Revised Final

Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)
AND
FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)

ENVIRONMENTAL ASSESSMENT
FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
AT TRAVIS AIR FORCE BASE, CALIFORNIA

INTRODUCTION

Air Force decisions on proposed actions must take the potential environmental impacts into consideration in accordance with the National Environmental Policy Act of 1969 (NEPA), 42 US Code (USC) §§4321-4347; the Council on Environmental Quality (CEQ) regulations to implement NEPA, Title 40 Code of Federal Regulations (CFR) Parts 1500-1508; and the Air Force *Environmental Impact Analysis Process* (EIAP), 32 CFR 989. An environmental assessment (EA) has been prepared for the proposed action described herein in accordance with NEPA, the CEQ and EIAP regulations, and is incorporated by reference into these findings. This Finding of No Significant Impact (FONSI), the integrated Finding of No Practicable Alternative (FONPA), and the attached EA have been prepared based on an analysis of the affected environment and anticipated environmental consequences of the proposed action.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to repair Runway 03R/21L, upgrade the lighting system, and associated infrastructure at Travis Air Force Base (AFB). The proposed action is needed to fix the deteriorated condition of the runway and to bring systems and infrastructure into compliance with current navigational and facilities standards.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes the demolition, repair and upgrade of runway 03R/21L. The standards and criteria applied to establish the preferred or action alternative include the underlying purpose and need to upgrade existing airfield facilities; the need to apply the Air Force Handbook (AFH) 32-1084, *Facility Requirements*, and Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* guidance for airfield and lighting systems; and, the need to comply with all environmental requirements applicable to airfield repair at Travis AFB.

Accordingly, the Air Force proposes the following activities within a 190-acre action area:

- Demolition of existing runway pavement, construct a new 200-foot-wide runway pavement section with 150-foot-wide overruns.
- Repair or replace the existing lighting system.
- Replace the electrical system, pavement marking, signage, and subsurface drainage system.
- Relocate navigational aids.
- Construct a turnaround for aircraft on the northwestern edge of the runway.
- Construct a new gate, the Meridian Gate, at the east side of the installation.

NO ACTION ALTERNATIVE

Under the no action alternative, the airfield runway would continue to be used and maintained. The existing runway and related infrastructure would continue to deteriorate with use (e.g., runway shoulders would continue to erode). The airfield lighting system, including lighting for the approach, centerline, touchdown, edge, and taxiway edge, would continue to violate current design criteria. Airfield operating waivers would need to remain in place to execute the flying mission. Travis AFB would remain out of compliance with AFH 32-1084 and UFC 3-260-01 recommendations for airfield design and lighting. The safety of airfield operation would remain an increasing concern as cracks and spall continue to develop.

Under the no action alternative, there would be no change in or adverse effects on air quality, noise levels, hazardous materials or waste, stormwater management, biological or cultural resources, socioeconomics, land use, the on-base transportation system, airfield operations, safety and occupational health, and environmental management at Travis AFB. Under the no action alternative, water would continue to collect on the runway pavement during storm events, resulting in unscheduled runway closures.

SUMMARY OF ANTICIPATED ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED ACTION

Based on the analyses accomplished as a part of the environmental assessment (EA), which is herewith incorporated by reference, I determine that no significant adverse effects are expected on any resource area as a result of the reconstruction of Runway 03R/21L, as described in the action alternative. The proposed action would result in less than significant impacts or no effects to air quality, noise, hazardous materials, hazardous waste, stored fuels, water resources, land use, cultural resources, transportation systems, airspace/airfield operations, safety and occupational health, environmental management, and environmental justice. During construction, the proposed action would provide short-term, socioeconomic benefits through the generation of construction jobs. The increased slope of the proposed runway shoulders and reduction of impermeable surface area may result in minor indirect impacts to down-gradient wetlands. Permanent and temporary impacts to vernal pools, wetlands, and habitat for the California tiger salamander will occur as a result of construction; however, restoration of the project area back to original conditions and compensation for permanent impacts at an approved mitigation bank will reduce impacts to less than significant levels. The US Fish and Wildlife Service (USFWS), Sacramento Office, issued its Biological Opinion 81420-2009-F-1000-1 pursuant to the Endangered Species Act on 29 October 2009. The Biological Opinion found that the proposed action may affect but is not likely to adversely affect the threatened Delta green ground beetle, the threatened vernal pool fairy shrimp, the endangered vernal pool tadpole shrimp, the endangered Conservancy fairy shrimp, and the endangered Contra Costa goldfields. Mitigation measures required by the USFWS and the US Army Corps of Engineers (USACE), San Francisco District, are described herein (including the attached EA). The California State Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, is finalizing certification of the project under Section 401 of the Clean Water Act (CWA) and has approved initiation of construction (based on an e-mail sent to the Air Force Western Regional Environmental Office on 5 November 2009).

The analysis of this EA indicates that the repair of airfield pavement and lighting for Runway 03R/21L would not result in or contribute to significant negative cumulative or indirect impacts to resources of the region, provided the prescribed mitigation measures are implemented.

MITIGATION

The Air Force will implement and comply with the Conservation and Minimization Measures listed in the referenced USFWS Biological Opinion, including mitigation for permanent impacts to 70.85 acres of upland habitat for the California tiger salamander (CTS). Mitigation will protect 212.55 acres of CTS upland habitat by the purchase of CTS mitigation credits at a USFWS-approved mitigation bank or the

purchase of a conservation easement, or a combination of both. Temporary impacts to 72.85 acres of upland habitat for the CTS (including 1.37 acres of upland habitat for the Delta green ground beetle) and 0.45 acre of wetted vernal pool crustacean and beetle habitat will be mitigated by preparing and implementing a restoration and revegetation plan. The restoration and revegetation plan will be submitted to the USFWS for approval before groundbreaking. The Air Force will also prepare and implement an erosion control and restoration plan to control short-term and long-term erosion and sedimentation effects.

The USACE issued authorization under Nationwide Permits 12 and 33 on 4 November 2009 for compliance with Section 404 of the CWA. The Air Force will implement and comply with the requirement to purchase 0.23 acre of wetlands creation credits from the Elsie-Gridley Mitigation Bank within 90 days of receipt of the authorization (4 February 2010). In addition, the Air Force will monitor temporarily impacted wetlands for five years and submit annual monitoring reports.

PUBLIC REVIEW AND INTERAGENCY COORDINATION

In accordance with Air Force policy, a notice of availability (NOA) for the draft EA and FONSI/FONPA was published on June 5, 2009, in local newspapers. The NOA provided for a 30-day public comment period on the documents placed in local libraries and made available to all interested parties on the Travis AFB public website. A concurrent interagency and intergovernmental coordination for environmental planning (IICEP) process was conducted. No public or IICEP comments were received during the 30-day review period. As described herein (including the attached EA), additional coordination occurred between the Air Force and the USFWS, USACE, and RWQCB.

FINDING OF NO PRACTICABLE ALTERNATIVE

Pursuant to Executive Order 11990, *Protection of Wetlands*, and considering the information contained herein (including the attached EA), in accordance with, and pursuant to the authority delegated by the Secretary of the Air Force, Order 791.1, I find that there is no practicable alternative to limited construction of runway improvements in a wetland. The impact of the runway repair on wetlands will not be significant due to mitigation measures and best management practices that must be carried out with implementation of the project.

FINDING OF NO SIGNIFICANT IMPACT

After a review of the EA prepared in accordance with the requirements of NEPA, and the CEQ and EIAP regulations, I have determined that the proposed action would not have a significant impact on the quality of the human or natural environment, and; therefore, an environmental impact statement does not need to be prepared. This decision has been made after taking into account all submitted information and considering the no action alternative and the action alternative that would meet the project requirements.

Theresa C. Carter

THERESA C. CARTER, Colonel, USAF
Director, Installations & Mission Support

4 Dec 09
Date

Attachment: Environmental Assessment

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Acronyms and Abbreviations

°F	degrees Fahrenheit
60 AMC	60th Air Mobility Wing
AICUZ	Air Installation Compatible Use Zone
Air Force	U.S. Air Force
AFB	Air Force Base
AMC	Air Mobility Command
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
Base	Travis Air Force Base
BMP	best management practices
BRPM	Base Remediation Program Manager
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
C&D	construction and demolition
CNEL	Community Noise Equivalent Level
CEQ	President's Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CTS	California tiger salamander
dB	decibel
DoD	Department of Defense
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
FEMA	Federal Emergency Management Agency
ft^2	square feet

Instruction	Travis Air Force Base *Instruction 91-212 Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program*
LZ	landing zone
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NEWIOU	North/East/West Industrial Operable Unit
nitrogen oxides	NO_x
PCC	Portland concrete cement
RCRA	Resource Conservation and Recovery Act
RRP	restoration and revegetation plan
RWQCB	San Francisco Bay Regional Water Quality Control Board
SIP	state implementation plan
SWPPP	stormwater pollution prevention plan
UFC	Unified Facilities Criteria
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

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 (AFB or Base) in Fairfield, California, proposes to repair Runway 03R/21L pavement and the associated lighting system and infrastructure (airfield facilities). The proposed project would be constructed on the existing Runway 03R/21L and areas adjacent to the runway. The repaired runway, lighting system, and infrastructure would comply with current navigational standards.

Runway 03R/21L is the primary instrument approach runway for Travis AFB and is heavily used. The northeast end of the runway is designated 21L and the southwest end of the runway is designated 03R. Runway 03R/21L is 10,995 feet long and 300 feet wide. The proposed airfield improvements would include the following:

- Demolishing the existing runway pavement
- Constructing a new 200-foot-wide runway with 150-foot-wide overruns
- Repairing or replacing existing lighting and electrical systems, pavement marking, and signage
- Constructing a subsurface drainage system
- Constructing an aircraft turnaround on the northeastern edge of Runway 21L

A permanent laydown area would be constructed of gravel and one temporary batch plant would be operated to provide Portland concrete cement (PCC) for the runway repair. In addition, a gate would be installed to facilitate access to the runway from the east side of the installation during construction. The gate facilities would be removed after construction is completed; the fill and roadbase would remain.

Travis AFB, with the support of the Air Mobility Command (AMC) 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 title 40 Code of Federal Regulations (CFR), Parts 1500 through 1508, Air Force Regulation 32 CFR 989, and Department of Defense (DoD) directives. This EA evaluates the potential environmental impacts that would result from implementation of the Proposed Action.

1.2 Need for the Action

Implementation of the Proposed Action would meet the Base's continued need to fully support the global mission requirements of AMC. Runway 03R/21L and airfield facilities currently do not meet the requirements set forth in the following two documents: Air Force Handbook (AFH) 32-1084, *Civil Engineering Facility Requirements* (Department of the Air

Force, 1996), and Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* (DoD, 2008).

Runway 03R/21L is approximately 50 years old and in deteriorating condition. Routine maintenance of the runway is increasingly difficult and progressively more expensive. The following deficiencies exist:

- There are longitudinal and transverse cracks through the full depth of PCC in several locations of Runway 03R/21L. Foreign object debris and spall (chips or fragments of concrete) have developed along the cracks. Runway shoulders are degraded.
- Runway 03R/21L is 300 feet wide. The runway is currently marked for a 150-foot width; however, the edge lights and signs are located for a 300-foot width. The authorized width for the runway is 150 feet according to the requirements in AFH 32-1084. In addition, 25-foot-wide shoulders would be constructed on both sides of the runway, resulting in a total width of 200 feet. Overruns would be 150 feet wide.
- The lighting system of Runway 03R/21L does not meet the requirement in the UFC guidance, and runway approach lights do not meet the recommended lighting criteria (DoD, 2008).
- Puddles form on the current runway pavement during seasonal rains, causing unscheduled runway closures.

Because the airfield currently does not meet standard Air Force design requirements, waivers are in place for flying operations. The deteriorated condition could hamper Travis AFB's ability to meet its mission for strategic airlift, air refueling, and aeromedical evacuation of troops needing immediate medical attention.

1.3 Objectives of the Action

The objective of any of the alternatives is to provide a safe and efficient runway and airfield facilities at Travis AFB that comply with Air Force design requirements. The alternatives should provide for the following:

- Upgrade lighting system
- Replace the electrical system and communication cables
- Upgrade airfield facilities to include pavement marking, signage, and navigational aids
- Improve the runway pavement to prevent flooding of the runway surface and unscheduled runway closures
- Provide additional access to East Perimeter Road
- Meet or exceed environmental requirements for construction

1.4 Location of Proposed Action

Travis AFB is located in the city of Fairfield, Solano County, and includes approximately 5,128 acres (see Figure 1-1; all figures are located at the end of the section in which they are

first referenced). The Base is located off Interstate 80, approximately midway between Sacramento and San Francisco, 7 miles northeast of central Fairfield.

The Proposed Action area is located in the eastern portion of the Base. There is open space to the northeast, south, and east; the developed areas of Travis AFB are to the northwest and west (see Figure 1-2).

1.5 Scope of the Environmental Assessment

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

1.6 Decision(s) That Must Be Made

The Air Mobility Command is responsible for selecting an alternative for the repair of the Runway 03R/21L airfield facilities at Travis AFB. A decision to take no action (Alternative 1) would result in Travis AFB not repairing the runway and airfield facilities; the runway would continue to be used in its deteriorating condition. A decision to implement the Proposed Action (Alternative 2) would result in Travis AFB repairing the runway and airfield facilities.

1.7 Applicable Regulatory Requirements and Required Coordination

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

Other environmental regulatory requirements relevant to the Proposed Action will be identified in the EA. Regulatory requirements under the following programs, among others, are assessed in this EA:

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

Requirements also include compliance with Executive Order (EO) 11988 (Floodplain Management), EO 11593 (Protection and Enhancement of the Cultural Environment), 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), and EO 13423 (Strengthening Federal Environmental, Energy, and Transportation Management).

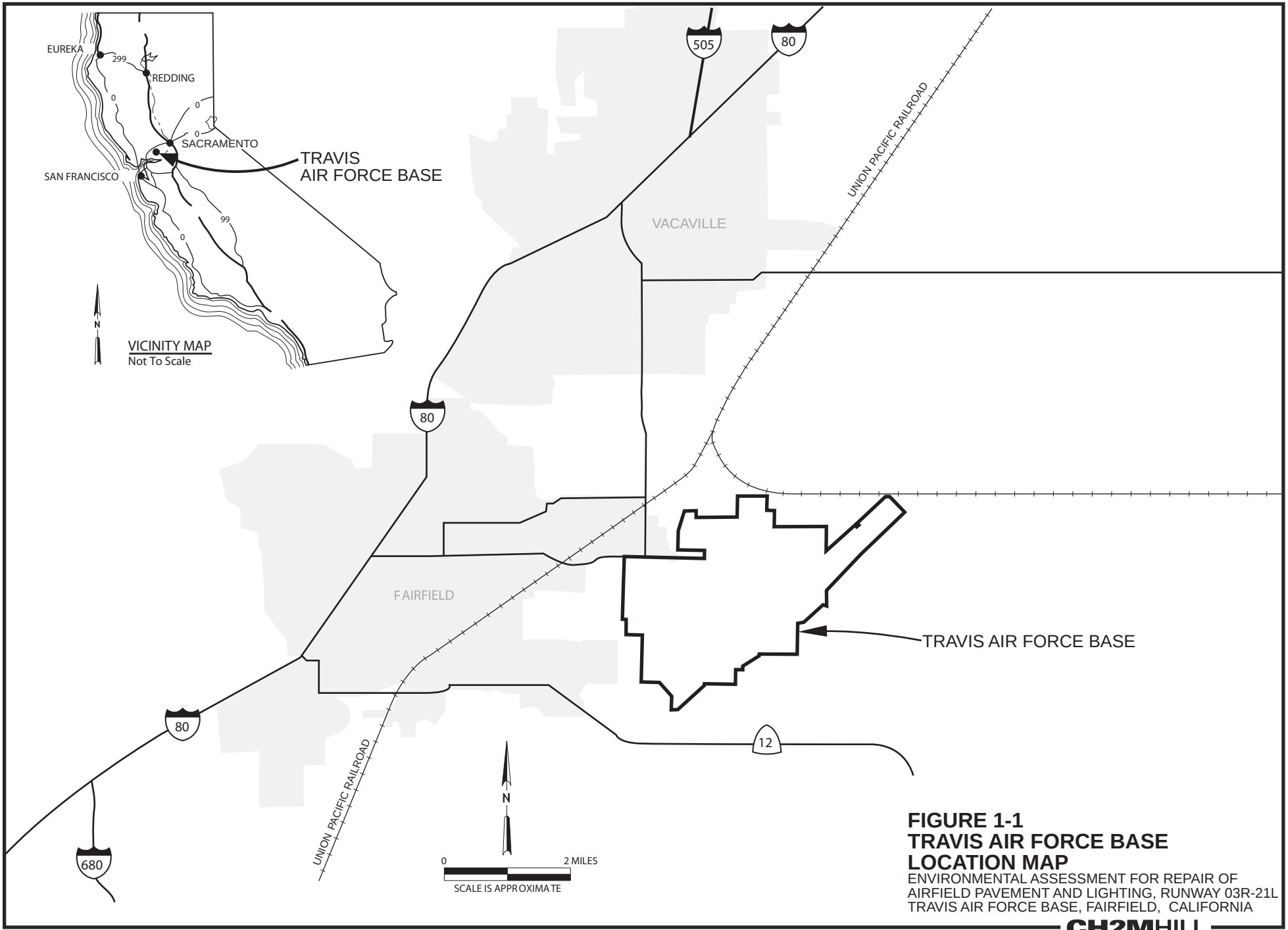

FIGURE 1-1
TRAVIS AIR FORCE BASE
LOCATION MAP
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R-21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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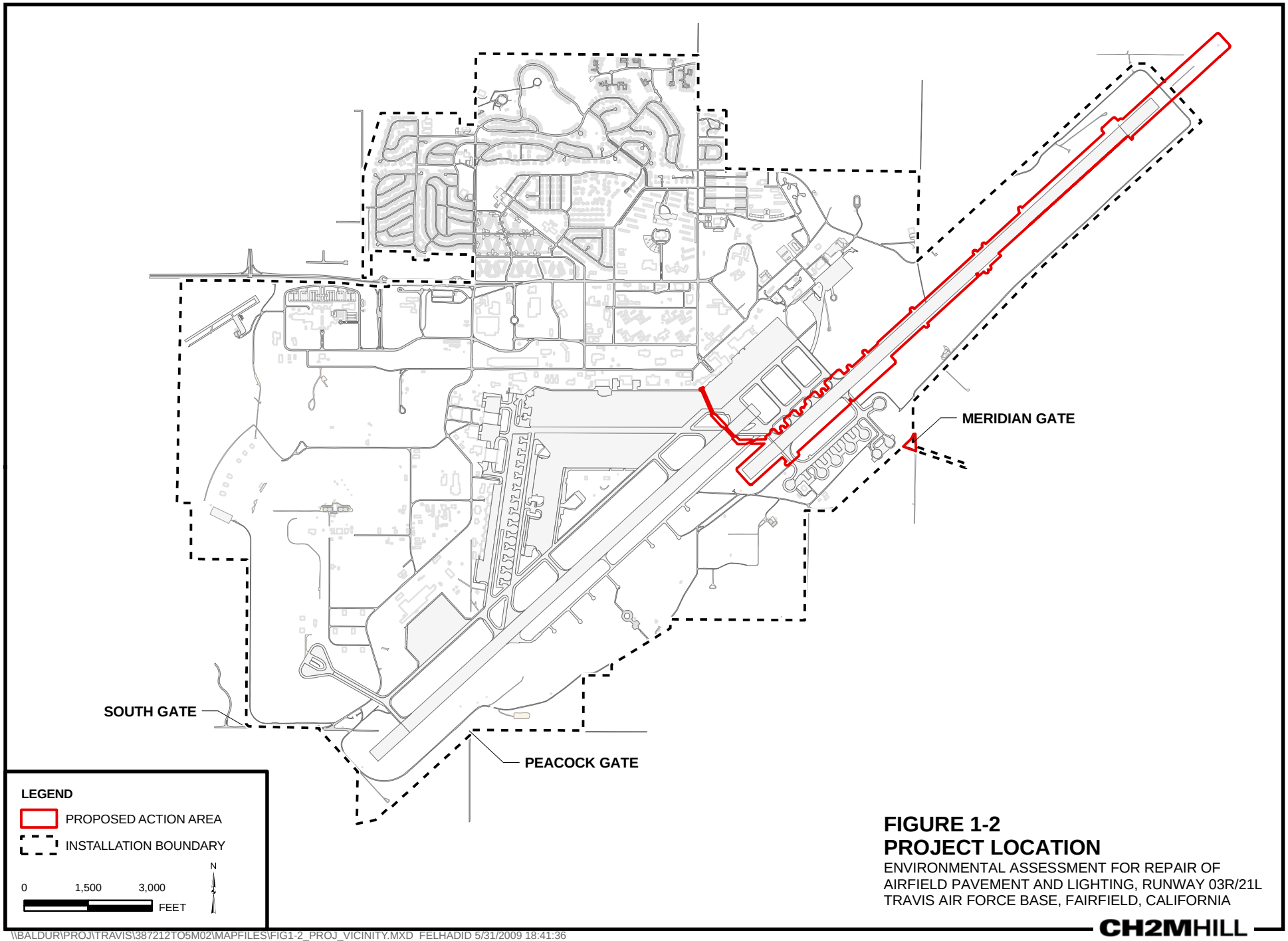

FIGURE 1-2
PROJECT LOCATION
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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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 and describes the alternatives to be carried forward for detailed analysis.

2.2 Selection Criteria for Alternatives

Reasonable alternatives for repair of the runway and airfield facilities should accomplish the following in a cost-efficient and cost-effective manner, with minimal impact to human health and the environment:

- Upgrade existing airfield facilities in place.
- Comply with AFH 32-1084 and UFC 3-260-01 criteria for airfield and lighting systems.
- Use environmentally compliant practices to conduct the airfield repair (e.g., recycle materials from demolition and use existing infrastructure whenever possible).

2.3 Description of the Proposed Alternatives

2.3.1 Alternative 1 – No Action

Under the No Action alternative, the existing runway would continue to be used and maintained. The runway would continue to deteriorate with use (e.g., runway shoulders would continue to erode). The lighting system consists of several elements including the runway centerline, touchdown, edge, and taxiway edge lighting; the system would continue not to meet current recommended criteria. Airfield operations would become an increasing concern to human and aircraft safety as cracks and spall continue to develop.

Under the No Action alternative, the runway pavement would not be improved and puddles would continue to form on the runway during storm events, resulting in unscheduled runway closures.

Travis AFB would continue to operate an airfield that would not comply with AFH 32-1084 and UFC 3-260-01 requirements for airfield design and lighting. Runway approach, edge, taxiway, threshold, and centerline lighting would continue to violate current recommended criteria and airfield operating waivers would need to remain in place for execution of the flying mission.

2.3.2 Alternative 2 – Proposed Action

Under Alternative 2, the Proposed Action alternative, the following activities would be performed:

- Demolish existing runway pavement, construct a new 200-foot-wide pavement section and 150-foot-wide overruns.
- Repair or replace the existing lighting system.
- Replace the electrical system, pavement marking, signage, and subsurface drainage system.
- Relocate navigational aids.
- Construct a turnaround for aircraft on the northwestern edge of the runway.
- Install a gate (Meridian Gate), on the east side of the installation. The gate facilities would be removed after construction is completed.

A laydown area would be constructed in an area southeast of the runway, and a temporary batch plant would provide PCC for the runway repair. The runway would be constructed at a higher elevation than the existing runway (see Section 2.3.2.1). Soil from the edge of the asphalt shoulders to adjacent open areas would be graded and revegetated with native grasses. Figure 2-1 shows the proposed facilities under Alternative 2.

The total Proposed Action area under Alternative 2 contained within a construction fence would be approximately 340 acres. Of this area, it is anticipated that up to 245 acres could be affected by construction or by use during construction for the following:

- Runway pavement repair areas
- Shoulders
- Airfield facilities
- Graded areas
- Laydown area
- Access roads
- A temporary gate to connect Meridian Road (offbase) to Perimeter East Road (onbase)

The subsections, below, provide additional detail on construction activities. The Proposed Action is estimated to require 18 months to construct.

Runway 03R/21L currently supports multiple military and civilian aircraft including the C-5, C-17, KC-10, and 747. During repair of Runway 03R/21L, all aircraft would use Runway 21R-03L (see Figure 2-1). After repair of Runway 03R/21L, operation of both runways would resume at existing levels. The discussion of construction and operation under Alternative 2 in the following subsections is based on information from Air Force Form 1391, which is contained in Appendix A, and the *Travis Air Force Base Repair Runway 21L-03R and Repair 200 Ramp Final Design Report* (CH2M HILL, 2005).

2.3.2.1 Demolition and Repair of the Runway and Taxiway

The entire existing runway footprint (approximately 93 acres) would be demolished and replaced with a new concrete runway and shoulders. Demolition would consist of rubbelization of the existing runway pavement. The rubbelized pavement would be left in place and serve as the base for the new runway. Rubbelized concrete pavement that is outside of the new runway width will be picked up, hauled to an onsite crusher and recycled back into new concrete products for this project. Demolished asphalt pavement outside of the new runway width will be picked up and hauled offsite for recycling, in accordance with standard industry practice.

The taxiway and taxiway spurs (see Figure 2-1) would be demolished, and a new taxiway and taxiway spurs would be constructed at the same location. The total width of the runway would be reduced from 300 feet to 200 feet; the width of the overrun would be reduced from 300 feet to 150 feet. The runway would be grooved to improve skid resistance, and sloped approximately 1.5 percent from the runway centerline. The runway would be constructed at a higher elevation (up to 18 inches higher) than the existing runway. Graded and buffer areas would be seeded with native grass after construction activities are completed.

2.3.2.2 Electrical System

The proposed electrical system would upgrade the existing system that powers the airfield lights, runway markers, distance markers, and signs. The electrical system would consist of a homerun duct and cables connecting to the upgraded airfield infrastructure.

Repairing the lighting system would require access to offbase locations. Travis AFB Security Forces control access to the area through an existing gate located along a road off Perimeter Road. Travis AFB has an easement from landowners to use the property.

A new homerun duct bank (a series of conduits for electrical wire) would be constructed to the southwestern edge of the runway for a length of approximately 1,300 feet (see Figure 2-1). The duct bank would consist of up to 50 conduits encased in concrete. The new duct bank would be constructed by drilling under existing pavement to reduce construction costs and maintain access to the 200 Ramp and Runway 03L-21R (see Figure 2-1). In areas where no pavement exists, a trench would be dug.

2.3.2.3 Underdrain System and Encasing Pipe Outlets

The existing runway underdrain system would be removed and upgraded. The new underdrain system would be constructed along the entire length of Runway 03R/21L (not including overruns). This system would maintain consistent moisture content beneath the runway by drawing subsurface drainage away from the pavement structure and reducing the effects of varying subgrade conditions.

Utility sleeves would be installed beneath the airfield surface. The utility sleeves would be high density polyethylene pipes 24 inches in diameter that would be installed perpendicular to the airfield at various locations along the length of the runway. The purpose of the pipes would be for routing of future utilities beneath the runway, as needed, without the need to disturb airfield facilities for future routing of utilities. Encasing pipes would be installed beneath the airfield surface. The encasing pipes would be steel pipes 6 feet in diameter that

would be installed parallel to the airfield at various locations along the length of the runway. The encasing pipes would be capped at both outlets. The purpose of the pipes would be for routing of future utilities beneath the runway, as needed, without need to disturb airfield facilities for future routing of utilities. The location of the encasing pipe outlets is shown on Figure 2-1.

2.3.2.4 Laydown Area and Temporary Batch Plant

A laydown area would be constructed southeast of the runway (see Figure 2-1) in an area that currently is undisturbed. The laydown area would consist of a gravel pad and gravel access roads, covering up to 19 acres.

A temporary PCC batch plant would be located in the laydown area. For access, a gravel road would be built from Perimeter East Road to the laydown area and continue on to the runway (see Figure 2-1). The laydown area would also be used for staging vehicles and aggregate storage.

The laydown area would be left in place after the runway repair and used as needed for future construction projects. The batch plant is mobile and is used for various projects on Travis AFB. The batch plant would be removed from the laydown area after construction is completed.

2.3.2.5 Access and Staging Areas

Access to the site from offbase would be from a gate that would be installed at the intersection of East Perimeter Road Meridian Road (Meridian Gate) (see Figure 2-1). Meridian Road is a private road, and permission from adjoining landowners to use the road would be necessary. A gate at this location is proposed to avoid congestion resulting from construction traffic at the South Gate and to avoid use of bridge crossings that are not designed to withstand the traffic. Construction of the gate would require access to unpaved areas on both sides of the onbase portion of Meridian Road. Approximately 1.4 acres of unpaved area would be accessed for construction of the gate. The gate facilities would be removed after construction is completed; the fill and roadbase would be removed and the area restored to pre-project conditions.

Contractor personnel and equipment would work within the designated construction limits. Staging of equipment used during construction would occur on existing airfield paved areas or within the designated laydown area. Construction vehicles would stay within the buffer and grading areas for access to unpaved areas of the site.

2.4 Alternatives Considered but Eliminated from Analysis

This EA analyzes the No Action and the Proposed Action. No other alternatives were considered in this EA because Travis AFB does not have land available to construct a new runway onbase. Repair of the existing runway and airfield infrastructure in its present location is the only feasible alternative to the No Action alternative.

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 in the planning stages, and future actions that are related to the Proposed Action. Details regarding actions that have the potential to cause cumulative impacts in association with the Proposed Action are included in the indirect and cumulative impacts section of this EA.

2.6 Identification of Preferred Alternative

The Air Force preferred alternative for this EA is the Proposed Action alternative described in Section 23.2. The Proposed Action alternative is the only alternative that meets the selection criteria.

2.7 Comparison of the Environmental Impacts of Alternatives

Table 2-1 presents the potential environmental consequences of implementing Alternatives 1 and 2.

TABLE 2-1
Summary of Potential Environmental and Socioeconomic Consequences
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

Resource	Alternative 1 No Action	Alternative 2 Proposed Action
Air Quality	No impact	Less than significant
Noise	No impact	Less than significant
Hazardous Materials, Wastes, Environmental Restoration Program Sites and Stored Fuels	No impact	Less than significant
Water Resources, Floodplains and Wastewater		
Water Quality	No impact	Less than significant
Flooding	No impact	Less than significant
Biological Resources	No impact	Less than significant with mitigation
Socioeconomic Resources	No impact	Short-term beneficial (construction); less than significant (operation)
Cultural Resources	No impact	Less than significant
Land Use	No impact	No impact
Transportation System	No impact	Less than significant
Airfield Operations	No impact	Less than significant (construction); beneficial (operation)
Safety and Occupational Health	Significant negative impact	Less than significant (construction); beneficial (operation)

TABLE 2-1
Summary of Potential Environmental and Socioeconomic Consequences
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

Resource	Alternative 1 No Action	Alternative 2 Proposed Action
Environmental Management	No impact	Less than significant
Environmental Justice and Protection of Children	No impact	No impact
Indirect and Cumulative Impacts	No impact	Less than significant

LEGEND

- APPROACH LIGHT
- PROPOSED E-WINDCONE
- RUNWAY CENTERLINE
- LAYDOWN AREA
- AIRFIELD
- BUFFER AREA
- GRADING LIMITS
- UTILITY SLEEVES
- UNDERDRAIN OUTFALL AND BUFFER AREA
- TURNAROUND
- TAXIWAY SPURS
- PROPOSED HOMERUN DUCT BANK
- INSTALLATION BOUNDARY
- PROPOSED MERIDIAN GATE

0 1,250 2,500 FEET

N

FIGURE 2-1
PROPOSED ACTION FOOTPRINT
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

CH2MHILL

\\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\FIG2-1_INFRASTRUCTURE.MXD FELHADID 5/31/2009 18:43:57

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 (°F). The lowest temperatures occur in January, with a mean of 46°F. The highest temperatures occur in July and August, with a mean of 72°F. 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 standards for ozone, particulate matter less than 10 micrometers (PM_{10}), or fugitive dust, and particulate matter less than 2.5 micrometers ($PM_{2.5}$) (CARB, 2009). Relevant ambient air quality standards are listed in Table 3-1, with their respective attainment status. The Basin is designated attainment for state standards for carbon monoxide, lead particulates, nitrogen oxide, sulfate particulates, and sulfur dioxide. For federal standards, the Basin is designated nonattainment for 8-hour ozone, and in maintenance carbon monoxide. 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 Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

		CAAQS		NAAQS	
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 –	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 –	Attainment
SO_2	Annual 24 Hour 3-hour 1 Hour	– 0.04 ppm 0.25 ppm	Attainment	0.03 ppm 0.14 ppm – 	Attainment
PM_{10}	Annual geometric mean 24 Hours	20 µg/m^3 50 µg/m^3	Nonattainment	– 150 µg/m^3	Attainment
$PM_{2.5}$	Annual arithmetic mean 24 Hours	12 µg/m^3 –	Nonattainment	15 µg/m^3 35 µg/m^3	Attainment

Source: CARB, 2009

Notes:

– = not applicable
µg/m^3 = micrograms per cubic meter
CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
ppm = parts per million
SO_2 = sulfur dioxide

Table 3-2 lists the number of days when pollutant concentration exceeded NAAQS or CAAQS in BAAQMD over the last 10 years for state and federal nonattainment and maintenance pollutants (ozone, carbon monoxide, PM_{10}, and $PM_{2.5}$). There are no exceedances of carbon monoxide concentrations for the 1-hour and 8-hour state and federal standards in these 10 years.

TABLE 3-2
San Francisco Bay Area Air Basin Exceedances of the California and National Ambient Air Quality Standards, 1998 through 2007
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

	Standard Exceeded	Period	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
O_3	CAAQS	1-hour	29	20	12	15	16	19	7	9	18	4
	NAAQS	8-hour	16	9	4	7	7	7	0	1	12	1
	CAAQS	8-hour	–	–	–	–	–	–	–	9	22	9
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	5	12	7	10	6	6	7	6	15	4
$PM_{2.5}$	NAAQS	24-hour	–	–	1	5	7	0	1	0	10	14

Source: BAAQMD, 2007

Notes:
– = No data available
CO = carbon monoxide

Ozone concentrations exceeded the NAAQS (8-hour) and CAAQS (1-hour and 8-hour) every year during the last 10 years in BAAQMD. 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 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. The Vacaville-Ulatis station started monitoring ozone concentrations in 2003. Maximum 1-hour ozone concentrations monitored at this station range from 0.094 to 0.103 ppm and exceeded the CAAQS 1-hour standard in 4 of the 5 years monitored. The 8-hour ozone concentrations range from 0.078 to 0.081 ppm, exceeding the CAAQS in all 5 years and exceeding the NAAQS in 2 of the 5 years.

Particulate matter is generated within the project area by combustion sources and wind during dry conditions. PM_{10} levels are elevated during the winter (due to stable conditions and low mixing heights) 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 33 to 82 μg/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.

3.3 Noise

The Air Force uses the Air Installation Compatible Use Zone (AICUZ) guidelines to promote compatible land use development. Noise is one consideration addressed by AICUZ. The Community Noise Equivalent Level (CNEL) is one noise level descriptor that is used. 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 between 7:00 a.m. and 10:00 p.m. and a 10-dB penalty to noise events 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. Most 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.

Operations occur throughout the Base and experience noise levels that range from 65 to more than 75 dB. The airfield experiences noise levels between 80 and 85 dB.

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

This section provides a description of the hazardous materials and hazardous waste, solid wastes, Environmental Restoration Program (ERP) sites, and stored fuels at Travis AFB.

3.4.1 Hazardous Materials and Hazardous Waste

The activities that use most of the hazardous materials include maintenance of aircraft, transportation, equipment, and facilities. For example, these activities use flammable solvents, fuels, lubricants, stripping chemicals, oils, and paint (Travis AFB, 2006). Hazardous materials are ordered, stored, and used in accordance with AFI 32-7086, AMC Supplement 1 (Air Force, 1997).

Activities conducted at Travis AFB generate more than 1,000 kilograms of hazardous waste per month, qualifying the Base as a large-quantity generator under the federal Resource Conservation and Recovery Act (RCRA). Travis AFB is operated in accordance with EPA and State of California regulations pertaining to large-quantity generators; the Base is subject to state regulations that implement RCRA requirements in California (Travis AFB, 2006). Most of the hazardous waste are flammable solvents, contaminated fuels, lubricants, stripping chemicals, waste oil, waste paint, absorbent materials, chemicals stored beyond their expiration date, and asbestos (Travis AFB, 2006).

The Base maintains and implements the *Hazardous Waste Management Plan* (Travis AFB, 2004c) to comply with RCRA, state, and Air Force regulations. The plan establishes the procedures, training requirements, inspections, and record management procedures for

hazardous waste. Building 1365 is permitted for long-term storage of hazardous waste; the building is managed by the 60th Civil Engineering Squadron Asset Management Flight (60 CES/CEV) 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 (11,927 tons per year), including recycled waste and waste sent to a disposal facility. The amount of diverted waste (e.g., composting, mulching, recycled, and reused) averaged 13.48 tons per day (4,921 tons per year). The amount of nonhazardous waste sent to disposal facility averaged 19.19 tons per day (7,006 tons per year) (Travis AFB, 2006).

Travis AFB recycles an average of 1.8 tons per month of aluminum, glass, and plastic at the onbase recycling center and 0.5 ton per month at the offbase facility located outside the main gate.

Construction and demolition (C&D) debris disposal is cyclic by nature; however, much of C&D debris is recycled, reused, or otherwise diverted from landfills. By weight, concrete composes the largest percentage of the C&D debris generated by most projects. In fiscal year 2003, 46,545 tons of C&D debris (e.g., concrete, wood, and metal) was recycled (Travis AFB, 2006).

Nonhazardous solid wastes and refuse, excluding metal, at Travis AFB are collected and disposed of by Solano County Garbage Company at Potrero Hill Landfill. The onbase Defense Reutilization Marketing Office (DRMO) recycles all metal. The Asset Management Flight Recycling Program Manager administers a basewide recycling program that includes education, briefings, computer based training, and teaching tools available to all squadrons. All solid waste is disposed of in accordance with the *Travis Air Force Base Integrated Solid Waste Management Plan* (Travis AFB, 2004a).

3.4.3 Operable Units and Environmental Restoration Program Sites

An operable unit is a geographical area that contains sites with soil or groundwater contamination. The West/Annexes/Basewide Operable Unit and the North/East/West Industrial Operable Unit (NEWIOU) contain approximately 32 ERP sites (Travis AFB, 2002b).

The 60 CES/CEA Restoration Section implements the ERP to remediate threats 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 former small arms range. Some groundwater ERP sites have had extraction/remediation systems installed to facilitate site cleanup (Travis AFB, 2003a).

The western portion of the Proposed Action site is within the NEWIOU. The record of decision (ROD) describing the selected remedies for ERP sites within the NEWIOU on Travis AFB include the following:

- *North/East/West Industrial Operable Unit Soil, Sediment and Surface Water (SSSW) ROD* (URS Corporation, 2006)
- *Groundwater Interim ROD for the NEWIOU* (URS Corporation, 1997)

Land use controls (LUC) for the above-listed contaminated areas within NEWIOU are discussed in Section 3.9.

3.4.4 Stored Fuels

Fuel is stored onbase in USTs and aboveground storage tanks (AST). Fuel is provided 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 at various onbase locations. Thirty USTs are currently in use and regulated by the California UST program. Activities for removal or replacement of 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 provides a description of the groundwater and surface water resources, floodplains, and wastewater at Travis AFB.

3.5.1 Groundwater

Travis AFB is not underlain by extensive water-bearing materials. Groundwater occurs at the Base in shallow deposits and generally follows the surface topography south to the Suisun Marsh, Suisun Bay, and ultimately into San Francisco Bay (Travis AFB, 2003a).

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 (CH2M HILL, 2001). Suisun Marsh drains into Grizzly Bay and Suisun Bay. Water from these bays flows through the Carquinez Strait to San Pablo Bay and San Francisco Bay, which discharges into the Pacific Ocean near the city of San Francisco.

Travis AFB lies in the southern portion of the Union Creek, Denverton Creek, and McCoy Creek watersheds. 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 at Travis AFB (see Figure 3-1). 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 re-routing 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 eastern portion of the Base is served by one of the drainage systems that collects runoff along the runway and the inactive sewage treatment plant area and directs it to Denverton Creek and Denverton Slough. Denverton Creek is an intermittent stream near the Base that drains into Suisun Marsh.

The northwestern portion of the Base drains to the west toward the McCoy Creek drainage area. McCoy Creek is also an intermittent stream near the Base.

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, 2003a). The stormwater drainage system is designed to accommodate a 10-year, 24-hour storm (Travis AFB, 2003a).

