



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Ecological Services  
Carlsbad Fish and Wildlife Office  
6010 Hidden Valley Road  
Carlsbad, California 92011



In Reply Refer To:  
FWS-SD-08B0316-12F0037

NOV 23 2011

Mr. Vincent P. Mammano  
Division Administrator  
Federal Highway Administration  
650 Capitol Mall, Suite 4-100  
Sacramento, California 95814

Colonel R. Mark Toy  
District Engineer  
U.S. Army Corps of Engineers, Los Angeles District  
P.O. Box 532711  
Los Angeles, California 90053-2325

Subject: Biological Opinion for the State Route 11/Otay Mesa East Port of Entry, Otay Crossings Commerce Park, and Otay Business Park Projects, San Diego County, California

Dear Colonel Toy and Mr. Tally:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the proposed issuance of Clean Water Act (CWA) Section 404 permits by the U.S. Army Corps of Engineers (Corps) to facilitate construction of three projects located on east Otay Mesa in the County of San Diego, California, and the associated effects of these projects on federally listed endangered and threatened species and designated critical habitat. The three projects are the proposed State Route 11 and Otay Mesa East Port of Entry ("SR-11 and Port of Entry") project, the Otay Crossings Commerce Park ("Otay Crossings") project, and the Otay Business Park project. Funding is provided through the Federal Highway Administration's (FHWA) Federal-Aid Highway Program and is facilitated by the Coordinated Border Infrastructure Programs of the FHWA for the SR-11 and Port of Entry project; thus, FHWA funding for the SR-11 and Port of Entry project is also a part of the proposed action addressed by this biological opinion. The Corps is the designated lead Federal action agency for the Otay Business Park and Otay Crossings projects, and FHWA is the designated lead Federal action agency for the SR-11 and Port of Entry project.

Formal consultation was initiated by the Corps on November 25, 2009, and April 20, 2009, respectively, for the Otay Crossings and Otay Business Park projects and by the FHWA on June 7, 2011, for the SR-11 and Port of Entry project. This biological opinion addresses the

collective effects of the three projects on the federally listed endangered San Diego button-celery (*Eryngium aristulatum* var. *parishii*), San Diego fairy shrimp (*Branchinecta sandiegonensis*), Riverside fairy shrimp (*Streptocephalus woottoni*), and Quino checkerspot butterfly (*Euphydryas editha quino*); the threatened spreading navarretia (*Navarretia fossalis*); and designated critical habitat for Otay tarplant (*Deinandra conjugens*) and San Diego fairy shrimp, in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). We are addressing all three projects in this biological opinion due to overlap in their action areas. For the purpose of our analyses, we are assuming that the SR-11 and Port of Entry project will be constructed first, followed by the Otay Crossings project, and then the Otay Business Park project.

In our letter to FHWA dated July 29, 2011 (FWS-SDG-08B0316-11F0472), we concurred with FHWA's determination that the proposed restoration work on the Lonestar Ridge conservation property was not likely to adversely affect the federally endangered Otay tarplant, spreading navarretia, California Orcutt's grass (*Orcuttia californica*), and Otay Mesa mint (*Pogogyne nudiuscula*) or critical habitat for spreading navarretia and the Quino checkerspot butterfly. In that letter, we also concurred with FHWA's determination that the proposed SR-11 and Port of Entry project is not likely to adversely affect the Otay tarplant. Although Otay tarplant occurs within the designated open space on the Otay Crossings project site and on the Lonestar Ridge East conservation parcels, there are no impacts anticipated to Otay tarplant from the Otay Crossings project, the Otay Business Park project, or their associated restoration activities; therefore, this species is not addressed by the biological opinion.

The Otay Crossings project will impact 0.38 acre of unoccupied designated critical habitat for the coastal California gnatcatcher (*Polioptila californica californica*, "gnatcatcher"). The impact area is disturbed with only a few scattered shrubs and some grassland [primary constituent elements (PCEs)] occurring within the very edge of critical habitat Unit 1. Unit 1 encompasses 14,898 acres of the 197,303 total acres designated as gnatcatcher critical habitat. The loss of 0.38 acre of disturbed habitat supporting only a few scattered PCEs on the edge of the unit will have no measurable effect on the overall function of the designation to support gnatcatcher dispersal, foraging, or reproduction. Thus, we have determined that implementation of the Otay Crossings project is not likely to adversely affect designated critical habitat for the gnatcatcher, and it is not addressed in the biological opinion.

The Otay Crossings project will also impact 0.17 acre of designated critical habitat for the Quino checkerspot butterfly. As with designated critical habitat for the gnatcatcher, the impact area is disturbed with scattered nectar resources and larval host plants (PCEs) occurring within the western edge of critical habitat Unit 8. Unit 8 encompasses 7,289 acres of the 62,125 total acres designated as critical habitat for the Quino checkerspot butterfly. The loss of 0.17 acre of disturbed habitat supporting only a few scattered PCEs along the western edge of the unit will have no measurable effect on the overall function of the designation to support Quino checkerspot butterfly dispersal, foraging, or reproduction. Thus, we have determined that

implementation of the Otay Crossings project is not likely to adversely affect designated critical habitat for the Quino checkerspot butterfly, and it is not addressed in the biological opinion.

