wider areas (48 feet wide by 180 feet long). The new road and W Street will be used to route traffic around Taxiway M, and the improved C Bunker access road will continue to provide access to the C Bunker parking lot.

The C Bunker parking lot is a secured area used by vehicles (generally large trucks) that contain shipments of hazardous materials entering Travis AFB after hours. Operations at the parking lot will not change as a result of road improvements. The C Bunker access road improvements will allow safe truck access to the C Bunker parking area. The existing road is narrow and deteriorating.

The proposed project includes the following actions:

- Construct a new road from south Ragsdale Street to W Street. The road will pass southwest of Taxiway M, cross Cordelia Avenue, and intersect W Street;

- Construct improvements to W Street. W Street is a one-way street north of the munitions buildings and northwest of Taxiway M. W Street currently consists of an asphalt road, lined on either side by buildings. W Street connects on the east end with Dixon Avenue. The new road will intersect with W Street. The eastern end of W Street will be demolished and widened to 36 feet and repaved. Improvements also include converting W Street into a two-lane, two-way street;

- Construct a new road from Ragsdale Street to Perimeter Road, which includes a new intersection; and

- Construct improvements to the C Bunker access road. The existing access road leading from south Ragsdale Street to the C Bunker consists of a one-lane asphalt road used by commercial vehicles to access the C Bunker parking lot. The new access road to the C Bunker parking lot will join the proposed bypass road near the western boundary of the Travis AFB. A stop sign for traffic from the C Bunker parking lot will be placed at the intersection with the new bypass road.

The proposed project will take approximately 12 months to construct and is anticipated to start the summer of 2011. Staging of equipment used during construction will occur on existing paved areas near the new bypass road and the C Bunker access road and will also occur at the C Bunker parking lot. Typical construction equipment that will be used includes a dump truck, backhoe, and truck concrete mixer.

Conservation and Minimization Measures

According to the BA and additional information provided to the Service, this action will be designed and constructed in the following way that will minimize effects on the Central California tiger salamander and vernal pool crustaceans. The conservation measures proposed below are considered part of the proposed action evaluated by the Service in this biological opinion.

1. To minimize the permanent adverse effects of the proposed project on the Central California tiger salamander, the Air Force will protect a combined total of 32.61 acres of upland habitat (10.87 acres of impact compensated at a 3:1 ratio = 32.61 acres). This habitat compensation can be achieved by the purchase of Central California tiger

salamander compensation credits at an existing Service-approved conservation bank or banks, in Solano County;

2. To minimize the indirect adverse effects of the proposed project on vernal pool crustaceans, the Air Force will protect a combined total of 6.92 acres of vernal pool habitat (1.73 acres of impact compensated at a 4:1 ratio = 6.92 acres). This habitat compensation can be achieved by the purchase of vernal pool fairy shrimp and vernal pool tadpole shrimp compensation credits at an existing Service-approved conservation bank or banks, in Solano County;

3. The Air Force will use best management practices (BMPs) to control runoff and sedimentation from the roadway to adjacent vernal pools and will include the use of silt fences, minimization of earth-moving activities and revegetation of disturbed areas;

4. Exclusion fencing/high-visibility fencing will be installed around all vernal pools within the action area;

5. The Air Force will restrict project-related vehicle traffic to established roads, construction areas, and other designated areas to minimize disturbance;

6. A biological monitor will be on-site to monitor construction activities that occur in or near Central California tiger salamander upland habitat and vernal pool crustacean habitat to ensure the amount of habitat disturbed does not exceed what is proposed for the project and evaluated in this biological opinion. The biological monitor will contact the Service immediately if the amount of habitat proposed for disturbance is going to be exceeded.

Action Area

The action area is defined in 50 CFR §402.02 as, "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the Travis AFB Taxiway M Bypass Road, the total action area would be approximately 13.00 acres, which includes the buffer areas of 300 feet on each side of the new roadways to incorporate road improvement areas, vehicle turn around areas, installation of fencing, and staging areas. The action area is located in the southwestern portion of Travis AFB. The new bypass road will be located in a portion of Travis AFB that is in undisturbed grazed annual grassland. This undisturbed grazed annual grassland is where habitat for the Central California tiger salamander and vernal pool crustaceans occurs. The other components of the action such as road improvements and road demolition will occur in areas of Travis AFB that are already developed. The action area was determined based on the direct and indirect effects of the proposed action, including: demolition of portions of old existing roadways, construction of a new road from south Ragsdale Street to W Street; improvements to W Street. Improvements also include converting W Street into a two-lane, two-way street; construct a new road from Ragsdale Street to Perimeter Road; improvements to the C Bunker access road; and a stop sign for traffic from the C Bunker parking lot will be placed at the intersection with the new bypass road.

Analytical Framework for the Jeopardy Analysis

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the Central California tiger salamander's and the vernal pool crustacean's range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the Central California tiger salamander and vernal pool crustaceans in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the Central California tiger salamander and vernal pool crustaceans; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the Central California tiger salamander and vernal pool crustaceans; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the Central California tiger salamander and vernal pool crustaceans.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Central California tiger salamanders and vernal pool crustaceans current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the Central California tiger salamander and vernal pool crustaceans in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Central California tiger salamander and vernal pool crustaceans and the role of the action area in the survival and recovery of the Central California tiger salamander and vernal pool crustaceans as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species

Central California Tiger Salamander

Listing Status

On May 23, 2003, we proposed to list the Central California DPS of the tiger salamander as threatened. At that time, we also proposed reclassification of the Santa Barbara County DPS and Sonoma County DPS from endangered to threatened (68 FR 28647). In the same notice, we also proposed a special rule under section 4(d) of the Act to exempt take for routine ranching operations for the Central California DPS and, if reclassified to threatened, for the Santa Barbara and Sonoma County DPSs (68 FR 28668). On August 4, 2004, after determining that the listed Central California population of the California DPS of the Central California tiger salamander was threatened (69 FR 47211), we determined that the Santa

Barbara and Sonoma County populations were threatened as well, and reclassified the Central California tiger salamander as threatened throughout its range (69 FR 47212), removing the Santa Barbara and Sonoma County populations as separately listed DPSs (69 FR 47241). In this notice, we also finalized the special rule to exempt take for routine ranching operations for the Central California tiger salamander throughout its range (69 FR 47248).

On August 18, 2005, as a result of litigation of the August 4, 2004 final rule on the reclassification of the California tiger salamander DPSs (*Center for Biological Diversity et al.* v. *United States Fish and Wildlife Service et al.*, C 04-04324 WHA [N.D. Cal. 2005]), the District Court of Northern California sustained the portion of the 2004 rule pertaining to listing the Central California tiger salamander as threatened with a special rule, vacated the 2004 rule with regard to the Santa Barbara and Sonoma DPSs, and reinstated their prior listing as endangered. The List of Endangered and Threatened Wildlife in part 17, subchapter B of Chapter I, title 50 of the Code of Federal Regulations (CFR) has not been amended to reflect the vacatures contained in this order, and continues to show the rangewide reclassification of the California tiger salamander (salamander[s]) as a threatened species with a special rule. We are currently in the process of correcting the CFR to reflect the current status of the species throughout its range.

Species Description

The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Recorded adult measurements have been as much as 8.2 inches long (Petranka 1998; Stebbins 2003). California tiger salamanders exhibit sexual dimorphism (differences in body appearance based on gender) with males tending to be larger than females. The coloration of the adults generally consists of random white or yellowish markings against a black body. The markings tend to be more concentrated on the lateral sides of the body; whereas other salamander species tend to have brighter yellow spotting that is heaviest on the dorsal surface.