3.5.5 Wastewater

The wastewater system on Travis AFB consists of industrial wastewater pipes, connections to the sanitary sewer from all lavatories, showers, and janitorial sinks from Base buildings and housing units. Wastewater is collected at two locations: the South Gate and the North Gate. From these collection points, wastewater is transferred to the Fairfield-Suisun Sewage Plant for treatment. During 2001, flows from Travis AFB were approximately 579,365 kilogallons (kgal) (an average of 48,240 kgal per month). Sanitary and de minimis industrial wastes are discharged under permit Number SIU 07/Zero 433-02, dated 1 May 2007, from the Fairfield-Suisun Sanitation District.

3.6 Biological Resources

The Proposed Action at Travis AFB occupies a remnant portion of the Solano-Colusa Vernal Pool Region (Keeler-Wolf et al., 1998), characterized by periodic basins surrounded by upland herbaceous-dominant vegetation of the Sacramento Valley (USFWS, 2005). Descriptions of this vernal pool region serve as a regional context for the action area.

The Solano-Colusa Vernal Pool Region covers the majority of Solano County, ranging northward from the low-lying plains adjacent to the Suisun Marsh and the Sacramento-San Joaquin Delta through the Colusa Basin of western Sacramento Valley to the vicinity of Princeton, Glenn County. It is best known for well-represented examples of northern claypan pools between Highway 113 and the Base. This is the only known region to contain the federally threatened Delta green ground beetle (*Elaphrus viridis*) and the federally endangered grass Crampton's tuctoria (*Tuctoria mucronata*), which distinguish this region from any other vernal pool region defined by Keeler-Wolf (1998).

Agricultural practices, water diversion and impounding for waterfowl enhancement, development, and road-building have impacted vernal pools in the region. Many of the vernal pool areas in the region have been converted to agriculture or developed for residential, commercial, or industrial uses.

The Solano Land Trust, California Department of Fish and Game, and Wilcox Ranch are targeting restoration of some of the less intensely altered agricultural lands (including former rice fields) through direct purchases, conservation easements, or other cooperative agreements. The Solano Land Trust and the California Department of Fish and Game manage adjacent reserves to protect portions of the northern claypan (totaling approximately 2,300 acres). In addition, the Wilcox Ranch, adjacent to Travis AFB on the east, is a preservation area under restricted land use.

3.6.1 Vegetation and Wildlife

The vegetation community found in the area of the Proposed Action is best described as a degraded vernal pool/grassland complex. The area is considered degraded because of (1) alterations of surface and subsurface hydrology, (2) filling in depressional features (vernal pools) and leveling mima-mound topography (topography indicating wetland habitat), (3) dominance of introduced grasses in upland areas, and (4) effects from current land management activities accomplished under the *Instruction 91-212 Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Program* (AFI 91-212) (Travis AFB, 2008).

Past land use practices and grading activities within the action area included construction of the original airfield that leveled much of the characteristic mima-mound topography. Consequently, many of the vernal pools were either filled in or the surrounding upland area was altered sufficiently to decrease the flow of surface water into remnant wetlands.

The AFI 91-212 (Travis AFB, 2008) prescribes a vegetation management regime for vegetated areas on the airfield with the goal to maintain a homogeneous vegetation cover. Travis AFB Airfield Management is responsible for maintaining grass height between a minimum of 7 inches to a maximum of 14 inches to reduce attractiveness to wildlife/birds. The AFI 91-212 (Travis AFB, 2008) does not contain a mowing schedule; however, it mandates that grass should be cut before seed heads develop to avoid attracting grain-eating birds. Most of the grass genera in the action area are considered winter annuals (*Avena*, *Bromus*, *Hordeum*, and *Vulpia*) (see Section 3.6.1.1), which typically develop seed heads in the mid to late spring, and are fully mature by the onset of the dry season. Therefore, spring mowings are required by the AFI 91-212. Stands of brush and shrubs are also removed.

The vernal pool/grassland complex has been categorized into the following two vegetation community types; upland annual grassland and non-native seasonal wetland, and vernal pool. These vegetation community types are dispersed along a xeric-mesic gradient, where no distinct boundary between these areas can be defined without quantitative vegetation sampling. The vegetation community types identified are described in the following paragraphs.

3.6.1.1 Upland Annual Grassland Community

This community type is dominated by introduced annual grasses associated with agricultural practices (grazing), along with occurrences of non-native and native wildflowers and weedy forbs. The annual grasses germinate with the onset of fall rains, and grow throughout the winter to flower throughout the spring. By summer, the annual grasses have set seed and are desiccated. Most areas within the action area are dominated by soft brome (*Bromus hordeaceus*), rat-tail fescue (*Vulpia myuros*), Italian ryegrass (*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), Hardinggrass (*Phalaris tuberosa*), wild oat (*Avena fatua*), and slender oat (*Avena sativa*).

3.6.1.2 Non-Native Grass Seasonal Wetland

This community type is found in depressional areas in the action area and is characterized by depressions, swales, or drainage features. These depressional areas hold water for short periods of time relative to active vernal pools found on adjacent properties or the western and southwestern portion of the Base. Swales are evident within the action area, more so toward the northern portion of the Proposed Action. Many of these areas were once more mesic and perhaps functioned as vernal pools under historical/pre-disturbance hydrological conditions. These mesic depressional prairie areas within the action area are dominated by Italian ryegrass, ripgut brome, wild oat, and filaree (*Erodium* spp.). Other species associated with this community type include soft brome, Fremont's goldfields (*Lasthenia fremontii*) and coyote thistle (*Eryngium vaseyi*). The overall habitat quality and species diversity are generally low in these areas relative to true vernal pool habitats (CH2M HILL, 2006).

3.6.1.3 Vernal Pool Community

This community type is found in remnant vernal pools outside the area of the Proposed Action and is dominated by native annual plants characteristic of northern claypan soil (Sawyer and Keeler-Wolf 1995). Vernal pools are shallow depressions or small, shallow pools that fill with water during the winter rainy season. These areas typically occur in areas where the basin topography is pronounced and surface water is present for a relatively short duration. 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 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).

Vernal pools have developed an ecologically unique flora that has evolved to tolerate the extreme wetting and drying cycle. Goldfields (*Lasthenia* spp.) observed in the adjacent C-17 Assault Landing Zone project has been identified by Collinge (2007) as the common Fremont's goldfield (*L. fremontii*). Other species included ripgut brome, wild oat, Italian ryegrass, filaree, annual hairgrass (*Deschampsia danthonioides*), and occasional occurrences of dowingia (*Downingia cuspidata*).

The Wilcox Ranch is near the site of the Proposed Action and is under deed restrictions that prohibit most kinds of development. This area exhibits mima-mound topography, a relatively higher composition of native plant species and diversity, and is actively grazed by cattle (CH2M HILL, 2001; TNC, 2002). Cattle grazing has been shown to help maintain native and aquatic diversity in vernal pool habitats (Marty, 2005). Muzzy Ranch, bordering Wilcox Ranch, also exhibits relatively higher species diversity, and parcels of Muzzy Ranch have been proposed to the U.S. Army Corps of Engineers as a mitigation bank (LSA Associates, Inc., 2004).

3.6.2 Special-status Species

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

- Any species officially listed as federal endangered or threatened or any species that are candidates for federal listing as endangered or threatened under the Federal Endangered Species Act (ESA)
- California-listed threatened, endangered, or rare species under the California Endangered Species Act (CESA)

Both ESA and CESA define species that are "threatened" and "endangered" as follows:

- Endangered Species: Any species in danger of extinction throughout all or a significant portion of its range (ESA Section 3(6)).
- Threatened Species: Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (ESA Section 3(20)).
- Candidate Species: Plant and animal taxa considered for possible addition to the List of Endangered and Threatened Species. These are taxa for which the USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions (61 CFR 7596 – 7613).

A list of species that potentially occur in the area of the Proposed Action has been compiled from the results of previous studies conducted on Travis AFB (see Table 3-3) as well as from information from the California Natural Diversity Database (CNDDB) (CNDDB, 2009) and the California Native Plant Society (CNPS, 2009). Preliminary database searches included the following nine U.S. Geological Survey Quadrangles: Mt. Vaca, Allendale, Dixon, Fairfield North (499D), Elmira (498C), Dozier (498D), Fairfield South (482A), Denverton (481B), and Vine Hill (482D). Information on federally listed species for the Elmira Quadrangle was also obtained from the U.S. Fish and Wildlife Service (USFWS), Sacramento Field Office.

Fifteen special-status species including 6 plants and 9 animals were identified as having potential to occur within Travis AFB (see Table 3-4).

TABLE 3-3
Existing Biological Resources Studies
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, 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

TABLE 3-4
Special-status Species Potentially Occurring at Travis AFB
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

Species Scientific Name	Species Common Name	Protection Status	Presence
Plants			
Gratiola heterosepala	Boggs Lake hedge-hyssop	SE	Potential
Neostapfia colusana	Colusa grass	FT/SE	Potential
Lasthenia conjugens	Contra Costa goldfields	FE	Known
Tuctoria mucronata	Crampton's tuctoria	FE/SE	Potential
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	FT/SE	Potential
Trifolium amoenum	Showy Indian clover	FE	Potential
Animals			
Rana aurora draytonii	California red-legged frog	FT	Potential
Ambystoma californiense	California tiger salamander	FT	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
Buteo swainsoni	Swainson's hawk	CT	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; California Department of Fish and Game, 2004

Notes:

FE = Federal Endangered
FT = Federal Threatened
SE = State Endangered
ST = State Threatened

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

Wetlands and other waters are ecological habitats that are protected under both federal and state laws and regulations. The Clean Water Act (CWA) is the primary statute providing protection of aquatic resources and is administered by the U.S. Army Corps of Engineers (USACE) and the California Regional Water Quality Control Boards. Any actions that involve the placement of fill material into jurisdictional waters or wetlands must comply with Sections 404 and 401 of the CWA.

The 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

Sections of Union Creek, including those to the south of the Proposed Action, would be subject to regulation as Waters of the United States under CWA Section 404. 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). These may include seasonal wetlands and vernal pools in the area of the Proposed Action.

Section 401 of the federal CWA specifies that states must certify that any activity subject to a federal permit (such as a USACE permit) meet all state water quality standards. In California, the State Water Resources Control Board and the regional boards evaluate whether to certify actions for activities subject to any permit issued by USACE. Wetlands and waters in the area of the Proposed Action are subject to the jurisdiction of the San Francisco Bay Regional Water Control Board (RWQCB) (Region 2). Under state regulatory authority, wetlands and other waters of the state, including isolated wetlands, are potentially subject to the jurisdiction of the California Regional Water Quality Control Boards.

3.6.4 Botanical Surveys

Botanical surveys have been conducted throughout the area of the Proposed Action by Travis AFB staff. A report discussing the results of these surveys is currently being prepared.

Special-status plants are known to occur on Travis AFB from previous studies (see Table 3-4).

3.6.5 Wildlife Surveys

Wildlife surveys were conducted by CH2M HILL on March 30, March 31, and April 9, 2009, concurrent with wetland delineations (see Section 3.6.6). Surveys involved walking meandering transects along the area of the Proposed Action and recording all bird, mammal, reptile and amphibian species observed.

Three California Species of Special Concern, tricolor blackbird (*Agelaius tricolor*), northern harrier (*Circus cyaneus*), and western burrowing owl (*Athene cunicularia*) were observed within the project vicinity during the surveys. Western burrowing owl nesting pairs were observed within the approach lighting area of the project. Although they are not listed under ESA or CSA, these species are afforded protection under the Federal Migratory Bird Treaty Act. No federal or state-listed wildlife species were observed during the field surveys, and there are no known reports of special-status wildlife species in this area. Small mammal burrows were noted in the project area that may provide upland habitat for California tiger salamander (CTS).

3.6.5.1 California Tiger Salamander

The large areas of grasslands with seasonal wetlands within Travis AFB may provide suitable habitat for the CTS. A general habitat assessment for CTS was conducted for selected wetlands on Travis AFB including the larger seasonal wetlands east and west of Runway 03R/21L (Rana Resources, 2005). The habitat assessment considered wetland characteristics such as water depth, size, and density of aquatic vegetation, species of amphibian larvae, and the presence of small mammal burrows. Selected wetlands were sampled during daylight hours 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 greater than 1 foot deep, 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 regards 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. These pools were rated "None" (with regards to their potential to serve as CTS breeding habitat).

According to the habitat assessments conducted by Rana Resources (2005), none of the wetlands in the area of the Proposed Action were considered to provide 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*]).

Biosystems Analysis, Inc (1993) reported an occurrence of CTS in a pool east of the base, adjacent to the proposed Meridian Gate (Figure 3-2). Additional occurrences are also known from the Wilcox Ranch and other large playa pools and stock ponds to the east of Travis AFB (CNDDB, 2009).

During 2008 vernal pool invertebrate monitoring, CTS larvae were discovered in the northeastern part of Travis AFB, in the Burke Property housing area approximately 1.6 miles northwest of the Proposed Action (CH2M HILL, 2008). CTS upland habitat is defined as habitat within 1.3 miles of a known breeding pool.

3.6.5.2 Vernal Pool Branchiopod 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 (EcoAnalysts, 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. One occurrence of vernal pool fairy shrimp (*Branchinecta lynchi*) was observed in a vernal pool approximately 100 feet north of Runway 03R/21L (Figure 3-2).

Biosystems Analysis, Inc (1993) reported an occurrence of vernal pool tadpole shrimp (*Lepidurus packardi*) in a pool outside of the Base boundaries, adjacent to the proposed Meridian Gate (Figure 3-2).

3.6.6 Wetland Delineations

Wetland delineations were conducted by Wetland Research Associates on March 30, March 31, and April 9, 2009, concurrent with the wildlife surveys. The survey methodology followed USACE's 1987 Wetland Delineation Manual (USACE, 1987) and the Arid West Region Supplement (USACE, 2006). A report discussing the results of these surveys is pending. Survey results are shown on Figure 3-2.

3.7 Socioeconomic Resources

Socioeconomic resources include the population, income, employment, and housing conditions of a community or region of influence. The total population of Solano County, based on a 2006 estimate, is approximately 412,000 (U.S. Census Bureau, 2000). The Base's overall impact on the county and surrounding area is estimated to be in excess of $1.2 billion (Travis AFB, 2006).

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 migrate to Solano County by 2010.

3.8 Cultural Resources

3.8.1 Cultural History

The region in which Travis AFB is located was once inhabited by the Southern Patwin (or Wintuan) tribe of Native Americans. The early inhabitants of the region established tribelets (i.e., villages) adjacent to freshwater marshes and hunted, gathered, and fished for subsistence. The primary tribelets in a region were the Suisun and Talenas. Spanish missionaries arrived circa A.D. 1750 to find a proto-agriculture culture existing in the region (Travis AFB, 2003b). 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, 2004).

Travis AFB was originally created as a temporary bomber base in 1942. The location 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 U.S.

3.8.2 Cultural Resource Investigations and Resources

Since 1909, 16 cultural resource studies have been conducted at Travis AFB or in the surrounding area. These studies identified 10 archeological sites and 27 buildings and structures on Base property that were potentially significant. Three of the 10 archeological sites were considered potentially prehistoric and the remaining 7 were considered potentially historic. All 10 sites were evaluated for eligibility for the National Register of Historic Places and were deemed not eligible.

Twenty-seven buildings and structures associated with the Cold War are potentially eligible for inclusion on the National Register of Historic Places (NRHP) (Travis AFB, 2003b).

3.9 Land Use

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

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 personnel and their families.
- **Community (Service) –** uses include schools, education centers, library, chapel, post office, and child development facilities. Supports the needs of 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.

The runway and adjacent areas are situated in the area designated for Airfield. Land use restrictions and controls are established as buffers around certain facilities to protect human health from potential adverse effects. For example, the areas immediately adjacent to the short side of the runways are designated as clear zones which will not be developed to protect onbase military and civilian population. For further detail, see Section 3.11 Airfield Operations. In addition, land use controls are established for the ERP sites, as required by the RODs for the WABOU and NEWIOU. Travis AFB has also agreed to adhere to land use control procedures for certain sites with groundwater contamination.

Travis AFB has an easement with local owners to use their property for operation and maintenance of the lighting system.

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 3-3.

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. 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 on-base roads is 14,000 lbs (Highway Class).

3.11 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, 2003c).

Travis AFB has established several clearance zones, in accordance with UFC 3-260-01. 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.

3.12 Safety and Occupational Health

Safety and occupational health is managed by BioEnvironmental (60AMDS/SGPB). Construction site safety and accident prevention are ongoing activities at 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.

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 in effect 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, is west of Travis AFB (Thomasson et al., 1960; Olmsted and Davis, 1961).

The land surface structure (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.

The geology at Travis AFB shows unconsolidated silty clays located at the surface and silts and fine sands at depths of 15 to 20 feet. The average water table at the Base is 10 feet below grade (Travis AFB, 2003a). Topographic relief in the form of very low ridges is caused by outcroppings of sedimentary rock in the area.

Portions of the north part of the Base are underlain by alluvium of recent origin, consisting of sand, gravel, silt, and clays with thicknesses varying from 5 to 60 feet. The major portion of the Base is underlain by older alluvium, consisting of inter-fingering lenses of sands, gravel, silts, and clays. (Travis AFB, 2003a)

Bedrock at Travis AFB consists of consolidated to semi-consolidated sedimentary rock. 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 over 200 feet (Thomasson et al., 1960).

The San Francisco Bay Area is a region of seismic activity due to the presence of the San Andreas, the Hayward, and the Calaveras fault zones. Travis AFB is more than 20 miles from each of these fault zones. The Green Valley fault is a smaller potentially active fault that is located approximately 10 miles west of the Base. In addition, the Vaca Fault System, consisting of several separate lineaments, has been inferred from photo lineaments, but no surface evidence has been identified in the field. This system is generally east and northeast of Travis AFB, although the Vaca Fault probably traverses the Base to the east (Travis AFB, 2003a).

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.

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. Soil in the vicinity of Travis AFB are classified as alfisols, which are primarily silt and clay loam soils that exhibit low permeability and poor drainage characteristics. The lower layers of most of the soils comprising Travis AFB are dense and compact. They are typically impervious to air and discourage the penetration of roots or water. Therefore, little drainage occurs through the soil. In general, the soils on Travis AFB have been considerably altered by heavy construction and by imported fill. (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 disposal as a last resort. The *Travis AFB Pollution Prevention Management Action Plan (P2MAP)* (Travis AFB, 2004b) defines the framework to accomplish these actions. The plan analyzes all processes that use hazardous materials and generate hazardous waste streams; it then evaluates options to reduce the volume or toxicity of generated wastes. This program includes minimizing wastes generated by ERP sampling activities.

3.14 Environmental Justice and Protection of Children

EO 12898 (1994) 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 is 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 of Hispanic origin, and where such population exceeds 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 (President's Council on Environmental Quality [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 population of Solano County in 2006 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 population of 119,708 in 2003. Vallejo is more diverse than the county as a whole; its population was 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 Solano County, with an estimated population of 102,762 in 2006. 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 the population lives at or below the poverty level (U.S. Census Bureau, 2000).

Travis AFB employs approximately 15,000 people. In 2006 the Travis AFB population consisted of approximately 7,944 active duty personnel; 3,384 Air Force, Army Reserve, and National Guard; and 9,225 active duty dependents. In addition, the Base population included 1,892 appropriated fund civilian personnel and 1,662 non-appropriated fund civilians, contractors, and private business people (Travis AFB, 2006).

Although demographic data for Travis AFB was not available, the racial composition of the Air Force serves as an approximation of the racial composition of the Base. In 2008, the Air Force was 70.3 percent White, 11.9 percent African American, and the remaining 6.4 percent comprised other races (Air Force, 2008).

Children are present on Travis AFB in family housing, child development centers, the Travis AFB youth center, schools, and playgrounds (Travis AFB, 2006).

West Branch of Union Creek

East Branch of Union Creek

North Gate Park Pond or Duck Pond

West Branch of Union Creek (Drainage Channel)

Travis Air Force Base

Area I

Area II

Area III

Area IV

Area V

Area VI

Area X

Outfall A Area I

Outfall B Area II

Outfall C Area III

Outfall D Area IV

Outfall E Area V

Outfall F Area VI

Union Creek

LEGEND

- PROPOSED ACTION AREA
- TRAVIS AIR FORCE BASE BOUNDARY
- WATER BODY
- AREA I
- AREA II
- AREA III
- AREA IV
- AREA V
- AREA VI
- OUTFALL AREA

N

0 2,500 5,000 FEET

FIGURE 3-1
STORMWATER DRAINAGE AREAS AND OUTFALL LOCATIONS
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

CH2MHILL

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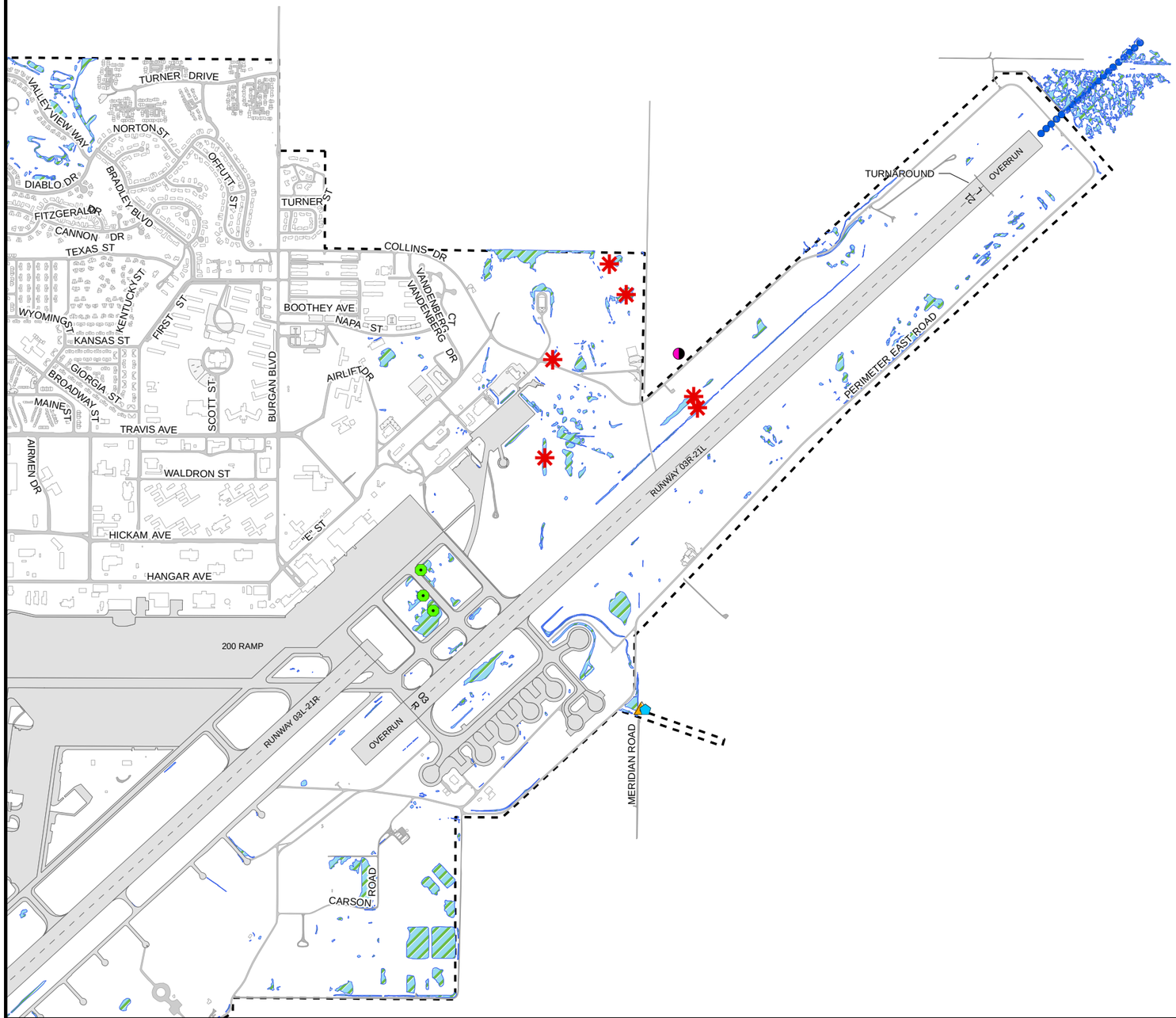

LEGEND

- California tiger salamander *(Ambystoma californiense)*
- Brittlescale *(Atriplex depressa)*
- Vernal pool fairy shrimp *(Branchinecta lynchi)*
- Vernal pool tadpole shrimp *(Lepidurus packardi)*
- Burrowing owl *(Athene cunicularia)*
- APPROACH LIGHT
- AIRFIELD
- WETLANDS
- INSTALLATION BOUNDARY
- RUNWAY CENTERLINE

N

0 1,700 3,400 FEET

FIGURE 3-2
BIOLOGICAL RESOURCES IN THE VICINITY OF THE PROPOSED ACTION AREA

ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

CH2MHILL

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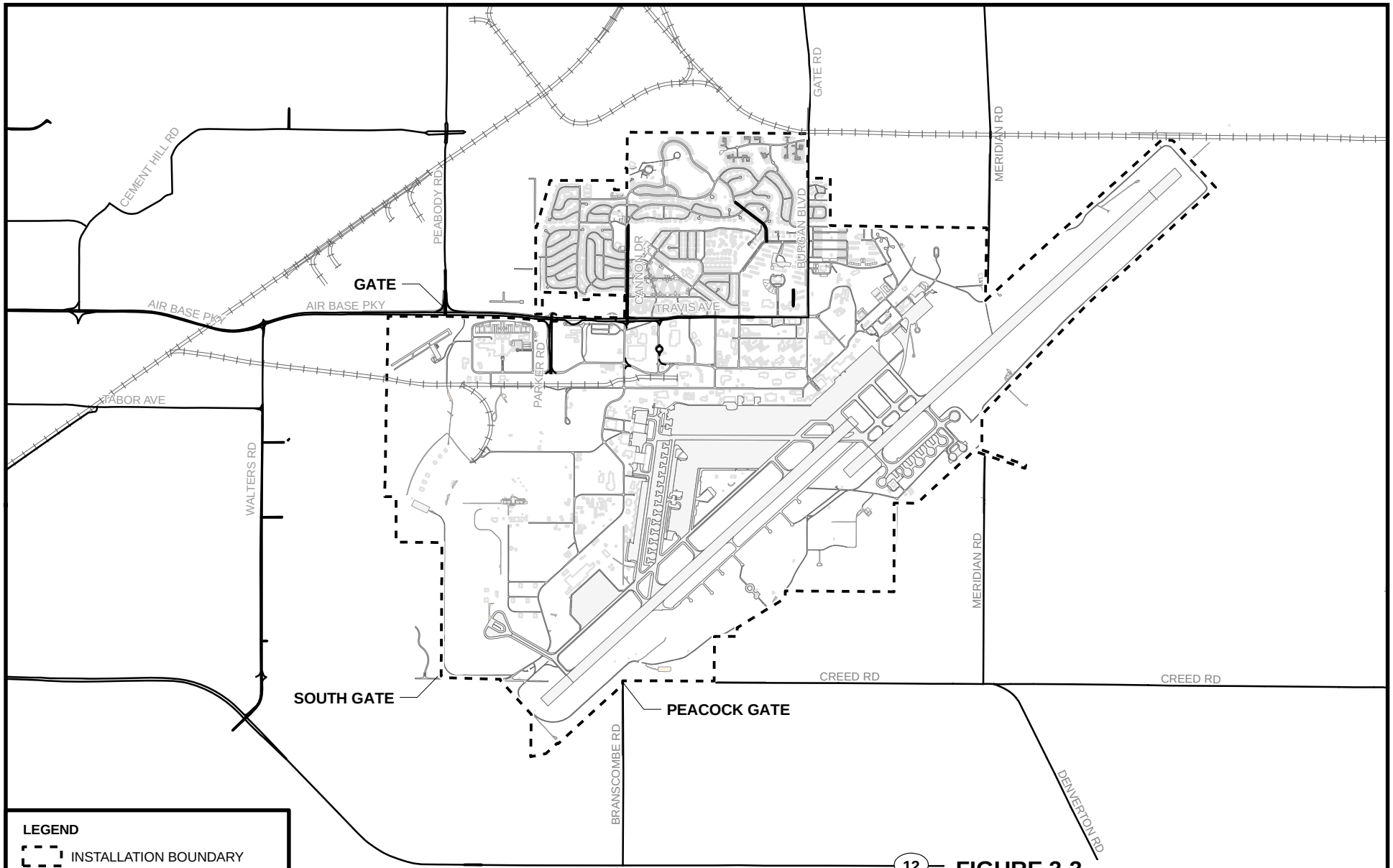

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FIGURE 3-3
TRANSPORTATION SYSTEM IN THE VICINITY OF TRAVIS AFB
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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\\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\FIG3-3_TRANSPORTATION.MXD FELHADID 5/31/2009 18:56:26

SECTION 4

Environmental Consequences

4.1 Introduction

This section evaluates potential impacts of the alternatives described in Section 2. Potential impacts to the human and natural environments were evaluated by comparing the Proposed Action (Alternative 2) to the No Action alternative. Because operation of the repaired runway would be the same as current operations, no impacts would result and are therefore not addressed in this section. 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 Alternative 2.

4.2 Air Quality

4.2.1 Laws and Regulations

4.2.1.1 Federal

The U.S. Environmental Protection Agency (EPA) adopted the Clean Air Act of 1970 (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 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. The provisions apply only in areas designated as nonattainment or maintenance for NAAQS. The general conformity determination is issued as a written finding after a minimum 30-day public comment period on the draft determination.

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 (presumed to conform) if the total net project-related emissions (construction and operation) pass two tests: (1) they are less than the de minimis thresholds

established by the conformity rule, and (2) they are not regionally significant (emissions are regionally significant if they exceed 10 percent of the total regional emission inventory).

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 CAAQS were established in 1969, pursuant to the Mulford-Carrell Act. These standards 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

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.

BAAQMD's guidelines and thresholds for determination of air quality impacts significance are in the *CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans* (BAAQMD, 1999). Determination of significance with respect to construction emissions are based on a consideration of the control measures to be implemented. From BAAQMD's perspective, quantification of construction emissions is not necessary (although a lead agency may elect to do so). Construction emission impacts are considered insignificant if a project implements the applicable fugitive dust control measures listed in California Environmental Quality Act (CEQA) guidelines. Determination of significance with respect to operational emissions is based on a set of thresholds for localized carbon monoxide impacts, criteria pollutant emission rates, and toxic air emissions.

4.2.2 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 and aircraft operations would not change from current conditions. No additional air quality impacts are expected from Alternative 1.

4.2.3 Alternative 2 – Proposed Action

4.2.3.1 Construction Emissions Impacts

The total duration of the project demolition and construction would take approximately 18 months, with the majority of the construction occurring in 2010. 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 oxides (NO_x), PM_{10}, $PM_{2.5}$, SO_2, and volatile organic compounds (VOC). In addition, demolition, site preparation and grading, vehicle travel on unpaved roads, and the concrete batching plant operation would result in fugitive dust emissions. The offroad 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 (Urbemis, 2007) along with the projected construction duration and estimated hours of construction equipment operations. Default settings in URBEMIS2007 were used when project-specific data were not available. To estimate the worst-case annual emissions during the project construction, it was assumed that majority of the demolition, grading, paving, and concrete production will occur in 2010.

Fugitive dust emissions from demolition, grading, and paving were estimated using default URMEMIS emission factors. Emissions from vehicle re-entrained dust from unpaved roads were calculated following the methodology in EPA's EPA *Compilation of Air Pollutant Emission Factors* (AP-42). Dust emissions from batch plants were estimated using the methodology from BAAQMD Permit Handbook (BAAQMD, 2009).

Emissions associated with worker commutes were estimated by using the expected number of vehicle miles traveled by the workers. Vehicle emissions from onroad delivery trucks and other vehicles were calculated based on the expected daily VMTs for the vehicles. It is assumed that the construction will occur 5 days per week. Vehicle emission factors were calculated by using EMFAC2007 (Urbemis, 2007) for BAAQMD for the year 2010. Passenger vehicle and heavy duty vehicle emission factors were used for emission calculations for workers commute and delivery trucks, respectively.

The estimated worst-case annual construction emissions under Alternative 2 are shown in Table 4-1. Detailed construction emission calculations and assumptions are provided in Appendix B.

TABLE 4-1
Estimated Alternative 2 Construction Emissions (ton/yr)
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

Emission Source	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Equipment exhaust	0.88	3.53	6.62	0.00	0.40	0.37	573
Delivery trucks exhaust	2.00	9.70	42.75	0.05	1.54	1.31	5,089
Worker commute	0.04	1.21	0.13	0.00	0.016	0.01	165
Fugitive dust – construction site	-	-	-	-	11.49	2.41	-
Fugitive dust – vehicle travel	-	-	-	-	105.38	10.54	-
Fugitive dust – batch plant	-	-	-	-	0.91	0.91	-
Total	**2.9**	**14.4**	**49.5**	**0.05**	**119.7**	**15.5**	**5,827**

Notes:
– = not applicable
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter less than 10 microns
$PM_{2.5}$ = particulate matter less than 2.5 microns
SO_2 = sulfur dioxide
ton/yr = ton or tons per year

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 guideline. Therefore, potential air quality impacts during Alternative 2 construction would be less than significant.

4.2.3.2 Operation Emissions Impacts

Operation emissions from Alternative 2 would be generated by aircraft and supporting vehicles using the runway. Operation of the aircraft and other vehicle activities will not change after the project construction. Therefore, operation emissions would not increase compared to current conditions, long-term adverse impacts are not expected and no further analysis is required.

General Conformity. A general conformity applicability analysis for the project has been performed (see Appendix C) 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 NAAQS. In addition, the urbanized areas of Solano County (which include the area occupied by Travis AFB) are maintenance areas for carbon monoxide. As a result, carbon monoxide and ozone precursor emissions (nitrogen oxides 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 nitrogen oxide), per federal action. The de minimis threshold for a carbon monoxide 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, and VOCs during the construction of the project are below the de minimis thresholds.

TABLE 4-2
Alternative 2 General Conformity Applicability
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

	Annual Emissions (ton/yr)		
Activity	**VOC**	**NO_x**	**CO**
Construction (2010)	2.9	49.5	14.4
De Minimis Threshold	100	100	100

Regional Significance. When the total emissions of the nonattainment and maintenance criteria pollutants do not exceed the de minimis limit, the emissions must then be compared to the Basin emissions inventory to determine the regional significance of the federal action. If the amount of the emissions is greater than 10 percent of the emissions inventory, the federal action is considered regionally significant for that pollutant (40 CFR Part 93, Subpart 153[i]).

Table 4-3 compares the annual emissions from the construction of Alternative 2 with the Basin emissions inventory. VOC and NO_x emissions inventory data were obtained from the *San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard* (BAAQMD et al., 2001). Carbon monoxide emissions inventory data were obtained from the *2004 Revision to the California State implementation Plan for Carbon Monoxide, Updated Maintenance Plan For Ten Federal Planning Areas* (CARB, 2004). The potential increases in annual emissions of CO, NO_x, and VOCs, for construction are below the 10 percent threshold. Therefore, regional impacts due to Alternative 2 construction are less than significant.

TABLE 4-3
Comparison of Project Emissions and Emissions Inventory
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

	VOC	**NO_x**	**CO**
Basin Emissions Inventory (ton/yr)	162,425	191,625	692,040
Construction Emissions (2010) (ton/yr)	2.9	49.5	14.4
Percent of Emissions Inventory	**0.0018%**	**0.026%**	**0.0021%**

Notes:

Basin emissions inventory data for NO_x and VOCs were obtained from *San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard* (BAAQMD et al., 2001). Emissions inventory data for 2006 were used for emissions comparisons for all years.

Basin emissions inventory data for CO were obtained from *2004 Revision to the California State implementation Plan for Carbon Monoxide, Updated Maintenance Plan For Ten Federal Planning Areas* (CARB, 2004). Emissions inventory data for 2010 were used for the emissions comparison.

In summary, construction emissions of CO, NO_x, and VOCs under Alternative 2 would be below the de minimis levels. The emissions would not exceed 10 percent of the total Basin emission inventories listed in the SIPs. On the basis of the conformity applicability criteria, the project conforms to the most recent EPA-approved SIP; therefore, Alternative 2 is exempt from the CAA conformity requirements and does not require a detailed conformity demonstration.

4.2.3.3 Compliance of Permitting Requirements

Emissions associated with the batch plant operation would result in less than significant impacts to air quality. The project may require a permit for the batch plant unless it is exempt according to BAAQMD regulations. According to BAAQMD Regulation 2-1-105, portable batch plants are exempt from permitting requirements if the plants are in compliance with all the applicable requirements in the Statewide Portable Equipment Registration Program (CCR Title 13, Division 3, Chapter 3, Article 5). Applicability, and whether or not permits are required, would be determined through coordination with the BAAQMD.

4.3 Noise

This section describes noise impact criteria and discusses potential project-related noise impacts. Potential future noise impacts were determined by analyzing the anticipated changes in noise exposure attributable to construction-related activities under the No Action

alternative and Alternative 2, the Proposed Action. After construction, no change in noise levels is anticipated above existing levels.

The fundamental measure of sound levels is expressed in decibels 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

4.3.1 Alternative 1 – No Action

Implementing Alternative 1 would not result in any changes in construction or operational activities and would generate noise levels similar to current levels.

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. The EPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company has extensively studied noise from different types of construction equipment and construction sites (Barnes et al., 1977).

Noise levels associated with trucks, backhoes, concrete mixers, jackhammers, rock drills, and pneumatic tools range from 85 to 98 dB 50 feet from the source. Depending on the source and the types of activities, noise associated with construction activities would be temporary, occur only during daytime hours, and vary in levels. Noise associated with flightline activities is approximately 80 to 85 dB CNEL (Travis AFB, 2006).

There are no sensitive receptors, such as residences or schools, within 1,000 feet of the site. The noise from construction of Alternative 2 would be temporary. Because construction noise would be temporary and sensitive receptors would not be affected, noise impacts resulting from implementing Alternative 2 would be less than significant.

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

Congress passed the RCRA in 1976 to protect 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 waste. Regulations adopted by EPA in 40 CFR 260 to 279 implement the RCRA. In California, hazardous material and hazardous waste are regulated under Title 22 of the Code of California Regulations, Article 4.5.

Travis AFB implements procedures for handling hazardous materials and managing and disposing of hazardous wastes. 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, 1994)
- *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. The Alternative 2 site is not located on or near any bulk fuel storage areas, and no impacts to bulk fuel storage areas are anticipated.

4.4.1 Alternative 1 – No Action

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

4.4.2 Alternative 2 – Proposed Action

Operation of the runway under Alternative 2 would not involve any activities that would increase the use of hazardous materials or the generation of hazardous waste. Hazardous materials, such as fuels and paints, would be used during repair of the runway and installation of new infrastructure at the runway. Construction could generate some hazardous wastes, such as empty containers and rags. All hazardous materials will be handled in accordance with the *Travis AFB Waste Management Plan* (Travis AFB, 2004c), which includes protocols for storing, labeling and disposing of hazardous materials. With implementation of the Base waste management procedures, impacts resulting from use of hazardous materials and generation of hazardous waste during construction would be less than significant.

The western portion of the Alternative 2 site overlaps ERP Sites ST032 and SS016 (see Figure 4-1). Both ERP sites SD032 and SS016 are undergoing active remediation for groundwater contamination. In addition, several ERP sites are located adjacent to the Alternative 2 site. Soil, sediment and surface water Site SD001 consists of storm sewer systems A and C and Union Creek and has some sediment contamination. The Air Force has agreed to excavate contaminated sediment from Union Creek at certain locations. ERP sites with soil contamination that are located close to the Alternative 2 site include FT003, FT004, and FT005. (Travis AFB, 2003a)

Prior to construction, the following measures would be implemented:

- For construction at ERP Sites ST032 and SS016, consult with the Base Remediation Program Manager (BRPM) prior to construction. A waiver to construct on the ERP sites is required in accordance with Air Force Instruction (AFI) 32-1021 (Air Force, 2003). The Headquarters Air Mobility Command implementation policy (7 Jan 04) for waivers to construct on ERP sites requires that "the regulatory agencies be notified of the proposed construction project" and that the waiver request include the "date that regulatory agencies were notified in writing of construction projects (and response, if any)" (paragraphs 2. and 4.e., *Request for Waiver Process*).
- Obtain a dig permit (60 AMW Form 55).
- Prepare a contingency plan 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 based on direction from the BRPM, and potential impacts to human health and the environment from the existing contamination would be less than significant.

4.5 Water Resources, Floodplains, and Wastewater

Alternative 2 is not located within the 100-year floodplain. The alternatives would not use groundwater or release water in a way that could impact groundwater. No significant impacts to floodplains or groundwater are expected from implementation of the Proposed Action.

4.5.1 Alternative 1 – No Action

Under Alternative 1, no changes to the stormwater drainage system or in the management of stormwater would occur.