To offset impacts of their projects on federally listed species, all three project proponents have contributed to the acquisition of lands identified herein as the “Lonestar Ridge Conservation Area.” Designated critical habitat for spreading navarretia and proposed critical habitat for Riverside fairy shrimp occur within the Lonestar Ridge Conservation Area. Restoration proposed as part of the projects will enhance PCEs for spreading navarretia and Riverside fairy shrimp and provide an overall benefit to the proposed and designated critical habitat. Thus, we have determined that the proposed restoration work is not likely to adversely affect designated critical habitat for spreading navarretia or proposed critical habitat for the Riverside fairy shrimp, and they are not addressed by the biological opinion.

Our biological opinion is based on information listed in Table 1, literature relevant to the species and effects of the activities addressed in the biological opinion, and site visits conducted during the consultation process. The complete project files addressing this consultation are maintained at the Carlsbad Fish and Wildlife Office (CFWO).

Table 1. Information used in review of the SR-11 and Port of Entry, Otay Crossings, and Otay Business Park projects.

<b>Project</b>	<b>Document</b>	<b>Date</b>
SR-11 and POE	State Route 11 and the Otay Mesa East Port of Entry Draft Tier II Environmental Impact Report/Environmental Impact Statement	November 2010
	Biological Assessment for State Route 11 and Otay Mesa East Port of Entry prepared by California Department of Transportation (Caltrans)	April 2011
	FHWA letter requesting initiation of formal consultation on State Route 11 and the Otay Mesa East Port of Entry	June 6, 2011
	Lonestar Ridge West Habitat Restoration Plan prepared by Caltrans	August 2011
Otay Crossings	U.S. Army Corps of Engineers’ letter requesting initiation of formal consultation on Otay Crossings Commerce Park	November 25, 2010
	Draft Supplemental Environmental Impact Report for Otay Crossings Commerce Park and Technical Appendices	May 2010
Otay Business Park	U.S. Army Corps of Engineers’ letter requesting initiation of formal consultation on Otay Business Park	April 20, 2009
	Draft Supplemental Impact Report for Otay Business Park and Technical Appendices	September 20, 2010
	Otay Business Park Vernal Pool Restoration Plan	October 17, 2011

## CONSULTATION HISTORY

We began meeting on these projects in the fall of 2005. With regard to the Otay Crossings and Otay Business Park projects, much of the early discussion centered around the projects' consistency with the Multiple Species Conservation Program (MSCP), County of San Diego Subarea Plan (County of San Diego 1997). Both of these projects required a "Minor Amendment" to the County of San Diego's Subarea Plan for the MSCP in order for the County to process land development permits for the projects. Following resolution of the Minor Amendments, the project proponents began processing their environmental documents and applied for CWA permits. We received a request for consultation from the Corps for the Otay Business Park project on April 20, 2009, and for the Otay Crossings project on November 25, 2009. Initiation of formal consultation for the Otay Business Park and Otay Crossings projects was acknowledged in our response letters to the Corps dated June 2, 2009, and December 22, 2009, respectively.

Our early coordination on the SR-11 and Port of Entry project was focused on the environmental review pursuant to the National Environmental Policy Act. We regularly participated in the Regional Interagency Working Group meetings upon their initiation in January of 2006. The working group was established to provide a forum to discuss project-related issues including the work required to obtain a Presidential permit for the proposed Port of Entry as well as general interagency coordination required for the environmental review and permitting. We provided a letter identifying federally listed species in the general project area to Caltrans (acting on behalf of FHWA) dated October 6, 2006. We have provided written comments, as appropriate, throughout the environmental review process. We received a request for initiation of formal consultation from FHWA on June 7, 2011. We acknowledged initiation of formal consultation for the SR-11 and Port of Entry project in a letter to FHWA dated July 29, 2011 (FWS-SDG-08B0316-11F0472).

Because the proposed project footprints overlap, we determined that a comprehensive evaluation of the impacts on federally listed species and designated critical habitat would be more efficiently provided through preparation of a single biological opinion rather than three separate ones. Thus, we recommended to the FHWA and Corps that their section 7 consultations be completed as joint Federal agencies. A meeting was held on August 16, 2011, to discuss and facilitate the joint consultation process. Subsequently, we met multiple times with the project proponents and their consultants both individually and together as a group to refine the project description for the combined consultation. Our discussions identified how the three projects relate to each other, potential impacts to endangered and threatened species and designated critical habitat from development of the three projects, and conservation actions aimed at avoiding and minimizing impacts.

A draft biological opinion was provided to the FHWA, Corps, and Caltrans for their review and comment on November 16, 2011.