Distribution

The California tiger salamander is endemic to California and historically inhabited the low-elevation grassland and oak savanna plant communities of the Central Valley, adjacent foothills, and Inner Coast Ranges (Jennings and Hayes 1994; Storer 1925; Shaffer *et al.* 1993). The species has been recorded from near sea level to approximately 3,900 feet in the Coast Ranges and to approximately 1,600 feet in the Sierra Nevada foothills (Shaffer and Trenham 2004). Along the Coast Ranges, the species occurred from the Santa Rosa area of Sonoma County, south to the vicinity of Buellton in Santa Barbara County. The historic distribution in the Central Valley and surrounding foothills included northern Yolo County southward to northwestern Kern County and northern Tulare County.

The Central California tiger salamander occupies the Bay Area (central and southern Alameda, Santa Clara, western Stanislaus, western Merced, and the majority of San Benito counties), Central Valley (Yolo, Sacramento, Solano, eastern Contra Costa, northeastern Alameda, San Joaquin, Stanislaus, Merced, and northwestern Madera counties), southern San Joaquin Valley (portions of Madera, central Fresno, and northern Tulare and Kings Counties), and the Central

Coast Range (southern Santa Cruz, Monterey, northern San Luis Obispo, and portions of western San Benito, Fresno, and Kern counties).

Life History

The California tiger salamander has an obligate biphasic life cycle (Shaffer *et al.* 2004). Although the larvae develop in the vernal pools and ponds in which they were born, the species is otherwise terrestrial and spend most of their post-metamorphic lives in widely dispersed underground retreats (Shaffer *et al.* 2004; Trenham *et al.* 2001). Because they spend most of their lives underground, the animals rarely are encountered even in areas where California tiger salamanders are abundant. Subadult and adult California tiger salamanders typically spend the dry summer and fall months in the burrows of small mammals, such as California ground squirrels (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Although ground squirrels have been known to eat these amphibians, the relationship with their burrowing hosts is primarily commensal (an association that benefits one member while the other is not affected) (Loredo *et al.* 1996; Semonsen 1998).

California tiger salamanders may also use landscape features such as leaf litter or desiccation cracks in the soil for upland refugia. Burrows often harbor camel crickets (*Stenelopomatus* species) and other invertebrates that provide likely prey for the amphibians. Underground refugia also provide protection from the sun and wind associated with the dry California climate that can cause excessive drying of amphibian skin. Although California tiger salamanders are members of a family of "burrowing" salamanders, they are not known to create their own burrows. This may be due to the hardness of soils in the California ecosystems in which they are found. California tiger salamanders depend on persistent small mammal activity to create, maintain, and sustain sufficient underground refugia for the species. Burrows are short lived without continued small mammal activity and typically collapse within approximately 18 months (Loredo *et al.* 1996).

Upland burrows inhabited by California tiger salamanders have often been referred to as aestivation-sites. However, "aestivation" implies a state of inactivity, while most evidence suggests that the animals remain active in their underground dwellings. One study has found that salamanders move, feed, and remain active in their burrows (Van Hattem 2004). Because the adults arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving, researchers have long inferred that they are feeding while underground. A number of direct observations have confirmed this (Trenham 2001; Van Hattem 2004). Thus, "upland habitat" is a more accurate description of the terrestrial areas used by California tiger salamanders.

California tiger salamanders typically emerge from their underground refugia at night during the fall or winter rainy season (November-May) to migrate to their breeding ponds (Stebbins 1985, 1989; Shaffer *et al.* 1993; Trenham *et al.* 2000). The breeding period is closely associated with the rainfall patterns in any given year with less adults migrating and breeding in drought years (Loredo and Van Vuren 1996; Trenham *et al.* 2000). Male California tiger salamander are typically first to arrive and generally remain in the ponds longer than females.

Results from a 7-year study in Monterey County suggested that males remained in the breeding ponds for an average of 44.7 days while females remained for an average of only 11.8 days (Trenham *et al.* 2000). Historically, breeding ponds were likely limited to vernal pools, but now include livestock stock ponds. Ideal breeding ponds are typically fishless, free of non-native predators, and seasonal or semi-permanent (Barry and Shaffer 1994; Petranka 1998).

While in the ponds, adult California tiger salamanders mate and then the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Egg laying typically reaches a peak in January (Loredo and Van Vuren 1996; Trenham *et al.* 2000). Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer 1925; Twitty 1941). Eggs are often attached to objects, such as rocks and boards in ponds with no or limited vegetation (Jennings and Hayes 1994). Clutch sizes from a Monterey County study had an average of 814 eggs (Trenham *et al.* 2000). Seasonal pools may not exhibit sufficient depth, persistence, or other necessary parameters for adult breeding during times of drought (Barry and Shaffer 1994). After breeding and egg laying is complete, adults leave the pool and return to their upland refugia (Loredo *et al.* 1996; Trenham 1998a). Adult California tiger salamanders often continue to emerge nightly for approximately the next two weeks to feed amongst their upland habitat (Shaffer *et al.* 1993).

California tiger salamander larvae typically hatch within 10 to 24 days after eggs are laid (Storer 1925). The peak emergence of these metamorphs is typically between mid-June and mid-July (Loredo and Van Vuren 1996; Trenham *et al.* 2000). The larvae are totally aquatic and range in length from approximately 0.45 to 0.56 inches (Petranka 1998). They have yellowish gray bodies, broad fat heads, large, feathery external gills, and broad dorsal fins that extend well up their back. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson 1968). Larger larvae have been known to consume the tadpoles of Pacific tree frogs (*Pseudacris regilla*), western spadefoot toads (*Spea hammondii*), and California red-legged frogs (*Rana draytonii*) (J. Anderson 1968; P. Anderson 1968). California tiger salamander larvae are among the top aquatic predators in seasonal pool ecosystems. When not feeding, they often rest on the bottom in shallow water but are also found throughout the water column in deeper water. Young California tiger salamanders are wary and typically escape into vegetation at the bottom of the pool when approached by potential predators (Storer 1925).

The California tiger salamander larval stage is typically completed in 3 to 6 months with most metamorphs entering upland habitat during the summer (Petranka 1998). In order to be successful, the aquatic phase of this species' life history must correspond with the persistence of its seasonal aquatic habitat. Most seasonal ponds and pools dry up completely during the summer. Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins 1973). Larval development and metamorphosis can vary and is often site-dependent. Larvae collected near Stockton in the Central Valley during April varied between 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left breeding pools 60 to 94 days after eggs had been laid, with larvae developing faster in smaller,

more rapidly drying pools. Longer ponding duration typically results in larger larvae and metamorphosed juveniles that are more likely to survive and reproduce (Pechmann *et al.* 1989; Semlitsch *et al.* 1988; Morey 1998; Trenham 1998b). Larvae will perish if a breeding pond dries before metamorphosis is complete (P. Anderson 1968; Feaver 1971). Pechmann *et al.* (1989) found a strong positive correlation between ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 sampled pools supported larval salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only 6 (20 percent) provided suitable conditions for successful reproduction that year. Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch *et al.* 1988; Scott 1994; Morey 1998).

Following metamorphosis, juvenile California tiger salamanders leave their pools and move to upland habitat. This emigration can occur in both wet and dry conditions (Loredo and Van Vuren 1996; Loredo *et al.* 1996). Wet conditions are more favorable for upland travel but summer rain events seldom occur as metamorphosis is completed and ponds begin to dry. As a result, juveniles may be forced to leave their ponds on rainless nights. Under dry conditions, juveniles may be limited to seeking upland refugia in close proximity to their aquatic larval pool. These individuals often wait until the next winter's rains to move further into more suitable upland refugia. Juveniles remain active in their upland habitat, emerging from underground refugia during rainfall events to disperse or forage (Trenham and Shaffer 2005). Depending on location and other development factors, metamorphs will not return as adults to aquatic breeding habitat for 2 to 5 years (Loredo and Van Vuren 1996; Trenham *et al.* 2000).