4.5.2 Alternative 2 – Proposed Action

The Proposed Action area includes paved areas and adjacent impermeable areas. With implementation of this alternative, the runway width would be reduced from 300 feet to 150 feet. Accordingly, the runway footprint would be reduced from approximately 90 acres to approximately 45 acres. Neither wastewater treatment facilities nor sewer lines will be affected by or constructed for the Proposed Action.

4.5.2.1 Water Quality

Pollutants introduced to the drainage ditches near the construction area could result in significant impact to the water quality of Union Creek and/or Denverton Creek. Erosion during earth-moving activities would potentially cause short-term impacts to drainages and ultimately to Union Creek and/or Denverton Creek. The Base has a stormwater permit and a stormwater pollution prevention plan. Stormwater discharge at the Base is regulated under the *Travis AFB Industrial Activities Storm Water Discharge Permit* (Travis AFB, 2002b). A construction stormwater pollution prevention plan (SWPPP) would also be prepared. An erosion control and restoration plan would be prepared to control short-term and long-term erosion and sedimentation. Best management practices (BMP) to control runoff and sedimentation required by the construction SWPPP and the erosion control and restoration plan would include regular and documented site inspections, the use of silt fences, minimization of earth-moving activities during wet weather, and revegetation with appropriate native plant materials of disturbed areas. Alternative 2 would comply with all applicable restrictions in the stormwater permit, the SWPPP, and the erosion control and restoration plan. Compliance with the permit and implementation of BMPs would reduce potential impacts to water quality resulting from construction sediment discharged during storm events to Union Creek and Denverton Creek to less than significant levels. The RWQCB is finalizing certification of the project under Section 401 of the CWA. The RWQCB provided certification of the project under Section 401 on 17 December 2009, and has approved initiation of construction (see Appendix D and Section 4.6).

4.5.2.2 Floodplains

Neither construction nor operation of the Proposed Action would affect the floodplain. Large, permanent structures, such as buildings or walls, have the potential to impede or divert floods. Use of temporary structures, such as a portable inspection canopy and an administrative trailer to operate the Meridian Gate, would neither impede nor divert floods because they would likely be swept away by the floods. Operation of the upgraded airfield would not involve new vertical structures that could impede or divert floods. Impacts to the floodplain from operation of the repaired runway would not change from current conditions.

4.5.2.3 Stormwater

A hydrologic analysis (Analysis) was conducted to evaluate changes in stormwater runoff patterns (including runoff volumes and flow rates) and the hydrologic impact of land cover changes and changes in slope associated the reduced footprint of the runway, Meridian Gate, and the laydown area. Results of the Analysis are presented in this EA and the Analysis is included in Appendix E.

The results of the Analysis show that minor changes to stormwater runoff can be expected as a result of the project. The proposed condition would result in a decrease of almost 30 percent in impervious area due to a narrower runway surface. Consequently, the proposed condition would result in reductions to the rate, amount, and volume of stormwater runoff. The differences in peak flow rates and surface runoff volumes between existing and expected conditions under the Proposed Action range from an increase of less than 1 percent to a decrease of almost 16 percent with an average reduction of approximately 5 percent for the runway area. In addition, the proposed increase in the slope of the runway embankments would not substantially affect the runoff time of concentration (defined as the time required for a drop of water to travel from the most hydrologically remote point in the area of interest to the point of collection) between existing and proposed conditions.

Because construction of Meridian Gate and the laydown areas replaced unpaved areas with gravel surfaces, no net change to peak flow rates and runoff volumes are expected as a result of constructing these features.

The increase in pervious surface would result in a average decrease of 5 percent in the amount of stormwater runoff. Because the decrease is within the annual variation of runoff, it is considered to be less than significant.

4.6 Biological Resources

This section analyzes the potential for adverse impacts to biological resources, such as habitat loss, from implementation of the No Action Alternative and the Proposed Action Alternative. Impacts are depicted on Figure 4-2.

4.6.1 Alternative 1 – No Action

Under the No Action Alternative, repairs to Runway 03R/21L would not occur. The No Action Alternative would not result in any construction or other changes to the physical environment that could affect biological resources.

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. Formal consultation with the USFWS under the ESA regarding expected impacts has been completed, and Biological Opinion 81420-2009-F-1000-1 was issued for the project on October 29, 2009 (see Appendix F). The Biological Opinion found that the Proposed Action may affect, but is not likely to adversely affect, the threatened Delta green ground beetle, threatened vernal pool fairy shrimp, endangered vernal pool tadpole shrimp, endangered Conservancy fairy shrimp, and the endangered Contra Costa goldfields. If the Air Force implements the Proposed Action, the Air Force will implement and comply with the Conservation and Minimization Measures listed in the Biological Opinion.

4.6.3 Burrowing Owl

Western burrowing owls are protected under the Migratory Bird Treaty Act. Suitable nesting habitat for this species occurs in the north side of the runway. Installation of new lights and repair of existing lights for the approach lighting system may result in the direct loss of nesting habitat. Travis AFB has large expanses of contiguous habitat for the burrowing owl, and this loss of burrowing owl habitat (less than 5 acres) would be a less than significant impact and would, therefore, not require mitigation. If mortality of individuals resulted from repair of the lighting system (e.g., removal of occupied burrows or nest abandonment), this impact would be considered significant.

Measures to avoid impacts to western burrowing owls would include passive relocation of birds near the Proposed Action area. Preconstruction surveys will be conducted to identify burrow locations. The burrows will be either filled or equipped with one-way doors during the non-breeding season (September 1 to January 31) to prevent occupation of burrows. The one-way doors prevent owls from re-entering burrows, thus encouraging them to find other burrows. In addition, artificial burrows will be constructed nearby. Potential impacts to western burrowing owls would be less than significant with the implementation of this conservation measure.

4.6.4 California Tiger Salamander

The Proposed Action could adversely affect CTS upland habitat. Construction and operation of the Proposed Action could result in the permanent loss of 70.85 acres and the temporary loss of 72.85 acres of CTS upland habitat (including 1.37 acres of upland habitat for the Delta green ground beetle). The June 2009 Biological Assessment for this project indicated 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.

The Biological Opinion and incidental take permit for the Proposed Action stipulate conditions to minimize adverse effects on CTS habitat. To mitigate for permanent impacts at the required ratio of 3:1, the Air Force is required to protect 212.55 acres of upland habitat by either (1) purchase of compensation credits at an existing USFWS-approved bank or

banks in Solano County, as appropriate for the species, or (2) purchase and preservation of a USFWS-approved parcel and establishment of a conservation easement, together with development of a management plan and provision of a perpetual endowment sufficient to cover management and maintenance of protected lands for the benefit and recovery of CTS, or (3) a combination of these approaches. If the Air Force proceeds with the Proposed Action, it would mitigate the impacts to CTS in accordance with the Biological Opinion.

Travis AFB will submit a draft restoration and revegetation plan (RRP) for USFWS review at least 60 calendar days prior to initial ground breaking. The final RRP will be submitted for USFWS approval prior to ground breaking. The RRP will stipulate that, after completion of the Proposed Action, all CTS habitat subject to temporary ground disturbances will be regraded, if appropriate, and revegetated with seeds or cuttings of appropriate plant species to promote restoration of the area to the pre-project conditions. Areas that are "subject to temporary disturbance" include all areas that are disturbed during the project that are not subject to further disturbance after completion of the project and have the potential to be revegetated.

The goals of the RRP are to (1) achieve 100 percent vegetative cover after 5 years, encompassed by 90 percent native vegetative cover; and (2) restore vegetative cover for special-status and common wildlife species that use the area for foraging and cover.

To the maximum extent practicable, topsoil will be removed, cached, and returned to the site in accordance with successful restoration protocols. Loss of soil from runoff or erosion will be prevented by installing straw bales, straw wattles, or similar means provided they do not entangle or block salamander escape or dispersal routes. The draft and final RRPs will contain specific, quantifiable criteria to evaluate the success of the restoration. A biologist will ensure that areas subject to temporary disturbance have been adequately restored.

Potential impacts to CTS would be less than significant with implementation of the conservation and minimization measures in the USFWS Biological Opinion.

4.6.5 Vernal Pool Crustaceans

Construction of the proposed Meridian Gate could result in permanent direct impacts to vernal pool crustacean habitat. Measures to minimize impacts include the installation of fencing around vernal pool crustacean habitat during construction and implementation of stormwater BMPs (see Section 4.5.2). The fences would be installed 250 feet from the edge of pools that have reported occurrences of vernal pool crustaceans, where feasible.

Construction of the proposed Meridian Gate may result in temporary impacts to approximately 0.45 acre of suitable vernal pool crustacean habitat, including ground disturbing activities within 250 feet of reported occurrences. The Biological Opinion for this project addresses the incidental take of vernal pool crustaceans.

Restoration of vernal pool crustacean habitat that is subject to temporary ground disturbances will be accomplished by implementing the RRP (see Section 4.6.4). Potential impacts to vernal pool crustacean habitat would be less than significant with the implementation of the conservation and minimization measures in the USFWS Biological Opinion.

4.6.6 Wetlands

To the extent possible, the Proposed Action was designed to avoid wetland impacts. For example, the laydown area is placed in an area where no direct impacts to wetlands would occur. Measures to minimize impacts include the installation of temporary construction fencing around seasonal wetlands and the implementation of stormwater BMPs (see Section 4.5.2).

Grading and trenching activities associated with the runway repair may result in temporary impacts to approximately 0.446 acre of seasonal wetlands. The increased slope between the proposed runway shoulders and adjacent open areas, and the reduction of impermeable surface area, might result in changes to the hydrologic regime that could indirectly impact downgradient wetlands. The increase in slope would accelerate runoff commensurately. The reduction in impermeable surface area would allow for increased infiltration of runoff. Impacts resulting from these changes might differ between seasonal wetlands throughout the project area.

Travis AFB submitted a wetland delineation and Section 404 and Section 401 permit applications in June 2009 to USACE and the RWQCB, respectively, for impacts to wetlands. USACE issued an authorization under Nationwide Permit 12 and 33 on 4 November 2009 for compliance with Section 404 (see Appendix G). The RWQCB provided certification of the project under Section 401 on 17 December 2009, and has approved initiation of construction (see Appendix D).

The USACE 404 permit requires the purchase of 0.23 acre of wetland creation credits from a USACE-approved mitigation bank (i.e., the Elsie-Gridley Mitigation Bank) and monitoring the restored seasonal wetland for 5 years. Restoration of seasonal wetland habitats that are subject to temporary ground disturbances will be accomplished through implementation of the RRP (see Section 4.6.4).

Potential impacts to wetland resources would be less than significant with the implementation of the permit and mitigation requirements.

4.7 Socioeconomic Resources

The socioeconomic conditions of the region could be affected if implementation of either alternative resulted in 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 to socioeconomic resources. Alternative 2 would result in short-term, beneficial impacts.

4.7.1 Alternative 1 – No Action

Under the No Action alternative, there would be no effect on socioeconomic resources onbase or in Solano County because construction to repair the airfield 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 airfield. Given the 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. There would be minor, short-term economic benefits to local convenience businesses from construction workers purchasing meals, fuel, and other commodities near the Base. The impacts to socioeconomic conditions from temporary employment would be beneficial but minor compared with the Base or the county economy.

Alternative 2 would not result in a long-term change in socioeconomic conditions because operation of the repaired airfield is not anticipated to increase growth in the region.

4.8 Cultural Resources

Several laws and regulations govern cultural resources management at Travis AFB, including the following (Travis AFB, 2003b):

- National Historic Preservation Act of 1966, as amended (16 United States Code [USC] 470)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 – 3013)
- Archaeological Resources Protection Act of 1979 (16 USC 470aa – 47011)
- Cultural Resources Management (Air Force Instruction 32-7065)
- Protection of Historic Properties (36 CFR 800)
- National Register of Historic Places (36 CFR 60, 61, 63, and 68)
- Native American Graves Protection and Repatriation Act (43 CFR 10)
- Protection and Enhancement of the Cultural Environment (EO 11593)
- Accommodation of Sacred Sites (EO 13007)
- Consultation and Coordination with Indian Tribal Governments (EO 13175)

The primary statutes requiring federal agencies to protect cultural resources are the National Historic Preservation Act, EO 11593, the Archaeological and Historic Preservation Act, and the Archaeological Resources Protection Act. The Cultural Resources Manager, under the supervision of the Asset Management 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, such as runway maintenance, would continue. Therefore, no change to cultural resources are anticipated to 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 in the Proposed Action area; therefore, no impacts to any of these are anticipated with implementation of Alternative 2.

If cultural or archaeological resources are 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/CEO. 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 are discovered during construction, work would cease and the cultural resources manager would be contacted.

Adherence to the requirements of the dig permit and implementation of the contingency plan would reduce the potentially significant impacts to less than significant levels.

4.9 Land Use

This section discusses the potential effects to land use from the project alternatives. Land use at Travis AFB is described in the *General Plan for Travis Air Force Base, California* (Travis AFB, 2006).

4.9.1 Alternative 1 – No Action

Under the No Action alternative current land use designations would remain.

4.9.2 Alternative 2 – Proposed Action

According to the land use maps in the general plan, the existing and future land use designation for the Alternative 2 site is Airfield. No change in land use would be required with implementation of Alternative 2; therefore, there would be no impact to land use under Alternative 2.

Travis AFB has an easement for operation and maintenance of the lighting system. Therefore, no impact would result to land use from offbase construction.

4.10 Transportation System

The Proposed Action includes construction of a new gate, the Meridian Gate, to access the Base from the east side.

4.10.1 Alternative 1 – No Action

Under the No Action alternative, the use of the transportation system onbase and near the Base would not change. Current traffic levels and patterns on Travis AFB would continue.

4.10.2 Alternative 2 – Proposed Action

Under the Proposed Action, the airfield would be accessed from the newly constructed Meridian Gate at the east side of the Base (see Figure 2-1). Construction traffic would use Highway 12 and either proceed north on Denverton Road or Branscombe Road to Creed Road. Creed Road intersects with Meridian Road, which leads north to the new gate. The Outer Perimeter Road and construction access roads would be used to access the runway for construction.

Offbase roads east of the installation are currently used to access Peacock Gate. The roads north of Highway 12 are mostly used for access to Travis AFB and are not frequently traveled by the general public. Perimeter Road is onbase, but is not frequently used by onbase personnel. Therefore, access by construction traffic from the east side of the Base would result in a less than significant impact to transportation systems.

4.11 Airfield Operations

This section discusses the potential effects to airfield operations from the project alternatives.

4.11.1 Alternative 1 – No Action

No change in operations of the airfield would result from implementation of the No Action alternative.

4.11.2 Alternative 2 – Proposed Action

Runway 03R/21L will not be operable during repair work. Flight operations would be conducted using adjacent Runway 03L-21R. Except for the homerun duct construction (see Section 2.3.2.2), the Proposed Action would be located outside of the Taxiway Clearance Line Zone and would remain within the Clear Zone. The homerun duct would be constructed either by directional drilling, micro-tunneling, or trenching. If the homerun duct is constructed by trenching, Runway 03L-21R might need to be closed temporarily. Construction activities and timing would be coordinated with airfield management personnel to avoid and minimize potential effects on airfield operations. Using Runway 03L-21R during the repair of Runway 03R/21L and coordinating construction with airfield management personnel would reduce potential impacts to airfield operations to less than significant levels.

Implementation of Alternative 2 would upgrade the runway and airfield to meet current design standards. Compliance with these standards would improve the efficient operation of the airfield and avoid closures resulting from ponding water during storm events. The improved operation of the airfield is considered a beneficial impact.

4.12 Safety and Occupational Health

This section discusses the potential effects to safety and occupational health from implementation of either of the project alternatives.

4.12.1 Alternative 1 – No Action

Implementing the No Action alternative could affect safe operation of the runway. The runway currently does not meet design standards. It requires frequent maintenance and shut-down of flight operations during the rainy season because of stormwater pooling on the runway. Because it does not meet standards, operation of the runway is conducted under an Air Force waiver. Operation of the runway under the No Action alternative would continue the inefficiencies associated with frequent runway maintenance and could

adversely affect human health if an accident occurred as a result of operation of a runway that does not meet standards.

4.12.2 Alternative 2 – Proposed Action

Implementing Alternative 2 would require construction activities, such as grading, paving, drilling, and operation of construction equipment. 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 securing construction areas to prevent unauthorized personnel from entering the work sites. In addition, all workers would be provided with appropriate personal protective equipment including, 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. With implementation of the health and safety plan, the potential for adverse impacts to safety and occupational health are expected to be minor and limited to the duration of construction.

Implementation of Alternative 2 would upgrade the runway and airfield to meet current design standards. Compliance with these standards would reduce the risk for accidents that could affect human health and safety. The reduced risk to human health and occupational safety is considered a beneficial impact.

4.13 Environmental Management

Environmental management includes geology, soils, and pollution prevention. This section discusses the potential effects to environmental management from implementation of the project alternatives.

4.13.1 Alternative 1 – No Action

There would be no change to geology or soils or pollution prevention activities under the No Action alternative.

4.13.2 Alternative 2 – Proposed Action

Soil types in the area of the Proposed Project include Altamont-San Ysidro complex, Solano Loam, San Ysidro Sandy Loam, and Millsap Sandy Loam (Figure 4-3). No important soil resources are present in the area of Alternative 2 and therefore, impacts to soils would be less than significant. Implementation of Alternative 2 would not alter the geology of the area.

Implementation of Alternative 2 would comply with the overall objectives of the Pollution Prevention Program at Travis AFB. Implementation of Alternative 2 would produce waste in the form of construction debris, and all measures to prevent pollution would be implemented. The amount of construction debris for disposal would be reduced by rubbelizing the existing pavement and using it as a base for the new pavement. To the extent possible, all wastes generated during the construction phase and during subsequent periodic maintenance of the runway 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. Generation and management of waste is expected to meet the pollution prevention goals in the *Travis AFB Pollution Prevention Management Action Plan (P2MAP)* (Travis AFB, 2004b). Implementation of these measures would result in less than significant impacts to waste production and pollution prevention management.

4.14 Environmental Justice and Protection of Children

This section discusses the potential effects to minority populations, low-income populations, and children from implementation of the project alternatives.

4.14.1 Alternative 1 – No Action

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

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 are dangerous. However, the Proposed Action 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.

During implementation of Alternative 2, there would not be any additional traffic generated on Travis AFB. Therefore, emissions from flight operations at the runway 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 *Travis AFB Hazardous Waste Management Plan* (Travis AFB, 2005) and would not pose a disproportionate risk to minority populations.

Implementation of Alternative 2 would not affect any minority populations, low-income populations, or children.

4.15 Indirect and Cumulative Effects

4.15.1 Indirect Effects

Indirect effects are defined by the CEQ in 40 CFR 1508.8 as those "which are 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 effects of Alternative 2 have been addressed in the preceding resource-specific analyses. Implementing Alternative 2 is expected to result in less than significant indirect impacts to environmental resources. The alternatives would not result in any growth-

inducing effects, induced changes in population, or related effects. Potential impacts to health and safety would be beneficial.

4.15.2 Cumulative Effects

Cumulative effects are defined by the CEQ in 40 CFR 1508.7 as "impacts on the environment that 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 nonfederal) or person undertakes such other actions."

Projects considered for cumulative impacts in this EA are those that were recently completed, ongoing projects, or projects planned to begin within the next 2 years. Projects that are under consideration by the Base that would occur beyond 2 years are too uncertain to be evaluated. The following list (organized by year) includes recently completed or foreseeable future actions that could occur at Travis AFB:

- **Fiscal Year 2008**
  - Repair 500 Ramp Spot 513
  - Demolish skating rink (Building 869)
  - Repair Collins Drive
  - Repave parking lots at Building 804
  - Repair/replace 600 Ramp Spot 605 pull-through
  - Repair/replace 600 Ramp Spot 606
  - Repair access to Building 1365
  - Repair grounds contractor access road
  - Demolish surplus housing units (107 units)
  - Repair David Grant Medical Center parking lots at Building 777 PH2
  - Global Support Squadron
- **Fiscal Year 2009**
  - Construct C-17 Southwest Landing Zone (LZ)
  - Repair 600 Ramp Spot 603
  - Construct South Gate
  - Repair 600 Ramp Spot 604
  - Repair 500 Ramp Spot 514
  - C-17 Repair 300 Ramp PH9
  - C-17 Repair 300 Ramp PH10
  - Demolish Buildings 405, 707, 755, 756, 828, 1032, 1201, 1325, 1202, and 1333
  - Demolish skating rink
  - Demolish trailer east of Building 1026
- **Fiscal Year 2010**
  - Construct a large fire/crash station
  - KC-10 cargo load trainer
  - Repair Ramp Spot 515
  - C-17 Repair 300 Ramp PH11

  - C-5 Repair Ramp PH12
  - Replace bulk fuel transfer lines

- **Fiscal Year 2011**

  - Construct Taxiway M Bypass Road
  - Base Civil Engineer maintenance shops
  - C-17/C-5 Squad Operations/AGS training facility

Cumulative impacts could result from the construction of new facilities, such as the C-17 landing zone (LZ), the South Gate, or the Bypass Road, as well as permanent impacts resulting from construction activities. Travis AFB plans to conduct construction for the runway repair concurrently with the C-17 Southwest LZ project. Travis AFB proposes to construct an LZ to the south and directly adjacent to Runway 03R/21L. The LZ would be a permanent, 3,500-foot-long by 90-foot-wide airfield that would support missions involving the C-17 aircraft. The LZ project has been evaluated under NEPA in the *Environmental Assessment Permanent Western United States C-17 Landing Zone* (Department of the Air Force, 2008).

The potential for cumulative impacts to air quality would be from multiple construction projects occurring simultaneously. The potential impacts to air quality from construction are discussed in Sections 3.2 and 4.2. Not all of the projects listed above would be constructed simultaneously. The Proposed Action would conform to the SIP and not be regionally significant. After construction is complete, the Proposed Action would not contribute to long-term cumulative impacts to air quality because an increase in neither flight operations nor traffic would occur.

Construction of the projects could result in unavoidable, permanent impacts to protected biological resources. These impacts require agency approval and implementation of permit requirements, including conservation and minimization measures such as enhancing or restoring habitats or participating in mitigation banks. Several projects, including the Proposed Action, the LZ project, the Taxiway M project, and the South Gate project, would result in impacts to protected species, such as CTS and vernal pool branchiopods, and wetlands. Travis AFB has either already obtained necessary permits authorizing construction or is in the process of applying for them. With implementation of permit requirements and associated mitigation requirements, the permanent impacts to biological resources would not be cumulatively significant.

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 airfield under the Proposed Action. Adverse impacts resulting from construction of the airfield are anticipated to be minor and short in duration. There would be no significant adverse impacts to 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 repair Runway 03R/21L and airfield facilities. Repair of the airfield would reduce the potential safety hazards associated with deterioration of the existing runway. In addition, the airfield would comply with AFH 32-1084 and UFC 3-260-01 regulations for airfield and lighting systems. Long-term productivity would be enhanced by implementing Alternative 2 because the frequency of maintenance, and the associated use of materials and resources, would be reduced.

4.18 Irreversible and Irretrievable Commitment of Resources

There are no anticipated irreversible or irretrievable commitments of resources that would occur with implementation of the Proposed Action because operation of the airfield would not require additional natural gas or electrical consumption from existing levels.

4.19 Special Procedures

To reduce environmental impacts, the Air Force would implement the following BMPs and obtain necessary permits. Following is a list of BMPs and permits:

- A permit might be required for operation of the batch plant before construction can commence. Coordination with BAAQMD is required to determine whether the plant is exempt from permit requirements because it is in compliance with all the applicable requirements in the Statewide Portable Equipment Registration Program (CCR Title 13, Division 3, Chapter 3, Article 5).
- A dig permit (60 AMW Form 55) would be obtained prior to construction to avoid impacts to areas that should be avoided during construction, e.g., ERP sites, utility lines, and known cultural resources.
- The BRPM would be consulted prior to construction at any ERP sites. Additionally, a waiver will be obtained to construct on ERP sites. A contingency plan will be prepared in case soil discoloration or hydrocarbon vapors are detected or groundwater is encountered during construction.
- Construction and operation activities would comply with the *Travis AFB Industrial Activities Storm Water Discharge Permit* (Travis AFB 2002), the construction SWPPP, and the erosion control and restoration plan. BMPs would be employed during construction activities to minimize soil movement, stabilize runoff and generally control sedimentation. These BMPs would be described in the project-specific SWPPP and the erosion control and restoration plan. BMPs would include regular, documented site inspections, the use of silt fences, minimization of earth-moving activities during wet weather, and revegetation of disturbed areas.
- Measures to avoid impacts to western burrowing owls would include preconstruction surveys, passive relocation of birds in the vicinity of the Proposed Action area, and installation of artificial burrows.

- In accordance with the requirements in the Biological Opinion (see Appendix F) and the USACE Nationwide Permit 12 and 33 (see Appendix G) issued for the Proposed Action, compensation for permanent impacts to CTS, vernal pool tadpole shrimp, and wetlands will include (1) protection of 212.55 acres of CTS upland habitat by the purchase of CTS mitigation credits at a USFWS-approved mitigation bank or the purchase of a conservation easement, or a combination of both and (2) purchase of 0.23 acre of wetland creation credits at a USACE-approved mitigation bank (i.e., the Elsie-Gridley Mitigation Bank). Also, in accordance with the requirements of the Biological Opinion, the Air Force will prepare and implement a RRP, which will be submitted to USFWS for approval before groundbreaking activities may commence.
- Measures to minimize indirect impacts to wetlands include the installation of construction fencing around seasonal wetlands and the implementation of stormwater BMPs.
- All activities would take place in compliance with the *Integrated Cultural Resources Management Plan* (Travis AFB, 2003b). If human remains or archeological or cultural artifacts are discovered during construction, work would cease and the cultural resources manager would be contacted
- Construction activities and timing would be coordinated with airfield management personnel to avoid and minimize potential effects on airfield operations.
- A Health and Safety Plan for construction would be prepared and implemented. The plan would include, for example, requirements for wearing appropriate personal protective equipment.
- Construction and operation activities will comply with the overall objectives for waste minimization of the Travis AFB Pollution Prevention Program (Travis AFB, 2004b).
- To the extent possible, all waste generated during construction and maintenance will be removed from the site and recycled. If recycling is not possible, the waste will be disposed of in accordance with all applicable regulations and policies.
- Hazardous waste produced during construction will be managed and disposed of in accordance with applicable regulations and the *Travis AFB Hazardous Waste Management Plan (*Travis AFB, 2004c).

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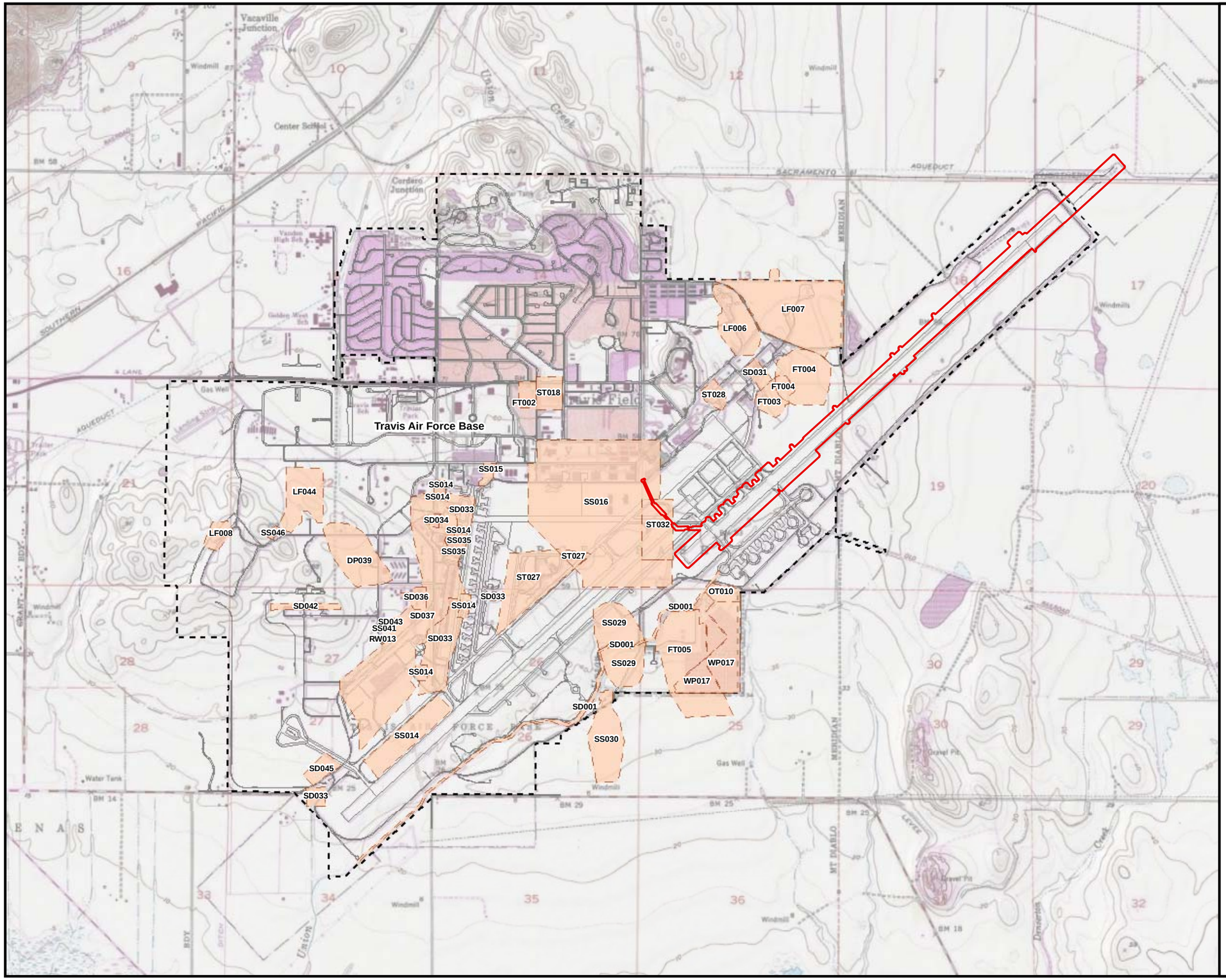

LEGEND

- PROPOSED ACTION AREA
- TRAVIS AIR FORCE BASE BOUNDARY
- RESTORATION SITES

0 2,500 5,000 FEET

N

FIGURE 4-1
ENVIRONMENTAL RESTORATION PROGRAM SITES AND GROUNDWATER CONTAMINATION
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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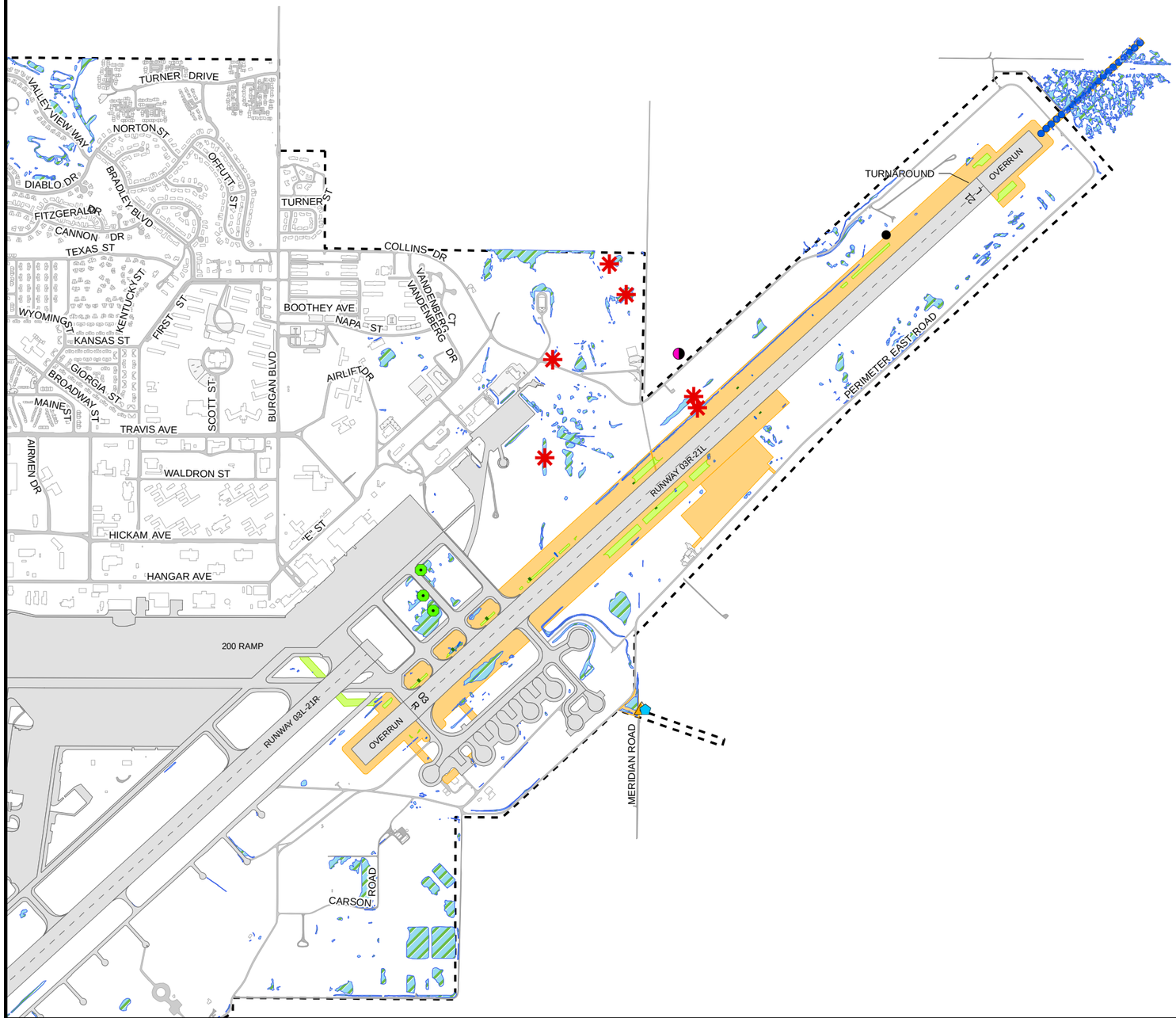

LEGEND

- California tiger salamander *(Ambystoma californiense)*
- Brittlescale *(Atriplex depressa)*
- Vernal pool fairy shrimp *(Branchinecta lynchi)*
- Vernal pool tadpole shrimp *(Lepidurus packardi)*
- Burrowing owl *(Athene cunicularia)*
- APPROACH LIGHT
- PROPOSED E-WINDCONE
- PROPOSED UNDERDRAIN
- PROPOSED UTILITY
- AREAS WITH PERMANENT IMPACTS TO CTS
- AREAS WITH TEMPORARY IMPACTS TO CTS
- AIRFIELD
- WETLANDS
- INSTALLATION BOUNDARY
- RUNWAY CENTERLINE

NOTE:
CTS = California tiger salamander *(Ambystoma californiense)*

N

0 1,700 3,400 FEET

FIGURE 4-2
IMPACTS TO BIOLOGICAL RESOURCES
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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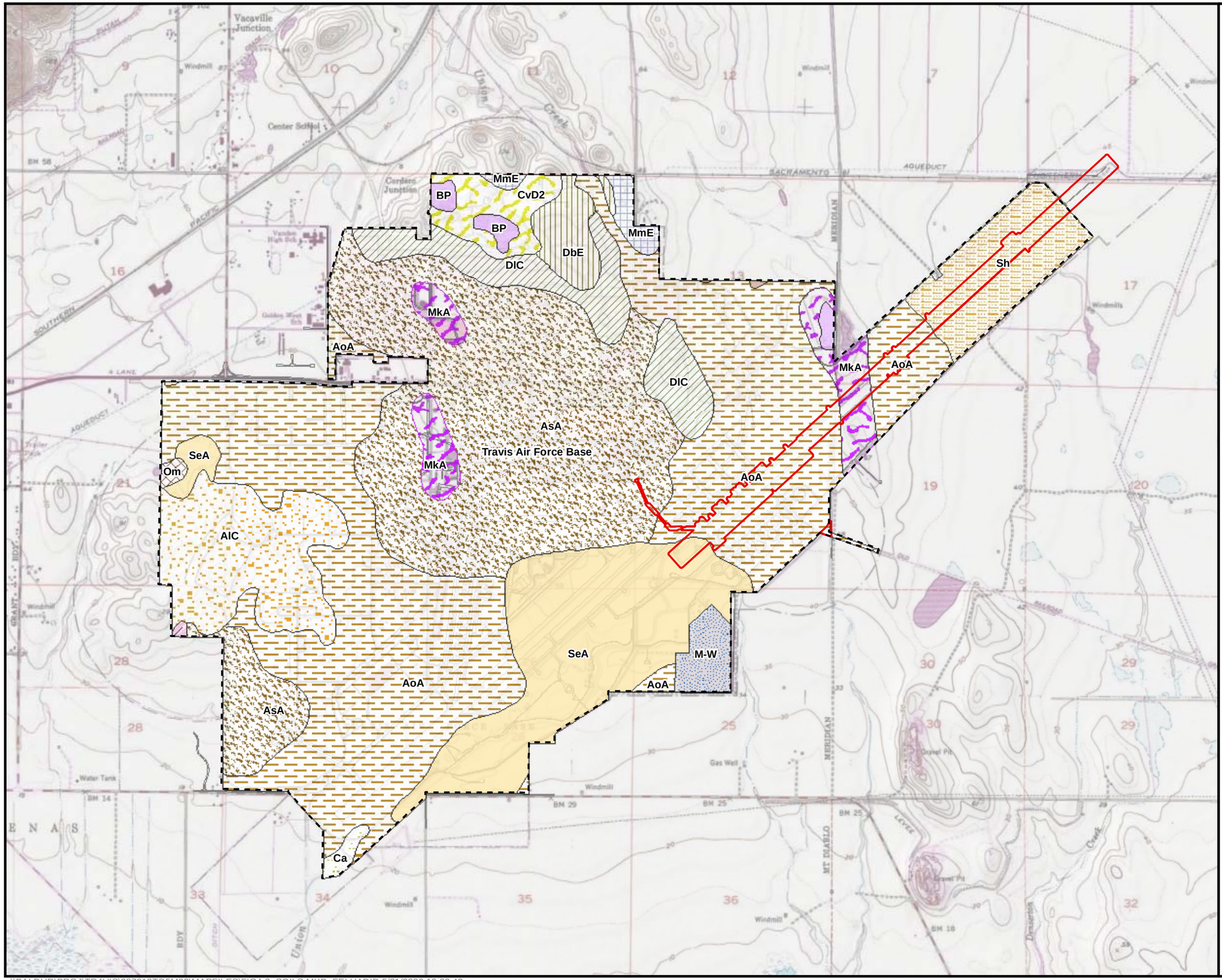

LEGEND

- PROPOSED ACTION AREA
- TRAVIS AIR FORCE BASE BOUNDARY
- ALC: ALTAMONT-SAN YSIDRO-SAN BENITO COMPLEX
- AOA: ANTIOCH-SAN YSIDRO COMPLEX
- ASA: ANTIOCH-SAN YSIDRO COMPLEX, THICK SURFACE
- BP: BORROW PIT
- CA: CAPAY SILTY CLAY LOAM
- CEA: CLEAR LAKE CLAY
- CVD2: CORNING GRAVELLY LOAM
- DBE: DIBBLE-LOS OSOS LOAMS
- DLC: DIBBLE-LOS OSOS CLAY LOAMS
- M-W: MISCELLANEOUS WATER
- MKA: MILLSAP SANDY LOAM
- MME: MILLSAP LOAM
- OM: OMNI CLAY LOAM
- PC: PESCADERO CLAY LOAM
- SEA: SAN YSIDRO SANDY LOAM
- SH: SOLANO LOAM

0 2,500 5,000 FEET

N

FIGURE 4-3
SOIL TYPES
ENVIRONMENTAL ASSESSMENT FOR REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, FAIRFIELD, CALIFORNIA

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SECTION 5

List of Preparers

TABLE 5-1
List of Preparers
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L
Travis Air Force Base, Fairfield, California

Name	Education	Experience	Role
Marjorie Eisert	B.S., Wildlife and Fisheries Biology	19 years	Project Manager
Karin Lilienbecker	M.S., Biology	16 years	Senior Consultant
Michael Clary	B.S., Biology and Zoology	14 years	Ecologist
Jeremy Thomas	M.L.A., Environmental Planning	12 years	Hydrologist
Julie Petersen	B.S., Biology	7 years	Environmental Scientist
Hong Zhuang	M.S., Environmental Science and Engineering	9 years	Air Quality Engineer
John Deaton	B.S., Natural Resources Management	6 years	Technical Publications Specialist

SECTION 6

List of Agencies and People Consulted and/or Provided Copies

The following people were consulted during preparation of this EA:

- David Musselwhite, 60 CES/CEA
- Rodolfo Pontemayor, 60 CES/CEAO
- LCDR Jason Zeda, ROICC
- Steve Fleshman, 60 CES/CEPM
- Dennis Chen, CES/CEPM
- TSgt Richard Berry, Airfield Management
- Phil Pedersen, ROICC
- Paul Salecina, CES/CEPM2

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. Army Corps of Engineers
  Attn: Jane Hicks
  San Francisco District
  1455 Market Street
  San Francisco, California 94103-1398

- **U.S. Air Force**

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

  Regional Water Quality Control Board
  San Francisco Bay Region
  Attn: Jolanta Uchman
  1515 Clay Street
  Oakland, California 94612

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

  State of California Clearinghouse
  Governor's Office
  1400 Tenth Street
  Room 121
  Sacramento, California 95814

- **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

SECTION 7

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Appendix A
Air Force Form 1391

1. COMPONENT	FY 2008 PROJECT DATA	2. DATE
AIR FORCE	(computer generated)	

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
TRAVIS AIR FORCE BASE, CALIFORNIA	REPAIR AIRFIELD PAVEMENTS/LIGHTING, RUNWAY 03R/21L

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
41976	111-111	XDAT051059	EEIC MULTI [redacted]

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
PRIMARY FACILITIES				[redacted]
NEW TRAFFIC-D ASPHALT PAVEMENT	SM	54,500	[redacted]	([redacted])
CONCRETE PAVEMENT	SM	105,850	[redacted]	([redacted])
NEW SHOULDER	SM	51,100	[redacted]	([redacted])
STRIPING/GROOVING	LS			([redacted])
SUPPORTING FACILITIES				[redacted]
TOUCHDOWN ZONE LIGHTS	M	938	[redacted]	([redacted])
TW TURNOUT LIGHTS	M	1,200	[redacted]	([redacted])
COMM LINE	M	2,000	[redacted]	([redacted])
RW EDGE	M	6,250	[redacted]	([redacted])
RW CENTERLINE LIGHTS	M	3,125	[redacted]	([redacted])
APPROACH/THRESHOLD LIGHTS	M	938	[redacted]	([redacted])
ALZ LIGHTING CONTROLS	M	156	[redacted]	([redacted])
DRAINAGE	M	2,250	[redacted]	[redacted]
OVERRUN REPLACEMENT	SM	27,900	[redacted]	([redacted])
DEMOLITION	SM	306,552	[redacted]	([redacted])
SUBTOTAL				[redacted]
SUPERVISION, INSPECTION, AND OVERHEAD ([redacted])				
PROFIT AND OVERHEAD ([redacted])				
TOTAL FUNDED COST				[redacted]
UNFUNDED COST [redacted]				
TOTAL REQUEST				[redacted]

10. Description of Proposed Work: Repair by replacing Runway 03R-21L pavements and lighting. Demolish and replace existing Portland Cement Concrete (PCC) keel, groove runway pavement to improve skid resistance, repaint runway markings; repair by replacing touchdown zone, edge, threshold, approach, taxiway turnout, and centerline lights; repair by replacing communications cables/lines; repair drainage system.