## BIOLOGICAL OPINION

### DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the issuance of three Department of the Army (DA) permits by the Corps pursuant to section 404 of the CWA to authorize impacts to 1.07 acres of waters of the U.S. and provision of funding by the FHWA for the SR-11 and Port of Entry project under their Federal-Aid Highway Program and Coordinated Border Infrastructure Programs. The proposed action represents three separate projects with overlapping project footprints within a 518-acre area of Otay Mesa in San Diego County, California including the: 1) FHWA and Caltrans proposed construction of SR-11 and the Port of Entry; 2) Otay Business Park, LLC proposed Otay Business Park; and 3) Otay Crossings Commerce Park, LLC proposed Otay Crossings project. The SR-11 and Port of Entry would be implemented first, followed by Otay Crossings project and then the Otay Business Park. The SR-11 and Port of Entry project would impact 0.22 acre of jurisdictional waters of the U.S. with subsequent impacts of 0.41 acre and 0.44 acre attributable to the Otay Crossings and Otay Business Park projects, respectively. The Corps, as the lead Federal action agency for the Otay Crossings and Otay Business Park projects, has determined their scope of action to include the Otay Crossings and Otay Business Park projects in their entirety but has restricted their scope of action for the SR-11 and Port of Entry project to Corps jurisdictional areas on the site. FHWA as the lead Federal action agency for the SR-11 and Port of Entry Project has included the entirety of the SR-11 and Port of Entry project in their scope of action.

The three projects are located in the extreme southeastern portion of Otay Mesa within unincorporated San Diego County, California, immediately north of the U.S./Mexico border, with SR-11 extending into the City of San Diego (Figures 1 and 2). The proposed projects are located predominately within the County of San Diego's (County) East Otay Mesa Specific Plan (EOMSP) area and are within areas designated in the County's Subarea Plan for the MSCP as "Minor Amendment Areas" and "Minor Amendment Areas Subject to Special Consideration." Parcels proposed to offset project-related impacts are located on: Otay Mesa within the City of San Diego (i.e., the Lonestar Ridge Conservation Area, including Lonestar Ridge East and West conservation parcels); in the County on Otay Mountain (O'Neal Canyon); and within the Otay Crossings project site. Each project is described in further detail below.

The three projects have each developed individual, but complimentary, conservation strategies to offset their respective project impacts on federally listed species and designated critical habitat. Each project proponent will only be responsible for implementing their respective avoidance, minimization, and conservation measures that include a combination of enhancement, restoration, and/or preservation of habitat on Otay Mesa and Otay Mountain. All three projects have contributed to the acquisition of the Lonestar Ridge Conservation Area that is comprised of seven parcels located in the Otay Mesa area of the City of San Diego, north of Otay Mesa Road, and northeast of the Brown Field Airport (Figure 2 and 3). A total of approximately 334 acres of habitat will be preserved at this site. The Lonestar Ridge Conservation Area is located within

designated critical habitat for the San Diego fairy shrimp, Quino checkerspot butterfly, and spreading navarretia and proposed critical habitat for the Riverside fairy shrimp. The specific details of the enhancement and restoration that will occur within the Lonestar Ridge Conservation Area are provided below under the description of each project. In addition, at the Otay Crossing project site, 24.3 acres in three locations will be included within open space easements on the eastern edge of the project site (Figure 4).

### **State Route 11 and Otay Mesa East Port of Entry Project**

The SR-11 and Port of Entry project components include the construction of three new facilities: a highway (SR-11); the Port of Entry; and a Commercial Vehicle Enforcement Facility (CVEF) within a total 470.6-acre footprint. In addition, the project includes preservation, enhancement, and restoration of wetlands, grassland, and vernal pool habitat within the Lonestar Ridge Conservation Area.

#### SR-11

SR-11 will be constructed as a four-lane toll facility with two interchanges (Figure 5). The proposed design will include two standard-width main lanes (12 feet wide) and shoulders (10 feet wide) in each direction, as well as auxiliary lanes and connectors near the interchanges. SR-11 will be located midway between Otay Mesa and Airway roads for most of its length and will cross four local surface streets: Sanyo Avenue, Enrico Fermi Drive, Alta Road, and Siempre Viva Road. It will extend east from the vicinity of Harvest Road (at the future SR-125/SR-905 Interchange) for approximately 1.5 miles, before curving to the southeast near Alta Road and continuing for approximately 0.6 mile to connect with the proposed Port of Entry/CVEF site. The proposed project includes an undercrossing structure at Sanyo Avenue, an overcrossing structure at Alta Road, and interchanges with local roadways at Siempre Viva Road (partial interchange) and Enrico Fermi Drive.<sup>1</sup> To link SR-11 to SR-905, connectors will be provided and certain modifications to the approved SR-905 design will be required; however, they are entirely within the existing SR-905 right-of-way. A summary of the proposed SR-905 modifications is provided in the *Biological Assessment for SR11 and Otay Mesa East Port of Entry* (BA). Impacts from construction of SR-905 were addressed in a biological opinion dated July 12, 2004 (Service 2004a).