Lifetime reproductive success for the California tiger salamander is low. Results from one study suggest that the average female bred 1.4 times over their lifespan and produced 8.5 young per reproductive effort that survived to metamorphosis (Trenham *et al.* 2000). This resulted in the output of roughly 11 metamorphic offspring over a breeding female's lifetime. The primary reason for low reproductive success may be that this relatively short-lived species requires two or more years to become sexually mature (Shaffer *et al.* 1993). Some individuals may not breed until they are four to six years old. While California tiger salamanders may survive for more than ten years, many breed only once, and in one study, less than 5 percent of marked juveniles survived to become breeding adults (Trenham 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well human-caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated pools can quickly extirpate a population.

Dispersal and migration movements made by California tiger salamanders can be grouped into two main categories: (1) breeding migration; and (2) interpond dispersal. Breeding migration is the movement of salamanders to and from a pond from the surrounding upland habitat. After metamorphosis, juveniles move away from breeding ponds into the surrounding uplands, where they live continuously for several years. At a study in Monterey County, it was found that upon reaching sexual maturity, most individuals returned to their natal/ birth pond to breed, while 20 percent dispersed to other ponds (Trenham *et al.* 2001). After breeding, adult California tiger salamanders return to upland habitats, where they may live for one or more years before attempting to breed again (Trenham *et al.* 2000).

California tiger salamanders are known to travel long distances between breeding ponds and their upland refugia. Generally it is difficult to establish the maximum distances traveled by any species, but salamanders in Santa Barbara County have been recorded dispersing up to 1.3 miles from their breeding ponds (Sweet 1998). As a result of a 5-year capture and relocation study in Contra Costa County, Orlaf (2007) estimated that captured California tiger salamanders were traveling a minimum of 0.5 miles to the nearest breeding pond and that some individuals were likely traveling more than 1.3 miles to and from breeding ponds. Tiger salamanders are also known to travel between breeding ponds. One study found that 20 to 25 percent of the individuals captured at one pond were recaptured later at other ponds approximately 1,900 and 2,200 feet away (Trenham *et al.* 2001). In addition to traveling long distances during juvenile dispersal and adult migration, salamanders may reside in burrows far from their associated breeding ponds.

Although previously cited information indicates that California tiger salamanders can travel long distances, they typically remain close to their associated breeding ponds. A trapping study conducted in Solano County during the winter of 2002/2003 suggested that juveniles dispersed and used upland habitats further from breeding ponds than adults (Trenham and Shaffer 2005). More juvenile California tiger salamanders were captured at traps placed at 328, 656, and 1,312 feet from a breeding pond than at 164 feet. Approximately 20 percent of the captured juveniles were found at least 1,312 feet from the nearest breeding pond. The associated distribution curve suggested that 95 percent of juvenile California tiger salamanders were within 2,099 feet of the pond, with the remaining 5 percent being found at even greater distances. Preliminary results from the 2003-04 trapping efforts at the same study site detected juvenile California tiger salamanders at even further distances, with a large proportion of the captures at 2,297 feet from the breeding pond (Trenham 1998a). Surprisingly, most juveniles captured, even those at 2,100 feet, were still moving away from ponds. In Santa Barbara County, juvenile California tiger salamanders have been trapped approximately 1,200 feet away while dispersing from their natal pond (Science Applications International Corporation, unpublished data). These data show that many California tiger salamanders travel far while still in the juvenile stage. Post-breeding movements away from breeding ponds by adults appear to be much smaller. During post-breeding emigration from aquatic habitat, radio-equipped adult California tiger salamanders were tracked to burrows between 62 to 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult California tiger salamanders exiting the ponds with depleted physical reserves, or drier weather conditions typically associated with the post-breeding upland migration period.

California tiger salamanders are also known to use several successive burrows at increasing distances from an associated breeding pond. Although previously cited studies provide information regarding linear movement from breeding ponds, upland habitat features appear to have some influence on movement. Trenham (2001) found that radio-tracked adults were more abundant in grasslands with scattered large oaks (*Quercus* species), than in more densely wooded areas. Based on radio-tracked adults, there is no indication that certain habitat types are favored as terrestrial movement corridors (Trenham 2001). In addition, captures of arriving adults and dispersing new metamorphs were evenly distributed around two ponds completely encircled by drift fences and pitfall traps. Thus, it appears that dispersal into the terrestrial habitat occurs randomly with respect to direction and habitat types.

Threats

Documented or potential Central California tiger salamanders predators include coyotes (*Canis latrans*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), egrets (*Egretta* species), great blue herons (*Ardea herodias*), crows (*Corvus brachyrhynchos*), ravens (*Corvus corax*), garter snakes (*Thamnophis* species), bullfrogs (*Rana catesbeiana*), California red-legged frogs (*Rana draytonii*), mosquito fish (*Gambusia affinis*), and crayfish (*Procrambus* species).

The Central California tiger salamander is imperiled throughout its range due to a variety of human activities (Service 2004). Current factors associated with declining Central California tiger salamander populations include continued habitat loss and degradation due to agriculture and urbanization; hybridization with the non-native eastern salamander (*Ambystoma tigrinum*) (Fitzpatrick and Shaffer 2004; Riley *et al.* 2003); and predation by introduced species. Central California tiger salamander populations are likely threatened by multiple factors but continued habitat fragmentation and colonization of non-native salamanders may represent the most significant current threats. Habitat isolation and fragmentation within many watersheds have precluded dispersal between sub-populations. Other threats include predation and competition from introduced exotic species; possible commercial over-utilization; diseases; various chemical contaminants; road kill; and certain mosquito and rodent control operations. Currently, these various primary and secondary threats are largely not being offset by existing Federal, State, or local regulatory mechanisms. The Central California tiger salamander is also prone to chance environmental or demographic events to which small populations are particularly vulnerable.

The global average temperature has risen by approximately 0.6 degrees Celsius during the 20th Century (IFPC 2001, 2007; Adger *et al* 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IFPC 2001, 2007; Adger *et al.* 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger *et al.* 2007). Ongoing climate change (Anonymous 2007; Inkley *et al.* 2004; Adger *et al.* 2007; Kanter 2007) likely imperils the Central California tiger salamander, and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Local Status

Travis AFB is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Core area, which is defined by landscape and hydrological features that support a complex of vernal pools and a variety of associated endemic and special-status plant and animal species according to the Service's Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Recovery Plan) (Service 2005a). Travis AFB also lies in the range of the Central California tiger salamander. The Central California tiger salamander has been adversely affected by development and modification of the vernal pool, grassland, and open woodland habitat within the Solano-Colusa vernal pool region. Construction of and around Travis AFB contributes to local Central California tiger salamander habitat loss and fragmentation. The Central California tiger salamander is known to be present in much of the undeveloped areas surrounding Travis AFB and has been documented breeding on Travis AFB. The California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB) includes multiple reported Central California tiger salamander observations within 0.50 miles surrounding the project action area (CDFG 2011). Some of these observations include those at Wilcox Ranch property, Muzzy Conservation Bank, North Suisun Conservation Bank, Burke Ranch Conservation bank and one observation of breeding on Travis AFB in 2008.