11. Requirement: 211450 SM Adequate: 0 SM Substandard: 211450 SM

PROJECT: Repair Runway 03R-21L pavements, airfield lighting, fiber optic communication lines, markers, and drainage systems by replacing.

REQUIREMENT: Runway 03R/21L supports multiple military and civilian large frame aircraft including, but not limited to, the C-5, C-17, KC-10, 747, etc. This is the base's only precision instrument approach runway and is critical in meeting Department of Defense (DOD) readiness requirements. Demolish and remove existing excess PCC pavements. Repair runway shoulders. Repair by replacing the PCC runway keel. Groove entire runway to improve skid resistance. Re-stripe runway upon completion of repairs. Repair drainage to eliminate standing water on runway surface. Repair existing lighting systems to meet AFI 13-217 Airfield Marking Pattern 1 (Night) guidelines. Replacement approach lighting shall be Approach Light System with Sequenced Flashing Lights (ALFS-II).

1. COMPONENT	FY 2008 PROJECT DATA	2. DATE
AIR FORCE	(computer generated)	

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
TRAVIS AIR FORCE BASE, CALIFORNIA	REPAIR AIRFIELD PAVEMENTS/LIGHTING, RUNWAY 03R/21L

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
41976	111-111	XDAT051059	EEIC MULTI [redacted]

CURRENT SITUATION: The existing pavements and lighting are approximately 50 years old and have exceeded their expected useful lives. The PCC slabs in the existing runway keel are suffering from longitudinal and transverse cracking through the full depth in several areas of the pavement, indicating overloaded pavements. The longitudinal and transverse cracks generate Foreign Object Debris (FOD) from spalls that develop along the length of the cracks. The overall Pavement Condition Index (PCI) value for airfield pavements at Travis AFB is 70 - a PCI value of between 56 and 70 equates to a degraded rating. The overall PCI is based on an airfield survey assessment performed in May 2003. A FY2000 Airfield Pavement Condition Survey identified several areas as having medium foreign object debris (FOD) potential from cracking and spalling. The runway does not meet airfield geometric criteria set forth in UFC 3-260-01. Existing pavements are approximately 300' wide - however, the runway is striped to meet current 150' width standards. Shoulder areas adjacent to the 21L departure end receive constant erosion from jet engine blast during aircraft turning maneuvers. The existing runway edge lights are not 10' off the edge of the pavement per Uniform Facility Criteria (UFC) -1 guidance. Runway approach lighting does not meet current recommended lighting criteria. Poor drainage on the runway results in annual flooding causing unscheduled runway closures.

IMPACT IF NOT PROVIDED: Deterioration of the existing pavements will continue to the point that keeping up with routine maintenance will be difficult. Shoulder areas adjacent to the 21L departure end will continue to erode from jet engine blast. Runway approach, edge, taxiway, threshold, and centerline lighting will not meet current recommended criteria and current airfield operating waivers will remain in place for flying operations. As pavements continue to age and failures occur, the potential of human injury and aircraft damage increase. Poor drainage on the runway will continue to result in annual flooding on the runway, requiring unanticipated closures during annual rain seasons.

ADDITIONAL: The repair cost of [redacted] is [redacted] of runway/taxiway pavements and airfield lighting PRV. This project will permanently demolish 102,184SM from the width of the runway. This project meets the criteria/scope specified in AFH 32-1084, "Civil Engineering Facility Requirements" and UFC-3-260-01, "Airfield Heliport Planning and Design." An analysis of reasonable options for accomplishing this project (status quo, renovation, upgrade/removal, new construction, leasing) was completed. It indicates that repair by replacement is the most cost effective method of meeting operational mission requirements. The design has been reviewed by AMC Pavements and Airfield Lighting Engineers as well as the Army Corps of Engineers Pavements Center of Expertise. While the 03R/21L is closed for repairs, flying operations will continue on parallel runway 03L/21R. All work will be coordinated and scheduled in advance with the Wing, Operations Group, and HQ AMC.

JOINT USE CERTIFICATION: This facility can be used by other components on an "as available" basis; however, the scope of the project is based on Air Force requirements.

JOHN I. SCHOPF, YF-03
Deputy Base Civil Engineer

I have reviewed this document and certify it is complete and accurate. I have validated the project's primary and supporting costs and work classification. It

1. COMPONENT	FY 2008 PROJECT DATA	2. DATE
AIR FORCE	(computer generated)	

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
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5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
41976	111-111	XDAT051059	EEIC MULTI [redacted]

has been fully coordinated with the user and other appropriate agencies and approved by the Installation Commander.

EFREN V. M. GARCIA, Colonel, USAF
Chief, Plans and Programs Division
Directorate of Installations & Mission Support

Appendix B
Construction Emission Calculations

APPENDIX B

Air Emission Calculations

B.1 Onsite Construction Equipment and Fugitive Dust Emissions

The offroad construction equipment and vehicle emissions of nitrogen oxides ($NO_{x)}$, sulfur dioxides ($SO_{2)}$, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), carbon monoxide (CO), and volatile organic compounds (VOC) were estimated using CARB's URBEMIS2007 model (URBEMIS, 2007) based on the acreage of the construction area, projected construction duration, and estimated hours of construction equipment operations. Construction of the project would take approximately 18 months, and will disturb about 190 acres of area. The total duration of the project will take approximately 18 months, with majority of the construction in 2010. Default settings in URBEMIS2007 were used when project specific data were not available. Fugitive dust emissions from grading were estimated based on a 10 lb/acre default emissions factor for PM_{10}. $PM_{2.5}$ emissions were calculated assuming the $PM_{2.5}$ to PM_{10} fraction is 0.212 (SCAQMD, 2006). Fugitive dust emissions from demolition used the URBEMIS2007 default emission factor of 0.00042 lb per cubic foot of volume demolished. Other settings used in URBEMIS are:

For runway demolition:

- Demolition volume: 7,800,800 cubic feet (89.5 acres, 2 feet deep)
- Three Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day
- Two Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

For site grading:

- Total Acres disturbed: 190 acres
- Maximum daily disturbed area: 10 acres
- One grader (174 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
- Two 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 acres to be paved: 60 acres
- 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
- Two roller (95 hp) operating at 56 percent load for 7 hours/day

A summary of the emissions from onsite construction equipment and fugitive dusts are shown in Table B-1. Detailed assumptions and URBEMIS outputs are provided in Attachment 1.

TABLE B-1
Estimated Alternative 2 Onsite Construction Equipment and Fugitive Dust Emissions
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

	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 - demolition	0.18	0.84	1.49	0.00	0.07	0.07	132.24
Equipment Exhaust - grading	0.41	1.72	3.31	0.00	0.18	0.16	296.24
Equipment Exhaust - paving	0.29	0.97	1.82	0.00	0.15	0.14	144.69
Fugitive Dust	-	-	-	-	11.49	2.41	-

Notes:

Emission data estimated using URBEMIS2007.

ton/yr = ton or tons per year

B.1.1 Onroad Vehicle Emissions

Emissions associated with worker commutes were estimated by using the expected number of vehicle miles traveled by the workers. It was assumed that there will be 50 workers with a round trip commute distance of 40 miles during the construction period.

Vehicle emissions from onroad delivery trucks and other vehicles were calculated based on the expected daily VMTs for these vehicles. The majority of the delivery truck travel will occur during concrete production for material delivery. To be conservative, it was assumed that the 8 months of concrete production will occur entirely in 2010.

Vehicle emission factors for workers commute and delivery trucks were calculated by using EMFAC2007 (CARB, 2007) for BAAQMD for the year 2010. The average vehicle speeds were assumed to be 15 mph onsite and 45 mph offsite. Passenger vehicle and heavy-duty vehicle emission factors were used for emission calculations for workers commute and delivery trucks, respectively.

The EMFAC2007 emission factors and the annual emissions for vehicle travel are shown in Table B-2.

TABLE B-2
Estimated Alternative 2 Vehicle Emissions
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

		Emission factor (lb/mile)						
Emission Source		**VOC**	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Passenger car	lb/mile	0.00014	0.0046	0.00051	0.000007	0.000062	0.000029	0.635
Haul Trucks (onsite)	lb/mile	0.00608	0.0194	0.04243	0.000055	0.002443	0.002165	5.723
Haul Trucks (Offsite)	lb/mile	0.00140	0.0070	0.03162	0.000035	0.001122	0.000950	3.750

TABLE B-2
Estimated Alternative 2 Vehicle Emissions
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

		Emissions (ton/year)						
Emission Source	**VMT/yr**	**VOC**	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Worker Commute to Site	520,000	0.04	1.21	0.13	0.00	0.02	0.01	165
Delivery Trucks (onsite)	52,000	0.16	0.50	1.10	0.00	0.06	0.06	149
Delivery Trucks (Offsite)	2,634,667	1.84	9.20	41.65	0.05	1.48	1.25	4940

Note:
Emission factors estimated using EMFAC2007 for BAAQMD for 2010.

B.1.2 Re-entrained Fugitive Dust from Unpaved Roads

Emissions from vehicle re-entrained dust from unpaved roads were calculated following the methodology in EPA's *Compilation of Air Pollutant Emission Factors* (AP-42), along with the default calculation parameters provided in BAAQMD Permit Handbook (Handbook) (BAAQMD, 2009):

EF = k [(s/12)^a] [(W/3)^b] [(365-K)/365]

Where:
EF = Emission Factor (lb/VMT)
k = Particle size multiplier (dimensionless); k = 1.5 for PM10; k = 0.15 for PM2.5
a = Empirical Constants; a = 0.9
b = Empirical Constants; b = 0.45
s = Silt content of road surface (%);
W = Mean vehicle weight (tons);
P = Number of days with greater than, or equal to, 0.01 inches of precipitation per year;

Silt content was obtained from EPA AP-42 Table 13.2.2-1. The value of scraper routes of construction sites was used.

According to the Handbook, the average vehicle weight (W) of 146 tons, and the number of days with 0.01 inches or more precipitation per year (P) of 70 were used in the calculation. A control efficiency of 50 percent applied to the onsite-unpaved road emissions, assuming the road will be watered at least twice a day. The calculated emission factors and PM emissions are presented in Table B-3:

TABLE B-3
Estimated Alternative 2 Fugitive Dust from Unpaved Roads
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

	Emission factor (lb/VMT)	Onsite VMT per year	Offsite VMT per year	Emissions (ton/year)
PM_{10}	5.11	52000	78000	105.4
$PM_{2.5}$	0.51	52000	78000	10.5

B.1.3 Concrete Batch Plants

Dust emissions from concrete batch plants were estimated using the methodology from the Handbook. Uncontrolled emission factors of raw material processing were obtained from the Handbook and converted to pounds per cubic yard of concrete produced using the default concrete composition in the Handbook. A control efficiency of 70% for watering the site was used in calculating the controlled emission factors. Annual emissions were calculated assuming the concrete batch plant will operate for 8 months in 2010. Table B-4 presents the emission factor conversions and the derived PM_{10} emission factor. PM_{10} emissions from concrete batching are calculated in Table B-5. $PM_{2.5}$ was assumed to be the same as the PM_{10} emissions from the batch plant.

TABLE B-4
Estimated Alternative 2 Fugitive Dust Emission Factors of Concrete Batching
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

Process	Uncontrolled Emission Factor (lb/ton material processed)	Controlled Emission Factor (lb/ton material processed)	Controlled Emission Factor (lb/yard^3 concrete Produced)
Aggregate delivery to ground storage	0.0033	0.00231	0.00215
Sand delivery to ground storage	0.00099	0.000693	0.00049
Aggregate transfer to conveyors	0.0033	0.00231	0.00215
Sand transfer to conveyor	0.00099	0.000693	0.00049
Aggregate transfer to elevated storage	0.0033	0.00231	0.00215
Sand transfer to elevated storage	0.00099	0.000693	0.00049
Cement delivery to Silo (controlled)	-	0.00034	0.00008
Cement supplement delivery to silo (controlled)	-	0.0049	0.00018
Weigh hopper loading	0.0024	0.00168	0.00277
Central Mix loading (controlled)	-	0.0048	0.00135
PM_{10} Emissions from Concrete Batching (with 70 percent control by watering)			**0.01233**

TABLE B-5
Estimated Alternative 2 Fugitive Dust Emissions from Concrete Batching
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

Quantity of Concrete Produced (total cubic yards)	100000
Emission factor of concrete batching (lb/yard^3)	0.01233
PM_{10} Emissions (tpy)	**0.616**

Emission factor of PM_{10} for storage piles at concrete batch plants is assumed to be 1.7 lb per acre per day, according to the Handbook. The emission factor includes emissions from loading into storage piles, equipment traffic in storage pile area, and wind erosion. The stockpile area is assumed to be 2 acres at any time at the batch plant site. A summary of PM_{10} emissions from stock pile is provided in Table B-6:

TABLE B-6
Estimated Alternative 2 Fugitive Dust Emissions from Concrete Batch Plant Stock Piles
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

Emission Factor of Storage Piles (lb/acre/day)	1.7
Area of Storage Piles (acres)	2
PM_{10} Emissions from Storage Piles (lb/day)	3.4
PM_{10} Emissions from Storage Piles ton/year)	0.29

B.1.4 Total Construction Emissions

Table B-7 presents the total of the construction emissions:

TABLE B-7
Estimated Alternative 2 Total Construction Emissions
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Air Emission Calculation

Emission Source	VOC (ton/yr)	CO (ton/yr)	NOx (ton/yr)	SO_2 (ton/yr)	PM_{10} (ton/yr)	$PM_{2.5}$ (ton/yr)	CO_2 (ton/yr)
Equipment Exhaust	0.88	3.53	6.62	0.00	0.40	0.37	573
Delivery Trucks Exhaust	2.00	9.70	42.75	0.05	1.54	1.31	5089
Worker Commute	0.04	1.21	0.13	0.00	0.016	0.01	165
Fugitive Dust - construction site	-	-	-	-	11.49	2.41	-
Fugitive Dust - vehicle travel	-	-	-	-	105.38	10.54	-
Fugitive Dust - batch plant	-	-	-	-	0.91	0.91	-
Total	2.9	14.4	49.5	0.05	119.7	15.5	5827

Note:
– = not applicable

B.1.5 Operation Emissions

Operation emissions from Alternative 2 would be generated by aircraft and supporting vehicles using the runway. Operation of the aircraft and other vehicle activities will not change after the project construction. Therefore, operation emissions would not increase compared to current conditions.

B.2 Works Cited

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Attachment 1
URBEMIS Outputs

5/6/2009 12:29:44 PM

Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Documents and Settings\hzhuang\Application Data\Urbemis\Version9a\Projects\Travis runway.urb924

Project Name: Travis Runway

Project Location: Bay Area Air District

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

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2010 TOTALS (tons/year unmitigated)	0.93	6.64	3.84	0.00	11.46	0.40	11.87	2.39	0.37	2.76	600.94
2011 TOTALS (tons/year unmitigated)	0.49	3.32	1.96	0.00	6.45	0.22	6.67	1.35	0.20	1.55	317.08

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

2010	0.93	6.64	3.84	0.00	11.46	0.40	11.87	2.39	0.37	2.76	600.94
Demolition 01/01/2010-03/31/2010	0.18	1.49	0.89	0.00	1.61	0.07	1.68	0.34	0.07	0.40	136.31
Fugitive Dust	0.00	0.00	0.00	0.00	70.98	0.00	70.98	14.76	0.00	14.76	0.00
Demo Off Road Diesel	0.18	1.49	0.84	0.00	0.00	0.07	0.07	0.00	0.07	0.07	132.24
Demo 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
Demo Worker Trips	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.08
Fine Grading 04/01/2010-06/30/2011	0.41	3.32	1.86	0.00	9.85	0.18	10.03	2.06	0.16	2.22	308.78
Fine Grading Dust	0.00	0.00	0.00	0.00	9.85	0.00	9.85	2.06	0.00	2.06	0.00
Fine Grading Off Road Diesel	0.41	3.32	1.72	0.00	0.00	0.18	0.18	0.00	0.16	0.16	296.24
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	0.01	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.55
Asphalt 05/01/2010-06/30/2011	0.34	1.83	1.09	0.00	0.00	0.15	0.15	0.00	0.14	0.14	155.84
Paving Off-Gas	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.28	1.68	0.92	0.00	0.00	0.15	0.15	0.00	0.14	0.14	124.15
Paving On Road Diesel	0.01	0.14	0.05	0.00	0.00	0.01	0.01	0.00	0.00	0.01	20.54
Paving Worker Trips	0.00	0.01	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.15

2011	0.49	3.32	1.96	0.00	6.45	0.22	6.67	1.35	0.20	1.55	317.08
Asphalt 05/01/2010-06/30/2011	0.24	1.28	0.78	0.00	0.00	0.11	0.11	0.00	0.10	0.10	114.88
Paving Off-Gas	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	0.19	1.18	0.67	0.00	0.00	0.10	0.10	0.00	0.10	0.10	91.51
Paving On Road Diesel	0.01	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.14
Paving Worker Trips	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.22
Fine Grading 04/01/2010-06/30/2011	0.25	2.04	1.17	0.00	6.45	0.11	6.56	1.35	0.10	1.45	202.20
Fine Grading Dust	0.00	0.00	0.00	0.00	6.45	0.00	6.45	1.35	0.00	1.35	0.00
Fine Grading Off Road Diesel	0.25	2.04	1.09	0.00	0.00	0.11	0.11	0.00	0.10	0.10	193.98
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	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.22

Phase Assumptions

Phase: Demolition 1/1/2010 - 3/31/2010 - Default demolition

Building Volume Total (cubic feet): 0

Building Volume Daily (cubic feet): 0

On Road Truck Travel (VMT): 0

Off-Road Equipment:

3 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

2 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

Phase: Fine Grading 4/1/2010 - 6/30/2011 - Default Fine Site Grading Description

Total Acres Disturbed: 190

Maximum Daily Acreage Disturbed: 10

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 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 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 5/1/2010 - 6/30/2011 - Default Paving Description

Acres to be Paved: 60

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day

Appendix C
Clean Air Act Conformity Applicability Analysis

APPENDIX C

Clean Air Act Conformity Applicability Analysis

C.1 Purpose

The U.S. Air Force is required to perform a general conformity applicability analysis to determine whether the Repair of Airfield and Lighting, Runway 03R-21L Project at Travis Air Force Base, 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).

C.2 Background

EPA has issued regulations addressing the applicability and procedures for ensuring that federal activities comply with the amended CAA. The EPA Final Conformity Rule implements Section 176(c) of the CAA, as amended in 42 U.S.C. 7506(c). This rule was published in the *Federal Register* on November 30, 1993, and took effect on January 31, 1994.

The EPA Final Conformity Rule requires all federal agencies to ensure that any federal action resulting in nonattainment or maintenance criteria pollutant emissions conforms 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 ensuring that 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 current General Conformity Rule applies only to federal actions in NAAQS nonattainment or maintenance areas.

C.3 Summary of Air Pollutant Emissions and Regulatory Standards

The proposed project would be implemented in Solano County, California, under the jurisdiction of CARB, the Bay Area Air Quality Management District (BAAQMD), and EPA Region 9. The area is designated as nonattainment (marginal) for 8-hour O_3. In addition, the urbanized areas of Solano County, which include the area occupied by Travis AFB, are maintenance areas for carbon monoxide (CO) 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 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 O_3 precursors (volatile organic

compounds [VOCs] and nitrogen oxides [NO_x]), be considered in determining conformity. The rule does not apply to actions where the total direct and indirect emission of non-attainment and maintenance criteria pollutants do not exceed threshold levels for criteria pollutants established in 40 CFR 93.153(b). Consequently, the applicable *de minimis* levels for the proposed project are 100 tons per year (tpy) for emissions of ozone (O_3) precursors (VOCs and NO_x), and 100 tpy for emissions of CO. Tables C-1 and C-2 present the *de minimis* threshold levels of nonattainment and maintenance areas, respectively.

TABLE C-1
De Minimis Thresholds in Nonattainment Areas
Environmental Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Clean Air Act Conformity Applicability Analysis

Pollutant	Degree of Nonattainment	*De Minimis* Threshold[a]
O_3 (VOCs and NO_X)	Serious	50
	Severe	25
	Extreme	10
	Other ozone – outside an O_3 transport region	**100**
O_3 (VOCs)	Marginal and moderate – inside an O_3 transport region:	50
O_3 (NO_X)	Marginal and moderate – inside an O_3 transport region:	100
CO	All	100
PM_{10}	Moderate	100
	Serious	70
PM2.5	Direct emissions	100
	NOx	100
	SO_2	100
	VOC or ammonia	100
SO_2 or NO_2	All	100
Pb	All	25

[a] *De minimis* thresholds are listed in tons per year. The bold number reflects *de minimis* threshold used in this analysis.

Source: 40 CFR 93.153(b)

TABLE C-2
De Minimis Thresholds in Maintenance Areas
Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Clean Air Act Conformity Applicability Analysis

Pollutant	Maintenance Area	*De Minimis* Threshold[a]
O_3 (NO_X)	All	100
O_3 (VOCs)	Inside an O_3 transport region	50
	Outside an O_3 transport region	100
CO	All	**100**
PM_{10}	All	100
PM2.5	Direct emissions	100
	NOx	100
	SO_2	100

TABLE C-2
De Minimis Thresholds in Maintenance Areas
Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Clean Air Act Conformity Applicability Analysis

Pollutant	Maintenance Area	*De Minimis* Threshold[a]
	VOC or ammonia	100
SO_2 or NO_2	All	100
Pb	All	25

[a] *De minimis* thresholds are listed in tons per year. The bold number reflects *de minimis* threshold used in this analysis.

Source: 40 CFR 93.153(b)

In addition to meeting *de minimis* requirements, a federal action must not be considered a regionally significant action. A federal action is considered regionally significant when the total emissions from the action equal or exceed 10 percent of the emissions budget of the air quality control area for the applicable pollutant. If a federal action meets *de minimis* requirements and is not considered a regionally significant action, detailed conformity analyses are not required pursuant to 40 CFR 93.153(c).

C.4 Emission Calculations

C.4.1 Construction Emissions

Construction of Runway 03R-21L and the associated lighting system and infrastructure would involve demolition of the existing runway pavement, construction of a new runway with shoulders on both sides, construction a subsurface drainage system, construction of an aircraft turnaround, and repairing or replacing existing lighting and electrical systems. In addition, a laydown area will be constructed and two temporary batch plants will be operated to provide Portland concrete cement for the runway construction. The total duration of the project will take approximately 18 months. 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, NOx, PM_{10}, $PM_{2.5}$, SO_2, and VOC. In addition, demolition, site preparation and grading, vehicle travel on unpaved roads, and the concrete batching plant operation would result in fugitive dust emissions. The offroad construction equipment and vehicles emissions of CO, NOx, PM_{10}, $PM_{2.5}$, SO_2, and VOCs were estimated by using the URBEMIS2007 model (CARB, 2007) along with the projected construction duration and estimated hours of construction equipment operations. Default settings in URBEMIS2007 were used when project-specific data were not available. To estimate the worst-case annual emissions during the project construction, it was assumed that majority of the demolition, grading, paving, and concrete production will occur in 2010.

Fugitive dust emissions from demolition, grading, and paving were estimated using default URMEMIS emission factors. Emissions from vehicle re-entrained dust from unpaved roads were calculated following the methodology in EPA's EPA *Compilation of Air Pollutant Emission Factors* (AP-42). Dust emissions from batch plants were estimated using the methodology from BAAQMD Permit Handbook (BAAQMD, 2009)

Emissions associated with worker commutes were estimated by using the expected number of vehicle miles traveled by the workers. Vehicle emissions from onroad delivery trucks and other vehicles were calculated based on the expected daily VMTs for the vehicles. It is assumed that the construction will occur 5 days per week. Vehicle emission factors were calculated by using EMFAC2007 (CARB, 2007) for BAAQMD for the year 2010. Passenger vehicle and heavy duty vehicle emission factors were used for emission calculations for workers commute and delivery trucks, respectively. Detailed construction emission calculations and assumptions are provided in Appendix C.

C.4.2 Operation Emissions

Operation emissions from Alternative 2 would be generated by aircraft and supporting vehicles using the runway. Operation of the aircraft and other vehicle activities will not change after the project construction. Therefore, operation emissions would not increase compared to current conditions, long-term adverse impacts are not expected and no further analysis is required.

C.4.3 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 C-3. Emissions of VOC, NOx, and CO during the construction of the project are all far below the *de minimis* thresholds for each of the three applicable pollutants.

TABLE C-3
General Conformity Analysis for Alternative 2 and Alternative 3
Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Clean Air Act Conformity Applicability Analysis

Activities	Annual Actual Emissions (ton/yr)		
	VOC	NO_x	CO
Construction Emissions (2010)	3.0	49.5	14.4
***De minimis* Threshold**	**100**	**100**	**100**

C.4.4 Regional Significance

When the total emissions of the nonattainment and maintenance criteria pollutants do not exceed the *de minimis* limit, the emissions must then be compared to the air quality emissions inventory of the air basin to determine regional significance of the federal action. If the amount of the emissions is greater than 10 percent of the emission inventory, the federal action is considered regionally significant for that pollutant (40 CFR Part 93, Subpart 153[i]).

Table C-4 compares the net emissions from the construction of the Project with the San Francisco Bay Area Air Basin (Basin) emissions inventory. NO_x and VOC emissions inventory data were obtained from the *San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard* (BAAQMD et al., 2001). CO emission inventory data were obtained from the *2004 Revision to the California State Implementation Plan for Carbon Monoxide, Updated Maintenance Plan for Ten Federal Planning Areas* (CARB, 2004). The potential emission increase of VOCs, NO_x, and CO for project constructions are below the 10 percent threshold. Therefore, the proposed project is not considered regionally significant.

TABLE C-4
Comparison of Project Emissions and Emissions Inventory
Repair of Airfield Pavement and Lighting, Runway 03R/21L, Travis Air Force Base, Fairfield, California – Clean Air Act Conformity Applicability Analysis

	VOC	NO_x	CO
Basin Emissions Inventory (ton/yr)	162,425	191,625	692,040
Construction Emissions (2010) (ton/yr)	3.0	49.5	14.4
Percent of Emissions Inventory (construction)	0.0018	0.026	0.0021

Notes:

Basin emissions inventory data for NO_x and VOCs were obtained from *San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard* (BAAQMD et al., 2001). Emissions inventory data for 2006 were used for emissions comparisons for all years.

Basin emissions inventory data for CO were obtained from *2004 Revision to the California State Implementation Plan for Carbon Monoxide, Updated Maintenance Plan For Ten Federal Planning Areas* (CARB, 2004). Emissions inventory data for 2010 were used for the emissions comparison.

C.4.5 Conclusion

The emissions were estimated based on conservative assumptions that the construction will occur for the entire year of 2010, and all concrete productions will be done within 2010. The emissions are far below the de minimis level for each of the pollutants analyzed. In addition, the project emissions of CO and ozone precursors would not exceed 10 percent of the total Bay Area Air Basin emission inventories listed in the EPA approved State Implementation Plan. On the basis of the conformity applicability criteria, the project conforms to the most recent EPA-approved State Implementation Plan; therefore, the project is exempt from the CAA conformity requirements and does not require a detailed conformity demonstration.

C.5 Works Cited

Bay Area Air Quality Management District (BAAQMD), Association of Bay Area Governments, and Metropolitan Transportation Commission. 2001. *San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard*. October.

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

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

URBEMIS 2007 for Windows, Version 9.2. www.urbemis.com/software/Urbemis2007v9_2.html. Released June 2007.

Bay Area Air Quality Management District (BAAQMD). 2009. *Permit Handbook*. March.

Appendix D
Section 401 Certification, San Francisco Bay Regional Water Quality Control Board

California Regional Water Quality Control Board
San Francisco Bay Region

Linda S. Adams
Secretary for Environmental Protection

1515 Clay Street, Suite 1400, Oakland, California 94612
(510) 622-2300 • Fax (510) 622-2460
http://www.waterboards.ca.gov/sanfranciscobay

Arnold Schwarzenegger
Governor

Date: December 17, 2009
Site No. 02-07-C0431 (JGU)
CIWQS Place No. 741355

Sent via electronic mail: No hardcopy to follow

Department of the Air Force
411 Airmen Drive (B570)
Travis AFB, CA 94535-2001
Attn: David Musselwhite, YC-02, DAF
dave.musselwhite@travis.af.mil

SUBJECT: **Conditional Water Quality Certification for the Runway 03R/21L Repair Project, Travis Air Force Base, Solano County; Corps File No. 2009-0200248N**

Dear Mr. Musselwhite:

San Francisco Bay Regional Water Quality Control Board (Water Board) staff have reviewed the June 18, 2009, application (Application) submitted by Travis Air Force Base (Applicant) for the repair of the Runway 03R/21L (Project) at the Travis Base (Travis AFB) in Solano County. We hereby issue water quality certification for the Project. On November 4, 2009, the U.S. Army Corps of Engineers (Corps) determined that the Project qualifies for authorization pursuant to Clean Water Act (CWA) Section 404 under the Army Nationwide Permit (NWP) 12 for Utility Line Activities and NWP 33 for Temporary Construction, Access, and Dewatering. You applied to the Water Board in compliance with Section 401 of the CWA for verification that the Project does not violate State water quality standards.

Project Description: The following Project description is from application materials received by the Water Board on June 18, 2009, and supplemental information received in July, August, and December of 2009. The Applicant has proposed to repair Runway 21L/03R to meet current Unified Facilities Criteria for Class B Air Force runways. The Project area encompasses approximately 190 acres and includes portions of the existing Runway 21L/03R and adjacent area on Travis AFB. The Project proposes to repair the existing runway that is 10,995 feet long and 300 wide and reduce its width to 200 feet and the overruns from 300 to 150 feet. The proposed Project improvements include, among others, replacement of the existing runway pavement and the drainage system under the runway, construction of a new homerun duct bank to provide electrical service for runway lighting, construction of a new 1.37 acre commercial vehicle access gate at Meridian Road, and construction of a 17.02-acre contractor staging area

for the duration of the Project connected with the existing Perimeter Road, the runway, and the new landing zone.
Runoff from the Project site discharges into Union Creek, which conveys flows downstream into the Hill Slough. It is then conveyed to the Suisun Slough and thence to Suisun Bay. The Project is in the Suisun Slough hydrologic unit 207.23.

Impacts: The Project will have no permanent impacts. The total temporary impacts for the Project will occur over approximately 0.45 acre of jurisdictional wetlands. These impacts will take place while constructing: a) a new drainage system under the runway - 0.004 acre; b) the new homerun duct bank - 0.089 acre, and c) the Meridian Road Gate - 0.353 acre. In addition, the proposed Project will result in permanent disturbance to 70.85 acres of the California tiger salamander (CTS) upland habitat and temporary disturbance to 72.85 acres of CTS upland habitat. Board staff finds that the project proponent has taken appropriate steps to avoid and then to minimize impacts, as required by the Basin Plan.

Mitigation: To compensate for the temporary loss of jurisdictional wetlands the Applicant has proposed to purchase 0.23 acre of wetland creation credits from the Elsie Gridley Mitigation Bank in Solano County. To minimize the permanent adverse effects of the Project on the CTS the Applicant will protect 212.55 acres of upland habitat by purchasing and/or preserving of salamander compensation credits in a conservation bank in Solano County or on a purchased and preserved parcel approved by the Fish and Wildlife Service. Upon completion of the Project, all temporarily disturbed areas will be restored to pre-Project conditions by re-grading and re-vegetating with native plants. The disturbed area will be monitored annually to ensure that vegetative cover is effectively established and the habitat restored.

Wetland Tracker System: It has been determined through regional, state, and national studies that tracking of mitigation/restoration projects must be improved to better assess the performance of these projects, following monitoring periods that last several years. To effectively carry out the State's No Net Loss Policy for wetlands, the State needs to closely track both wetland losses and mitigation/restoration project success. Therefore, we require that the Applicant use a standard form to provide Project information related to impacts and mitigation/restoration measures. An electronic copy of the form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. Project information concerning impacts and mitigation/restoration will be made available at the web link: http://www.wetlandtracker.org.

CEQA Compliance: Pursuant to NEPA guidance, 32 CFR 989 (Air Force Environmental Impact Analysis Process) the Department of the Air Force completed an environmental assessment (EA) in June 2009, and signed findings of no significant impact (FONSI) on December 4, 2009. NEPA documents satisfy CEQA requirements pursuant to Title 14 California Code of Regulations, Section 15221 – NEPA Document Ready Before CEQA Document.

Certification: I hereby issue an order certifying that any discharge from the referenced project will comply with the applicable provisions of sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003 - 0017 - DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification" which requires compliance with all conditions of this Water Quality Certification. The following conditions are associated with this certification:

CONDITIONS

1. The Applicant, and any contractors hired by the Applicant to implement the Project, are required to comply with this water quality certification;

2. The Project shall be implemented as described in conformance with the Project description in the application materials, which were received over the period June 19, 2009 through December 7, 2009. Any additional work or variation from the described work which may result in additional or increased impacts to beneficial uses of waters of the State is not authorized unless approved in writing by the Executive Officer prior to implementation;

3. The applicant shall adhere to the conditions of the Biological Opinion dated October 29, 2009, reference No. 81420-2009-F-1001-1, prepared by the United States Department of the Interior, Fish and Wildlife Service for the Project;

4. No debris, soil, sand, cement, concrete, or washings thereof, or other construction related materials or wastes, oil or petroleum products or other organic or earthen material shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess material shall be removed from the work area and any areas adjacent to the work area where such material may be washed into waters of the State. During construction, the contractor shall not dump any litter or construction debris within the wetlands. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site;

5. Disturbance or removal of vegetation shall be minimized. The Project site shall be stabilized through incorporation of appropriate Best Management Practices, including the successful re-establishment of native vegetation to enhance wildlife habitat values, and to prevent and control erosion and sedimentation. Any temporary roads, equipment staging areas and construction areas shall be revegetated or otherwise winterized following completion of the project, to prevent erosion of sediments into waters of the State;

6. No equipment shall be operated in areas of flowing or standing water, no fueling, cleaning, or maintenance of vehicles or equipment shall take place within any areas where accidental discharge to waters of the State may occur;

7. The Applicant shall apply for coverage under, and comply with, the State's National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity, and incorporate appropriate construction-stage and post-construction Best Management Practices into the Project that promote the following conditions: a) prevention and control of erosion and sedimentation; b) source control of potential pollutants; c) control and treatment of runoff; and, d) protection of wetlands, riparian habitat, and water quality resources;

8. The Applicant shall provide documentation that 0.23 acre of wetland creation mitigation credits from the Elsie Gridley Mitigation Bank in Solano County have been purchased, as compensation for the Project's wetlands and waters impacts. A copy of the final agreement acceptable to the Water Board Executive Officer shall be submitted no later than February 4, 2010, or prior to the initiation of construction activities, whichever occurs first;

9. The Applicant shall submit the on-site mitigation and monitoring plan with performance standards and compliance schedule acceptable to the Executive Officer by February 4, 2010, or prior to the initiation of construction activities, whichever occurs first;

10. The Applicant shall submit annual monitoring reports acceptable to the Executive Officer no later than October 31 of each year for a minimum of 5 years. If the monitoring report indicates that mitigation of temporarily impacted wetlands fails to achieve the performance standards, the annual mitigation monitoring reports shall evaluate the probable cause(s) of any problems and propose appropriate corrective measures. These reports should clearly reference Site No. 02-48-C0431 on their title page;

11. The Applicant is required to use the standard Wetland Tracker form to provide Project information describing impacts and mitigation/restoration measures within 14 days from the date of this certification. The completed Wetland Tracker form shall be submitted electronically to wetlandtracker@waterboards.ca.gov or shall be submitted as a hard copy to both: 1) San Francisco Bay Regional Water Quality Control Board (see letterhead for address), to the attention of Wetland Tracker and 2) San Francisco Estuary Institute, 7770 Pardee Lane, Oakland, CA 94621-1242, to the attention of Mike May;

12. Three working days before the commencement of the Project construction activities, the Applicant shall notify the Water Board staff via email and hard copy;

13. The Applicant shall notify the Water Board staff via email and hard copy when construction is complete;

14. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section 13330 and Section 3867of the California Water Code (CWC), Title 23 of the California Code of Regulations (23 C.C.R.);

15. Certification is not intended and shall not be construed to apply to any activity involving a hydroelectric facility and requiring a FERC license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to 23 C.C.R. Subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought; and,

16. Certification is conditioned upon total payment of the full fee required in State regulations (23 CCR Section 3833) and owed by the applicant. The fee for the proposed project is $1,878 and it has been paid in full.

Please be advised that any violation of water quality certification is a violation of State law and subject to administrative civil liability pursuant to California Water Code (CWC) Section 13350. Failure to respond, inadequate response, late response, or failure to meet any condition of a certification may subject the Applicant to civil liability imposed by the Water Board to a maximum of $5,000 per day of violation or $10 for each gallon of waste discharged in violation of this action. Any requirement for a report made as a condition to this action is a formal requirement pursuant to CWC Section 13267, and failure or refusal to provide, or falsification of such required report is subject to civil liability as described in CWC Section 13268.

We anticipate no further action on this Project. Should new information come to our attention that indicates a water quality problem with this project, the Water Board may issue Waste Discharge Requirements pursuant to 23 CCR Section 3857.

If you have any questions, please contact Jolanta Uchman at (510) 622-2432, or email JUchman@waterboards.ca.gov.

Sincerely,

Shin-Roei Lee acting for

Bruce Wolfe
Executive Officer

cc: Bill Orme, SWRCB-DWQ, Stateboard401@waterboards.ca.gov
David Smith, US EPA Region 9, WTR-8 R9-WTR8-Mailbox@epa.gov
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Michelle Tovar US FWS Michelle_Tovar@fws.gov

Appendix E
Hydrological Assessment for the Travis AFB Runway 03R/21L Project

Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

PREPARED FOR: Travis Air Force Base

PREPARED BY: CH2M HILL

DATE: June 5, 2009

1.0 Introduction

Travis Air Force Base (AFB or Base) is proposing construction of a new Runway 03R/21L. This project will change existing land cover within the project site by converting an area that is currently impervious runway surface to grasslands. Planned construction activities include the demolition of the existing Runway 03R/21L surfaces and construction of a narrower runway along the same alignment. Construction activities also include the conversion of existing grasslands to a construction entrance and staging area. This hydrologic analysis evaluates the associated hydrologic impact of changes in the land cover and slope, which includes the footprint of the proposed Runway 03R/21L, construction entrance, and staging area. This hydrologic analysis was prepared to understand how storm water runoff patterns (including runoff volumes and flow rates) will likely change as a result of the proposed construction and how any changes could affect onbase resources.