From west to east, the proposed SR-11 median in the vicinity of Sanyo Avenue will be 22 feet wide for a distance of approximately 1,600 feet to minimize impacts to nearby buildings before widening out over a distance of approximately 630 feet to a 62-foot median width for the remaining length of SR-11. Within the Sanyo Avenue area, the proposed project includes the 22-foot long median, two through lanes in each direction, an auxiliary lane in each direction

---

<sup>1</sup> The Caltrans Highway Design Manual defines an undercrossing as a structure designed to allow a local roadway to pass under a highway, while an overcrossing is defined as a structure designed to allow a local roadway to pass over a highway. An interchange is defined as a system of interconnecting roadways in conjunction with one or more grade separations providing for the interchange of traffic between two or more roadways on different levels.

associated with the Enrico Fermi Drive interchange, shoulders, and related grading. Concrete barriers of approximately 3 feet in height will extend along each side of the roadway in this area, in addition to a 3-foot tall concrete barrier that will extend along the median.

Proposed limits of grading and right-of-way are expected to be up to 500 feet wide, with the exception of the interchange locations, which will require additional space. These limits include all required cut/fill slopes and project-related drainage facilities, lighting, fencing, utilities and landscaping and will be sufficient to accommodate all required construction, staging and storage for the proposed project. The proposed grading limits include several easements that are outside of the proposed SR-11 right-of-way. Permanent and temporary easements are associated with the relocation of a gas pipeline around the east side of the proposed Port of Entry. A 0.2-acre permanent easement is proposed west of the Siempre Viva Boulevard Interchange for proposed offsite drainage enhancements. In the Sanyo Avenue area, the project requires permanent easements across existing developed properties adjacent to SR-11.

#### SR-125 Modifications to Accommodate SR-11 Connections

A southbound SR-125 to eastbound SR-11 connector will be added to the SR-905/SR-125/SR-11 interchange. A local connector ramp from Enrico Fermi Drive to northbound SR-125 was approved under the SR-905 project; the proposed project build alternative assumes a direct connector from westbound SR-11 to northbound SR-125. The addition of the complementary southbound SR-125 to eastbound SR-11 connector will complete the direct link between the two highways.

#### Enrico Fermi Drive and Siempre Viva Road Interchanges

The proposed interchange at Enrico Fermi Drive will have on- and off-ramps to/from both eastbound and westbound SR-11 (and unmanned toll facilities along the westbound on-ramp and eastbound off-ramp). This interchange will be located approximately one mile east of the previously described SR-905/SR-125/SR-11 Interchange, and approximately one mile west of the proposed interchange at Siempre Viva Road. The proposed Siempre Viva Road Interchange will provide partial connectivity between SR-11, Siempre Viva Road, and the Port of Entry. Specific features associated with this interchange design are described in the BA for the SR11 and Port of Entry project.

#### Otay Mesa East Port of Entry

The proposed Port of Entry will accommodate northbound and southbound commercial and passenger traffic, as well as pedestrians and bicycles. The currently proposed Tier II Port of Entry site includes an irregularly-shaped polygon of approximately 101.1 acres north of the international border and across from the associated Otay II Port of Entry site in Mexico. A 150-foot wide strip of federal land patrolled by the U.S. Border Patrol is located between the two Port of Entries. Temporary and permanent easements are proposed outside of the proposed project

right-of-way to accommodate the relocation of a natural gas pipeline along the northeastern boundary of the proposed Port of Entry/CVEF, as well as for modifying and maintaining a portion of an existing drainage along the western boundary of the Siempre Viva interchange. The Port of Entry footprint also includes a two-acre site that could accommodate a potential future transit center. The analysis assumes that the overall footprint and impacts will remain the same, regardless of potential changes to the facilities and their locations within the project footprint.

### Commercial Vehicle Enforcement Facility

The proposed site for the new CVEF encompasses approximately 17.9 acres located east of SR-11 along the northern Port of Entry boundary that will include an approximately 8,000-square foot main building. After receiving clearance to enter the U.S. at the Port of Entry, northbound commercial vehicles will be routed into the CVEF facility for a safety inspection then onto the regional roadway system. Table 2 summarizes the proposed measures that will be implemented to address impacts to upland and wetland habitats from the development of the SR-11 and Port of Entry project.

Table 2. Summary of proposed measures to offset permanent impacts to upland and wetland habitats associated with the SR-11 and Port of Entry project.

Habitat Type	Permanent Impacts (Acres)	Compensation Ratio	Total Compensation (Acres) <sup>2</sup>	Conservation Location
Native Grassland	0.20	2:1	0.40 enhancement of non-native grassland with native grassland	Lonestar Ridge West
Non-Native Grassland	171.90	1:1	171.90 enhancement and preservation of native upland habitat	Lonestar Ridge West <sup>3</sup>
Grassland Restoration <sup>1</sup>	3.20	1:1	3.20 enhancement of native grassland	Lonestar Ridge West
Mule Fat Scrub	0.42	2:1	0.84	Johnson Canyon
Linear Streambed (Other Waters of the U.S.)	0.22/ 4,492	1:1	0.22 / 4,492	Johnson Canyon

<sup>1</sup> Grassland restoration refers to an area that was temporarily impacted and has been recently revegetated as part of another project.