Central California tiger salamander protocol level surveys have never been conducted on Travis AFB but CH2MHILL biologist, Mr. Russell Huddleston, incidentally captured Central California tiger salamander larvae while conducting vernal pool crustacean sampling at the Travis AFB Burke Property vernal pool mitigation-site (Burke Property). The Burke property is on Travis AFB near housing at the north central boundary of Travis AFB, approximately 0.50 mile northeast of the action area (Service personal communication with Russell Huddleston on April 7, 2008). Mr. Huddleston informed the Service and Dr. Brad Shaffer from the University of California at Davis, and on April 3, 2008, Dr. Shaffer and his associates visited the Burke Property on Travis AFB to sample basin #BP35a and two other nearby pools on the Burke property for Central California tiger salamanders. According to Mr. Huddleston, Dr. Schaffer captured over 60 Central California tiger salamander larvae between two of the pools on the Burke property and took tissue samples from 20 individuals at each pool for genetic analysis. These captures were the first time Central California tiger salamanders had been identified on Travis AFB. This is more likely a result of a lack of survey data rather than

the potential of the species to be present in appropriate habitat throughout Travis AFB. Further surveys in 2010 were conducted in pools on the Burke property. These surveys detected Central California tiger salamander larvae as well. The vernal pools located within the action area were determined in the BA to not be suitable breeding habitat for Central California tiger salamanders due to short ponding duration. There is one project currently under construction adjacent to the action area of the proposed project. This project is the Travis AFB Southgate Improvement Project (Service File # 81420-2008-F-0596-1). This project will incidentally take all Central California tiger salamanders inhabiting 4.44 acres of upland habitat, near the southern edge of the current action area.

Vernal Pool Fairy Shrimp

Listing Status

A final rule was published on September 19, 1994, listing the vernal pool fairy shrimp as threatened under the Act (Service 1994). The final rule to designate critical habitat for 15 vernal pool species, including the vernal pool fairy shrimp, was published on August 6, 2003 (Service 2003a). A final rule was published again on August 11, 2005 (Service 2005a). Further information on the life history and ecology of the vernal pool fairy shrimp may be found in the final listing rule, the final rule to designate critical habitat, the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005c), Eng *et al.* (1990), Helm (1998), and Simovich *et al.* (1992).

Species Description

The fairy shrimp has a delicate elongate body, large stalked compound eyes, no carapace, and 11 pairs of swimming legs. It swims or glides gracefully upside down by means of complex beating movements of the legs that pass in a wave-like anterior to posterior direction. Fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus. The females carry the eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The "resting" or "summer" eggs are capable of withstanding heat, cold, and prolonged desiccation. When the pools fill in the same or subsequent seasons, some, but not all, of the eggs may hatch. The egg bank in the soil may consist of eggs from several years of breeding (Donald 1983). The eggs hatch when the vernal pools fill with rainwater. The early stages of the vernal pool fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season long before the vernal pools dry up.

Distribution

The fairy shrimp is known from 32 populations extending from the Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County, and along the central coast range from northern Solano County to the Pinnacles in San Benito County (Eng *et al.* 1990; Fugate 1992; Sugnet and Associates 1993). Five additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County; one in the mountain grasslands of northern Santa Barbara County; one on the Santa Rosa Plateau in Riverside

County, one near Rancho California in Riverside County and one on the Agate Desert near Medford, Oregon. Three of these isolated populations each contain only a single pool known to be occupied by the fairy shrimp. The genetic characteristics of these species, as well as ecological conditions, such as watershed continuity, indicate that populations of these animals are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes.

Life History

The fairy shrimp inhabits vernal pools with clear to tea-colored water, most commonly in grass or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands. The fairy shrimp has been collected from early December to early May. It can mature quickly, allowing populations to persist in short-lived shallow pools (Simovich *et al.* 1992). Fairy shrimps occupy 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;). The pool types where the species has been found include Northern Hardpan, Northern Claypan, Northern Volcanic Mud Flow, and Northern Basalt Flow vernal pools formed on a variety of geologic formations and soil types. Although fairy shrimp have been collected from large vernal pools, including one exceeding 25 acres in area (Eriksen and Belk 1999), it is most frequently found in pools measuring less than 0.05 acre in area (Helm 1998; Gallagher 1996). The fairy shrimp occurs at elevations from 33 feet to 4,003 feet (Eng *et al.* 1990), and is typically found in pools with low to moderate amounts of salinity or total dissolved solids (Keeley 1984; Syrdahl 1993). Vernal pools are mostly rain fed, resulting in low nutrient levels and dramatic daily fluctuations in pH, dissolved oxygen, and carbon dioxide (Keeley and Zedler 1998). Although there are many observations of the environmental conditions where fairy shrimp have been found, there have been no experimental studies investigating the specific habitat requirements of this species.

The fairy shrimp has evolved unique physical adaptations to survive in vernal pools. Vernal pool environments are characterized by a short inundation phase during the winter, a drying phase during the spring, and a dry phase during the summer (Holland and Jain 1988). The timing and duration of these phases can vary significantly from year to year, and in some years vernal pools may not inundate at all. In order to take advantage of the short inundation phase, vernal pool crustaceans have evolved short reproduction times and high reproductive rates. Fairy shrimps generally hatch within a few days after their habitats fill with water, and can start reproducing within a few weeks (Eng *et al.* 1990; Helm 1998; Eriksen and Belk 1999). Fairy shrimps can complete their entire life cycle in a single season, and some species may complete several life cycles. Fairy shrimps can also produce numerous offspring when environmental conditions are favorable. Some species may produce thousands of cysts during their life spans.

To survive the prolonged heat and desiccation of the vernal pool dry phase, vernal pool crustaceans have developed a dormant stage. After vernal pool crustacean eggs are fertilized in the female's brood sac, the embryos develop a thick, usually multi-layered shell. When embryonic development reaches a late stage, further maturation stops, metabolism is drastically slowed, and the egg, now referred to as a cyst, enters a dormant state called diapause. The cyst

is then either dropped to the pool bottom or remains in the brood sac until the female dies and sinks. Once the cyst is desiccated, it can withstand temperatures near boiling (Carlisle 1968), fire (Wells *et al.* 1997), freezing, and anoxic conditions without damage to the embryo. The cyst wall cannot be affected by digestive enzymes, and can be transported in the digestive tracts of animals without harm (Horne 1967). Most fairy shrimp cysts can remain viable in the soil for a decade or longer (Belk 1998).

Although the exact signals that cause fairy shrimp cysts to hatch are unknown, factors such as soil moisture, temperature, light, oxygen, and osmotic pressure may trigger the embryo's emergence from the cyst (Brendonck 1990). Because the cyst contains a well-developed embryo, the animal can quickly develop into a fully mature adult. This allows fairy shrimps to reproduce before the vernal pool enters the dry phase, sometimes within only a few weeks (Helm 1998, Eriksen and Belk 1999). In some species, cysts may hatch immediately without going through a dormant stage, if they are deposited while the vernal pool still contains water. These cysts are referred to as quiescent, and allow the vernal pool crustacean to produce multiple generations in a single wet season as long as their habitat remains inundated.