The hydrological assessment includes determination of rainfall amounts and patterns, quantification of change in impervious cover and time of concentration (T_c), and an assessment of change in runoff volumes and flow rates. Three storm events will be used to formulate various scenarios with pre- and post-development comparisons to evaluate change.

1.1 Proposed Runway 03R/21L Construction

The Runway 03R/21L site lies at the easternmost boundary of Travis Air Force Base in Fairfield, Solano County, California (see Figure 1). The study area is bordered in the west by the developed portions of Travis Air Force Base and in the east by undeveloped grassland.

The footprint of the proposed Runway 03R/21L is narrower than the existing runway, and some areas that are currently impervious surfaces will change to grasslands. Existing Runway 03R/21L surfaces occupy 116.17 acres, and proposed Runway 03R/21L surfaces will occupy 83.43 acres, resulting in a 28.2 percent decrease in impervious area. In several locations, the proposed Runway 03R/21L will be constructed at a higher elevation than the existing Runway 03R/21L surface, increasing the slopes of the embankments from existing conditions.

As part of this project, a meridian access gate and laydown area will be constructed near the outlet of Sub-basin C1; during this process, areas that are currently wetlands and grasslands will be converted to unpaved roads and staging areas. Additionally, a temporary laydown area will be constructed in Sub-basin B1, displacing seasonal wetlands and grasslands. It is assumed that both of these areas will have a compacted gravel surface.

2.0 Land Cover and Drainage

Travis AFB has limited topographic relief, and the clayey soils prevent rapid drainage. Mima-mound topography at Travis AFB leads to the formation of vernal pools and seasonal wetlands, with grasslands on the upper terraces. The annual cycle of vernal pools includes standing water during the winter and spring and desiccation during the summer and fall. During the time that the vernal pools contain water, biotic communities develop over relatively restricted areas. In the larger areas, grasslands form; in more confined, deeper areas, wetlands form (see Figure 2).

Travis AFB is located in the northeastern portion of the Fairfield-Suisun Hydrologic Basin. Within the basin, water generally flows south to southeast toward Suisun Marsh, a 116,000-acre tidal marsh that is the largest contiguous estuarine wetland in the continental United States. 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.

A surface water collection system divides the Base into eight independent drainage areas. The eastern portion of the Base is served by one of the drainage systems that collects runoff from along the runway and the inactive sewage treatment plant area and directs it to Denverton Creek and Denverton Slough. Denverton Creek is an intermittent stream in the vicinity of the Base that drains into Suisun Marsh. The northwestern portion of the Base drains to the west, toward the McCoy Creek drainage area. McCoy Creek is also an intermittent stream in the vicinity of the Base. The remaining six drainage areas at the Base empty into Union Creek, the primary surface water pathway for runoff at Travis AFB. Union Creek discharges into Hill Slough, a wetland located 1.6 miles southwest of the Base boundary. Surface water from Hill Slough flows into Suisun Marsh. The south-central portion of the Base contains the headwaters for two small unnamed intermittent tributaries that parallel the Mount Diablo Meridian and drain directly into the Suisun Marsh complex south of the Base. No springs have been recorded within the confines of Travis AFB.

2.1 Drainage at the Project Site

The Runway 03R/21L project site lies within five drainage basins that drain to the larger watercourses described in the previous section: Basins A through E (see Figure 3). These basins are further divided into sub-basins according to topographic boundaries and stormwater drainage infrastructure. These basins and sub-basins contain ephemeral drainages and swales that support seasonal wetlands and vernal pool complexes. Although no distinct geomorphic channel features are present in the study area, many of these swales convey open-channel flow during peak runoff events. At the basin outfalls indicated on Figure 3, many of these basins and sub-basins drain into well-formed channels.

Basin A (consisting of only Sub-basin A1) is 97.17 acres in size and consists of a swale that drains to the northeast, paralleling the northwestern side of Runway 03R/21L and two swales that drain the Perimeter Road and an access road. These surface drainages confluence at a 36-inch culvert that runs beneath the runway and drains to an outfall beyond the southeastern Base boundary, where an intermittent channel directs flow to Denverton Creek.

Basin B consists of Sub-basins B1 and B2. Sub-basin B1 is 176.85 acres in size and consists of a swale that drains to the northeast, paralleling the southeastern side of Runway 03R/21L. As it intersects the eastern boundary of Perimeter Road, the swale flows together with drainage from Sub-basin B2 and bends 90 degrees to the right. A 36-inch culvert directs flow under Perimeter Road and offbase into Denverton Creek. Sub-basin B2 is 43.88 acres in size and consists of a grassed swale that drains to the northeast, paralleling the northwestern side of Runway 03R/21L. At the intersection with Perimeter Road, surface flows are directed southeast into Sub-basin B1.

Basin C (consisting only of Sub-basin C1) is 85.10 acres in size and consists of a swale that drains to the southwest, paralleling the southeastern side of Runway 03R/21L. This swale then intersects the embankments from the larger complex of Base taxiways and holding areas and is directed toward the southeast, where the swale bifurcates into two distinct channels. These intermittent channels both drain into culverts under a small access road and then into culverts under Perimeter Road. The channels converge in a small pond and wetland complex that drains offbase into a small unnamed tributary that flows due south, paralleling the Mount Diablo Meridian until it flows together with the northern reaches of Nurse Slough in Suisun Marsh. The outfall of Basin C at the Base boundary is also the location proposed for a construction access gate (i.e., the Meridian Gate).

Basin D consists of Sub-basins D1, D2, and D3, which drain into a piped storm drainage system with an outfall into the east branch of Union Creek. Sub-basin D1 is 45.04 acres in size and consists of a swale that drains to the southwest, paralleling the northwestern side of Runway 03R/21L. Near the intersection with embankments from taxiways on the northwest side of Runway 03R/21L, an inlet directs flow into the subsurface storm drainage system. Sub-basin D2 is 24.41 acres in size and lies northwest of Runway 03R/21L. Sub-basin D2 consists of three cells of grasslands that are encircled by the runway and adjacent taxiways. These cells also drain into the subsurface storm drainage system. Sub-basin D3 is 45.08 acres in size and lies southeast of Runway 03R/21L. Sub-basin D3 consists of one large cell of grasslands that is encircled by the runway and adjacent taxiways. An inlet directs flow from Sub-basin D3 into the subsurface storm drainage system.

Basin E (consisting only of Sub-basin E1) is 50.63 acres in size and consists of a network of surface runoff features and small swales that drains the southwestern extent of Runway 03R/21L. Several roadways intersect the drainage features, and small culverts direct surface runoff into the Union Creek channel.

2.2 Land Cover and Soils at the Project Site

Stormwater runoff is dependent on both land cover and soil characteristics. The more impervious a surface is (e.g., a runway is nearly 100 percent impervious), the more runoff it produces.

The project area contains disturbed herbaceous-dominant vegetation characteristic of the Solano-Colusa Vernal Pool Region. The vegetation community includes a grassland and vernal pool complex that has been degraded by surface alterations, including runway construction and other Base-related construction activities and the introduction of invasive grasses. Excavation and fill have altered the mima-mound topography, seasonal wetlands, and vernal pool ecosystems that are native to this area.

Soils in the project area include Solano loam, Antioch-San Ysidro complex, Millsap sandy loam, and San Ysidro sandy loam.

2.2.1 Solano Loam

Solano loam occupies the eastern portion of the project site. Solano loam consists of nearly level, somewhat poorly drained soils on terraces. These soils formed in alluvium from sedimentary rock. Permeability is very slow (Soil Conservation Service [SCS], 1977).

2.2.2 Antioch-San Ysidro Complex – 0 to 2 Percent Slopes

The Antioch-San Ysidro Complex occupies the central portion of the project site, and composes the largest area of the soils groups found onsite. These soils formed in alluvium from sedimentary sources. This complex is approximately 50 percent Antioch loam and 35 percent San Ysidro sandy loam. The remaining 15 percent is included small areas of Solano loam and Pescadero clay loam. Permeability is very slow. Both the Antioch and San Ysidro loams have very slow runoff. Erosion is a slight hazard. (SCS, 1977)

2.2.3 Millsap Sandy Loam – 0 to 2 Percent Slopes

Millsap sandy loam occupies a narrow band in the center of the project site. Millsap sandy loam consists of moderately well-drained soils on uplands, underlain by sandstone at a depth of 20 to 30 inches. Permeability is very slow. Erosion is a slight hazard (SCS, 1977).

2.2.4 San Ysidro Sandy Loam – 0 to 2 Percent Slopes

San Ysidro sandy loam occurs in the far western portion of the project site. San Ysidro sandy loam consists of moderately well-drained soils on terraces. These soils formed in alluvium derived from sedimentary rocks. Permeability is very slow. Runoff is slow. Erosion is a slight hazard (SCS, 1977).

2.2.5 Hydrologic Soil Groups

Soils are classified by the Natural Resource Conservation Service (NRCS) into four hydrologic soil groups on the basis of their runoff potential. The four Hydrologic Soil Groups are A, B, C and D, where soils in Hydrologic Soil Group A generally have the smallest runoff potential (indicating high permeability) and soils in Hydrologic Soil Group D have the greatest runoff potential (indicating low permeability). Details of these classifications can be found in *Urban Hydrology for Small Watersheds,* published by the

Engineering Division of the Soil Conservation Service, which is now known as NRCS (SCS, 1986).

Hydrologic Soil Group A includes sand, loamy sand, or sandy loam. These soils have low runoff potential and high infiltration rates when thoroughly wetted. Soils in this group consist chiefly of deep, well- to excessively drained sands or gravels and have a high rate of water transmission.

Hydrologic Soil Group B includes silt loam or loam. Soils in this group have a moderate infiltration rate when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well- to well-drained soils with moderately fine to moderately coarse textures.

Hydrologic Soil Group C soils are sandy clay loam. Soils in this group have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.

Hydrologic Soil Group D soils are clay loam, silty clay loam, sandy clay, silty clay, or clay. This hydrologic soil group has the highest runoff potential. Soils in this group have very low infiltration rates when thoroughly wetted and this group consists chiefly of clay soils with a high swelling potential, a permanent high water table, a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

Solano loam, Antioch-San Ysidro complex, Millsap sandy loam, and San Ysidro sandy loam are all classified as Hydrologic Soil Group D, with low permeability and moderate to high runoff potential.

3.0 Model Development

A hydrologic model was used to determine changes in pre- and post-development hydrology for the project site.

The hydrologic model used for the analysis was WinTR-55, Urban Hydrology for Small Watersheds, which was developed by the U.S. Department of Agriculture's Soil Conservation Service (now NRCS) to calculate the storm runoff volume, peak rate of discharge, hydrographs, and storage volumes required for storm water management structures. WinTR-55 is a single-event rainfall-runoff hydrologic model for small watersheds. The model generates hydrographs from both urban and agricultural areas and at selected points along the stream system. Hydrographs are routed downstream through channels and reservoirs. Multiple sub-areas can be modeled within the watershed. WinTR-55 is an appropriate hydrologic model to use for watersheds less than 25 square miles with less than 10 sub-areas and a T_c of less than 10 hours. A thorough description of WinTR-55 is available online at http://www.wsi.nrcs.usda.gov/products/W2Q/H&H/Tools_Models/WinTR55.html.

Using WinTR-55, basic runoff calculations were performed for Basins A, B, C, D, and E to determine runoff volumes and flow rates for existing and proposed development conditions. This section describes the methods used to derive hydrologic model data inputs and summaries of the data inputs.

3.1 Drainage Area and Runoff Curve Number Data

Three key elements of a sub-basin (or catchment) are used to determine hydrologic performance: the type of land cover, hydrologic soil group, and land cover condition. These elements determine what is known as an SCS runoff curve number. The SCS runoff curve number is used to determine how much rainfall is absorbed before runoff occurs. All soils at the project site were determined to be Hydrologic Soil Group D.

Drainage basins for the project site were delineated using 2-foot contour topographic data. Principal drainage areas for the project site are Sub-basins A1, B1, B2, C1, D1, D2, D3, and E1 (see Figure 3).

Land cover data were classified as "meadow – cont. grass (non-grazed)" to reflect the maintained grasslands and seasonal wetlands that are ubiquitous across the project area, "gravel (w/right of way)" to reflect the Meridian Gate and temporary laydown areas in the proposed conditions, or "paved parking lots, roofs, and driveways" to reflect the impervious runway, taxiway, and holding areas in the project area.

The existing and proposed project footprints were determined by using existing geographic information system datasets and importing computer-aided design-based design files into geographic information system data to perform spatial analyses. It was assumed that the proposed Runway 03R/21L design will tie into the existing taxiway, holding area, and runway surfaces that surround the project site.

Tables 1 and 2 provide the type of land cover, type of hydrologic soil group, land area, and runoff curve number for the existing and proposed development conditions for Runway 03R/21L within each sub-basin.

TABLE 1
Land Use and Runoff Curve Numbers for Existing Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Land Cover	Hydrologic Soil Group	Land Area (acres)	Runoff Curve Number
A1	Paved parking lots, roofs, driveways	D	15.28	98
	Meadow – cont. grass (non-grazed)	D	81.88	78
	Total		***97.16***	***81***
B1	Paved parking lots, roofs, driveways	D	25.58	98
	Meadow – cont. grass (non-grazed)	D	151.27	78
	Total		***176.85***	***81***
B2	Paved parking lots, roofs, driveways	D	9.71	98
	Meadow – cont. grass (non-grazed)	D	34.17	78
	Total		***43.88***	***82***
C1	Paved parking lots, roofs, driveways	D	14.02	98
	Meadow – cont. grass (non-grazed)	D	71.08	78
	Total		***85.1***	***81***
D1	Paved parking lots, roofs, driveways	D	10.71	98
	Meadow – cont. grass (non-grazed)	D	34.33	78
	Total		***45.04***	***83***

TABLE 1
Land Use and Runoff Curve Numbers for Existing Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Land Cover	Hydrologic Soil Group	Land Area (acres)	Runoff Curve Number
D2	Paved parking lots, roofs, driveways	D	16.34	98
	Meadow – cont. grass (non-grazed)	D	8.07	78
	Total		***24.41***	***91***
D3	Paved parking lots, roofs, driveways	D	17.85	98
	Meadow – cont. grass (non-grazed)	D	27.23	78
	Total		***45.08***	***86***
E1	Paved parking lots, roofs, driveways	D	6.67	98
	Meadow – cont. grass (non-grazed)	D	43.96	78
	Total		***50.63***	***81***

TABLE 2
Land Use and Runoff Curve Numbers for Proposed Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Land Cover	Hydrologic Soil Group	Land Area (acres)	Runoff Curve Number
A1	Paved parking lots, roofs, driveways	D	10.22	98
	Meadow – cont. grass (non-grazed)	D	86.94	78
	Total		***97.16***	***80***
B1	Paved parking lots, roofs, driveways	D	16.34	98
	Gravel (w/right of way)	D	17.27	91
	Meadow – cont. grass (non-grazed)	D	143.24	78
	Total		***176.85***	***81***
B2	Paved parking lots, roofs, driveways	D	6.56	98
	Meadow – cont. grass (non-grazed)	D	37.32	78
	Total		***43.88***	***81***
C1	Paved parking lots, roofs, driveways	D	11.18	98
	Gravel (w/right of way)	D	1.37	91
	Meadow – cont. grass (non-grazed)	D	72.55	78
	Total		***85.1***	***81***
D1	Paved parking lots, roofs, driveways	D	7.34	98
	Meadow – cont. grass (non-grazed)	D	37.7	78
	Total		***45.04***	***81***

TABLE 2
Land Use and Runoff Curve Numbers for Proposed Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Land Cover	Hydrologic Soil Group	Land Area (acres)	Runoff Curve Number
D2	Paved parking lots, roofs, driveways	D	13.39	98
	Meadow – cont. grass (non-grazed)	D	11.02	78
	Total		***24.41***	***89***
D3	Paved parking lots, roofs, driveways	D	14.33	98
	Meadow – cont. grass (non-grazed)	D	30.75	78
	Total		***45.08***	***84***
E1	Paved parking lots, roofs, driveways	D	4.07	98
	Meadow – cont. grass (non-grazed)	D	46.56	78
	Total		***50.63***	***80***

3.2 Time of Concentration Data

There are typically three distinct runoff patterns in a watershed: sheet flow, shallow concentrated flow, and channel flow. Sheet flow occurs in the upper reaches of a watershed and persists for a maximum of 100 feet. After flowing in sheets, water typically becomes less sheet-like and more concentrated. After shallow concentrated flow, water typically collects in natural or constructed channels. Each flow pattern requires a unique mathematical expression (see Appendix A).

The T_c is generally defined as the time required for a drop of water to travel from the most hydrologically remote point in the subcatchment to the point of collection. The path is then broken into segments according to the type of flow (segments of sheet flow, shallow concentrated flow, and channel flow, depending on the exact site conditions). Adding the T_c for all segments yields the total T_c for the subcatchment. The factors affecting the T_c are surface roughness, channel shape, and flow pattern, and slope.

Runoff conditions were determined separately for existing and proposed conditions within each sub-basin to account for unique surface features. Common runoff features for all sub-basins at the project site were as follows:

- Sheet flow was estimated to continue on path for 50 feet from the most distant point within the sub-basin. For all sub-basins, this first 50 feet of sheet flow occurred on the runway surface. Sheet flow roughness was determined to be "smooth surface" (Manning's n = 0.011).
- Shallow concentrated flows were calculated within each basin by measuring the distance between termination of sheet flow (50 feet) and the initiation of channel features (grassed swales and ditches were classified as channels for this analysis) within each sub-basin. Shallow concentrated flows were considered to be "paved" for the remaining distance along paved runway features and "unpaved" as runoff continues down the runway embankment onto adjacent slopes.

- Open channel flows were calculated according to the following process:
  - The distance of surface runoff between the initiation of channel features and the sub-basin outlet was measured.
  - The channel dimensions (including cross-sectional area and wetted perimeter) were estimated using high-resolution aerial imagery and field measurements.
  - The channel roughness (Manning's n) was always assumed to be 0.05, determined by comparing roughness coefficients from several references for a grassed swale (including the Bentley library of Manning's n values; Chow, 1959; and Field et al., 2005).
  - Channel slopes were calculated using ESRI ArcMap 9.3 with available 2-foot topography.

For existing conditions, slopes for sheet flow, shallow concentrated flows, and open channel flows were calculated using ESRI ArcMap 9.3 with available 2-foot topography. For proposed conditions, slopes for sheet flow and shallow concentrated flow were calculated using design cross sections from the Runway 03R/21L construction design documents. Because the extent of grading involved with the proposed Runway 03R/21L design would not affect existing channel features, channel slopes were the same for both existing and proposed conditions.

The type of flow, length, slope, roughness, channel dimensions, velocity, and T_c data for existing and proposed-development conditions within each sub-basin are provided in Tables 3 and 4.

TABLE 3
Time of Concentration Data for Runway 03R/21L Existing Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Type of Flow	Flow Length (feet)	Slope (ft/ft)	Manning's n	Cross-sectional Area (ft^2)	Wetted Perimeter (feet)	Velocity (ft/sec)	Travel Time (hour)
A1	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	210	0.0200	0.050				0.026
	Channel	3900	0.0021	0.050	10.00	12.00	1.209	0.896
	T_c							**0.950**
B1	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	225	0.0266	0.050				0.024
	Channel	7680	0.0018	0.050	15.00	17.00	1.163	1.834
	T_c							**1.886**
B2	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	1690	.0053	0.050				0.400
	Channel	1710	.0020	0.050	8.00	10.00	1.147	0.414
	T_c							**0.842**

TABLE 3
Time of Concentration Data for Runway 03R/21L Existing Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Type of Flow	Flow Length (feet)	Slope (ft/ft)	Manning's n	Cross-sectional Area (ft^2)	Wetted Perimeter (feet)	Velocity (ft/sec)	Travel Time (hour)
C1	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	225	0.0266	0.050				0.024
	Channel	4725	0.0021	0.050	15.00	17.00	1.256	1.045
	T_c							**1.097**
D1	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	225	0.0266	0.050				0.024
	Channel	2525	0.0016	0.050	14.00	16.00	1.091	0.643
	T_c							**0.695**
D2	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	260	0.0154	0.050				0.036
	T_c							**0.100***
D3	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	275	0.0290	0.050				0.028
	T_c							**0.100***
E1	Sheet	50	0.0133	0.011				0.016
	Shallow	100	0.0133	0.025				0.012
	Shallow	2000	0.0050	0.050				0.487
	T_c							**0.515**

*Required minimum T_c of 0.100 for sub-basins.

Notes:
ft^2 = square feet
ft/ft = vertical foot per horizontal foot
ft/sec = feet per second

TABLE 4
Time of Concentration Data for Runway 03R/21L Proposed Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Type of Flow	Flow Length (feet)	Slope (ft/ft)	Manning's n	Cross-sectional Area (ft^2)	Wetted Perimeter (feet)	Velocity (ft/sec)	Travel Time (hour)
A1	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	260	0.0262	0.050				0.028
	Channel	3900	0.0021	0.050	10.00	12.00	1.209	0.896
	T_c							**0.944**

TABLE 4
Time of Concentration Data for Runway 03R/21L Proposed Conditions
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

Sub-basin	Type of Flow	Flow Length (feet)	Slope (ft/ft)	Manning's n	Cross-sectional Area (ft^2)	Wetted Perimeter (feet)	Velocity (ft/sec)	Travel Time (hour)
B1	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	275	0.0364	0.050				0.025
	Channel	7680	0.0018	0.050	15.00	17.00	1.163	1.834
	T_c							**1.879**
B2	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	1740	.0063	0.050				0.377
	Channel	1710	.0020	0.050	8.00	10.00	1.147	0.414
	T_c							**0.811**
C1	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	275	0.0327	0.050				0.026
	Channel	4725	0.0021	0.050	15.00	17.00	1.256	1.045
	T_c							**1.091**
D1	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	275	0.0291	0.050				0.028
	Channel	2525	0.0016	0.050	14.00	16.00	1.091	0.643
	T_c							**0.691**
D2	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	310	0.0202	0.050				0.038
	T_c							**0.100***
D3	Sheet	50	0.0150	0.011				0.015
	Shallow	50	0.0175	0.025				0.005
	Shallow	325	0.0225	0.050				0.037
	T_c							**0.100***
E1	Sheet	25	0.0200	0.011				0.008
	Shallow	50	0.0200	0.025				0.005
	Shallow	2075	0.0059	0.050				0.465
	T_c							**0.478**

*Required minimum T_c of 0.100 for sub-basins.

3.3 Design Storm Amounts

The amount of precipitation falling onto a catchment over a given time interval will influence the amount of stormwater runoff that occurs at a given site.

The highest peak discharges from small watersheds in the United States are usually caused by intense, brief rainfalls that may occur as distinct events or as part of a longer storm. These intense rainstorms do not usually extended over a large area, and intensities vary greatly. For these reasons, synthetic rainfall distributions are used instead of observed data. These distributions include maximum rainfall intensities for the selected design frequency arranged in a sequence that is critical for producing peak runoff.

Because the intensity of rainfall varies considerably during a storm as well as between different geographic regions, SCS (NRCS) developed four synthetic 24-hour rainfall distributions (I, IA, II, and III) based on duration-frequency data and local storm data recorded by the National Weather Service. Types I and IA represent the Pacific maritime climate, with wet winters and dry summers.

A storm event is defined by the probability or frequency of occurrence (expressed as number of occurrences annually), the duration it lasts (in hours), and how much precipitation falls (in inches). Another consideration is the rate of rainfall over the event duration (usually expressed as inches per hour).

For this analysis, storm data were input from NRCS Type I synthetic rainfall distributions for Northern California. Type I distributions were chosen because they represent the most intense storms as compared to Type IA and, thus, provide the most conservative estimate of potential hydrology. The 24-hour rainfall amounts for hypothetical 2-year, 10-year, and 100-year storms were used.

Table 5 summarizes the rainfall information for Travis AFB in Solano County, California, that was used for this analysis.

TABLE 5
Precipitation Data for Travis AFB in Solano County, California
Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

	Rainfall Amount by Return Period (inches)		
Duration	**2-year**	**10-year**	**100-year**
24-hour	2.4	3.5	5.1

Source: National Oceanic and Atmospheric Administration, 1973

4.0 Results

WinTR-55 uses a set of standard surface flow routing equations to compute peak flows, volumes, and velocities. These equations are included in Appendix A. Table 6 summarizes the results of the hydrologic analyses for the Travis AFB Runway 03R/21L project, as well as changes in peak hourly runoff and total runoff volumes from the project site for existing and proposed development runoff conditions at each sub-basin. The conditions shown in Table 6 are expected to occur at the **outlet** of each respective sub-basin.

TABLE 6

WinTR-55 Hydrologic Model Output – Comparison of Peak Flow Rates, Runoff Amounts, and Runoff Volumes for Existing and Proposed Runway 03R/21L

Repair of Airfield Pavement and Lighting, Runway 03R/21L Project – Hydrological Assessment, Travis Air Force Base, Fairfield, California

	Peak Flow by Rainfall Return Period (cfs)				Runoff Amount by Rainfall Return Period (inches)				Runoff Volume by Rainfall Return Period (acre-feet)			
Sub-basin	**Existing Conditions**	**Proposed Conditions**	**Difference**	**Percent Difference**	**Existing Conditions**	**Proposed Conditions**	**Difference**	**Percent Difference**	**Existing Conditions**	**Proposed Conditions**	**Difference**	**Percent Difference**
2-Year Storm												
A1	14.2	12.9	**-1.2**	**-8.6**	0.87	0.82	**-0.05**	**-5.9**	1,015.6	956.1	**-59.5**	**-5.9**
B1	16.6	16.6	**0.0**	**0.2**	0.87	0.87	**0.00**	**0.0**	1,850.5	1,850.5	**0.0**	**0.0**
B2	7.6	7.1	**-0.5**	**-6.5**	0.92	0.87	**-0.05**	**-5.7**	486.6	458.7	**-27.9**	**-5.7**
C1	11.3	11.3	**0.0**	**0.3**	0.87	0.87	**0.00**	**0.0**	889.5	889.5	**0.0**	**0.0**
D1	9.6	8.1	**-1.5**	**-15.8**	0.98	0.87	**-0.11**	**-11.1**	529.7	470.8	**-58.9**	**-11.1**
D2	23.5	20.8	**-2.7**	**-11.5**	1.52	1.37	**-0.15**	**-10.0**	444.9	400.4	**-44.5**	**-10.0**
D3	31.7	27.6	**-4.1**	**-13.0**	1.16	1.04	**-0.12**	**-10.6**	628.6	562.1	**-66.5**	**-10.6**
E1	10.9	10.4	**-0.5**	**-4.6**	0.87	0.82	**-0.05**	**-5.9**	529.2	498.2	**-31.0**	**-5.9**
10-Year Storm												
A1	31.6	29.9	**-1.7**	**-5.4**	1.71	1.64	**-0.07**	**-4.2**	1,991.5	1,907.5	**-84.0**	**-4.2**
B1	36.7	36.8	**0.1**	**0.3**	1.71	1.71	**0.00**	**0.0**	3,624.6	3,624.6	**0.0**	**0.0**
B2	16.4	15.9	**-0.5**	**-3.2**	1.78	1.71	**-0.07**	**-4.2**	938.4	899.4	**-39.0**	**-4.2**
C1	25.2	25.4	**0.2**	**0.6**	1.71	1.71	**0.00**	**0.0**	1,744.2	1,744.2	**0.0**	**0.0**
D1	20.0	18.0	**-2.0**	**-9.8**	1.86	1.71	**-0.15**	**-8.1**	1,004.3	923.2	**-81.1**	**-8.1**
D2	39.7	36.7	**-3.0**	**-7.5**	2.54	2.36	**-0.18**	**-7.2**	744.2	690.3	**-53.9**	**-7.2**
D3	59.4	54.2	**-5.2**	**-8.8**	2.10	1.94	**-0.16**	**-7.7**	1,135.0	1,047.3	**-87.6**	**-7.7**
E1	24.3	23.9	**-0.3**	**-1.4**	1.71	1.64	**-0.07**	**-4.2**	1,037.7	994.0	**-43.7**	**-4.2**
100-Year Storm												
A1	60.9	58.7	**-2.2**	**-3.6**	3.07	2.98	**-0.09**	**-3.1**	3,584.2	3,474.6	**-109.6**	**-3.1**
B1	70.7	70.8	**0.1**	**0.2**	3.07	3.07	**0.00**	**0.0**	6,523.5	6,523.5	**0.0**	**0.0**
B2	30.9	30.4	**-0.5**	**-1.7**	3.17	3.07	**-0.10**	**-3.0**	1,668.2	1,618.2	**-50.0**	**-3.0**
C1	48.7	48.9	**0.2**	**0.3**	3.07	3.07	**0.00**	**0.0**	3,138.2	3,138.2	**0.0**	**0.0**
D1	36.9	34.5	**-2.4**	**-6.6**	3.26	3.07	**-0.19**	**-5.9**	1,764.2	1,661.0	**-103.2**	**-5.9**
D2	63.4	60.4	**-3.0**	**-4.7**	4.08	3.87	**-0.21**	**-5.2**	1,194.7	1,132.6	**-62.1**	**-5.2**
D3	102.6	96.4	**-6.1**	**-6.0**	3.56	3.36	**-0.20**	**-5.6**	1,925.9	1,818.8	**-107.1**	**-5.6**
E1	46.4	46.7	**0.3**	**0.7**	3.07	2.98	**-0.09**	**-3.0**	1,867.0	1,810.5	**-56.5**	**-3.0**

Note:

cfs = cubic feet per second

The "Difference" columns in Table 6 display the changes in peak flow rates or runoff volume quantities from existing to proposed conditions for each sub-basin, along with the percent change. A decrease in the quantity is displayed in red, no change is displayed in black, and an increase in quantity is displayed in green. Hydrographs for the existing and proposed development runoff conditions for each sub-basin are presented in Appendix B.

The results of the hydrologic analysis show that there will be very minor changes to stormwater runoff conditions in sub-basins adjacent to Runway 03R-21L as a result of the project. The proposed condition will result in a 28.2 percent decrease in impervious area because of the narrower runway surface. Consequently, the proposed condition will result in minor reductions to the rate, amount, and volume of stormwater runoff in Sub-basins A1, B2, D1, D2, D3, and E1. Basin D will experience the greatest change in hydrology as a result of the proposed project, with reductions to peak flow rates and runoff volumes ranging from 5 percent to almost 16 percent for modeled storm events.

In Sub-basins B1 and C1, proposed conditions include the Meridian Gate access and temporary laydown areas, introducing additional compacted gravel surfaces to these sub-basins. As a result, there will be no net change to peak flow rates and runoff volumes at the outlets of these sub-basins. Because detailed design plans were not available at the time of analysis, the hydrologic evaluation excluded some potential impacts resulting from the construction of the proposed Meridian Gate and temporary laydown areas within Sub-basins C1 and B1. If additional grading or alteration of existing surface drainage features occurred (including the installation or removal of culverts), the proposed Meridian Gate and temporary laydown areas would likely cause additional impacts to the hydrologic performance in these sub-basins.

The differences in peak flow rates and surface runoff volumes between existing and proposed conditions are minor, ranging from an increase of less than 1 percent to a decrease of almost 16 percent, with an average reduction of approximately 5 percent for the project site. The discrepancy between the substantial reduction in impervious cover between the existing and proposed conditions and the relatively minor changes to surface runoff rates and volumes can be explained by the clay-like, impervious nature of soils at the site, which tend to naturally produce high rates of runoff. This is reflected in the weighted runoff curve numbers, which are similar for existing and proposed development conditions (see Tables 1 and 2), despite the difference in runway surface area between the two scenarios. In addition, the minor increase in the slope of runway embankments that will occur as a result of the proposed Runway 03R/21L will not substantially affect the runoff T_c between existing and proposed conditions.

5.0 Works Cited

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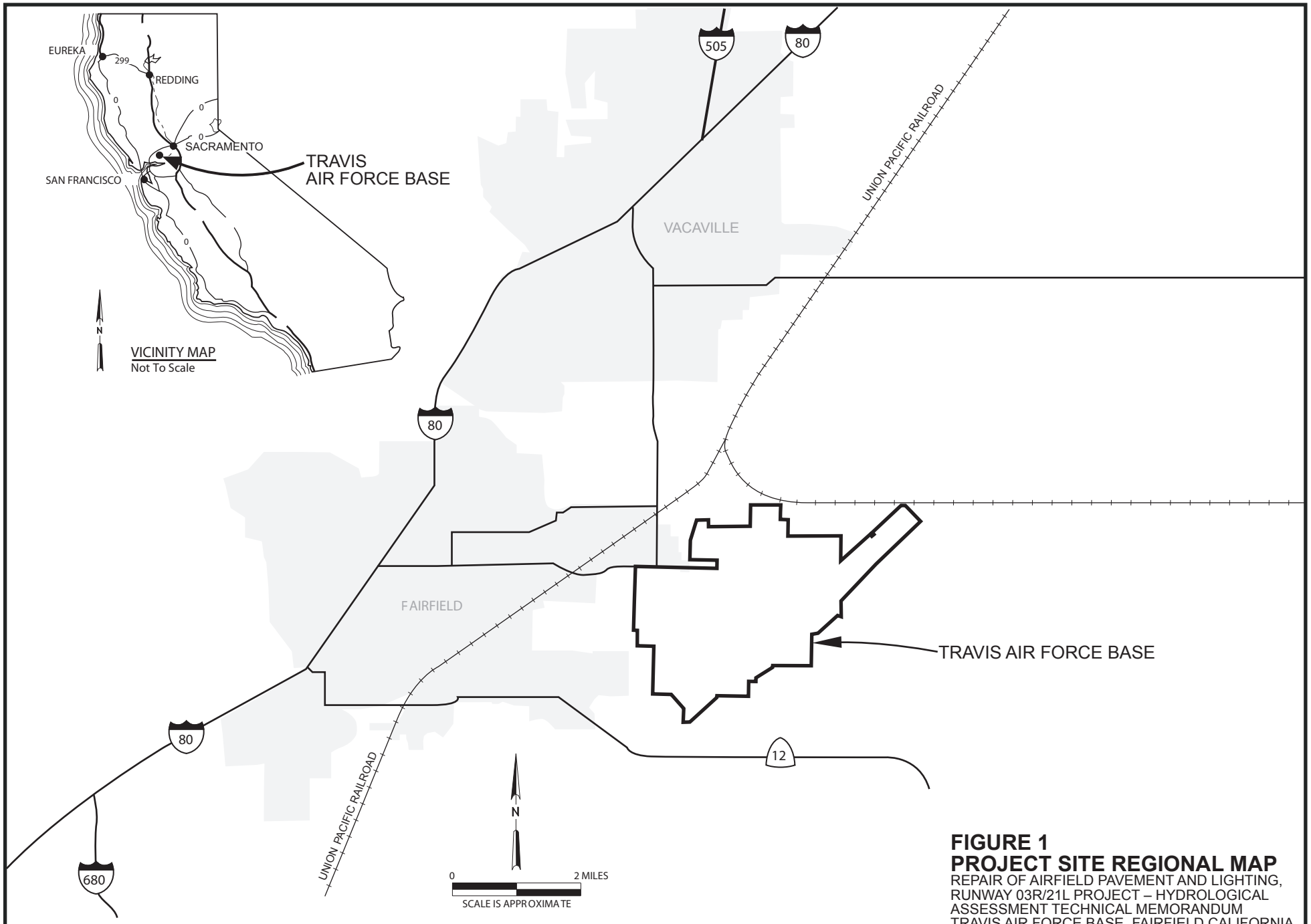

FIGURE 1
PROJECT SITE REGIONAL MAP
REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L PROJECT – HYDROLOGICAL ASSESSMENT TECHNICAL MEMORANDUM
TRAVIS AIR FORCE BASE, FAIRFIELD CALIFORNIA

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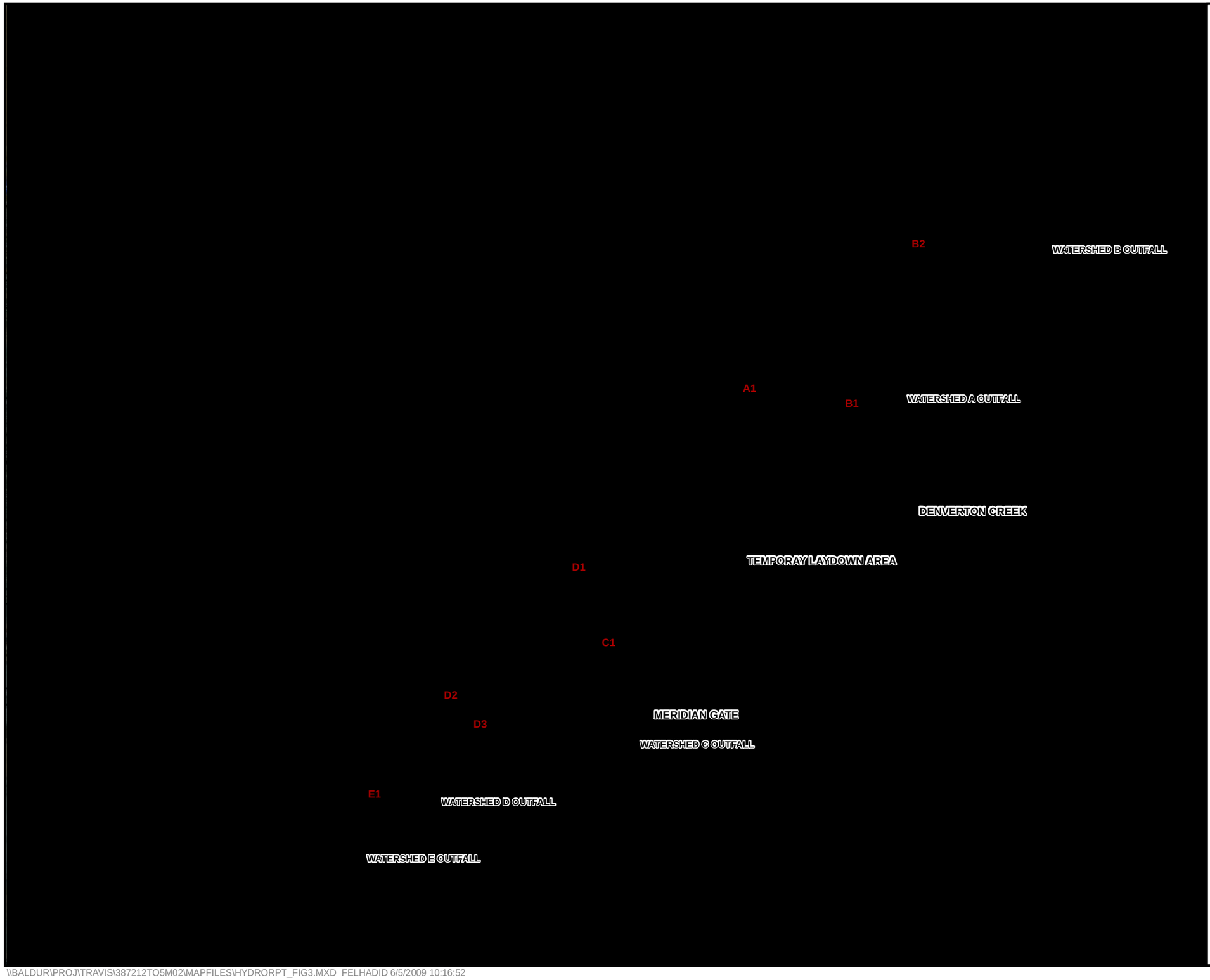
FIGURE 2
PHOTOGRAPHS OF TYPICAL LAND COVER AND TOPOGRAPHY ADJACENT TO RUNWAY 03R/21L
REPAIR OF AIRFIELD PAVEMENT AND LIGHTING,
RUNWAY 03R/21L PROJECT – HYDROLOGICAL
ASSESSMENT TECHNICAL MEMORANDUM
TRAVIS AIR FORCE BASE, FAIRFIELD CALIFORNIA



LEGEND

- HYDROLOGIC BASIN OUTLETS
- MERIDIAN GATE AND PROPOSED LAYDOWN AREAS
- RUNWAY 03R/21L DRAINAGE BASINS
- EXISTING RUNWAY 03R-21L
- PROPOSED RUNWAY 03R/21L FOOTPRINT
- SEASONAL WETLAND
- WETLANDS
- TRAVIS AIR FORCE BASE BOUNDARY
- GENERAL FLOW DIRECTION

N

0 1,500 3,000 FEET

FIGURE 3
SITE HYDROLOGIC MAP

REPAIR OF AIRFIELD PAVEMENT AND LIGHTING, RUNWAY 03R/21L PROJECT – HYDROLOGICAL ASSESSMENT TECHNICAL MEMORANDUM
TRAVIS AIR FORCE BASE, FAIRFIELD CALIFORNIA

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Attachment 1
WinTR-55 Equations

ATTACHMENT 1

WinTR-55 Equations

Stormwater runoff and routing equations used by the WinTR-55 application for the Runway 03R/21L hydrologic analysis are provided below.