<sup>2</sup> Final approved compensatory mitigation for impacts to waters of the U.S. will be determined by the Corps during the DA permitting process.

<sup>3</sup> Lonestar Ridge West includes three parcels, one to the west of SR-125, and two parcels east of Johnson Canyon (see Figure 2).

### Preservation, Enhancement, and Restoration

In order to address impacts associated with the SR-11 and Port of Entry project, including the CVEF, approximately 176 acres of upland habitat will be enhanced and/or preserved by Caltrans within three parcels (Figure 3). One of these parcels identified herein as the “Lonestar Ridge

West conservation parcel” is located west of SR-125 within the greater Lonestar Ridge Conservation Area. The Lonestar Ridge West conservation parcel includes approximately 155 acres of non-native grassland, 0.6 acre of disturbed vernal pools and basins supporting San Diego fairy shrimp, a 0.2-acre stock pond supporting Riverside fairy shrimp, 0.5 acre of eucalyptus woodland, and 7.5 acres of Diegan coastal sage scrub, all of which is designated critical habitat for the San Diego fairy shrimp. All 155 acres will be enhanced as part of the restoration and enhancement efforts within the Lonestar Ridge West conservation parcel to offset direct impacts to 89.07 acres of designated critical habitat for San Diego fairy shrimp within the project footprint. An intensive weeding effort has been implemented by Caltrans to control the non-native vegetation and enhance native grass and forb species. Caltrans will also be responsible for re-contouring the site to improve the hydrology for the extant vernal pools and to restore additional basins across the site. In addition, larval host and nectar plant species for the Quino checkerspot butterfly will be incorporated into the seed palette to improve the habitat for this species.

The other two conservation parcels purchased by Caltrans are located within the greater Lonestar Ridge property but further east of SR-125 and the “Lonestar Ridge East conservation parcels” (Figure 3). These two parcels will be preserved and protected in place. One parcel is approximately 11.78 acres and consists primarily of 10.72 acres of valley and foothill grassland and 0.53 acre of coastal sage scrub. The second parcel is approximately 8.46 acres and consists of 4.06 acres of valley and foothill grassland and 4.40 acres of coastal sage scrub. Caltrans proposes to restore waters of the U.S. by removing non-native vegetation and restoring native vegetation along 4,999 linear feet of the drainage located within the portion of Johnson Canyon that is adjacent to the Lonestar Ridge Conservation Area. Compensatory mitigation for permanent and temporary impacts to waters of the U.S. will be addressed through the DA permitting process with the Corps.

### **Otay Crossings**

The Otay Crossings project site consists of two parcels (Assessor’s Parcel Numbers 648-070-03 and 648-080-27) totaling 311.5 acres located to the southeast of the intersection of Otay Mesa and Alta roads. It occupies portions of Sections 31 and 32 within Township 18 South, Range 1 East of the U.S. Geological Survey 7.5-minute Otay Mesa quadrangle (Figure 2).

The proposed project is a Tentative Map (TM) and Preliminary Grading Plan (Tract 5405) for land designated for mixed industrial, rural residential, and SR-11 use in Subarea 2 of the EOMSP. The proposed SR-11 traverses the site and the Port of Entry will be situated on the southern portion of the property. The TM subdivides the 311.5-acre property into 56 industrial lots and 3 open space lots ranging in size from a 0.9 net acre to 59.1 net acres. Approximately 285.5 acres will be placed in lots, while 26 acres will contain public streets, including General Plan Circulation Element roadways (Alta, Otay Mesa, and Airway roads). The proposed right-of-way for SR-11 and the Port of Entry has been tentatively mapped on all, or portions of, 17 lots (lots 33-38, 42-45, and 51-57) covering 123.1 acres of the site. A total of 24.3 acres in three

locations are proposed to be included within open space easements on the eastern edge of the project site (Figure 4).

In addition to the proposed onsite development, offsite road improvements (approximately 23 acres) are proposed for Alta, Airway, Siempre Viva, and Otay Mesa roads, and an offsite sewer line is proposed along Alta Road, Airway Road, and Enrico Fermi Drive.

To address impacts to upland and wetland habitats, the Otay Crossings project includes enhancement and preservation of native habitats both on and off the project site (Table 3). Otay Crossings will be responsible for offsetting the direct impacts to approximately 163 acres of upland habitat through the conservation of 24.3 acres on their project site and portions of four parcels off site. The offsite parcels include two parcels (20 acres and 62 acres) within the Lonestar Ridge East conservation parcels and two parcels in the vicinity of O'Neal Canyon (15 acres and 69 acres) (Figure 2). Otay Crossings has purchased approximately 23 acres of land within the Lonestar Ridge East conservation parcels that may not be needed to fulfill their County MSCP obligations (Figure 3). If the County determines that these acres are not needed to fulfill Otay Crossings MSCP obligations, they will be conserved and enhanced consistent with the remainder of the 62-acre parcel, and the credits will be banked for future projects.

Table 3. Summary of proposed measures to offset permanent impacts to upland and wetland habitats associated with the Otay Crossings project.