Another important adaptation of vernal pool crustaceans to the unpredictable conditions of vernal pools is the fact that not all of the dormant cysts hatch in every season. Hathaway and Simovich (1996) found that only 6 percent of endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*) cysts hatched after initial hydration, and only 0.18 percent of Riverside fairy shrimp (*Streptocephalus woottoni*) cysts hatched. The cysts that don't hatch remain dormant and viable in the soil. These cysts may hatch in a subsequent year, and form a cyst bank much like the seed bank of annual plants. The cyst bank may be comprised of cysts from several years of breeding, and large cyst banks of viable resting eggs in the soil of vernal pools containing fairy shrimp have been well documented (Belk 1998). Based on a review of other studies (e.g. Belk 1977; Gallagher 1996, Brendonck 1990), Hathaway and Simovich (1996) concluded that species inhabiting more unpredictable environments, such as smaller or shorter lived pools, are more likely to have a smaller percent of their cysts hatch after their vernal pool habitats fill with water. This strategy reduces the probability of complete reproductive failure if a vernal pool dries up prematurely. This kind of "bet-hedging strategy" has been suggested as a mechanism by which rare species may persist in unpredictable environments (Chesson and Huntly 1989; Ellner and Hairston 1994).

Upland areas associated with vernal pools are also an important source of nutrients to vernal pool organisms (Wetzel 1975). Vernal pool habitats derive most of their nutrients from detritus which is washed into the pool from adjacent uplands, and these nutrients provide the foundation for vernal pool aquatic communities' food chain. Detritus is a primary food source for the vernal pool crustaceans (Eriksen and Belk 1999).

Fairy shrimp generally will not hatch until water temperatures drop to below 50°F (Gallagher 1996; Helm 1998). This species is capable of hatching multiple times within a single wet season if conditions are appropriate. Helm (1998) observed six separate hatches of fairy shrimp within a single wet season, and Gallagher (1996) observed three separate hatches in vernal pools in Butte County. Helm (1998) observed fairy shrimp living for as long as 147 days. The species can reproduce in as few as 18 days at optimal conditions of 68°F and

can complete its life cycle in as little as nine weeks (Gallagher 1996; Helm 1998). However, maturation and reproduction rates of fairy shrimp are controlled by water temperature and can vary greatly (Eriksen and Brown 1980; Helm 1998). Helm (1998) observed that fairy shrimp did not reach maturity until 41 days at water temperatures of 59°F. Fairy shrimp have been collected at water temperatures as low as 40°F (Eriksen and Belk 1999); however, the species has not been found in water temperatures above about 73°F (Helm 1998; Eriksen and Belk 1999).

The primary historic dispersal method for the fairy shrimp likely was large scale flooding resulting from winter and spring rains which allowed the animals to colonize different individual vernal pools and other vernal pool complexes. This dispersal currently is non-functional due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds likely are now the primary dispersal agents for vernal pool crustaceans (Simovich *et al.* (1992). The eggs of vernal pool crustaceans are either ingested (Krapu 1974; Swanson 1974; Driver 1981; Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats.

Vernal pool crustaceans are often dispersed from one pool to another through surface swales that connect one vernal pool to another. These dispersal events allow for genetic exchange between pools and create a population of animals that extends beyond the boundaries of a single pool. Instead, populations of vernal pool crustaceans are defined by the entire vernal pool complex in which they occur (Simovich *et al.* 1992, King 1996). These dispersal events also allow vernal pool crustaceans to move into pools with a range of sizes and depths. In dry years, animals may only emerge in the largest and deepest pools. In wet years, animals may be present in all pools, or in only the smallest pools. The movement of vernal pool crustaceans into vernal pools of different sizes and depths allows these species to survive the environmental variability that is characteristic of their habitats.

Threats

Vernal pool crustaceans are an important food source for a number of aquatic and terrestrial species. Aquatic predators include insects such as backswimmers (Woodward and Kiesecker 1994), predaceous diving beetles and their larvae, and dragonflies and damselfly larvae. Vernal pool tadpole shrimp are another significant predator of fairy shrimp. Vernal pools provide important habitat for resident and migratory birds, particularly waterfowl and shorebirds. Birds are particularly attracted to the pools because they offer foraging habitat at a time of year when resources are limited (Silveira 1998), and vernal pools help link aquatic resources in the California portion of the Pacific Flyway. Vernal pool crustaceans provide important proteins and calcium vital to the energetic needs of migratory bird migration and reproduction (Proctor *et al.* 1967; Silveira 1998). Vernal pool crustaceans are a major food source for a number of terrestrial vertebrate predators including water fowl, wading birds, toads, frogs, and salamanders (Proctor *et al.* 1967; Krapu 1974; Swanson 1974; Morin 1987; Simovich *et al.* 1992; Silveira 1998). Vernal pool crustaceans depend on the absence of water during the summer months to discourage aquatic predator species such as bullfrogs, garter snakes, and fish (Eriksen and Belk 1999).

The main threat to the fairy shrimp is the loss of habitat associated with human activities, including urban/suburban development, water supply/flood control development, and conversion of natural lands to intensively farmed agricultural uses. Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, and other activities, as well as modification of surrounding uplands which alters vernal pool watersheds. Other activities which adversely affect the species include off-road vehicle use, certain mosquito abatement measures, pesticide/herbicide use, alterations of vernal pool hydrology, fertilizer, invasions of aggressive non-native plants, gravel mining, and contaminated stormwater runoff. State and local laws and regulations do not protect the fairy shrimp, while other laws and regulations, including the Clean Water Act, have not effectively maintained habitat necessary to conserve and recover these species. Although developmental pressures continue, only a small fraction of vernal pool habitat is protected from the threat of destruction.

In addition to direct habitat loss, the vernal pool habitat for the fairy shrimp is also highly fragmented throughout its range due to the nature of vernal pool landscapes and the conversion of natural habitat by human activities. Such fragmentation results in small, isolated populations of fairy shrimp which may be more susceptible to extinction due to random demographic, genetic, and environmental events. Should an extirpation event occur in a population that has been fragmented, the opportunities for recolonization would be greatly reduced due to physical (geographical) isolation from other (source) populations. Excessive impacts to one or more of the vernal pool regions could jeopardize the long-term survival and recovery of the vernal pool crustaceans by increasing the vulnerability of the remaining vernal pool regions to catastrophic events (Service 2005a).

The global average temperature has risen by approximately 0.6°C during the 20th Century (IFPC 2001, 2007; Adger *et al* 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IFPC 2001, 2007; Adger *et al.* 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger *et al.* 2007). Ongoing climate change (Anonymous 2007; Inkley *et al.* 2004; Adger *et al.* 2007; Kanter 2007) likely imperils sensitive species, and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction.

Local Status

Travis AFB is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Core area, which is defined by landscape and hydrological features that support a complex of vernal pools and a variety of associated endemic and special-status plant and animal species according to the Service's Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Recovery Plan) (Service 2005a). Travis AFB is also within the range of the vernal pool fairy shrimp. The vernal pool fairy shrimp has been adversely affected by development and modification of the vernal pool, grassland, and open woodland habitat within the Solano-Colusa vernal pool region. Construction of and around Travis AFB

contributes to local vernal pool fairy shrimp habitat loss and fragmentation. The vernal pool fairy shrimp is known to be present in much of the undeveloped areas surrounding Travis AFB and has been documented in multiple areas on Travis AFB. The closest known occurrence of fairy shrimp to construction is approximately 100 feet. The CNDDB also includes multiple reported vernal pool fairy shrimp observations within 0.50 miles surrounding the project action area (CDFG 2011). Some of these observations include those at Wilcox Ranch property, Muzzy Conservation Bank, North Suisun Conservation Bank, Burke Ranch Conservation bank and multiple observations on Travis AFB. There is one project currently under construction adjacent to the action area of the proposed project. This project is the Travis AFB Southgate Improvement Project (Service File # 81420-2008-F-0596-1). There are no vernal pool crustacean effects associated with this project.