Runoff Equation

$$Q = \frac{\left[P - 0.2 \left(\frac{1000}{CN} - 10 \right) \right]^2}{P + 0.8 \left(\frac{1000}{CN} - 10 \right)}$$

Where

Q = runoff (in)
P = rainfall (in), and
CN = runoff curve number

Composite CN (connected impervious area)

$$CN_c = CN_p + \left(\frac{P_{im}}{100} \right) (98 - CN_p)$$

Where

CN_c = composite runoff curve number
CN_p = pervious runoff curve number, and
P_{im} = percent imperviousness

Composite CN (unconnected w/ <30% impervious)

$$CN_c = CN_p + \left(\frac{P_{imp}}{100} \right) (98 - CN_p) (1 - 0.5\ R)$$

Where

R = ratio of unconnected impervious area to total impervious area

Sheet Flow

$$T_t = \frac{0.007\ (nL)^{0.8}}{(P_2)^{0.5}\ S^{0.4}}$$

Where

T_t = travel time (hr)
n = Manning roughness coefficient (for sheet flow)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in), and
s = slope of hydraulic grade line (land slope, ft/ft)

Shallow Concentrated Flow

$V = 16.1345\sqrt{s}$ (Unpaved)

$V = 20.3282\sqrt{s}$ (Paved)

Where

V = average velocity (ft/s), and
s = slope of hydraulic grade line (watercourse slope, ft/ft)

These two equations are based on a solution of the Manning equation with different assumptions for *n* (Manning roughness coefficient) and r (hydraulic radius, ft). For unpaved areas, *n* is 0.05 and r is 0.4; for paved areas, *n* is 0.025 and r is 0.2.

Channel Flow (Manning Equation)

$$V = \frac{1.49 r^{2/3} \sqrt{s}}{n}$$

Where

V = average velocity (ft/s), and
r = hydraulic radius (ft) and is equal to a/p_w
a = cross sectional flow area (ft^2)
p_w = wetted perimeter (ft)
s = slope of hydraulic grade line (channel slope, ft/ft)
n = Manning roughness coefficient (for open channel flow)

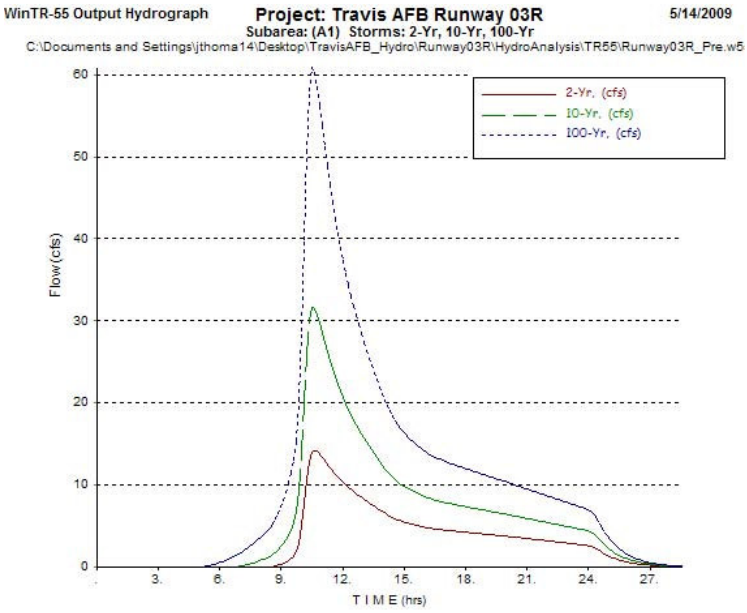
Attachment 2
Hydrographs

ATTACHMENT 2

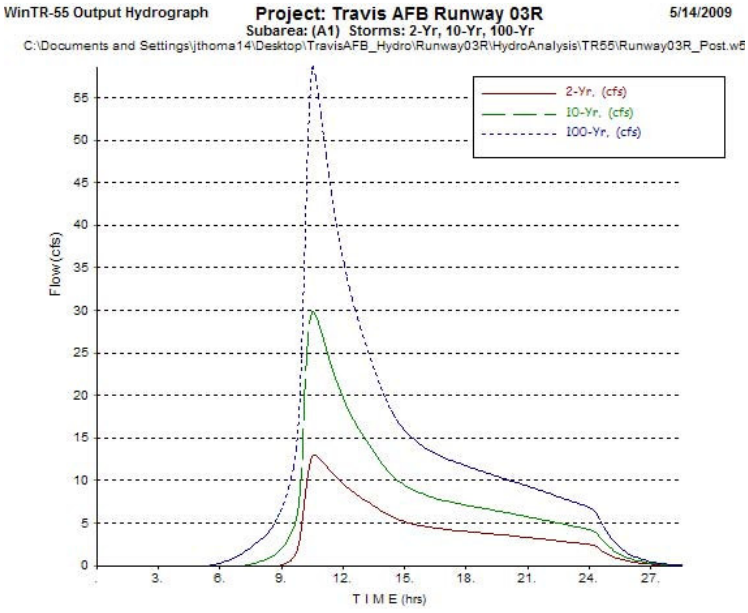
Hydrographs

This attachment presents 2-year, 10-year, and 100-year storm event hydrographs within each sub-basin for existing and proposed conditions.

Sub-Basin A1 – Existing Conditions



Sub-Basin A1 – Proposed Conditions



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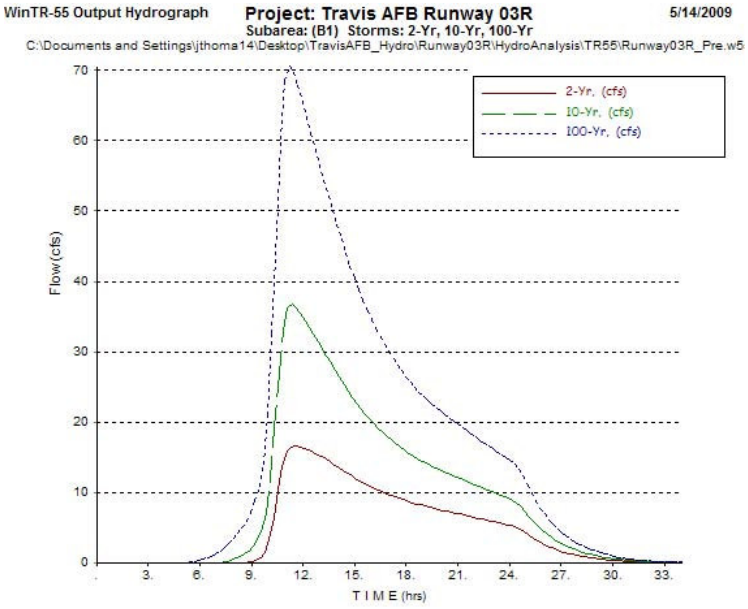
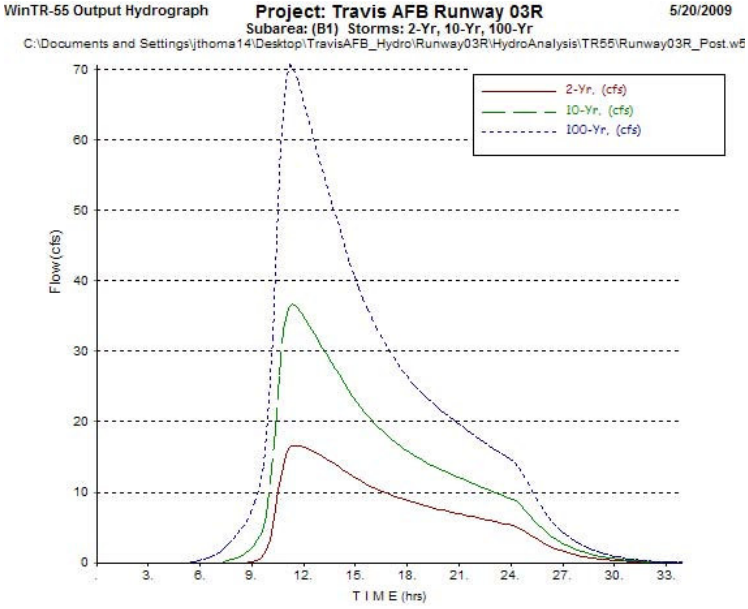
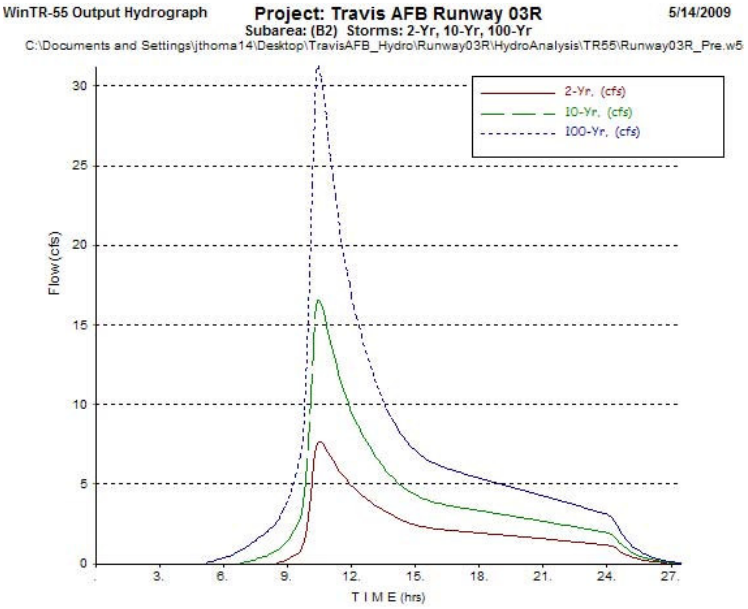


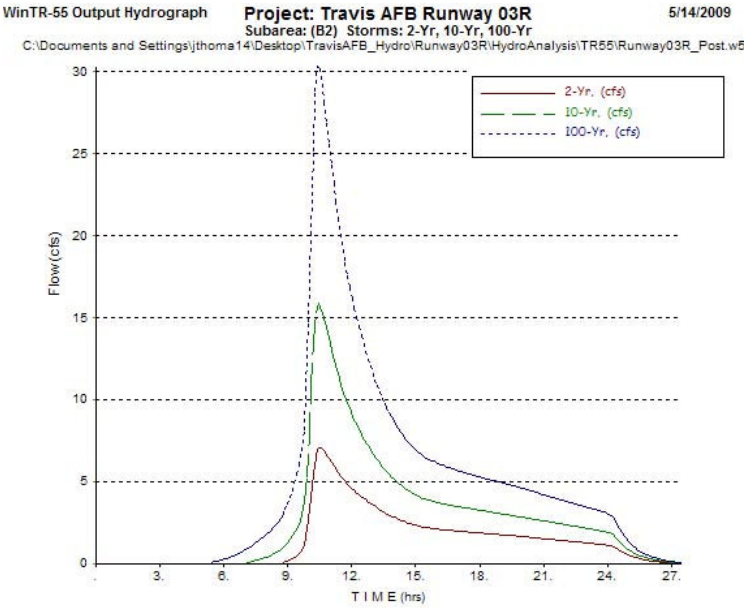
Sub-Basin B1 – Proposed Conditions



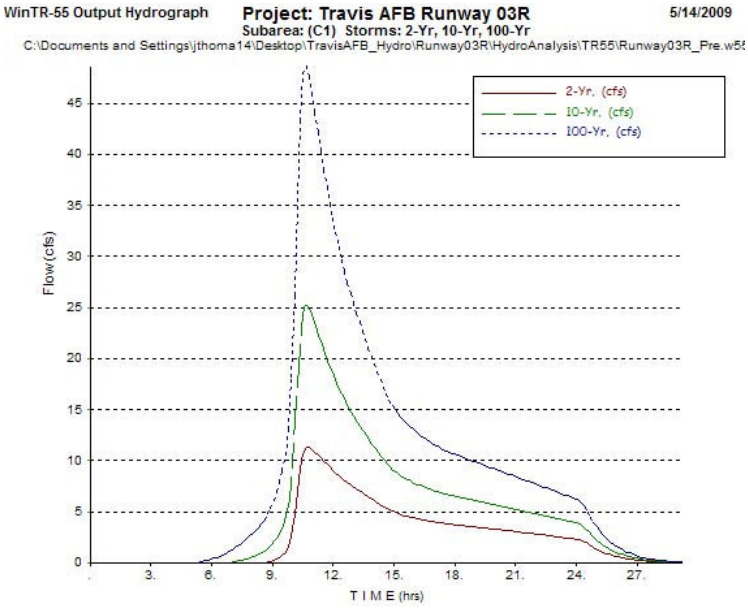
Sub-Basin B2 – Existing Conditions



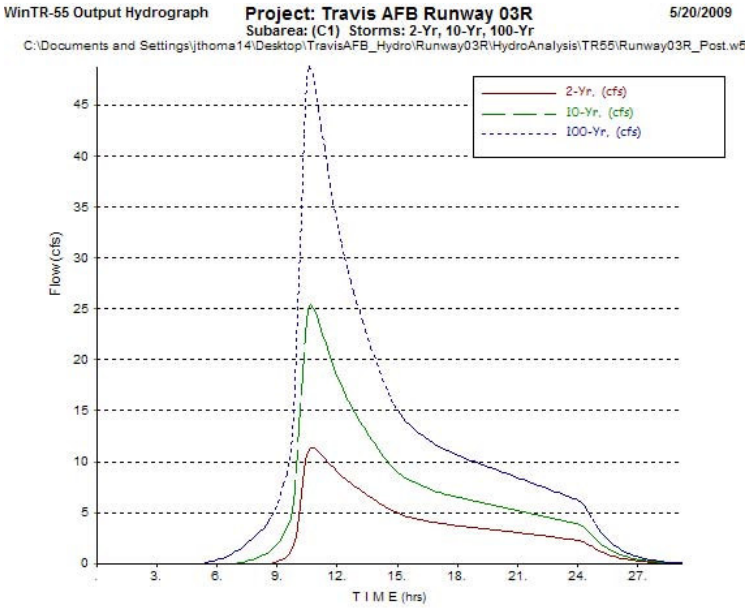
Sub-Basin B2 – Proposed Conditions



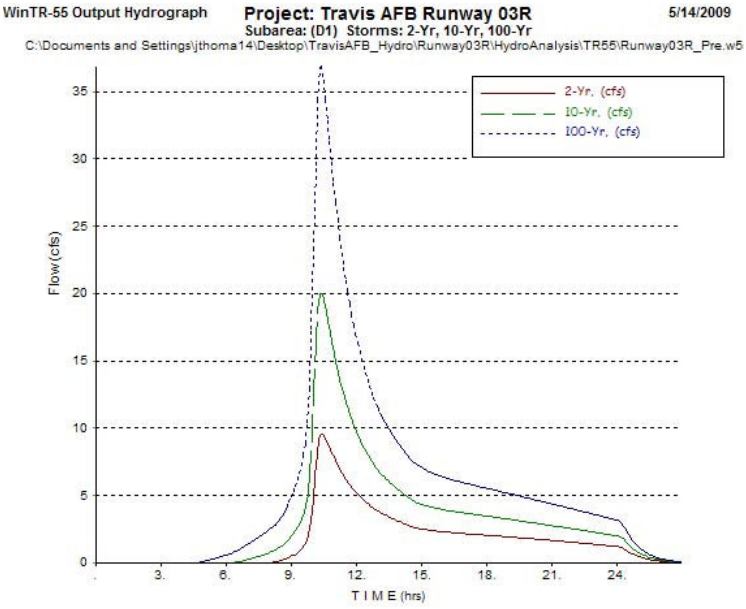
Sub-Basin C1 – Existing Conditions



Sub-Basin C1 – Proposed Conditions



Sub-Basin D1 – Existing Conditions



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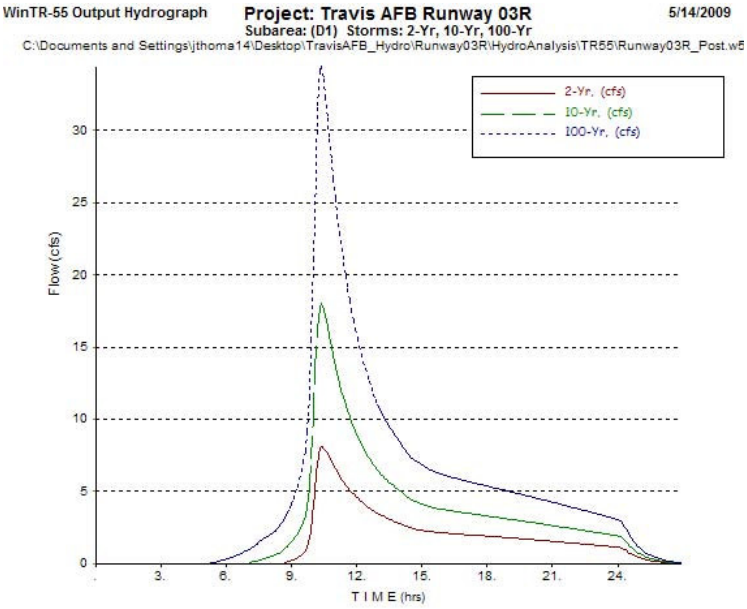

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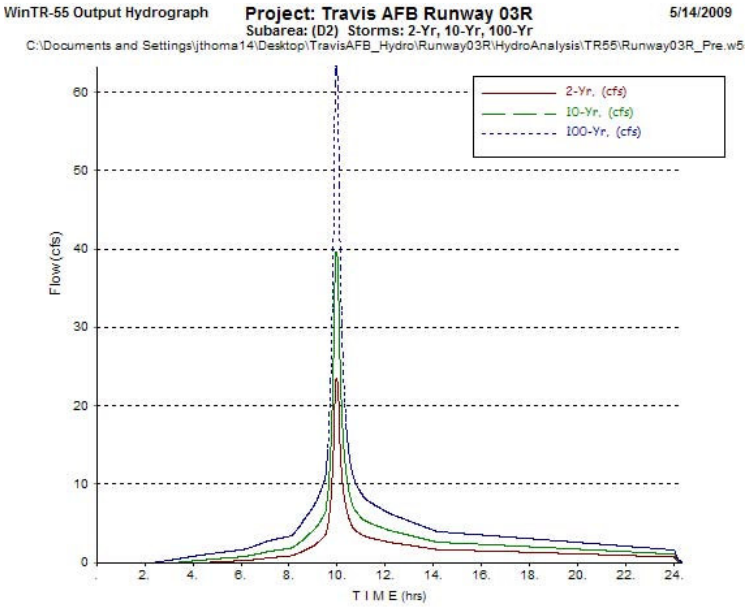

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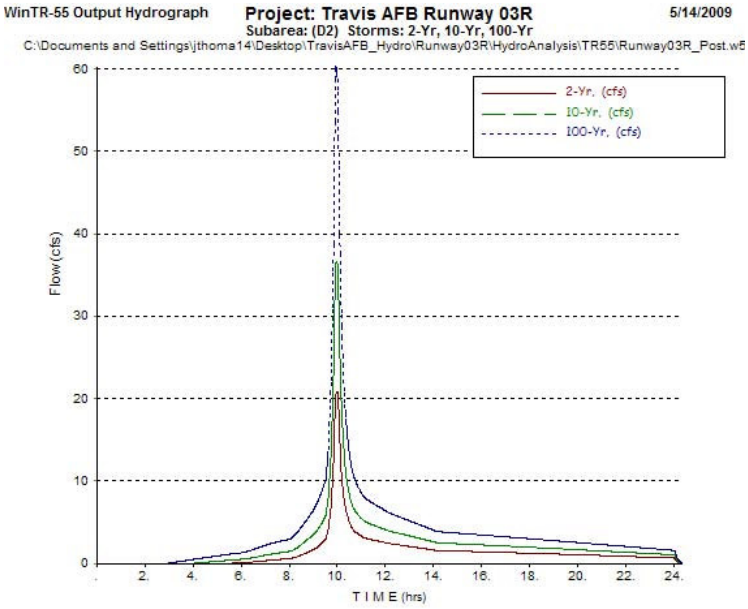
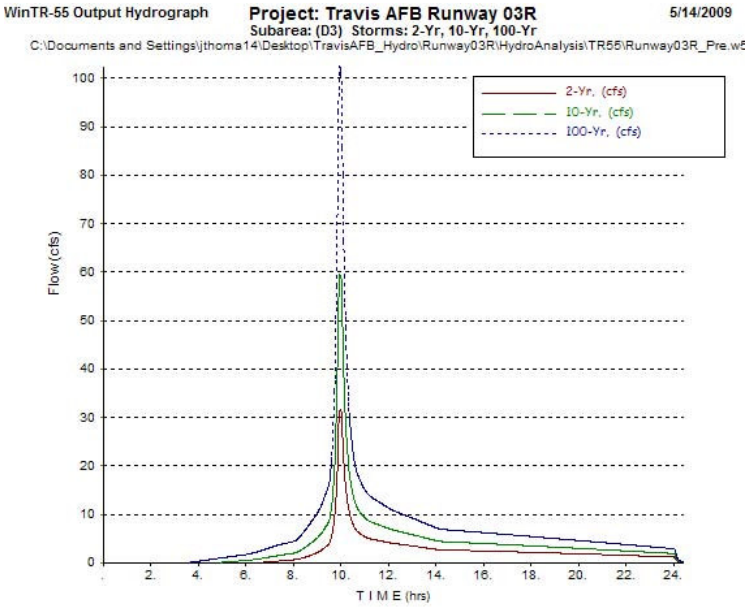
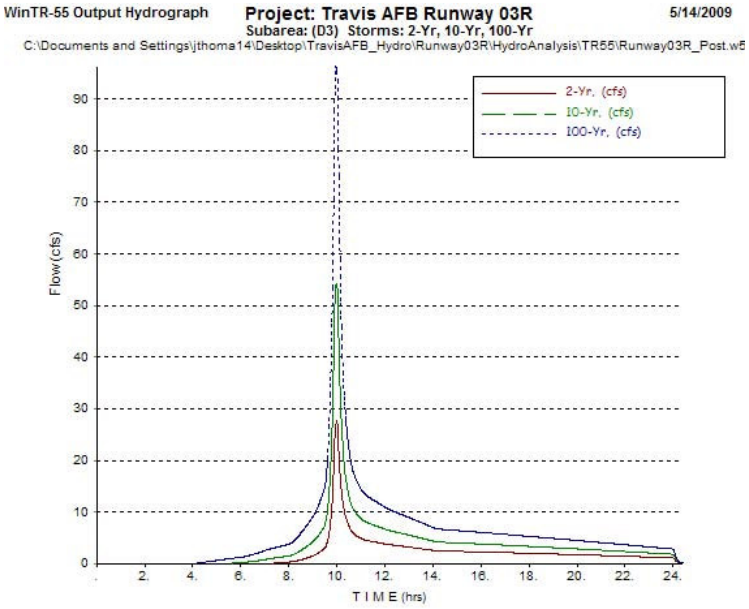


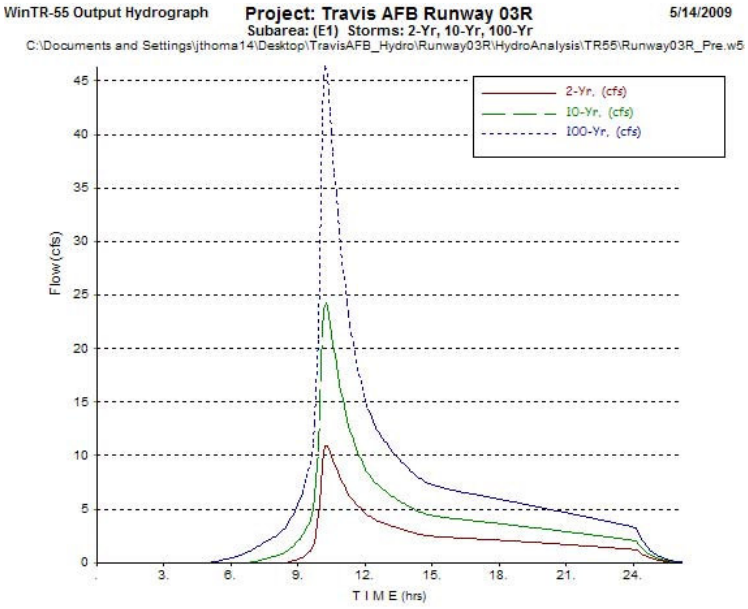
Sub-Basin D3 – Existing Conditions



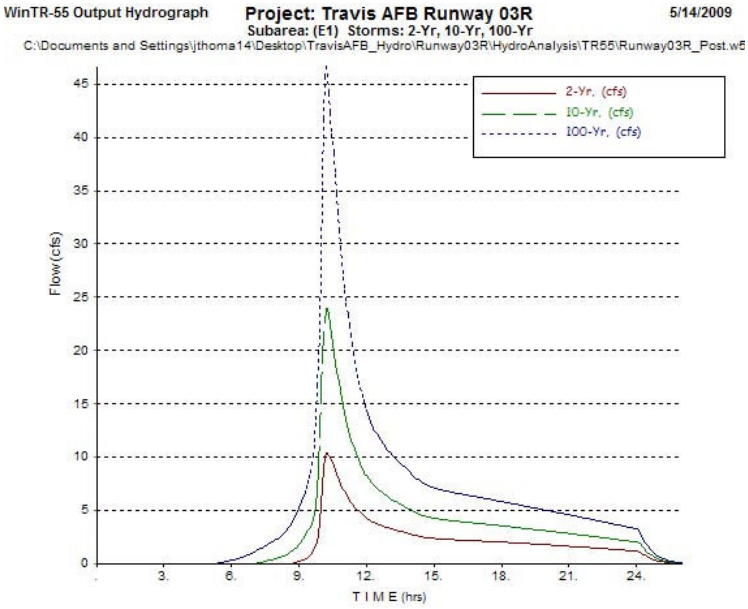
Sub-Basin D3 – Proposed Conditions



Sub-Basin E1 – Existing Conditions



Sub-Basin E1 – Proposed Conditions



Appendix F
Biological Opinion, U.S. Fish and Wildlife Service

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:
81420-2009-F-1000-1

OCT 29 2009

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 03R/21L Runway Repair Project, Solano County, California

Dear Mr. Musselwhite:

This letter is in response to your June 4, 2009, request for concurrence that the proposed Travis Air Force Base (Travis AFB) 03R/21L Runway Repair Project (proposed project) may affect but is not likely to adversely affect the threatened Delta green ground beetle (*Elaphrus viridis*)(beetle), threatened vernal pool fairy shrimp (*Branchinecta lynchi),* endangered vernal pool tadpole shrimp (*Lepidurus packardi*)(vernal pool crustaceans), endangered Conservancy fairy shrimp (*Branchinecta conservatio*)(conservancy) and the endangered Contra Costa goldfields (*Lasthenia conjugens*)(goldfields). Travis AFB also requested formal consultation for adverse effects to the threatened California tiger salamander (*Ambystoma californiense*) (salamander). The U.S. Fish and Wildlife Service (Service) received your request on June 4, 2009. The proposed project is located in Solano County, California on the southeastern edge of the 6,883 acre Travis AFB approximately 7 miles east of the City of Fairfield and 7 miles south of the City of Vacaville. Travis AFB is located within the eastern border of the Fairfield urban limits. Based upon the information provided, the Service concurs that the proposed action is not likely to adversely affect goldfields and conservancy, and concurs that the proposed action will result in adverse effects to the salamander. The Service has made this determination based on the results of guideline-level surveys and habitat assessments in the action area and 250 feet from the proposed action area.

The Service does not concur that the proposed project is not likely to adversely affect the vernal pool crustaceans and beetle due to the numerous known occurrences of these species on and near the proposed project action area, and suitable habitat for these species located in the action area for the proposed project. The proposed project is not located in proposed or designated critical habitat for any federally-listed species. Therefore, no critical habitat would be affected.

TAKE PRIDE IN AMERICA

This response is in accordance with section 7 of the Endangered Species Act if 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 vernal pool crustaceans, beetle and salamander.

This biological opinion is based on information provided in the following: (1) the June 2009, *Biological Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California (BA)*; (2) the July 23, 2009, *Revised Project Description for the Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California*; (3) the September 15, 2009 *Revised Project Description for the Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California*; (4) multiple meetings regarding the proposed project between the Service and Travis AFB personnel; (5) electronic mail correspondence (e-mail) and telephone conversations between representatives of the Service and the Travis AFB, on the proposed action; (6) references cited in this biological opinion; and (7) other information available to the Service.

CONSULTATION HISTORY

February 10, 2009: The Service met with Travis AFB to informally discuss the proposed project and impending future Travis AFB project consultations.

June 4, 2009: The Service received the *Biological Assessment for Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California*

July 16, 2009: The Service met with Travis AFB to further discuss the proposed project.

July 23, 2009: The Service received a *Revised Project Description for the Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California*

September 14, 2009: The Service met with Travis AFB the U.S. Army Corps of Engineers to further discuss the proposed project.

September 15, 2009: The Service received a *Revised Project Description for the Repair of Airfield Pavement and Lighting, Runway 03R/21L Travis Air Force Base, Fairfield, California*

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. Runway 03R/21L is the primary instrument approach runway for Travis AFB and is currently heavily

utilized. The proposed action will repair the runway to meet current Unified Facilities Criteria (UFC) for Class B Air Force runways that accommodate heavy aircraft. The runway will shrink in width from 300 feet(ft) to 200 ft and the overruns from 300 ft to 150 ft, a net reduction area of 30.66 acres. The proposed project improvements will include replacement of the existing runway pavement, construction of a new electrical duct bank, replacement of existing airfield lighting and signage, precision approach path indicator (PAPI) replacement, replacement of existing approach lighting, construction of a subsurface drainage system and storm sewer line replacement. A contractor staging/batch plant area and a new access gate will also be constructed to support the project. The proposed project will occur concurrently with construction of a C-17 Assault Landing Zone (ALZ) project that has been permitted separately (Service File number 81420-2008-F-1142-1). Where the work area for the proposed project overlaps with the ALZ study area, results of the ALZ studies are used to determine potential effects to listed species. The proposed project footprint is 236.95 acres, of that acreage 93.24 acres is currently improved. Due to the reduced size of the runway, establishment of a contractor laydown area and establishment of a new access gate the total improved area at the completion of the project will be 81.22 acres, the remaining construction footprint will be restored to pre-project conditions. In order to avoid impacts to federally-listed species beyond the limits of work, temporary exclusionary and construction fencing will be installed around the perimeter of the work area.

Runway Repair

The existing runway is 10,995 ft long and 300 ft wide. The design requirements for the repaired runway require the width to be physically reduced from 300 ft to 200 ft. All existing runway pavement will be broken up in place by a concrete guillotine breaker and some of the rubblelized concrete will be transported back to the contractor staging area where it will be recycled into other products required for the runway repair and landing zone construction. The remaining rubblelized concrete will be left in place where the new runway pavement will be placed on top, this can be done due to portions of the repaired runway will be up to 18 inches higher in elevation to match the elevation of the new landing zone. A turnaround has been designed at the northeast end of the runway to accommodate 180-degree turning maneuvers. Due to the elevation changes on the repaired runway an area of land around the perimeter of the runway will be graded to provide a gradual slope away from the paved surfaces. Grading limits vary along the length of the runway due to varying amounts of elevation rise from the existing runway surface. Much of the graded area is within the footprint of the existing 300 foot wide runway.

Homerun Duct Bank Construction

A new homerun duct bank will be constructed to provide electrical service for runway lighting, approach lighting, and associated taxiway circuits. The duct bank will consist of up to 50 conduits incased in concrete. It will be constructed by drilling under areas where there is existing pavement. In areas where no pavement exists, a trench will be dug for construction of the duct bank.

Airfield Lighting and Signage Installation

The existing runway edge lights, centerline lights, and touchdown zone lights will be replaced as part of the proposed action. Airfield lighting and signage will be placed within the runway pavement and grading limits. Existing runway distance markers (RDMs) and mandatory signs are proposed to be removed and replaced. The new RDMs will be located on both sides of the runway, offset from the runway edge at the maximum distance of 75 ft and spaced every 1,000 ft along the runway, and will be replaced in kind.

Precision Approach Path Indication Replacement

The existing PAPI system is a navigational aid that will be removed and replaced for both runway ends. The new system will be placed within the runway pavement and grading limits.

Approach Lighting System Replacement

The existing Approach Lighting System (ALS) will be upgraded to meet the reduced approach minimums of a Category II instrument approach. The existing foundations for approach lights located beyond the existing paved overrun will be reused. A new electrical duct bank will be constructed 18 inches below the surface along the path of the approach lighting to provide electrical service for the lights.

Subsurface Drainage and Storm Sewer Line

The proposed project will replace the existing drainage system to extend the life of piping and improve flow conditions under the runway. There are three main lines under the runway providing drainage for large portions of the Base area. A pavement underdrain system will be installed along the entire length of the runway, except for the overruns. This system is needed to maintain consistent moisture content by drawing subsurface drainage away from the pavement structure and therefore reducing the effects of varying subgrade conditions. The underdrain system will be placed within the runway pavement and grading limits.

Contractor Staging Area

A contractor staging area is proposed near the runway and will house a material laydown yard, batch plant for producing concrete, and a crushing plant for recycling the rubblelized concrete. The contractor staging area will occupy 17.02 acres and will be constructed of compacted gravel, which will remain in place at the completion of the project. This area includes the construction of new haul roads to connect the contractor staging and area with existing Perimeter Road, the runway, the new landing zone, and existing contractor offices.

Meridian Gate Construction and Contractor Hauling

A new 1.37 acre commercial vehicle access gate is proposed for construction where the base's fence line meets Meridian Road. The new gate is required to reduce equipment idling times

and avoid congestion at the existing South Gate that would otherwise be associated with the proposed project. Hauling operations will take place from the Meridian Gate onto the existing Perimeter Road and from there to the proposed contractor staging area.

Construction Schedule and Phasing

It is estimated that proposed project will begin in fall 2009 and that aircraft operations will resume after repairs are completed in approximately 18 months. The proposed project will not result in changes to current operations. A preliminary runway construction-phasing plan was developed to maintain at least one taxiway from the 200 Ramp to the TACAMO ramp. The phases were determined based on minimum construction set back criteria of 250 ft as requested by Travis AFB. The construction phases are as follows:

Phase 1: construction of the homerun duct bank.
Phase 2: involves the repair of the majority of the runway except for Taxiway G. This taxiway will provide access to and from the TACAMO ramp during construction.
Phase 3 consists of repairing Taxiway G.

The activities associated with the construction of the proposed project will result in permanent disturbance to 70.85 acres of salamander upland habitat and temporary disturbance to 72.85 acres of salamander upland habitat. Within the 72.85 acres of salamander upland habitat, 1.37 acres of upland beetle habitat will be temporarily disturbed. The activities associated with the construction of the proposed project will result in temporary disturbance to 0.45 acres of wetted vernal pool crustacean and beetle habitat. Permanent disturbance will result from new utility infrastructure, grading outside of the original runway footprint, and a contractor staging areas that will remain in place after project completion. Temporary disturbance will result from project activities such as the temporary Meridian Gate installation, approach lighting work to be installed in the dry season, and equipment turnaround areas beyond the permanent disturbance area that will be restored to pre-project conditions.

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 03R/21L Runway Repair Project, this includes all areas subject to the direct effects associated with construction which include replacement of the existing runway pavement, construction of a new electrical duct bank, replacement of existing airfield lighting and signage, precision approach path indicator (PAPI) replacement, replacement of existing approach lighting, construction of a subsurface drainage system and storm sewer line replacement. A contractor staging/batch plant area and a new access gate will also be constructed to support the project. All of these activities will encompass 236.95 acres, of which 70.85 acres are permanent upland disturbance, 72.85 acres are temporary upland disturbance, and 0.45 acres are temporary wetted disturbance.

Conservation and Minimization Measures

According to the June 2009, BA and the July 23, 2009 and September 15, 2009, supplemental project description, the Air Force proposed that this action will be designed and constructed in the following ways that will minimize effects on the salamander, vernal pool crustaceans, and the beetle. These measures are:

1. To minimize the permanent adverse effects of the proposed project on the salamander the Air Force will protect a combined total of 212.55 acres of upland (70.85 acres of impact compensated at a 3:1 ratio = 212.55). This habitat compensation can be achieved by: 1) purchase of salamander compensation credits at an existing Service approved bank or banks, in Solano County, 2) purchase and preservation of a Service-approved parcel and establishment of a conservation easement, development of a management plan, and provision of a perpetual endowment sufficient to cover management and maintenance of protected lands for the benefit of the salamander, or 3) a combination of these two approaches. The project proponents will also restore 72.85 acres of disturbed upland habitat for the salamander and the beetle to pre-project conditions as soon as construction is completed. Temporarily disturbed areas that are not restored within 6 months of construction completion will be considered permanently impacted by the Service and the Air Force will reinitiate formal consultation with the Service.

2. A permanent fence will be installed inside the perimeter of the project parcel prior to site clearance and grading activities. The fence will be constructed of materials sufficient to prevent salamanders from entering the project site, and will exclude construction equipment and personnel from entering habitat for federally listed vernal pool species beyond the project area.

3. The superintendent of construction or their designee will be responsible for implementing these conservation and minimization measures and Terms and Conditions of this biological opinion and shall be the point of contact for the project. The Resident Officer In Charge of Construction or their designee will maintain a copy of the biological opinion onsite whenever construction is taking place. Their name and telephone number will be provided to the Service at least thirty (30) calendar days prior to groundbreaking of the proposed project. Prior to ground breaking, the Resident Officer In charge of Construction will submit a letter to the Service verifying that they possess a copy of this biological opinion and will comply with its measures and Terms and Conditions.

4. All construction personnel will attend an environmental education program delivered by Service-approved biologist prior to working on the project site. The program will focus on how best to avoid take of listed species. The training session would be scheduled as a mandatory informational field meeting by the superintendant of construction for contractors and all construction personnel, and appropriate staff. The field meeting will include topics on species identification, life history, descriptions, and habitat

requirements during various life stages. Emphasis will be placed on the importance of the habitat and life stage requirements within the context of the project area. Maps showing areas where minimization and avoidance measures are being implemented will be included as part of this education program. The program will include an explanation of appropriate Federal and State laws protecting listed species as well as the importance of compliance with various resource agency conditions.

5. All construction activity will be confined within the project site, which may include established roads, construction areas, and other designated areas. These areas also will be included in pre-construction surveys and, to the maximum extent possible, will be established in locations disturbed by previous activities to prevent further adverse effects. At no time will equipment or personnel be allowed to access areas outside the project site without authorization from the Service.

6. The number of access routes, the number and size of staging areas and the total areas of the activity will be limited to the minimum areas necessary to achieve the project goal. To minimize temporary ground disturbance, construction equipment will remain in areas of permanent disturbance wherever possible.

7. During project activities, all trash that may attract predators will be properly contained in a closed container, removed from the work site, and disposed regularly. All workers will ensure their food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a day from the entire project site.

8. All equipment will be kept either in approved work areas or travel corridors, or in approved staging and storage areas.

9. Fires will not be permitted. Any smoke or open flame will be immediately reported to the subcontracting supervisor. A fire extinguisher is required in each field vehicle and will be maintained in good operating order and readily available. Smoking will be allowed only in approved areas.

10. Feeding or disturbing wildlife will not be permitted.

11. Use of pesticides at the proposed project site will be prohibited to prevent primary or secondary poisoning of listed species.

12. A qualified biologist will ensure that the spread or introduction of invasive exotic plant species is avoided to the maximum extent possible. Where practicable, invasive exotic plants in the project areas will be removed.

13. Storage of fuel or hazardous materials is not permitted in the vicinity of agricultural ditches.

14. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from agricultural ditches. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

15. Fluid spill containment and clean up materials will be readily available.

16. Erosion control measures will be utilized throughout all phases of operation where sediment runoff from exposed slopes threatens to enter waters of the U.S. At no time will silt-laden runoff be allowed to enter agricultural ditches or be placed where it may enter agricultural ditches.

17. Exclusionary fencing will be installed for the salamander around the entire work area throughout the project duration. Exclusionary fencing will consist of taut silt fabric; 24 inches in height, staked at 10-foot intervals, with the bottom buried 6 inches below grade. Exclusion fencing will be maintained so that it is intact during rain events and 24 hours after any rain event, and will be routinely checked for integrity or potential entrapment. Plastic mono-filament netting (erosion control matting) or similar material will not be used at the project site because the salamander may become entangled or trapped in it. The contractor will use either coconut coir matting or tackified hydroseeding compounds.