Habitat Type	Permanent Impacts	Compensation Ratio	Total Compensation <sup>1</sup>	Conservation Location
Native Grassland	0.10 acre	2:1	0.20 acre enhancement of non-native grassland with native grassland	Lonestar Ridge East
Non-Native Grassland	161.1 acres	1:1	161.1 acres of enhancement and preservation of native upland habitat	On site; Lonestar Ridge East; O'Neal Canyon
Diegan Coastal Sage Scrub	1.9 acres	1.5:1	2.9 acres of preservation	On site
Occupied fairy shrimp road pool	116 square feet	2:1	232 square feet of restoration	Lonestar Ridge East
Freshwater Marsh	0.003 acre	2:1	0.006 acre	Offsite wetland mitigation site to be determined
Tamarisk Scrub	0.97	1:1	0.73 acre	Offsite wetland mitigation site to be determined
Linear Streambed (Other Waters of the U.S.)	0.23	1:1	0.23 acre	Offsite wetland mitigation site to be determined

<sup>1</sup>Final approved compensatory mitigation for impacts to waters of the U.S. will be determined by the Corps during the DA permitting process.

Approximately 33 acres of designated critical habitat for San Diego fairy shrimp will be enhanced as part of the restoration and enhancement efforts within the Lonestar Ridge East conservation parcels to offset direct impacts to 12.97 acres of designated critical habitat for San Diego fairy shrimp within the project footprint. Also, 7.02 acres of designated critical habitat for the Otay tarplant will be conserved and managed within the onsite open space area.

As part of the overall enhancement activities within the entire Lonestar Ridge East conservation parcels, an intensive weeding effort will be implemented within a specific 5-acre site to control the non-native vegetation and enhance native grass and forb species. In addition to the extensive weeding, larval host and nectar plant species for the Quino checkerspot butterfly will be incorporated into the seed palette within the 5-acre site to improve the habitat for the species. Waters of the U.S. compensatory mitigation will occur off site at a location to be determined during the DA permitting process with the Corps.

### **Otay Business Park**

The proposed Otay Business Park project is an industrial business park development located on 161.6 acres. The project site consists of one parcel (Assessor's Parcel Number 648-070-21) and adjacent offsite improvements. The property lies approximately 0.5 mile east of Enrico Fermi Drive. It occupies the southeastern quadrant of Section 31 within Township 18 South, Range 1 East of the U.S. Geological Survey 7.5-minute Otay Mesa quadrangle (Figure 2).

The proposed project will divide the approximately 116.4-acre site into 59 industrial lots. Proposed lot sizes range from 0.9 acre to 5.0 acres. The project will be built in phases, but all mass grading will occur during the first phase. Two existing drainage channels on site will be realigned or re-routed as part of the proposed project. The western drainage course will be re-routed underground via the project's internal storm drain system. Drainage from the western portions of the site will be directed towards "Detention Basin A" and detained prior to being discharged towards the south. The eastern drainage channel will be re-routed underground as part of the SR-11 and Port of Entry project.

Implementation of the proposed project requires improvements to roadways, both on and off site. Proposed offsite improvements include the extension of Siempre Viva Road approximately 1,330 feet westerly of the proposed project site to the existing improved segment of the roadway that will then be minimally widened for approximately 1,300 feet to Enrico Fermi Drive. Proposed offsite improvements to Airway Road include the extension of the roadway approximately 1,300 feet westerly of the proposed project site to the existing improved segment of the roadway.

Construction of Otay Business Park is currently proposed to occur after construction of both the SR-11 and Port of Entry project and Otay Crossings project. These two projects overlap with the Otay Business Park project such that the area affected by the Otay Business Park will be reduced. The SR-11 and Port of Entry project will affect all or a portion of lots 47-55 and 57-59. The total acreage overlap of the SR-11 and Port of Entry project on the Otay Business Park site is 43.1

acres (Figure 6). Following construction of the Otay Crossings and SR-11 projects, the Otay Business Park project will develop approximately 118 acres of industrial, commercial, and associated facilities (streets, sewer, etc.).

Otay Business Park will be responsible for the preservation, restoration, and/or enhancement of approximately 69 acres of upland habitat within the Lonestar Ridge East conservation parcels (Figure 3). These areas are located east of SR-125 and north of Lonestar Road and include 62 acres of designated critical habitat for the San Diego fairy shrimp. All 62 acres of designated critical habitat for San Diego fairy shrimp will be enhanced as part of the Otay Business Park's restoration and enhancement efforts on their portion of the Lonestar Ridge East conservation parcels to offset direct impacts to 98 acres of designated critical habitat within the project footprint. An intensive weeding effort will be implemented within the vernal pool restoration area to control the non-native vegetation and enhance native grass and forb species. In addition, larval host and nectar plant species for the Quino checkerspot butterfly will be incorporated into the seed palette to improve the habitat for this species.