Vernal Pool Tadpole Shrimp

Listing Status

A final rule was published on September 19, 1994, listing the vernal pool tadpole shrimp as threatened under the Act (Service 1994). The final rule to designate critical habitat for 15 vernal pool species, including the vernal pool tadpole shrimp, was published on August 6, 2003 (Service 2005c). A final rule was published again on August 11, 2005 (Service 2005a). Further information on the life history and ecology of the vernal pool tadpole shrimp may be found in the final listing rule, the final rule to designate critical habitat, the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005b), Eng *et al.* (1990), Helm (1998), and Simovich *et al.* (1992).

Species Description

The species has dorsal compound eyes, a large shield-like carapace that covers most of the body, and a pair of long cercopods at the end of the last abdominal segment (Linder 1952; Longhurst 1955; Pennak 1989). It is primarily a benthic animal that swims with its legs down. Tadpole shrimp climb or scramble over objects, as well as move along or in bottom sediments. Their diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Pennak 1989).

Distribution

The tadpole shrimp is known from 19 populations in the Central Valley, ranging from east of Redding in Shasta County south to Fresno County, and from a single vernal pool complex located on the San Francisco Bay National Wildlife Refuge in Alameda County. The species inhabits vernal pools containing clear to highly turbid water, ranging in size from 54 square feet in the Mather Air Force Base area of Sacramento County, to the 93-acre Olcott Lake at Jepson Prairie in Solano County. Vernal pools at Jepson Prairie and Vina Plains (Tehama County) have a neutral pH, and very low conductivity, total dissolved solids, and alkalinity (Barclay and Knight 1984; Eng *et al.* 1990). These pools are located most commonly in grass-bottomed swales of grasslands in old alluvial soils underlain by hardpan or in mud-bottomed clay pan pools containing highly turbid water.

Life History

The tadpole shrimp occurs in a wide variety of vernal pool habitats including vernal pools, clay flats, ephemeral stock ponds, roadside ditches, and road ruts (Helm 1998). They have been found in pools with water temperatures ranging from 50°F to 84°F and pH ranging from 6.2 to 8.5 (Syrdahl 1993, King 1996). However, vernal pools exhibit daily and seasonal fluctuations in pH, temperature, dissolved oxygen, and other water chemistry characteristics (Syrdahl 1993, Scholnick 1995).

The life history of the tadpole shrimp is linked to the phenology of its vernal pool habitat. After winter rainwater fills the pools, the populations are reestablished from diapaused eggs which lie dormant in the dry pool sediments (Lanway 1974; Ahl 1991). Ahl (1991) found that eggs in one pool hatched within three weeks of inundation and sexual maturation was reached in another three to four weeks. The eggs are sticky and readily adhere to plant matter and sediment particles (Simovich *et al.* 1992). A portion of the eggs hatch immediately and the rest enter diapause and remain in the soil to hatch during later rainy seasons (Ahl 1991). The tadpole shrimp matures slowly and is a long-lived species (Ahl 1991). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991; Simovich et al. 1992).

Tadpole shrimp have relatively high reproductive rates. Ahl (1991) found that fecundity increases with body size. Large females, greater than 0.8 inch carapace length, could deposit as many as six clutches, averaging 32 to 61 eggs per clutch, in a single wet season. Tadpole shrimp sex ratios can vary (Ahl 1991). After winter rains fill their vernal pool habitats, dormant vernal pool tadpole shrimp cysts may hatch in as little as four days (Ahl 1991).

Additional cysts produced by adult tadpole shrimp during the wet season may hatch without going through a dormant period (Ahl 1991). Tadpole shrimp emerge from their cysts as metanaupliu, a larval stage which lasts for 1.5 to 2 hours. They then molt into a larval form resembling the adult.

Helm (1998) found that tadpole shrimp took a minimum of 25 days to mature and the mean age at first reproduction was 54 days. Other researchers have observed tadpole shrimp generally take between three and four weeks to mature (Ahl 1991; King 1996). Ahl (1991) found that reproduction did not begin until individuals were larger than 0.39 inch carapace length. Variation in growth and maturation rates may be a result of differences in water temperature, which strongly influences the growth rates of aquatic invertebrates. King (1996) studied genetic variation among vernal pool tadpole shrimp populations at 20 different sites in the Central Valley. She found that 96 percent of the genetic variation measured was due to differences between sites. This result corresponds with the findings of other researchers that vernal pool crustaceans have low rates of gene flow between separated sites. The low rate of exchange between vernal pool tadpole shrimp populations is probably a result of the spatial isolation of their habitats and their reliance on passive dispersal mechanisms. However, King (1996) also estimated that gene flow between pools within the same vernal pool complex was much higher, and concluded that vernal pool crustacean populations should be defined by vernal pool complex, not by the boundaries of an individual vernal pool.

Based on genetic differences, King (1996) separated tadpole shrimp populations into two distinct groups. One group was comprised of animals inhabiting the floor of the Central Valley, near the Sacramento and San Joaquin Rivers. The other group contained tadpole shrimp from sites along the eastern margin of the Central Valley. King (1996) concluded that these two groups may have diverged because cyst dispersal by overland flooding historically connected populations on the Central Valley floor, while populations on the eastern margin of the valley were not periodically connected by large scale flooding, and were therefore historically more isolated. When dispersal of these foothill populations occurred, it was probably through different mechanisms such as migratory birds.

Threats

Vernal pool crustaceans are an important food source for a number of aquatic and terrestrial species. Aquatic predators include insects such as backswimmers (Woodward and Kiesecker 1994), predaceous diving beetles and their larvae, and dragonflies and damselfly larvae. Vernal pool tadpole shrimp are another significant predator of fairy shrimp. Vernal pools provide important habitat for resident and migratory birds, particularly waterfowl and shorebirds. Birds are particularly attracted to the pools because they offer foraging habitat at a time of year when resources are limited (Silveira 1998), and vernal pools help link aquatic resources in the California portion of the Pacific Flyway. Vernal pool crustaceans provide important proteins and calcium vital to the energetic needs of migratory bird migration and reproduction (Proctor *et al.* 1967; Silveira 1998). Vernal pool crustaceans are a major food source for a number of terrestrial vertebrate predators including water fowl, wading birds, toads, frogs, and salamanders (Proctor *et al.* 1967; Krapu 1974; Swanson 1974; Morin 1987; Simovich *et al.* 1991; Silveira 1998). Vernal pool crustaceans depend on the absence of water during the summer months to discourage aquatic predator species such as bullfrogs, garter snakes, and fish (Eriksen and Belk 1999).

The main threat to the tadpole shrimp is the loss of habitat associated with human activities, including urban/suburban development, water supply/flood control development, and conversion of natural lands to intensively farmed agricultural uses. Habitat loss occurs from direct destruction and modification of pools due to filling, grading, discing, leveling, and other activities, as well as modification of surrounding uplands which alters vernal pool watersheds. Other activities which adversely affect the species include off-road vehicle use, certain mosquito abatement measures, pesticide/herbicide use, alterations of vernal pool hydrology, fertilizer, invasions of aggressive non-native plants, gravel mining, and contaminated stormwater runoff. State and local laws and regulations do not protect the tadpole shrimp, while other laws and regulations, including the Clean Water Act, have not effectively maintained habitat necessary to conserve and recover these species. Although developmental pressures continue, only a small fraction of vernal pool habitat is protected from the threat of destruction.

In addition to direct habitat loss, the vernal pool habitat for the tadpole shrimp is also highly fragmented throughout their ranges due to the nature of vernal pool landscapes and the conversion of natural habitat by human activities. Such fragmentation results in small, isolated

populations of tadpole shrimp which may be more susceptible to extinction due to random demographic, genetic, and environmental events. Should an extirpation event occur in a population that has been fragmented, the opportunities for recolonization would be reduced due to physical (geographical) isolation from other (source) populations. Excessive impacts to one or more of the vernal pool regions could jeopardize the long-term survival and recovery of the vernal pool crustaceans by increasing the vulnerability of the remaining vernal pool regions to catastrophic events (Service 2005b).