18. Upon completion of the proposed action, all salamander, vernal pool crustacean, and beetle habitat subject to temporary ground disturbances will be regraded, if appropriate, and revegetated with seeds and/or cuttings of appropriate plant species to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. The Air Force will submit to the Service their draft proposal for the restoration and revegetation plan at least sixty (60) calendar days prior to initial ground breaking; the final plan will be submitted for approval by the Service prior to ground breaking at the proposed project. To the maximum extent practicable, topsoil will be removed, cached, and returned to the site according to successful restoration protocols. Loss of soil from run-off or erosion will be prevented with straw bales, straw wattles, or similar means provided they do not entangle or block salamander escape or dispersal routes. The draft and final plan will contain specific quantifiable criteria to evaluate the success of the restoration. A biologist will ensure that areas subject to temporary disturbance have been adequately restored.

19. The Air Force will prepare and implement an erosion control and restoration plan to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities. The plan will include all the necessary local jurisdiction requirements regarding erosion control and will implement

Best Management Practices (BMP's) for erosion and sediment control as required. Only appropriate native plant material will be used for erosion control and restoration.

20. The Air Force will submit to the Regional Water Quality Control Board (RWQCB) a notice of intent to discharge stormwater before construction and/or operation activities begin and will develop and implement a Storm Water Pollution Prevention Plan (SWPPP) as required by the conditions of a National Pollutant Discharge Elimination System (NPDES) permit. The Air Force will prepare a SWPPP that identifies BMP's for discharges and groundwater disposal from dewatering operations associated with construction. The SWPPP will identify how and where these discharges would be disposed of during construction and operations.

21. At anytime during construction the Air Force will allow access by Service and/or California Department of Fish and Game personnel to the project site to inspect project effects to the California tiger salamander and their habitats.

22. To prevent inadvertent entrapment of California tiger salamanders during construction, all excavated, steep-walled holes or trenches more than 2 ft deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals.

Analytical Framework for the Jeopardy and Adverse Modification 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 salamander'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 salamander in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the salamander, vernal pool crustaceans, and the beetle; (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 salamander, vernal pool crustaceans, and the beetle; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the salamander, vernal pool crustaceans, and the beetle.

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 salamander, vernal pool crustaceans, and the beetle's 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 salamander, vernal pool crustaceans, and the beetle 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 salamander, vernal pool crustaceans, and the beetle and the role of the action area in the survival and recovery of the salamander, vernal pool crustaceans, and the beetle 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 and Environmental Baseline

California Tiger Salamander

On May 23, 2003, we proposed to list the Central California Distinct Population Segment (DPS) of the California 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 the Central California population of the California DPS of the California tiger salamander was threatened (69 FR 4721211), we determined that the Santa Barbara and Sonoma County populations were threatened as well, and reclassified the 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 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 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.

The 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). 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.

The 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 salamanders are abundant. Subadult and adult 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).

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 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. 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 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 salamanders.

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 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 stockponds. 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 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 averaged 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 salamanders often continue to emerge nightly for approximately the next two weeks to feed amongst their upland habitat (Shaffer *et al.* 1993).

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 treefrogs (*Pseudacris regilla*), western spadefoot toads (*Spea hammondii*), and California red-legged frogs (*Rana aurora draytonii*) (J. Anderson 1968; P. Anderson 1968). 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 salamanders are wary and typically escape into vegetation at the bottom of the pool when approached by potential predators (Storer 1925).

The 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 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 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 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 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 salamanders return to upland habitats, where they may live for one or more years before attempting to breed again (Trenham *et al.* 2000).

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 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 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 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 salamanders at even further distances, with a large proportion of the captures at 2,297 feet from the breeding pond (Trenham *et al.*, unpublished data). Surprisingly, most juveniles captured, even those at 2,100 feet, were still moving away from ponds. In Santa Barbara County, juvenile 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 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 salamanders were tracked to burrows between 62 to 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult salamanders exiting the ponds with depleted physical reserves, or drier weather conditions typically associated with the post-breeding upland migration period.

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.

Documented or potential 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 aurora draytonii*), mosquito fish (*Gambusia affinis*), and crayfish (*Procrambus* species).

The salamander is imperiled throughout its range due to a variety of human activities (Service 2004). Current factors associated with declining 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. 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 and jeopardized the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal, and are capable of colonizing or "rescuing" extinct habitat patches). 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 salamander is also prone to chance environmental or demographic events.

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 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.

Travis AFB is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Ecosystem, which is a geographical area, 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. The salamander is one of the primary species in the ecology of this vernal pool region. The 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 salamander habitat loss and fragmentation. The salamander is known to be present in much of the undeveloped areas surrounding the base. The California Department of Fish and Game's California Natural Diversity Database includes multiple reported salamander observations within 0.25 miles east, north and south of the project action area (CDFG 2009). Some of these observations include those at Wilcox Ranch and Muzzy Ranch properties, North Suisun Conservation Bank, and one observation on the base. The action area is within the known salamander dispersal range from these salamander-occupied properties and there are no significant artificial, hydrological, or landscape barriers between these occupied areas and the action area. The base boundary is defined by a tall chain link security fence that is not effective in preventing salamander movement on or off the base.

Areas immediately adjacent to the action area and the eastern boundary of Travis AFB have been assigned various designations relative to the ecological value of associated vernal pool habitat. The action area is a few miles west the Jepson Prairie Core area described in the Service's Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Service 2005). The California tiger salamander Central Valley Region, Designated Critical Habitat Unit 2 is located approximately 2 miles east of the action area. There are multiple records of salamanders in the vicinity of the action area.

Salamander protocol level surveys have never been conducted on Travis AFB but CH2M Hill biologist, Russell Huddleston, incidentally captured salamander larvae while conducting vernal pool crustacean sampling at a pond (basin BP35a) near base housing at the north central boundary of Travis AFB, approximately 2 miles north of the action area (Service personal communication with Russell Huddleston on April 7, 2008). Mr. Huddleston captured the larvae while sampling vernal pools in the general area as part of the monitoring requirements for the Burke Property vernal pool mitigation site. Huddleston informed the Service and Dr. Brad Shaffer from the University of California at Davis, and on April 3, 2008, Shaffer and his associates visited the Burke Property vernal pool mitigation site on Travis AFB to sample BP35a and two other nearby ponds for salamanders. According to Huddleston, Schaffer captured over 60 salamander larvae between two of the pools and took tissue samples from 20 individuals at each pool for genetic analysis. Base development presents a significant movement barrier between the occupied pools at the Burke Property vernal pool mitigation site and the action area. However, the significance of this capture is that it was the first time the salamander has 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 the base.

The Service believes that the 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 potential breeding ponds adjacent to the action area, known nearby occurrences within the dispersal range of the salamander, uninterrupted connectivity between occupied habitat and the action area, and the biology and ecology of the animal, especially the ability of the adults to move considerable distances between their breeding ponds and upland habitat.

Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (fairy shrimp) was listed as threatened on September 19, 1994 (U.S. Fish and Wildlife Service 1994). Simovich *et al.* (1992) and Ericksen and Belk (1999) provide further details about the life history and ecology of this species. 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.

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 fewer 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 hydrology that maintains the pattern of inundation and drying characteristic of vernal pool habitats is complex. Vernal pool habitats form in depressions above an impervious soil layer (duripan) or rock substrate. After winter rains begin, this impervious layer prevents the downward percolation of water and creates a perched water table causing the depression (or pool) to fill. Due to local topography and geology, the depressions are generally part of an undulating landscape, where soil mounds are interspersed with basins, swales, and drainages (Nikiforoff 1941; Holland and Jain 1988). These features form an interconnected hydrological unit known as a vernal pool complex. Although vernal pool hydrology is driven by the input of precipitation, water input to vernal pool basins also occurs from surface and subsurface flow from the swale and upland portions of the complex (Zedler 1987, Hanes *et al.* 1990, Hanes and Stromberg 1998). Surface flow through the swale portion of the complex allows vernal pool species to move directly from one vernal pool to another. Upland areas are a critical component of vernal pool hydrology because they directly influence the rate of vernal pool filling, the length of the inundation period, and the rate of vernal pool drying (Zedler 1987; Hanes and Stromberg 1998).

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 dessication 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 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 6 separate hatches of fairy shrimp within a single wet season, and Gallagher (1996) observed 3 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 9 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 has 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 fairy shrimp is known from 32 populations extending from 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 Pinnacles in San Benito County (Eng et al. 1990; Fugate 1992; Sugnet and Associates 1993) and a disjunct population on the Agate Desert in Oregon. 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. Individual vernal pools occupied by these species are most appropriately referred to as subpopulations.

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 tadpole shrimp and fairy shrimp (Brusca in. litt.; 1992; Simovich in. litt., 1992). The eggs of these 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.

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 fairy shrimp is imperiled by a variety of human-caused activities, primarily urban development, water supply/flood control projects, and land conversion for agricultural use. 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 these species include off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use. The main threat to listed vernal pool crustaceans 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. According to the 1997 National Resources Inventory, released by the Natural Resources Conservation Service (2000), California ranked sixth in the nation in number of acres of private land developed between 1992 and 1997, at nearly 695,000 acres. 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 these species include off-road vehicle use, certain mosquito abatement measures, and pesticide/herbicide use, alterations of vernal pool hydrology, fertilizer and pesticide contamination, activity, invasions of aggressive non-native plants, gravel mining, and contaminated stormwater runoff. State and local laws and regulations do not protect listed

vernal pool crustaceans, 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.

Holland (1978) estimated that between 67 and 88 percent of the area within the Central Valley of California which once supported vernal pools had been destroyed by 1973. However, an analysis of this report by the Service revealed apparent arithmetic errors which resulted in a determination that a historic loss between 60 and 85 percent may be more accurate. Regardless, in the ensuing years, threats to this habitat type have continued and resulted in a substantial amount of vernal pool habitat being converted for human uses in spite of Federal regulations implemented to protect wetlands. For example, the Corps' Sacramento District has authorized the filling of 467 acres of wetlands between 1987 and 1992 pursuant to Nationwide Permit 26 (U.S. Fish and Wildlife Service 1992). The Service estimates that a majority of these wetland losses within the Central Valley involved vernal pools, the habitat of the vernal pool tadpole shrimp and vernal pool fairy shrimp. Current rapid urbanization and agricultural conversion throughout the ranges of these two species continue to pose the most severe threats to the continued existence of the vernal pool tadpole shrimp and vernal pool fairy shrimp. The Corps' Sacramento District has several thousand vernal pools under its jurisdiction (Coe 1988), which includes most of the known populations of these listed species. It is estimated that within 20 years 60 to 70 percent of these pools will be destroyed by human activities (Coe 1988).

In addition to direct habitat loss, the vernal pool habitat for the fairy 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 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.

Travis AFB is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Ecosystem, which is a geographical area, 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. The fairy shrimp has been adversely affected by development and modification of the vernal pool and grassland habitat within the Solano-Colusa vernal pool region and known to be present in much of the undeveloped areas surrounding the base. The California Department of Fish and Game's California Natural Diversity Database includes multiple reported fairy shrimp observations within and near the action area (CDFG 2009). The action area is within the known listed crustacean dispersal range and there are no significant artificial, hydrological, or landscape barriers between these occupied areas and the action area. Areas immediately adjacent to the action area have been assigned various designations relative to the ecological value of associated vernal pool habitat.

Protocol-level surveys have been completed on Travis AFB and in immediate surrounding areas and have identified the presence of vernal pool fairy shrimp. The Service believes that the

vernal pool crustacean is reasonably certain to occur within the action area because of the presence of appropriate wetland habitat within the action area, known nearby occurrences within the dispersal range of the vernal pool crustacean, uninterrupted connectivity between occupied habitat and that action area, and the biology and ecology of the animal.

Vernal Pool Tadpole Shrimp

The vernal pool tadpole shrimp (tadpole shrimp) was listed as endangered on September 19, 1994 (U.S. Fish and Wildlife Service 1994). Simovich *et al.* (1992) provide further details about the life history and ecology of these animals. 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).

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 degrees F to 84 degrees 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 6 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 4 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 3 and 4 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 valley. King (1996) concluded that these two groups may have diverged because cyst dispersal by overland flooding historically connected populations on the 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.

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 claypan pools containing highly turbid water.

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. According to the Natural Resources Conservation Service (2000), California ranked sixth in the nation in number of acres of private land developed between 1992 and 1997, at nearly 695,000 acres. 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, and pesticide/herbicide use, alterations of vernal pool hydrology, fertilizer and pesticide contamination, activity, invasions of aggressive non-native plants, gravel mining, and contaminated stormwater runoff. State and local laws and

regulations do not protect the vernal pool 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 this listed vernal pool crustacean 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 listed crustaceans 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.

The proposed project is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Ecosystem, which is a geographical area, 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. This listed crustacean has been adversely affected by development and modification of the vernal pool and grassland habitat within the Solano-Colusa vernal pool region and known to be present in much of the undeveloped areas surrounding the towers. The California Department of Fish and Game's California Natural Diversity Database includes multiple reported vernal pool tadpole shrimp observations in proximity to the action area (CDFG 2009). The action area is within the known vernal pool crustacean dispersal range and there are no significant artificial, hydrological, or landscape barriers between these occupied areas and the action area. Areas immediately adjacent to the action area have been assigned various designations relative to the ecological value of associated vernal pool habitat.

Protocol-level surveys have been completed on Travis AFB and in immediate surrounding areas and have identified the presence of vernal pool tadpole shrimp. The Service believes that the vernal pool crustacean is reasonably certain to occur within the action area because of the presence of appropriate wetland habitat within the action area, known nearby occurrences within the dispersal range of the vernal pool crustacean, uninterrupted connectivity between occupied habitat and that action area, and the biology and ecology of the animal.

Delta Green Ground beetle

The Delta green ground beetle was listed as a threatened species in 1980 (U.S. Fish and Wildlife Service 1980a). The Delta green ground beetle was described over 125 years ago based on a single specimen by Dr. George Horn (Horn 1878). "California" was the only locality information supplied by A.S. Fuller who collected it in 1876 (Andrews 1978; Wells *et al* 1983). Nearly a century later the ecology and biogeography of this beetle was still an enigma to entomologists. The species was known only from the single specimen housed in the Museum of Comparative Zoology at Harvard University, until 1974, when a student from the University of California at Davis rediscovered it at the Jepson Prairie while collecting for their college entomology class. Goulet and Smetana (1997) evaluated the systematics of the genus *Elaphrus*.

Lindroth (1961) did not accept the synonymization of *Elaphrus viridis* by Csiki (1928) who considered it to be a color variation of *Elaphrus riparius*. Goulet (1983) revised the tribe Elaphrini and retained *Elaphrus viridus* as a valid taxa.

Although beetles of the genus *Elaphrus* superficially resemble tiger beetles (Cicindelidae), they belong to the ground beetle family Carabidae. The beetle is approximately 0.25 inch in length, and is the adults have two different color morphs, brilliant metallic green and bronze. Most adults are metallic green with bronze spots on the elytra (first pair of wings, which in beetles are hardened and act as a protective covering), but some adults lack the spots and are nearly uniform metallic green (Goulet 1983; Serpa 1985). The larvae are generally similar to other carabid larvae, and have hardened exterior surfaces with a metallic sheen (Goulet 1983). The range of the beetle overlaps with other ground beetles such as *Elaphrus californicus*, *E. finitimus*, and possibly *E. mimus* (Goulet 1983; D.). Adult beetles can be distinguished from related species by their brilliant metallic color, which are unique among California *Elaphrus*, and by the lack of outlined pits on the elytra (Goulet 1983). In addition, the beetle is the only known California *Elaphrus* species whose adults are active during the winter (Goulet 1983). Adult males can be differentiated from females by bundles of white sticky pads, called holdfasts, located at the base of the tarsus (terminal leg segment) on the underside of their front legs, which serve to keep the male in position during mating (D. Kavanaugh pers. comm.).

Although the historical distribution of the beetle is unknown, the widespread loss and disruption of wetlands and grassland habitat in California's Central Valley since the mid-1800s (Frayer *et al.* 1989) suggest that the range of this vernal pool-associated species has been reduced and fragmented by human activities, especially agricultural and water uses. The beetle, therefore, may have inhabited a much larger range than it does presently, but significant losses of Central Valley wetlands and the lack of comprehensive insect surveys in California over the past century, in addition to the its cryptic coloration (coloration adapted for concealment), small size, biology, and its habit of hiding in vegetation or cracks in mud, make it difficult to estimate the former historical range of this species. It is conceivable that the invasion of California's native grasslands by various introduced exotic plant species has adversely affected the beetle by altering the vegetation structure of its habitat, shading, soil texture, the seasonal pattern of soil moisture, and perhaps most importantly, the types and abundance of its prey, during both adult and larval stages.

The beetle is a terrestrial insect that is known only from a several square mile area that includes the Jepson Prairie and vicinity in Solano County. The beetle appears to have a very restricted geographic range that is centered on the matrix of native perennial grassland and vernal pool habitats at the Jepson Prairie. Two types of vernal pools occur in the Jepson Prairie area, including larger playa pool sometimes known as vernal lakes that typically occur on Pescadero clay soils, and smaller vernal pools. The playas are usually deeper and retain water longer than the smaller, shallower vernal pools. They often have well-defined shorelines that are bare or sparsely vegetated, as the high water recedes during the winter and spring activity period of beetle adults and larvae. Vernal pools and playas are widely scattered throughout the Valley Grassland habitat that characterizes this region. Six occurrences of the beetle are presumed extant and one is presumed extirpated (California Natural Diversity Database 2009). One of

two sites where Dr. Fred Andrews collected the species in 1974 and 1975 was later diked and plowed, likely extirpating the species from that site.

Two areas in south-central Solano County, separated by 0.5 mile and totaling 960 acres were designated as critical habitat for the beetle. The Service has designated critical habitat around the Jepson Prairie Preserve and outside of the Jepson Prairie Preserve on the Wilcox Ranch property owned by The Nature Conservancy and Solano County. The Jepson Prairie Preserve, the sole known preserve for the Delta green ground beetle, is located approximately 4 to 5 miles directly north of the Highway 12 intersection with Highway 113/Bird's Landing. On December 31, 1980, approximately 1,600 acres of land was purchased by The Nature Conservancy from the Southern Pacific Railroad Company and named the Willis Linn Jepson Prairie Preserve. The Jepson Prairie Preserve became associated with ongoing research at the University of California at Davis (R. Cole 1983), and part of the University of California Natural Reserve System (formerly the Natural Land and Water Reserve System). Next to the population on the Jepson Prairie Preserve, the most significant population of Delta green ground beetles is found in playa pools on the western half of the Wilcox Ranch in Solano County (L. Serpa pers. comm. 2004). The beetle also occurs in the playa lakes on the eastern half of the Wilcox Ranch. The Nature Conservancy purchased the 2,912-acre Wilcox Ranch in 2001 and sold the western half of the property (1,570 acres) to Solano County in 2002. A 57-acre parcel at the western side of the B & J Landfill property serves as a Delta green ground beetle mitigation site for a previous B & J Landfill expansion. Delta Green ground beetles have been observed at the Burke Ranch Conservation Bank, comprised of 962 acres. A 320-acre parcel located near the Burke Ranch Site is protected under a conservation easement as compensation for construction of the North Village development project near Vacaville in Solano County. No Delta green ground beetle surveys have been conducted on this site; however, potential habitat exists on the site. The Burke Ranch Site is located about 0.62 mile northwest of the Jepson Prairie Preserve.

Although the relationship between fire and the beetle has not yet been established, the Delta green ground beetle may prefer an open canopy habitat (Arnold 1983), and, therefore, fire may improve its habitat. Fire, which kills certain plants and removes dead plant litter, favors some native plant species and disfavors some problematic nonnative plants. However, seasonal application of any disturbance regime should be considered with respect to native versus nonnative species. On the Jepson Prairie, late-spring burning appears to reduce thatch and nonnative annual grasses while promoting native grasses and forbs (Jepson Prairie Preserve Docent Program 1998). Prescribed burning has been conducted on Jepson Prairie Preserve for over a decade (B. Leitner in litt. 1984). Although the burns typically did not take place in habitat known to contain Delta green ground beetles, it was viewed as a "neutral to beneficial" practice for maintenance of the sensitive species and resources on the Preserve, including the Delta green ground beetle and its habitat (R. Reiner pers. comm.; L. Serpa pers. comm., C. Witham pers. comm.). Burns typically take place when the grasses have dried sufficiently. Thus, such burns may not adversely affect the species because it is inactive and presumably deep underground when burns occur (D. Kavanaugh pers. comm.). No quantitative data are available on the effects of prescribed burning on the species. In 1997, the Solano County Farmlands and Open Space Foundation received a 3- year CalFed grant to restore riparian habitat along Barker Slough and Calhoun Cut, control nonnative plants, and enhance native

plant species in grasslands (Jepson Prairie Preserve Docent Program 1998). Such restoration initiatives will likely benefit native species including the Delta green ground beetle.

The proposed project is located within the Solano-Colusa vernal pool region and the Greater Jepson Prairie Ecosystem, which is a geographical area, 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. The Delta green ground beetle (beetle) has been adversely affected by development and modification of the vernal pool and grassland habitat within the Solano-Colusa vernal pool region and known to be present in much of the undeveloped areas surrounding the towers. The California Department of Fish and Game's California Natural Diversity Database includes multiple reported beetle observations in proximity to the action area (CDFG 2009). The action area is on the western edge the known beetle dispersal range and there are no significant artificial, hydrological, or landscape barriers between these occupied areas and the action area. Areas immediately adjacent to the action area have been assigned various designations relative to the ecological value of associated vernal pool habitat.

No surveys were completed in the immediate areas of disturbance but beetles are known to occur in the adjacent areas of Wilcox Ranch. Therefore, the Service believes that the Delta green ground beetle is reasonably certain to occur within portion of the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the action area, as well as the recent observations of this listed species.

Effects of the Action

California Tiger Salamander

The proposed project is likely to result in a number of adverse effects to the Central California DPS salamander. The proposed project will eliminate Central California DPS salamander habitat and likely cause direct mortality, injury, or harassment of individual juveniles and adults. Implementation of the proposed action would result in the permanent loss of 70.85 acres of upland habitat due to: new utility infrastructure, grading outside of the original runway footprint, and a contractor staging areas that will remain in place after project completion. Implementation of the proposed action would result in the temporary loss of 72.85 acres of upland habitat due to project activities such as the temporary Meridian Gate installation, approach lighting work to be installed in the dry season, and equipment turnaround areas beyond the permanent disturbance area that will be restored to pre-project conditions. No permanent or seasonal wetlands or ponds appropriate for salamander breeding would be directly lost from implementation of the proposed action.

Mortality, injury, or harassment of the salamander could occur from being crushed by project related equipment or vehicles and construction debris within the action area. Individual salamanders could also could fall into trenches, pits, or other excavations, and be directly killed, or unable to escape, be killed due to desiccation, entombment, starvation, or increased predation. Work activities, including vibration, may cause salamanders to leave the work site and surrounding areas or struck by vehicles on the roadway.

Salamander mortality and injury occurs when the animals attempt to cross roads and are hit by cars, trucks, or motorcycles. The majority of strikes would likely occur on rainy nights when the animals are moving to their breeding ponds. Thus, strikes would be a direct source of mortality for the salamander. If strikes are sufficiently frequent in a given locality, this could result in reduced abundance of this animal. Especially problematic is the death of females prior to the laying of their eggs because this could result in the loss of an entire cohort, and therefore, reduced recruitment of new individuals into the population.

Vernal Pool Fairy Shrimp/ Vernal Pool Tadpole Shrimp

Implementation of the proposed action would result in temporary impacts to vernal pool crustaceans inhabiting 0.45 acres of wetted vernal pool crustacean habitat due to project activities such as the temporary Meridian Gate installation, approach lighting work to be installed in the dry season, and equipment turnaround areas beyond the permanent disturbance area that will be restored to pre-project conditions. No permanent or seasonal wetlands or vernal pools appropriate for vernal pool crustaceans would be permanently lost from implementation of the proposed action.

Filling a portion of a pool will decrease the size of the pool resulting in a change in the period of inundation and in the capacity of the pool to buffer potential changes in water temperature caused by solar radiation. The biota of vernal pools and swales can change when the hydrologic regime is altered and small changes can have deleterious effects on entire populations of vernal pool crustaceans (Bauder 1986, 1987). Survival of aquatic organisms like 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 will, at times, result in the decline of local sub-populations of vernal pool organisms, including these two listed species.

Individual vernal pool crustaceans and their cysts may be indirectly injured or killed by activities that would temporarily damage the vernal pools in which they exist. The proposed project would: (1) temporarily affect 0.45 acres of vernal pool habitat of the vernal pool fairy shrimp and the vernal pool tadpole shrimp; and (2) increase construction-related disturbance to the these two listed species.

The ground disturbing activities associated with the proposed project are expected to result in increased erosion and sedimentation. Sedimentation in pools supporting vernal pool crustaceans may result in decreased cyst viability, decreased hatching success, and decreased survivorship among early life stages, thereby reducing the number of mature adults in future wet seasons.

Delta Green Ground Beetle

Implementation of the proposed action would result in temporary impacts to the beetle inhabiting 0.45 acres of wetted beetle habitat, and 1.37 acres of upland habitat due to project activities such as the temporary Meridian Gate installation, approach lighting work to be

installed in the dry season, and equipment turnaround areas beyond the permanent disturbance area that will be restored to pre-project conditions. No permanent or seasonal wetlands or vernal pools appropriate for the beetle would be permanently lost from implementation of the proposed action.

Failure to adequately revegetate the disturbed areas with appropriate locally collected native vegetation likely would facilitate invasion and establishment by non-native plant and animal species. Disturbance and alteration of habitat adjacent to the railroad line likely will create or maintain favorable conditions for these non-native taxa. Non-native plants and animals may reduce habitat quality for the beetle, or their prey, and reduce the productivity or the local carrying capacity for these species. A problematic species within the range of the beetle is the yellow star thistle (*Centaurea melitensis*). Dense stands of this plant can form along roadsides and then spread into adjacent habitat. This plant displaces native vegetation, competes with native plants for resources, and does not appear to be used by the beetle. Other exotic species that may disperse along disturbed areas and invade adjacent beetle habitats include mustards (*Brassica* species) and Russian thistle (*Salsola tragus*) (Tellman 1997).

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. One other project is going to occur in the action area, the C-17 Assault landing Zone project previously permitted by the Service. The ALZ Project will be built concurrently with the proposed project in this Opinion.

Conclusion

After reviewing the current status of the salamander, vernal pool crustaceans and the beetle, the environmental baseline for the action area, the effects of the proposed action, the cumulative effects, and the applicants proposed project description and minimization measures, it is the Service's biological opinion that the Travis AFB 03R/21L Runway Repair Project, as proposed, is not likely to jeopardize the continued existence of the Central California DPS salamander, vernal pool crustaceans, and beetle.

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 harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant

habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including 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 this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the Air Force so they become binding conditions of project authorization for the exemption under 7(o)(2) to apply. The Air Force has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Air Force (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of 7(o)(2) may lapse.

Amount or Extent of Take

The Service expects that incidental take of the Central California DPS salamander, vernal pool crustaceans, and beetle, will occur during the proposed action. The extent of the take will be difficult to detect or quantify because of the ecology and biology of this species. Additionally, 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 salamanders, vernal pool crustaceans, and beetles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of upland salamander habitat that will become unsuitable for salamanders due to direct effects as a result of the action, and acreages for vernal pool crustaceans and the beetles that will become unsuitable as result of temporary effects as a result of the action. Therefore, the Service estimates that the proposed action will result in the take of all salamanders inhabiting or utilizing 142.33 acres of appropriate upland habitat (70.85 permanent, 72.85 temporary) identified in the action area. The Service estimates that the proposed action will result in the take of all vernal pool crustaceans and beetles inhabiting or utilizing 0.45 wetted acres of appropriate habitat identified in the action area, but that the effects to the habitat will be temporary. The Service estimates that the proposed action will result in the take of all and beetles inhabiting or utilizing 1.37 acres of appropriate upland habitat identified in the action area, but that the effects to the habitat will be temporary. Upon implementation of the following reasonable and prudent measures, incidental take associated with the proposed Project on the salamander, vernal pool crustacean, and the beetle in the form of mortality from habitat loss or degradation will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the Central California DPS salamander, vernal pool crustaceans, or the beetle in this biological opinion.

Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the effects of the Travis AFB 03R/21L Runway Repair Project on the Central California DPS salamander, vernal pool crustaceans and beetle:

1. All conservation measures outlined in the project description, and as restated in this Biological Opinion must be fully implemented.

In order to be exempt from the prohibitions of section 9 of the Act, the Air Force shall ensure they comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. The following Term and Conditions will implement Reasonable and Prudent Measure number one (1):

    a. As part of the construction contract, the Air Force shall require that all contractors comply with the Reporting Requirements detailed below.

    b. As part of the construction contract, the Air Force shall require that all contractors comply with the Act in the performance of work necessary for project completion inside and outside the project right-of-way.

Reporting Requirements

The Service shall be notified within one (1) working day of the finding of any injured or dead salamanders, vernal pool crustaceans or beetles. Injured salamanders shall be cared for by a licensed veterinarian or other qualified person. Notification must include the date, time, and location of the incident or of the finding of a dead or injured 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 Peter Cross, Deputy Assistant Field Supervisor, 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. This Airforce must also contact the California Department of Fish and Game immediately in the case of a dead or injured listed species. The California Department of Fish and Game contact for immediate assistance is State Dispatch at (916) 445-0045.

Sightings of any listed or sensitive animal species should be reported to the California Natural Diversity Database of the California Department of Fish and Game. 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.

The Air Force shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction

occurred; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the salamander, if any; (v) occurrences of incidental take of any listed species, if any; and (vi) other pertinent information.

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 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 salamander breeding and upland habitat.

3. The Air Force should consider installing barriers to deter salamanders from entering areas such as roads and housing areas where they are likely to be killed.

4. 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 03R/21L Runway Repair 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. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have questions regarding our response, please contact Michelle Tovar, Senior Fish and Wildlife Biologist (Michelle_Tovar@fws.gov) or Jana Affonso, the Sacramento Valley Branch Chief (Jana_Affonso@fws.gov), of my office at (916) 414-6645.

Sincerely,

Susan K. Moore
Field Supervisor

cc:
Jane M. Hicks, U.S. Army Corps of Engineers, San Francisco, California
Liam Davis, California Department of Fish and Game, Yountville, California

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Appendix G
Letter, Nationwide Permit 12 and 33, U.S. Army Corps of Engineers

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

REPLY TO
ATTENTION OF

NOV 04 2009

Regulatory Division

SUBJECT: File Number 2009-00248N

Mr. David Musselwhite
Chief Asset Management
Travis Air Force Base
411 Airman Drive, Building 570
Travis Air Force Base, California 94535

Dear Mr. Musselwhite:

This is in response to your submittal of June 19, 2009 concerning Department of the Army authorization to construct the Travis Air Force Base Runway 21L/03R Repair Project. The project area includes portions of the existing Runway 21L/03R and adjacent lands on Travis Air Force Base, Solano County, California. The existing runway has been field surveyed as 10,995 ft long and 300 ft wide. The design requirements for the repaired runway require the width to be physically reduced from 300 feet to 200 feet.

All existing runway pavement will be broken up in place by a concrete guillotine breaker. Some of the rubblelized concrete will be transported back to the contractor staging area where it will be recycled into other products required for the runway repair and landing zone construction. The remaining rubblelized concrete will be left in place where the new runway pavement will be placed on top. This can be done because portions of the repaired runway will be up to 18 inches higher in elevation to match the elevation of the new landing zone. A turnaround has been designed at the northeast end of the runway to accommodate 180-degree turning maneuvers. Due to the elevation changes on the repaired runway an area of land around the perimeter of the runway will be graded to provide a gradual slope away from the paved surfaces. Grading limits vary along the length of the runway due to varying amounts of elevation rise from the existing runway surface. Much of the graded area is within the footprint of the existing 300 foot wide runway.

A new homerun duct bank will be constructed to provide electrical service for runway lighting, approach lighting, and associated taxiway circuits. The duct bank will consist of up to 50 conduits incased in concrete. It will be constructed by drilling under areas where there is existing pavement. In areas where no pavement exists, a trench will be dug for construction of the duct bank. Approximately 0.089 acre of wetlands will be temporarily impacted by the construction of the duct bank. Post construction, this area will be restored to pre-project conditions.

The existing runway edge lights, centerline lights, and touchdown zone lights will be replaced as part of the proposed action. Airfield lighting and signage will be placed within the runway pavement and grading limits. Existing runway distance markers (RDMs) and mandatory signs are proposed to be removed and replaced. The new RDMs will be located on both sides of the runway, offset from the runway edge at the maximum distance of 75 feet and spaced every 1,000 feet along the runway. These items are being replaced in kind. The existing PAPI system is a navigational aid that will be removed and replaced for both runway ends. The new system will be placed within the runway pavement and grading limits.

The existing Approach Lighting System (ALS) will be upgraded to meet the reduced approach minimums of a Category II instrument approach. The existing foundations for approach lights located beyond the existing paved overrun will be reused. A new electrical duct bank will be constructed 18 inches below the surface along the path of the approach lighting to provide electrical service for the lights. The approach lighting outside the installation boundary is surrounded by vernal pools. In order to only have temporary impacts to the hydrology the ALS replacement work will be performed during the dry season. The new electrical duct bank for the ALS will be constructed adjacent to the existing duct bank along an elevated area between each approach light. This existing elevated area does not contain vernal pools.

The runway reconstruction project provides an opportunity to replace the existing drainage system to extend the life of piping and improve flow conditions under the runway. There are three main lines under the runway providing drainage for large portions of the Base area. These items are being replaced in kind. Approximately 0.004 acre of wetlands will be temporarily impacted by the construction of the drainage system. Post construction, this area will be restored to pre-project conditions.

A pavement underdrain system will be installed along the entire length of Runway 03R/21L, except for the overruns. This system is needed to maintain consistent moisture content by drawing subsurface drainage away from the pavement structure and therefore reducing the effects of varying subgrade conditions. The underdrain system will be placed within the runway pavement and grading limits.

A contractor staging area located near the runway is required to complete the proposed action. The staging area will house a material laydown yard, batch plant for producing concrete, and a crushing plant for recycling the rubblelized concrete. The contractor staging area will occupy 17.02 acres for the duration of the project. It will be constructed of compacted gravel and will remain in place at the completion of the project. This area includes the construction of new haul roads to connect the contractor staging and area with existing Perimeter Road, the runway, the new landing zone, and existing contractor offices in Building 1185.

Construction of a new 1.37 acre commercial vehicle access gate is proposed for construction where the base's fence line meets Meridian Road. The new gate is required to reduce equipment

idling times and avoid congestion at the existing South Gate that would otherwise be associated with the project. Hauling operations will take place from the Meridian Gate onto the existing Perimeter Road and from there to the proposed contractor staging area. The Meridian Gate area contains seasonal wetlands. Approximately 0.353 acre of wetlands will be temporarily impacted by construction of the Meridian Gate. In order to only have temporary impacts to hydrology the entire area will be returned to pre-project conditions matching existing contours at the completion of the project.

Based on a review of the information you submitted and inspections of the project site conducted by Corps personnel on June 19, 2009, your project qualifies for authorization under Department of the Army Nationwide Permit (NWP) 12 for Utility Line Activities and 33 for Temporary Construction, Access, and Dewatering (72 Fed. Reg. 11092, March 12, 2007), pursuant to Section 404 of the Clean Water Act (33 U.S.C. Section 1344). See Enclosure 1. The project will be completed as shown on the attached project drawings titled "Runway Storm Drainage Plan," sheet 114, dated September 30, 2005, "Approach Lighting Plan and Profile," sheets 244 and 245, dated September 30, 2005, "Series Lighting-Typical Wiring Diagram," sheet 246, dated September 30, 2005, "Light Bar Layout Detail," sheet 247, dated September 30, 2005, and "Grading Plan," sheets 62, 63, 76, and 77, dated August 21, 2006, sheets 63 to 70 and sheets 73 to 75, dated September 29, 2005, and sheets 71 and 72, dated March 31, 2008, submitted with a cover letter titled "Travis AFB Runway 3R/21L Repair (File No. 2009-00248)," dated July 22, 2009 (Enclosure 2).

The project must be in compliance with the General Conditions cited in Enclosure 3 for this Nationwide Permit authorization to remain valid. Non-compliance with any condition could result in the suspension, modification or revocation of the authorization for your project, thereby requiring you to obtain an Individual Permit from the Corps. This Nationwide Permit authorization does not obviate the need to obtain other State or local approvals required by law.

This authorization will remain valid for two years from the date of this letter, unless the Nationwide Permit is suspended, modified or revoked. If you have commenced work or are under contract to commence work prior to the suspension, or revocation of the Nationwide Permit and the project would not comply with the resulting Nationwide Permit authorization, you have twelve (12) months from that date to complete the project under the present terms and conditions of the Nationwide Permit. Upon completion of the project and all associated mitigation requirements, you shall sign and return the Certification of Compliance, Enclosure 4, verifying that you have complied with the terms and conditions of the permit.

This authorization will not be effective until you have obtained a Section 401 water quality certification from the San Francisco Bay Regional Water Quality Control Board (RWQCB). If the RWQCB fails to act on a valid request for certification within two (2) months after receipt of a complete application, the Corps will presume a waiver of water quality certification has been

obtained. You shall submit a copy of the certification and the concurrence to the Corps prior to the commencement of work.

To ensure compliance with this Nationwide Permit authorization, the following special conditions shall be implemented:

1) This Corps permit does not authorize you to take an endangered species. In order to legally take a listed species, you must have a separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit or a Biological Opinion (BO) under ESA Section 7 with "incidental take" provisions with which you must comply). The U.S. Fish and Wildlife Service (FWS) BO dated **October 29, 2009** contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take authorized by the attached BO, whose terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take and it would also constitute non-compliance with this Corps permit. The FWS is the appropriate authority to determine compliance with the terms and conditions of its BO and with the ESA.

2) You shall purchase and submit proof of purchase of 0.23 acre of wetland creation credits from the Elsie-Gridley Mitigation bank within 90 days of receipt of this letter.

3) Monitoring of the temporarily impacted wetlands shall be conducted for 5 years after project completion.

4) Monitoring reports shall be submitted annually, no later than October 31, to the Corps for 5 years.

5) If at anytime it appears that the temporarily impacted wetlands will not return to their pre-construction condition within the 5 year monitoring period, then contingency measures will be developed by the Applicant and presented to the Corps for review and approval prior to implementation.

6) Your responsibility to complete the required compensatory mitigation as set forth in Special Conditions 2, 3, 4, and 5 will not be considered fulfilled until you have received written verification from the U.S. Army Corps of Engineers.

7) If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

8) Any waste material that enters the water or wetland areas shall be removed of immediately.

9) All material and debris generated as a result of project construction shall be removed from the site and disposed of in an appropriate location outside of Corps jurisdiction.

10) All staging, maintenance, and storage of heavy machinery shall be conducted in such a location and manner that no fuel, oil, or other petroleum products may run off or be washed by rainfall into the water.

11) All appropriate best management practices shall be implemented throughout the project site to help minimize sediment disturbance and suspension within the water.

12) Any change in the project design, materials, or construction methods, must be approved by the Corps in writing.

Should you have any questions regarding this matter, please call Bryan Matsumoto of our Regulatory Division at 415-503-6786. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter. If you would like to provide comments on our permit review process, please complete the Customer Survey Form available through the Forms and Contacts Block on our website: www.spn.usace.army.mil/regulatory/

Sincerely,

Jane M. Hicks
Chief, Regulatory Division

Enclosures

Copy furnished (w/o enclosures):

USFWS, Sacramento, CA (Attn: Michelle Tovar)
RWQCB, Oakland, CA (Attn: Jolanta Uchman)

2007 Nationwide Permits

12. *Utility Line Activities.* Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2 acre of waters of the United States.

Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. A ''utility line'' is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term ''utility line'' does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area. Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2 acre of waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for overhead utility line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the United States, provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the United States, provided the total discharge from a single and complete project does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters for access roads. Access roads

must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows. This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (See 33 CFR part 322).

Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials. (See general condition 27.) (Sections 10 and 404)

Note 1: Where the proposed utility line is constructed or installed in navigable waters of the United States (i.e., section 10 waters), copies of the pre-construction notification and NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

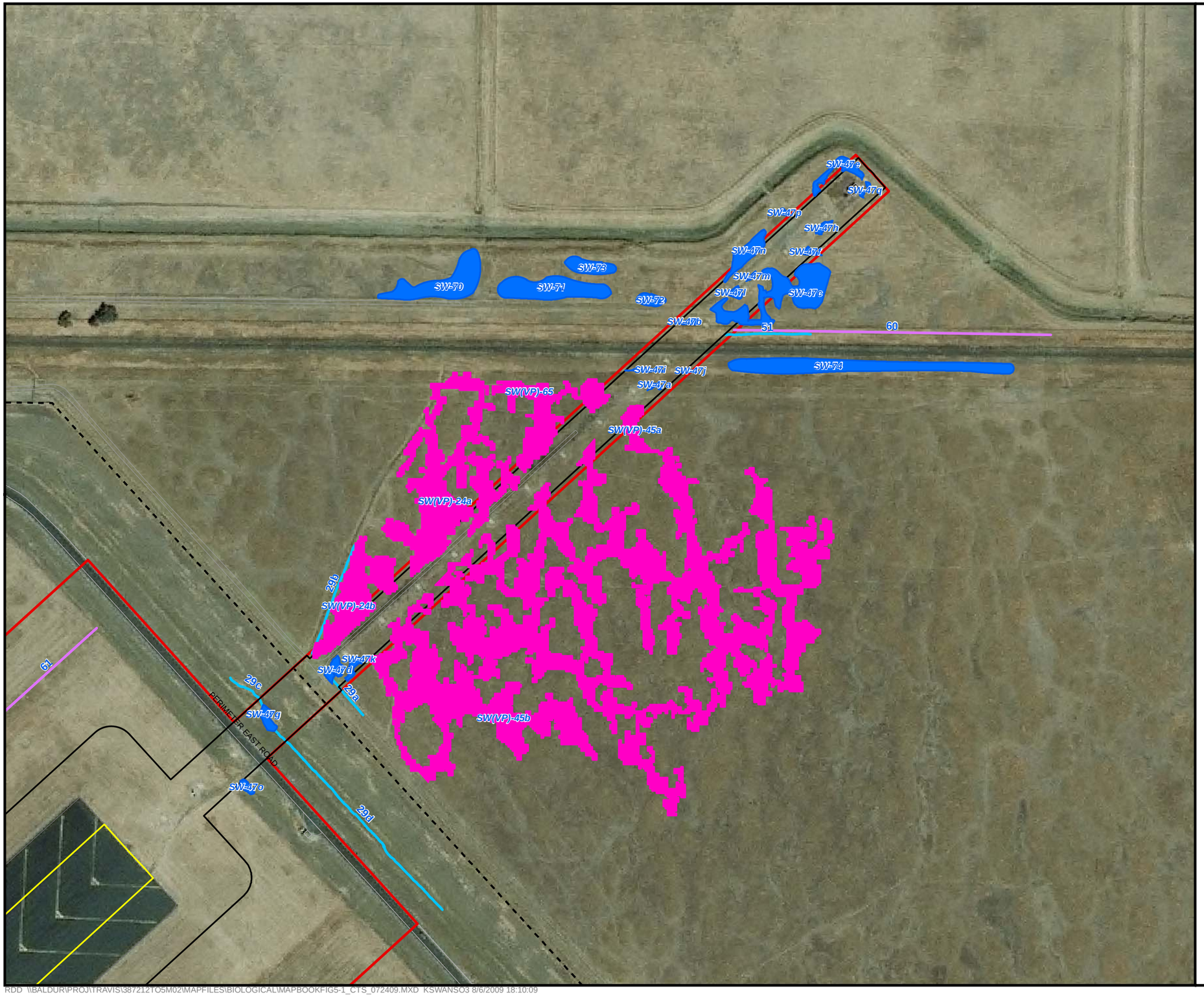
Note 2: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, accordance with the requirements for temporary fills.

Note 3: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to Section 9 of the Rivers and Harbors Act of 1899. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

33. *Temporary Construction, Access, and Dewatering.* Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites, provided that the associated primary activity is authorized by the Corps of Engineers or the U.S. Coast Guard. This NWP also authorizes temporary structures, work, and discharges, including cofferdams, necessary for construction activities not otherwise subject to the Corps or U.S. Coast Guard permit requirements. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. The use of dredged material may be allowed if the district engineer determines that it will not cause more than minimal adverse effects on aquatic resources. Following completion of construction, temporary fill must be entirely removed to upland areas, dredged material must be returned to its original location, and the affected areas must be restored to preconstruction elevations. The affected areas must also be revegetated, as appropriate. This permit does not authorize the use of cofferdams to dewater wetlands or other aquatic areas to change their use. Structures left in place after construction is completed require a section 10 permit if located in navigable waters of the United States. (See 33 CFR part 322.)

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 27). The pre-construction notification must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions. (Sections 10 and 404)

Enclosure 2



LEGEND

- PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

- SEASONAL WETLAND
- VERNAL POOL
- AVOIDED WETLAND
- EXISTING IMPACT AREAS
- DITCH PERMANENT EFFECT AREA - 0.84 ACRES
- DITCH TEMPORARY EFFECT AREA - 0.361 ACRES
- AVOIDED WETLANDS
- 03R PROJECT FOOTPRINT
- ALZ PROJECT FOOTPRINT
- 03R STUDY AREA
- ALZ STUDY AREA
- INSTALLATION BOUNDARY
- RUNWAY CENTERLINE

NOTES:
Field Verified by USACE on July 13 and July 14, 2009,
USACE File No. 2009-00248

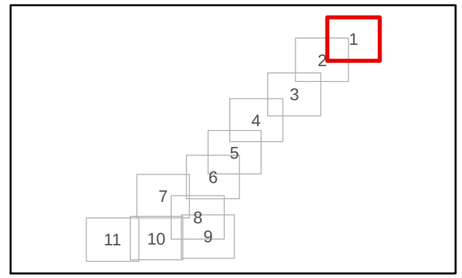


FIGURE S-2
SHEET 1
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09

PERIMETER EAST ROAD

SW(VP)-24a

29b

SW(VP)-24b

SW-47k

SW-47d

29c

29a

SW(VP)-45b

SW-47g

SW-47o

29d

61

SW(VP)-24

SW-3

LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

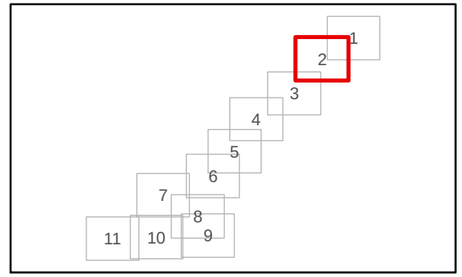
03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
Field Verified by USACE on July 13 and July 14, 2009,
USACE File No. 2009-00248



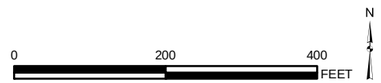
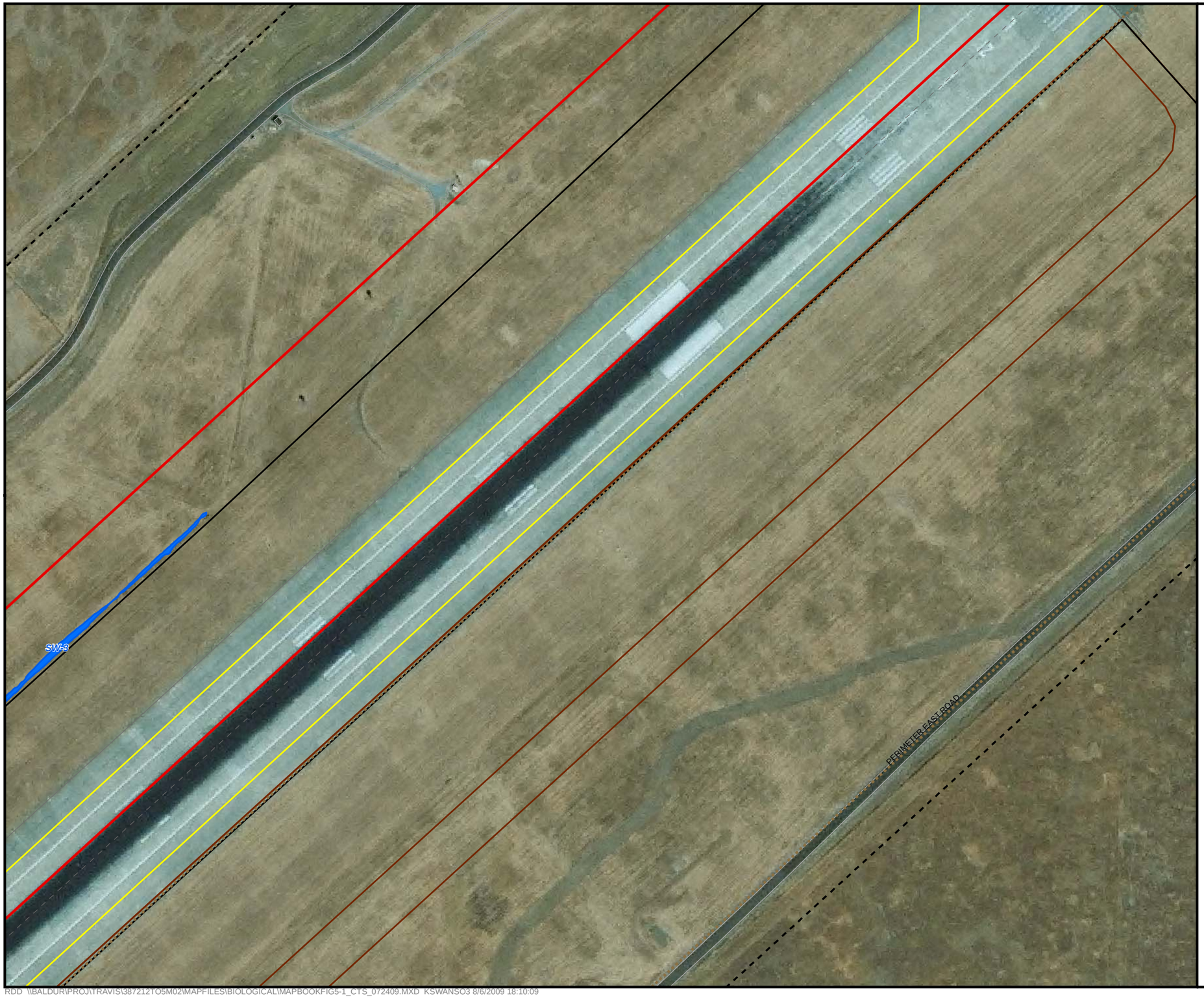


FIGURE S-2
SHEET 2
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09



LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

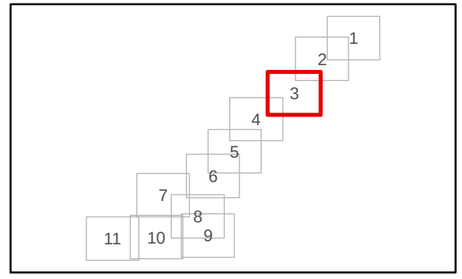
03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
Field Verified by USACE on July 13 and July 14, 2009,
USACE File No. 2009-00248



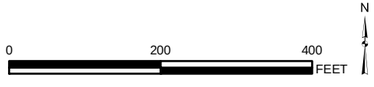
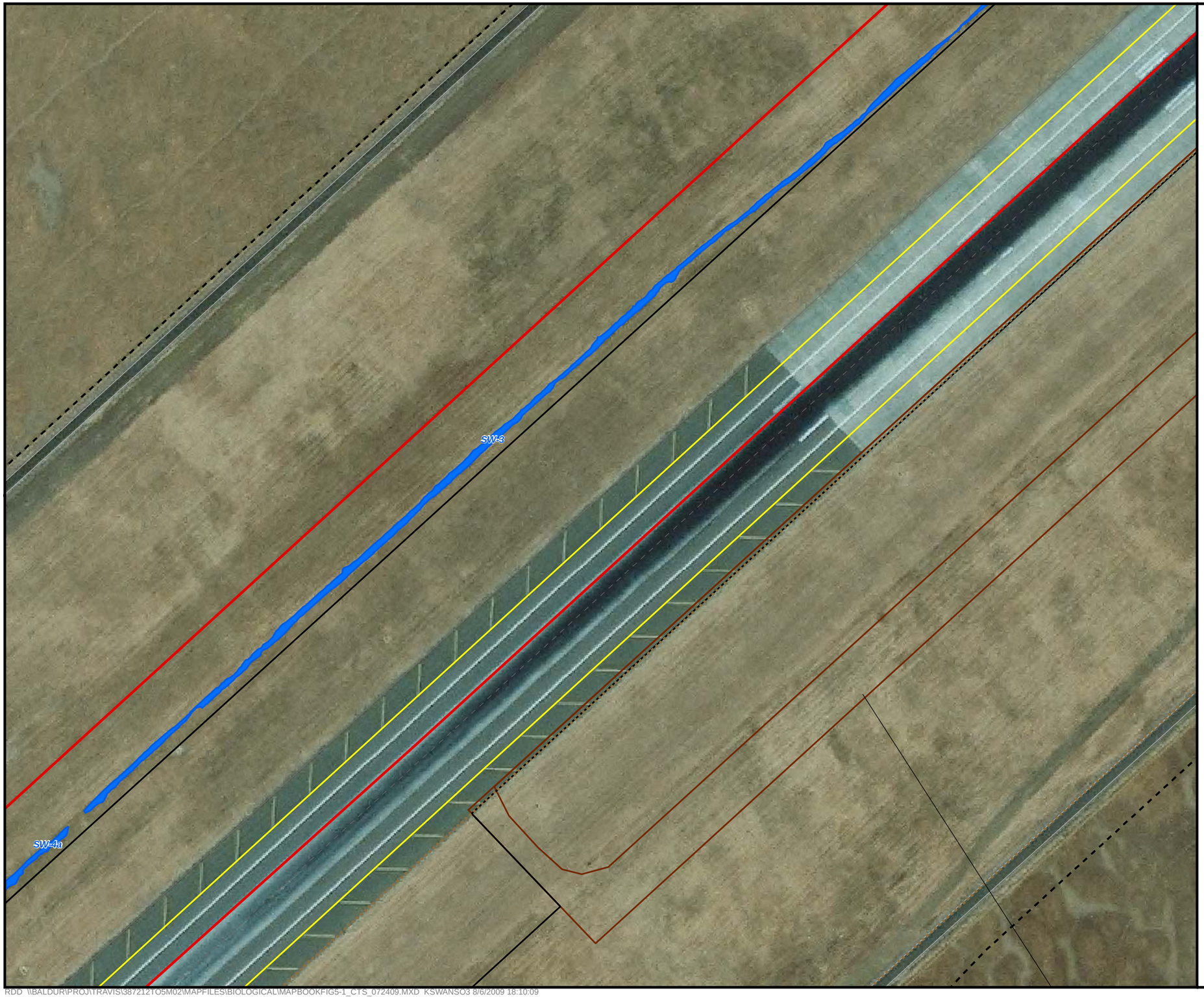


FIGURE S-2
SHEET 3
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09



LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

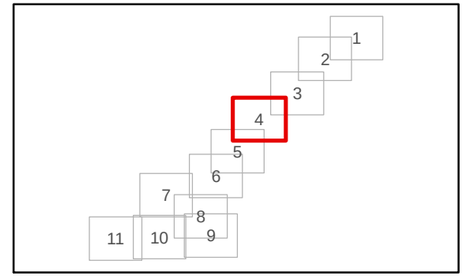
03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
Field Verified by USACE on July 13 and July 14, 2009,
USACE File No. 2009-00248



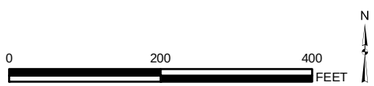
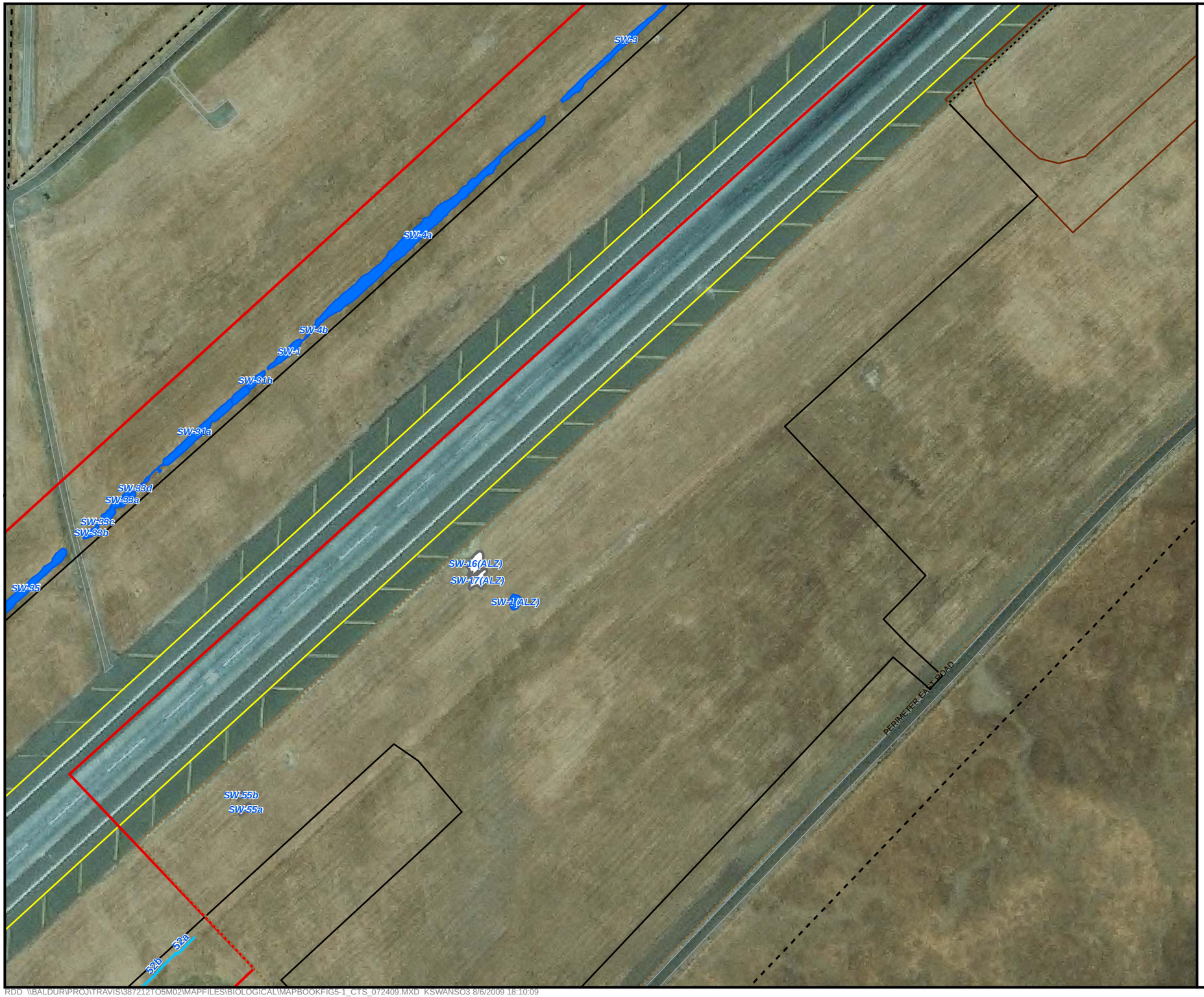


FIGURE S-2
SHEET 4
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09



LEGEND

- PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

- SEASONAL WETLAND
- VERNAL POOL
- AVOIDED WETLAND
- EXISTING IMPACT AREAS
- DITCH PERMANENT EFFECT AREA - 0.84 ACRES
- DITCH TEMPORARY EFFECT AREA - 0.361 ACRES
- AVOIDED WETLANDS
- 03R PROJECT FOOTPRINT
- ALZ PROJECT FOOTPRINT
- 03R STUDY AREA
- ALZ STUDY AREA
- INSTALLATION BOUNDARY
- RUNWAY CENTERLINE

NOTES:
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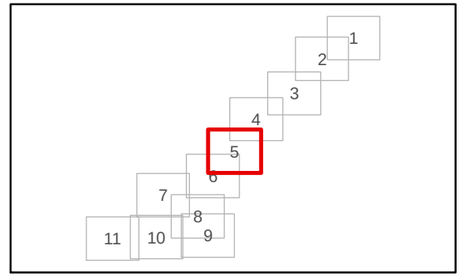

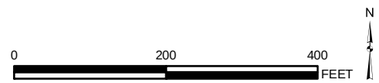

FIGURE S-2
SHEET 5
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09

SW-16(ALZ)
SW-17(ALZ)
SW-1(ALZ)
SW-33
SW-55b
SW-55a
35k
35a
35b
35m
35n
35o
35p
32a
32b
32c
32e

LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
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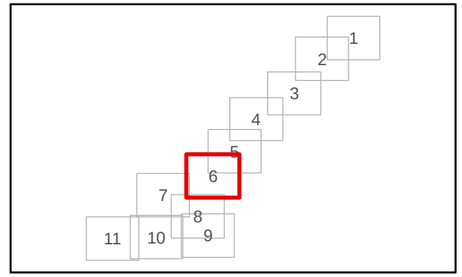
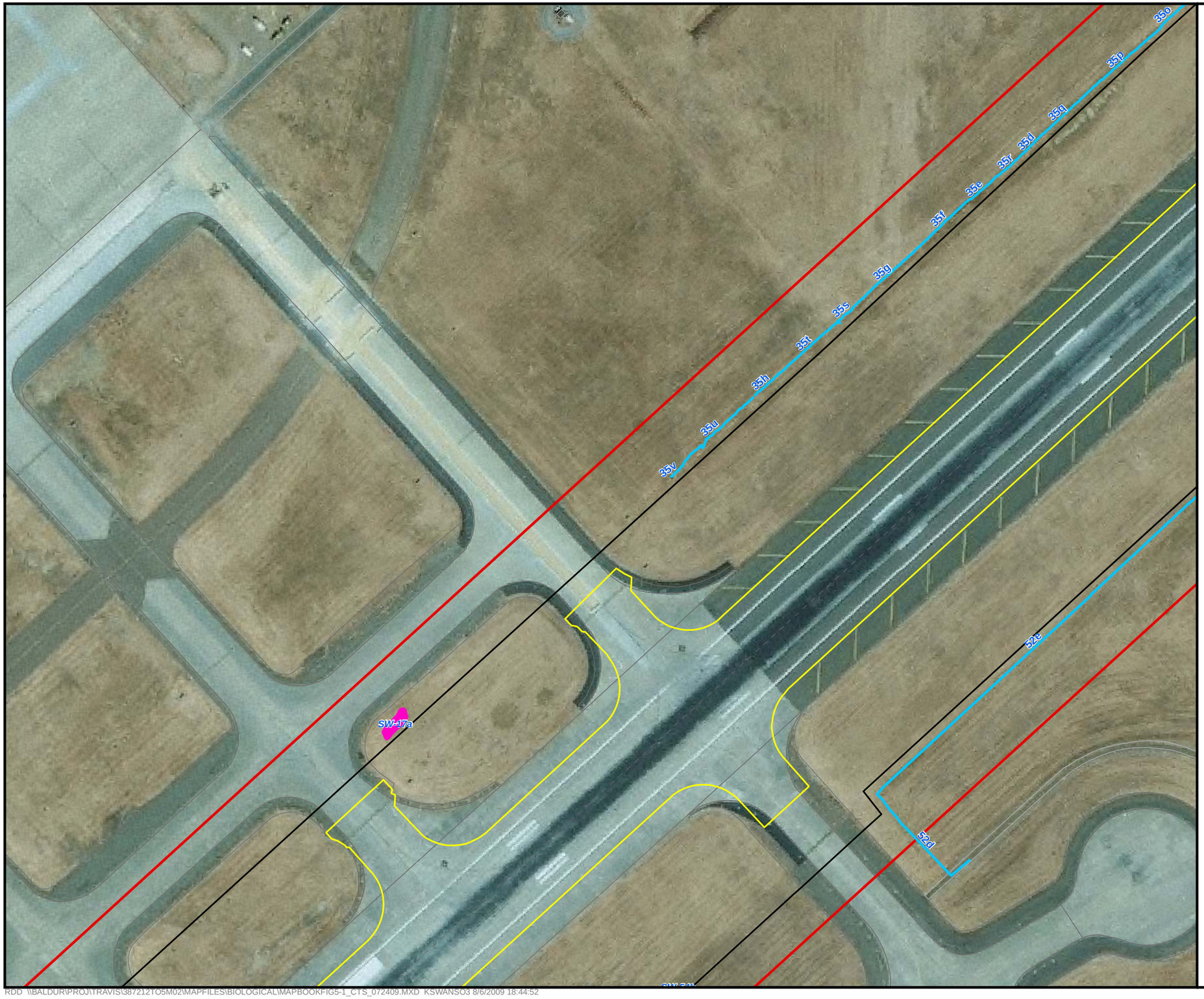


FIGURE S-2
SHEET 6
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:44:52



LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
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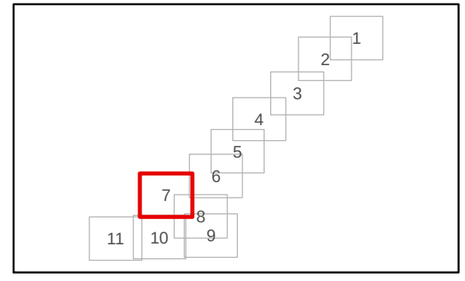
USACE File No. 2009-00248



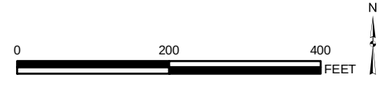


FIGURE S-2
SHEET 7
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:44:52

LEGEND

- PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

- SEASONAL WETLAND
- VERNAL POOL
- AVOIDED WETLAND
- EXISTING IMPACT AREAS
- DITCH PERMANENT EFFECT AREA - 0.84 ACRES
- DITCH TEMPORARY EFFECT AREA - 0.361 ACRES
- AVOIDED WETLANDS
- 03R PROJECT FOOTPRINT
- ALZ PROJECT FOOTPRINT
- 03R STUDY AREA
- ALZ STUDY AREA
- INSTALLATION BOUNDARY
- RUNWAY CENTERLINE

NOTES:
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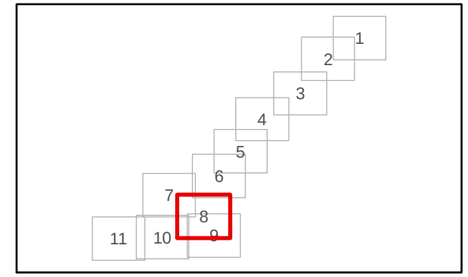
USACE File No. 2009-00248



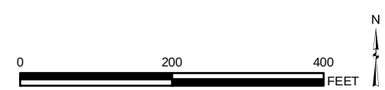
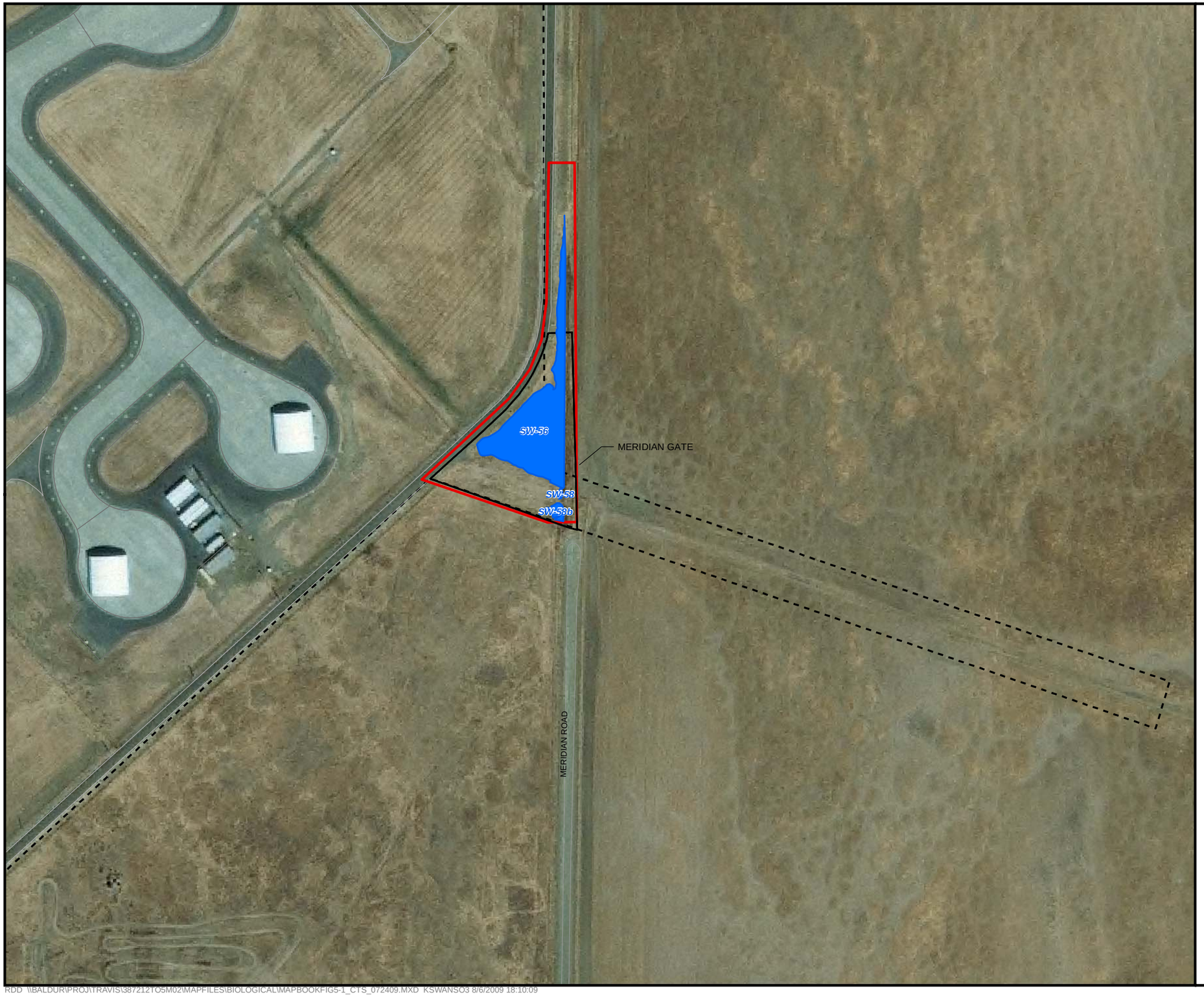


FIGURE S-2
SHEET 8
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL



LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
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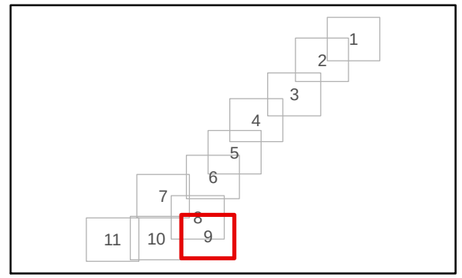

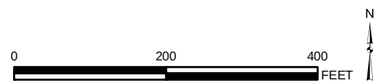

FIGURE S-2
SHEET 9
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09

LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
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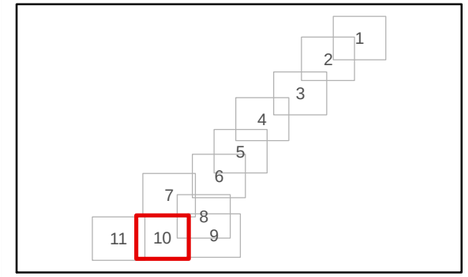


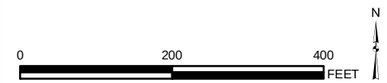
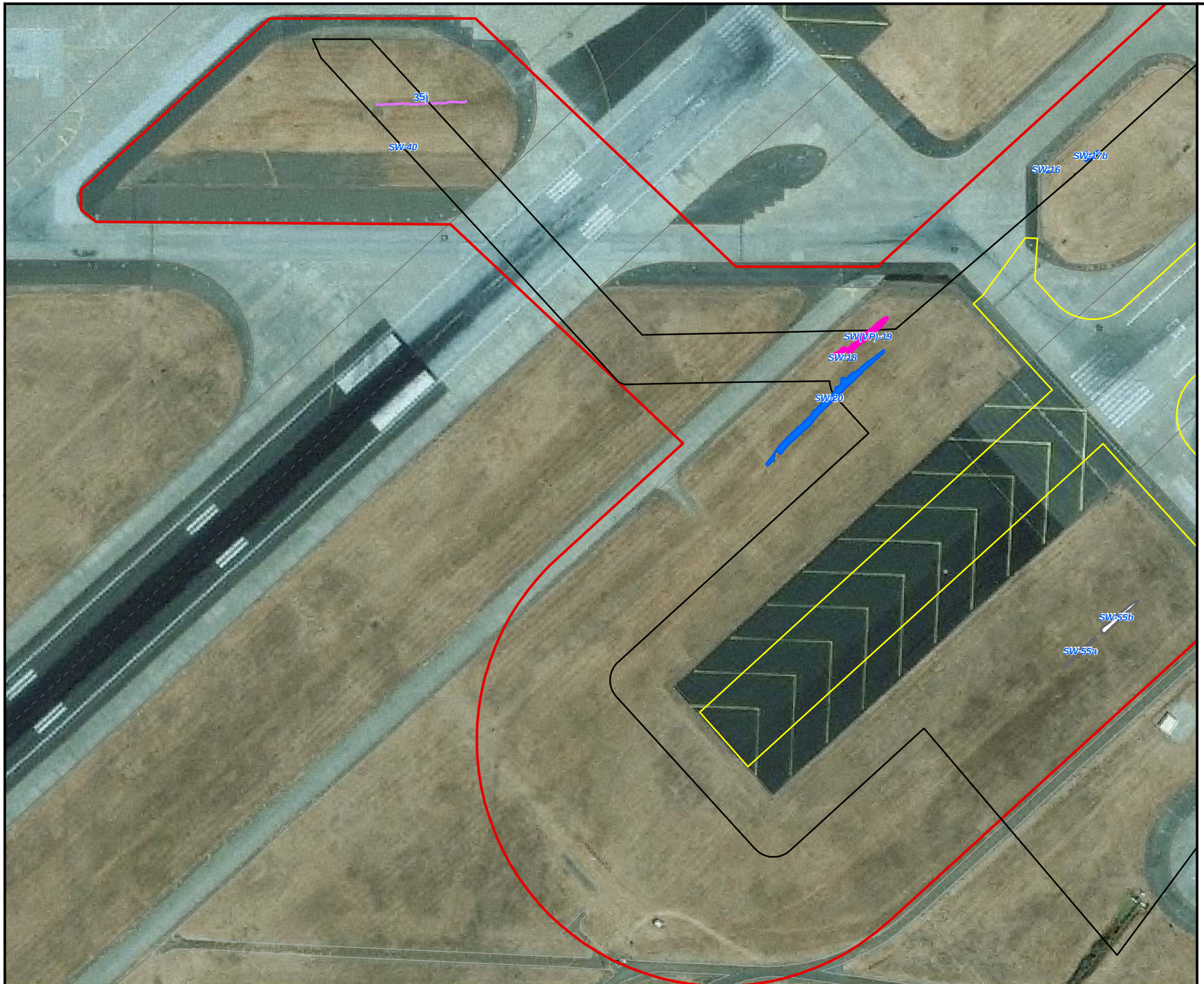


FIGURE S-2
SHEET 10
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIGS-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09



LEGEND

PROPOSED RUNWAY - 62.58 ACRES

WETLANDS

SEASONAL WETLAND

VERNAL POOL

AVOIDED WETLAND

EXISTING IMPACT AREAS

DITCH PERMANENT EFFECT AREA - 0.84 ACRES

DITCH TEMPORARY EFFECT AREA - 0.361 ACRES

AVOIDED WETLANDS

03R PROJECT FOOTPRINT

ALZ PROJECT FOOTPRINT

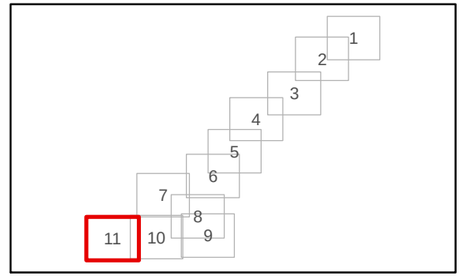
03R STUDY AREA

ALZ STUDY AREA

INSTALLATION BOUNDARY

RUNWAY CENTERLINE

NOTES:
Field Verified by USACE on July 13 and July 14, 2009,
USACE File No. 2009-00248



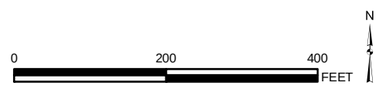


FIGURE S-2
SHEET 11
WETLANDS AND OTHER WATERS
REPAIR OF AIRFIELD AND LIGHTING, RUNWAY 03R/21L
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

RDD \\BALDUR\PROJ\TRAVIS\387212TO5M02\MAPFILES\BIOLOGICAL\MAPBOOKFIG5-1_CTS_072409.MXD KSWANSO3 8/6/2009 18:10:09

Enclosure 3:

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/ or Coastal Zone Management Act consistency for an NWP.

1. *Navigation.* (a) No activity may cause more than a minimal adverse effect on navigation. (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States. (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. *Aquatic Life Movements.* No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

3. *Spawning Areas.* Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. *Migratory Bird Breeding Areas.* Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. *Shellfish Beds.* No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48.

6. *Suitable Material.* No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. *Water Supply Intakes.* No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. *Adverse Effects From Impoundments.* If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. *Management of Water Flows.* To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. *Fills Within 100-Year Floodplains.* The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. *Equipment.* Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. *Soil Erosion and Sediment Controls.* Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. *Removal of Temporary Fills.* Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. *Proper Maintenance.* Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

15. *Wild and Scenic Rivers.* No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

16. *Tribal Rights.* No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

17. *Endangered Species.* (a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed. (b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. (c) Non-federal permittees shall notify the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed. (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species specific regional endangered species conditions to the NWPs. (e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. FWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide Web pages at *http://www.fws.gov/* and *http://www.noaa.gov/fisheries.html* respectively.

18. *Historic Properties.* (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the

National Historic Preservation Act (NHPA) have been satisfied. (b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed. (d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete preconstruction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed. (e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h–2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

19. *Designated Critical Resource Waters.* Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment. (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters. (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

20. *Mitigation.* The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal: (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site). (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal. (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10 acre and require preconstruction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project specific waiver of this requirement. For wetland losses of 1/10 acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that

compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered. (d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment. (e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2 acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2 acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs. (f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses. (g) Permittees may propose the use of mitigation banks, in-lieu fee arrangements or separate activity specific compensatory mitigation. In all cases, the mitigation provisions will specify the party responsible for accomplishing and/or complying with the mitigation plan. (h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

21. *Water Quality.* Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

22. *Coastal Zone Management.* In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

23. *Regional and Case-By-Case Conditions.* The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

24. *Use of Multiple Nationwide Permits.* The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

25. *Transfer of Nationwide Permit Verifications.* If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature: "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and

the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

(Transferee)_____
(Date) _____

26. *Compliance Certification.* Each permittee who received a NWP verification from the Corps must submit a signed certification regarding the completed work and any required mitigation. The certification form must be forwarded by the Corps with the NWP verification letter and will include: (a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions; (b) A statement that any required mitigation was completed in accordance with the permit conditions; and (c) The signature of the permittee certifying the completion of the work and mitigation.

27. *Pre-Construction Notification.* (a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either: (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or (2) Forty-five calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 17 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 18 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) is completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2). (b) *Contents of Pre-Construction Notification:* The PCN must be in writing and include the following information: (1) Name, address and telephone numbers of the prospective permittee; (2) Location of the proposed project; (3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided result in a quicker decision.); (4) The PCN must include a delineation of special aquatic sites and other waters of the United States on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters of the United States, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, where appropriate; (5) If the proposed activity will result in the loss of greater than 1/10 acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan. (6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and (7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by

the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act. (c) *Form of Pre-Construction Notification:* The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used. (d) *Agency Coordination:* (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level. (2) For all NWP 48 activities requiring pre-construction notification and for other NWP activities requiring preconstruction notification to the district engineer that result in the loss of greater than 1/2-acre of waters of the United States, the district engineer will immediately provide (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy of the PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the preconstruction notification. The district engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each preconstruction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5. (3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act. (4) Applicants are encouraged to provide the Corps multiple copies of pre-construction notifications to expedite agency coordination. (5) For NWP 48 activities that require reporting, the district engineer will provide a copy of each report within 10 calendar days of receipt to the appropriate regional office of the NMFS. (e) *District Engineer's Decision:* In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If the proposed activity requires a PCN and will result in a loss of greater than 1/10 acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed work are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the district engineer will notify the permittee and include any conditions the district engineer deems necessary. The district engineer must approve any compensatory mitigation proposal before the permittee commences work. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP. If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either: (1) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

28. *Single and Complete Project.* The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

Enclosure 4

Permittee: Department of the Air Force

File Number: 2009-00248N

Certification of Compliance
for
Nationwide Permit

"I hereby certify that the work authorized by the above referenced File Number and all required mitigation have been completed in accordance with the terms and conditions of this Nationwide Permit authorization."

_____ _____

(Permittee) (Date)

Return to:

Bryan Matsumoto
U.S. Army, Corps of Engineers
San Francisco District
Regulatory Division, CESPN-R-N
1455 Market Street
San Francisco, CA 94103-1398