Additional upland habitat will be preserved off site to offset impacts to non-native grassland; however, the location has not been identified. Mitigation for impacts to the onsite drainage will be met through a combination of habitat preservation and restoration and purchase of credits in the Rancho Jamul mitigation bank that is located in the County of San Diego. Table 4 summarizes the proposed measures that will be implemented to address impacts associated with the development of the Otay Business Park project.

Table 4. Summary of proposed measures to offset permanent impacts to upland and wetland habitats associated with the Otay Business Park project.

Habitat Type	Permanent Impacts	Compensation Ratio	Total Compensation (Acres) <sup>2</sup>	Conservation Location
Non-Native Grassland	110.7 acres	1:1	110.7 enhancement and preservation of native upland habitat	Lonestar Ridge East / Off site location to be determined
Vernal Pools	0.14 acre	2:1	0.28 restoration <sup>1</sup> ; 0.66 acre of preservation	Lonestar Ridge East
Occupied fairy shrimp road pool	0.10 acre	2:1	0.20 restoration <sup>1</sup>	Lonestar Ridge East
Linear Streambed (Other Waters of the U.S.)	0.13 acre 1,992 lf	N/A	0.40 acre preservation and restoration and 0.40 acre mitigation credit	Lonestar Ridge East, Onsite realigned channel, And Rancho Jamul bank

<sup>1</sup> Restoration acreage refers to the area of ponded water. In addition to the area of ponded water, 4.7 acres of supporting watershed will be enhanced and conserved as well.

<sup>2</sup> Final approved compensatory mitigation for impacts to waters of the U.S. will be determined by the Corps during the DA permitting process.

## **Conservation Measures**

The following conservation measures will be implemented as part of the project to avoid, minimize, and offset adverse effects to San Diego button celery, spreading navarretia, San Diego fairy shrimp, Riverside fairy shrimp, and Quino checkerspot butterfly and critical habitat for Otay tarplant and San Diego fairy shrimp.

### ***Conservation/Restoration/Management***

1. Impacts to vernal pool species and designated critical habitat for San Diego fairy shrimp will be offset through the preservation and restoration of vernal pool habitat within the Lonestar Ridge Conservation Area.
  - a) Caltrans/FHWA will offset impacts to 89.07 acres of designated critical habitat by the enhancement and preservation of PCEs within 155 acres of designated critical habitat within the Lonestar Ridge West conservation parcel. A total of 14 vernal pool basins (0.6 acre) will be enhanced and 111 vernal pool basins (3.6 acres) will be created/restored. These basins will be surrounded by approximately 27.3 acres of watershed (an average ratio of approximately 6.5 acres of watershed for every acre of vernal pool). Caltrans proposes no less than 4.2 acres of vernal pool basins will be created/restored with at least 27.3 acres of associated vernal pool watershed and upland that will be restored to support the vernal pool basins;
  - b) The project proponents for Otay Crossings will offset impacts to 1 road pool (116 square feet) and 13 acres of designated critical habitat by preservation of PCEs within 13.37 acres of designated critical habitat on site and the enhancement of PCEs within a minimum of 33 acres of designated critical habitat on the Lonestar Ridge East conservation parcels. Two basins will be created/restored totaling 232 square feet of vernal pools on the Lonestar Ridge East conservation parcels; and
  - c) The project proponents for the Otay Business Park will offset impacts to 24 vernal/road pools (0.24 acre) and 98.01 acres of designated critical habitat for San Diego fairy shrimp by the enhancement and preservation of 0.66 acre of vernal pools and the restoration of approximately 0.48 acre vernal pools on the Lonestar Ridge East conservation parcels. A total of approximately 1.14 acres of basin area and 62 acres of PCEs will be restored and enhanced on the site. Impacts to three individuals of San Diego button celery and three individuals of spreading navarretia will be offset through the salvage and translocation of the onsite plants. Seed will be collected from the onsite populations of these species and incorporated into the vernal pool restoration on one of the Lonestar Ridge East conservation parcels, as described in the Otay Business Park Vernal Pool Preserve Restoration Plan dated October 17, 2011.