The global average temperature has risen by approximately 0.6°C during the 20th Century (IFPC 2001, 2007; Adger *et al* 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IFPC 2001, 2007; Adger *et al.* 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger *et al.* 2007). Ongoing climate change (Anonymous 2007; Inkley *et al.* 2004; Adger *et al.* 2007; Kanter 2007) likely imperils sensitive species, and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction.

Local Status

Travis AFB is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Core area, which is defined by landscape and hydrological features that support a complex of vernal pools and a variety of associated endemic and special-status plant and animal species according to the Service's Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Recovery Plan) (Service 2005a). Travis AFB also is within range of the vernal pool tadpole shrimp. The vernal pool tadpole shrimp has been adversely affected by development and modification of the vernal pool, grassland, and open woodland habitat within the Solano-Colusa vernal pool region. Construction of and around Travis AFB contributes to local vernal pool tadpole shrimp habitat loss and fragmentation. The vernal pool tadpole shrimp is known to be present in much of the undeveloped areas surrounding Travis AFB. The CNDDB includes multiple reported vernal pool tadpole shrimp observations within 0.50 mile surrounding the project action area (CDFG 2011). Some of these observations include those at Wilcox Ranch property, Muzzy Conservation Bank, North Suisun Conservation Bank, Burke Ranch Conservation Bank. There is one project currently under construction adjacent to the action area of the proposed project. This project is the Travis AFB Southgate Improvement Project (Service File # 81420-2008-F-0596-1). There are no vernal pool crustacean effects associated with this project.

Environmental Baseline

Central California Tiger Salamander

General biological resource surveys were conducted on November 7, 2008 and January 27, 2010 to assess habitats suitable for listed species within the action area. These surveys indicated that the action area consists of cattle grazed annual grasslands and contain

numerous small mammal burrows which are suitable upland habitat for the Central California tiger salamander. The vernal pools located within the action area were determined in the BA to not be suitable breeding habitat for Central California tiger salamanders. The area where the new bypass road will be constructed is undisturbed grazed annual grassland. Other actions for the proposed project such as improvements to already existing roads will occur in areas deeper within the base near existing infrastructure. The action area is within 0.25 mile to pools which are either occupied habitat or suitable habitat for the Central California tiger salamander. The Central California tiger salamander can move in the uplands between the action area and these pools with no barriers to movement such as walls, or channels. The action area contains upland grasslands, dirt roadways, and at-grade paved surfaces which the Central California tiger salamander can cross.

The Service believes that the Central California tiger salamander is reasonably certain to occur within the action area because of the presence of appropriate upland habitat within the action area, the presence of breeding ponds within 0.25 mile to the action area, and known nearby occurrences within the dispersal range of the Central California tiger salamander. The Service also believes that the Central California tiger salamander is reasonably certain to occur within the action area because of the biology and ecology of the animal, especially the ability of the adults to move considerable distances between their breeding ponds and upland habitat. There are no barriers to prevent the Central California tiger salamanders from entering the action area from known breeding ponds. The boundary of Travis AFB is defined by a tall chain link security fence that does not restrict Central California tiger salamander movement on or off Travis AFB.

Vernal Pool Fairy Shrimp/Vernal Pool Tadpole Shrimp

General biological resource surveys were conducted on November 7, 2008 and January 27, 2010 to assess habitats suitable for listed species. These surveys indicated that the action area consists of cattle grazed annual grasslands and contain numerous vernal pools which are suitable habitat for these vernal pool crustaceans. The area where the new bypass road will be constructed is undisturbed grazed annual grassland. Other actions for the proposed project such as improvements to already existing roads will occur in areas deeper within Travis AFB near existing infrastructure. The majority of the vernal pools in the action area are concentrated within 300 feet south of the proposed new roadway alignment within the grassland area, with the closest vernal pool being located approximately 25 feet downslope from the edge of construction. There are 13 vernal pools south of the new roadway alignment, within 300 feet of the new bypass road. The remainder of vernal pools within the action area are north of the new bypass road. While the vernal pools north of the new bypass road are suitable habitat for listed crustaceans, these species' in the northern pools will not be affected by the proposed project. The action area is also approximately 100 feet from pools known to be occupied with vernal pool fairy shrimp as well as suitable habitat for vernal pool tadpole shrimp. The action area is also connected to undeveloped grasslands surrounding the Travis AFB which contains occupied habitat for vernal pool crustaceans.

The Service believes that vernal pool crustaceans are reasonably certain to occur within the action area because the presence of occupied habitat within 100 feet of the action area. The

Service also believes that vernal pool crustaceans are reasonably certain to occur in the action area because of the presence of appropriate wetland habitat within the action area such as impervious soils, seasonal hydroperiod, and topographical features that provide the necessary habitat attributes to support one or all of these species' life history stages.

Effects of the Action

Central California Tiger Salamander

Construction of the proposed project is likely to result in adverse effects to the Central California tiger salamander. The proposed project consists of (1) construction of a new road from south Ragsdale Street to W Street. The road will pass southwest of Taxiway M, cross Cordelia Avenue, and intersect W Street; (2) construction improvements to W Street which include demolishing portions of the old roadway, repaving, converting W Street into a two-lane, two-way street and widening the eastern end of W Street to 36 feet; (3) construction of a new road from Ragsdale Street to Perimeter Road, the old portion of Ragsdale Street will be demolished; and (4) construction improvements to the C Bunker access road which include demolishing portions of the old roadway, repaving, and a stop sign from the C Bunker parking lot will be placed at the intersection with the new bypass road.

The proposed project will grade, cut, excavate, and install permanent structures in upland grassland areas. Central California tiger salamanders are likely to be in the burrows within the action area. Ground disturbing activities will physically destroy the burrows and all Central California tiger salamanders within those burrows. Mortality or injury of individual Central California tiger salamanders is likely to occur from being crushed by project related equipment or vehicles during the grading, excavating or cutting within the action area. Individual Central California tiger salamanders are likely to be directly killed, unable to escape, be killed due to desiccation, or entombment.

Vernal Pool Fairy Shrimp/Vernal Pool Tadpole Shrimp

Construction of the proposed project is likely to result in adverse effects to vernal pool crustaceans. The proposed project consists of (1) construction of a new road from south Ragsdale Street to W Street. The road will pass southwest of Taxiway M, cross Cordelia Avenue, and intersect W Street; (2) construction improvements to W Street which include demolishing portions of the old roadway, repaving, converting W Street into a two-lane, two-way street and widening the eastern end of W Street to 36 feet; (3) construction of a new road from Ragsdale Street to Perimeter Road, the old portion of Ragsdale Street will be demolished; and (4) construction improvements to the C Bunker access road which include demolishing portions of the old roadway, repaving, and a stop sign from the C Bunker parking lot will be placed at the intersection with the new bypass road.

The proposed project will grade, cut, excavate, and install permanent impervious structures in upland grassland areas immediately north of habitat for vernal pool crustaceans. The closest vernal pool is approximately 25 feet south of proposed construction. All vernal pools indirectly affected range from 25-300 feet south from the edge of construction. Vernal pool crustaceans

are likely to be within vernal pools within the action area. Ground disturbing activities such as cutting and excavating will physically alter hydrologic connectivity to all vernal pools south of the new roadway, as surface/groundwater runs from north to south, according to Travis AFB. The proposed project involves grading, cutting and excavating activities, the coverage of land surfaces with concrete and asphalt, and the installation of fencing around the roadway.

Ground disturbing activities in the watershed of vernal pools are expected to result in siltation when pools fill during the wet season following construction. The proposed project construction activities could result in increased sedimentation transport into vernal pool crustacean habitats during periods of heavy rains. Construction of this project is anticipated to be year-round. Siltation in pools supporting listed crustaceans may result in decreased cyst viability, decreased hatching success, and decreased survivorship among early life history stages, thereby reducing the number of mature adults in future wet seasons. The hydrologic regime (e.g., change in rates of surface flow, reducing subsurface volumes) of the pools may be altered due to disturbance of the hardpan or changing the slope or groundcover of the surrounding landscape. The biota of vernal pools and swales can change when the hydrologic regime is altered (Bauder 1987). Survival of aquatic organisms such as vernal pool fairy shrimp and vernal pool tadpole shrimp are directly linked to the water regime of their habitat (Zedler 1987). Therefore, construction near vernal pool areas is likely to result in the decline of local sub-populations of vernal pool organisms, including the vernal pool crustaceans.

These activities can affect the amount and quality of water available to the perched water tables characteristic of vernal pool areas. Changes to the perched water table can lead to alterations in the rate, extent, and duration of inundation (water regime) of the remaining habitat on-site after construction (Hanes *et al.* 1990, Hanes and Stromberg 1998). Grading for roads may affect the water regime of vernal pool habitat, particularly when grading involves cutting into the substrata in or near these areas. Exposure of sub-surface layers of soil at road cuts may hasten the loss of water from adjacent habitat by mass flow through networks of cracks, lenses of coarser material, animal burrows, or other macroscopic channels. Mortality or injury of individual vernal pool crustaceans is likely to occur from wetted habitat being altered hydrologically by water depth, water quality, and or water temperature.

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 biological opinion. 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 Act. There are no cumulative effects from non-Federal actions that are reasonably certain to occur within the action area at this time.

Conclusion

After reviewing the current status of the Central California tiger salamander and vernal pool crustaceans, environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Taxiway M Bypass Road

Project, as proposed, is likely to adversely affect these species, but is not likely to jeopardize their continued existence. The Service has determined that the project as proposed will not indirectly or directly reduce, appreciably, the likelihood of both the survival and recovery of the Central California tiger salamander and vernal pool crustaceans in the wild.

Implementation of the project as proposed will incidentally take salamanders through grading, cutting, and excavating in upland grassland areas which will result in loss of individuals. Design measures in the project description will minimize effects to the Central California tiger salamander by having an on-site monitor, restricting vehicle construction traffic to pre-existing roadways, and preserving 32.61 acres of habitat for the Central California tiger salamander. Protecting the compensatory habitat in perpetuity and providing for long term management can be seen to provide minimization of the effect on this species.
Implementation of the project as proposed will incidentally take vernal pool crustaceans through grading, cutting, and excavating for the new bypass road in upland grassland areas immediately north of thirteen vernal pools in the action area, which will result in altered hydrology and increased sedimentation from wet season work as water flows from north to south. These activities will result indirectly in the loss of individuals. Design measures in the project description will minimize effects to vernal pool crustaceans by having an on-site monitor, avoiding direct effects to any vernal pools, fencing all vernal pools within the action area, and preserving approximately 6.92 acres of habitat for vernal pool crustaceans. Protecting the compensatory habitat in perpetuity and providing for long term management can be seen to provide minimization of the effect on these species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Air Force so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Air Force has a continuing duty to regulate the activity covered by this incidental take statement. If the Air Force; (1) fails to assume and implement the terms and conditions; or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant

document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Air Force must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Amount or Extent of Take

The Service expects that incidental take of Central California tiger salamanders and vernal pool crustaceans may occur during this action. The extent of the take will be difficult to detect or quantify because their size and cryptic nature makes the finding of a dead specimen unlikely. Seasonal population fluctuations also may mask the ability to determine the exact extent of take.

Due to the difficulty in quantifying the number of Central California tiger salamanders and vernal pool crustaceans that will be taken as a result of the proposed action, the Service is quantifying take incidental to the proposed project as the number of acres of upland (Central California tiger salamander habitat), and the number of acres of wetted habitat (vernal pool crustacean habitat) that will be affected as a result of the action. Therefore, the Service estimates that the proposed action will result in the direct take of all Central California tiger salamanders inhabiting 10.87 acres of habitat, and result in the indirect take of all vernal pool crustaceans inhabiting 1.73 acres of habitat. Anticipated take for the Central California tiger salamander is expected to be in the form of mortality and injury due to grading, installation of new impervious surfaces, and construction related ground disturbance. Anticipated take for vernal pool crustaceans is expected to be in the form of mortality and injury due to grading of areas immediately north of habitat, installation of a new impervious surface north of habitat that severs hydrologic connection to other wetted habitats, and other construction related ground disturbance.

Effect of the Take

The Service has determined in this biological opinion that this level of anticipated take is not likely to result in jeopardy to the Central California tiger salamander and vernal pool crustaceans.

Reasonable and Prudent Measures

The following reasonable and prudent measure is necessary and appropriate to minimize the effects of the Travis AFB Taxiway M Bypass Road Project on the Central California tiger salamander and vernal pool crustaceans:

1. All conservation measures outlined in the project description, and as restated in this biological opinion must be fully implemented.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Air Force shall ensure it complies with the following terms and conditions, which implement the Reasonable and

Prudent Measure described above. These terms and conditions are nondiscretionary.

The following Terms and Conditions implement Reasonable and Prudent Measure one (1):

1. The Air Force shall fully minimize the effect of take on the species caused by implementation of construction for the proposed project by securing compensatory habitat in the amounts and types as described in Conservation Measures one (1), and two (2); and

2. The Air Force shall require as a condition of their permit for the proposed project that the contractor implement all of the conditions (Conservation Measures 3-6) and reporting requirements as described in this biological opinion.

Reporting Requirements

The Service shall be notified within one (1) working day of the finding of any dead Central California tiger salamanders. Notification must include the date, time, and location of the incident or of the finding of a dead animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. The Service contacts are Division Chief, Endangered Species Program at the Sacramento Fish and Wildlife Office (916) 414-6600, and the Resident Agent-in-Charge of the Service's Law Enforcement Division (916) 414-6660.

The Air Force must also contact CDFG immediately in the case of a dead or injured listed species. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045.

Sightings of any Federal or state listed animal species should be reported to the CNDDB. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information or data bases. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations. The Service recommends the following conservation actions:

1. The Air Force should incorporate culverts, tunnels, or bridges on roadways that allow safe passage by the Central California tiger salamander, other listed animals, and wildlife. The Air Force should include photographs, plans, and other appropriate information in their biological assessments if they incorporate "wildlife friendly" crossings into their projects;

2. The Air Force should conduct base-wide surveys to determine extent of occupied Central California tiger salamander and vernal pool crustacean habitat; and

3. The Air Force should consider participating in the planning for a regional habitat conservation plan for listed and sensitive species.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the proposed Travis AFB Taxiway M Bypass Road Project in Solano County, California. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have questions, please contact Michelle Tovar, Senior Fish and Wildlife Biologist (Michelle_Tovar@fws.gov) or Kellie Berry, Chief, Sacramento Valley Division, of my office at (916) 414-6645.

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
Brenda Blinn, California Department of Fish and Game, Yountville, California

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Appendix G
Proof of Publication

APPENDIX G

Proof of Publication

Proof of publication will be included in Appendix G of the final version of this environmental assessment