2. Impacts to the Quino checkerspot butterfly will be offset through preservation of the historically occupied habitat within the Lonestar Ridge Conservation Area, which is designated as Quino checkerspot butterfly critical habitat.
  - a) Caltrans/FHWA will offset impacts to Quino checkerspot butterfly by the enhancement and preservation of habitat suitable for this species, including the establishment of a minimum of 17 focused planting areas that are dominated by Quino checkerspot butterfly host and nectar resource plants, within 87 acres of critical habitat on the Lonestar Ridge West conservation parcel. The goal of this conservation measure is to preserve or salvage stands of the native flora important to Quino checkerspot butterfly (host plants and adult nectar sources), seed the site with native host plants and nectar plants, and control nonnative plant species growth and reproduction so that non-native species do not out compete native flora;
  - b) Otay Crossings will offset impacts to Quino checkerspot butterfly by the enhancement and preservation of habitat suitable for this species including the establishment of a minimum of 5 focused planting areas that support habitat dominated by Quino checkerspot butterfly host and nectar resource plants within 44 acres of critical habitat on the Lonestar Ridge East conservation parcels. The 5 focused planting areas will be placed within a 5-acre area that will be more intensively weeded. The goal of this conservation measure is to provide for improved habitat value on parcels historically occupied by the Quino checkerspot butterfly; and
  - c) Otay Business Park will offset impacts to Quino checkerspot butterfly by the enhancement and preservation of habitat suitable for this species, including the establishment of a minimum of 6 focused planting areas that support habitat dominated by Quino checkerspot butterfly host and nectar resource plants within 62 acres of critical habitat on the Lonestar Ridge East conservation parcels. The goal of this conservation measure is to provide for improved habitat value on parcels historically occupied by the Quino checkerspot butterfly.
3. Each project proponent will submit to the Service and the Corps a final restoration plan for their respective conservation sites, for approval, at least 60 days prior to initiating impacts on their project site. Impacts will not occur on a given project site until the Service and the Corps have approved the final restoration plan for the associated project. The final restoration plans will be based on the *Lonestar Ridge West Habitat Restoration Plan* (Caltrans 2011), the *Onsite Revegetation Plan for Otay Crossings Commerce Park* (HELIX 2010d), the *Offsite Vernal Pool Revegetation Plan for Otay Crossings Commerce Park* (HELIX 2010 e), the *Quino Checkerspot Butterfly and Burrowing Owl Mitigation Plan for Otay Crossings Commerce Park* (HELIX 2010f), and the *Otay Business Park Lonestar Ridge Vernal Pool Restoration Plan* (HELIX 2011). In addition to the measures proposed in these draft plans, the final three plans will each include the following information:

- a) Implementation of the final plan will be conducted under the direction of a biologist with at least 3 years of vernal pool restoration experience (i.e., a vernal pool restoration specialist); the biologist will be approved by the Service and the Corps;
- b) The restoration area contains extant vernal pools and the Lonestar Ridge East conservation parcels are immediately adjacent to the Caltrans SR-125 vernal pool restoration site. To avoid impacts to extant vernal pools, all measures required in Conservation Measure 4 will be implemented at the restoration site and thus specified in the restoration plan;
- c) Each project's associated restoration/enhancement activities will commence the first summer-fall season prior to, or concurrently with, the start of vegetation clearing of their project site;
- d) All final specifications and topographic-based grading, planting, and watering plans will have 0.5-foot contours and show typical cross-sections for the vernal pools, watersheds, and surrounding uplands (including adjacent mima mounds) at the restoration/enhancement sites. The basis for this fine-scale resolution is the shallow depth (i.e., several inches) of the vernal pools that will be restored/enhanced. The grading plans will also show overflow pathways that hydrologically connect the restored pools in a way that mimics natural vernal pool complex topography/hydrology;
- e) A fine-scale, detailed hydraulic analysis that shows each proposed restored vernal pool and its watershed, and hydrologic connection between the pools, as well as the watershed of the extant vernal pools to be enhanced. The watersheds of the restored pools will not extend into the watersheds of the extant vernal pools to be enhanced;
- f) Discussion and a table on the exact activities that will occur at each restored or enhanced vernal pool. The discussion and table will also include the initial conditions of the pools and the as-built conditions including basin size, average depth, ponding duration, existing native and nonnative cover, and presence of listed species;
- g) All enhancement activities in the pools occupied by listed vernal pool species that require soil manipulation (e.g., removal/recontouring of tire ruts or road fills, recontouring of pool slopes) will be done by hand and/or small machinery (e.g., Bobcat) to reduce impacts to the existing pool resources. Soil manipulation will be limited to areas adjacent to the existing pool and will be the minimum area necessary to accomplish pool enhancement. Topsoil will only be salvaged from the portions of the pools subject to soil movement. The areas of existing habitat, which are to remain unaffected by enhancement activities, will be specified and protected by temporary barriers prior to implementation;

- h) A map depicting the locations of the control pools<sup>2</sup> within each reference site and a table detailing basin size, average depth, ponding duration, native cover, nonnative cover, and presence of listed species for each pool will be incorporated into the annual reports during the 5-year maintenance and monitoring period(s) for each project;
- i) As a last resort and after approval by the Service and the Corps, additional inoculum from offsite donor vernal pools in the Otay Mesa area may be used to supplement the inoculum collected at the project impact site. The final plan will identify any proposed donor pools and include documentation that they are free of versatile fairy shrimp (*Branchinecta lindahli*). A rough estimate of San Diego and/or Riverside fairy shrimp genetic similarity using mtDNA sequencing should be conducted before introducing inoculum collected off site into occupied pools. No more than 10 percent of the basin area of any additional, non-impacted donor pool will be used for collection of inoculum. Collection of inoculum from Agency-approved donor pools will be consistent with Conservation Measure 4 below;
- j) Inoculum and planting will not be installed until the Service and the Corps approve the habitat restoration site grading through evidence of ponding noted below. All planting will be installed in a way that mimics natural plant distribution and not in rows. Inoculum will not be introduced into the restored or enhanced pools until after they have been demonstrated to retain water for the appropriate amount of time to support San Diego (i.e., at least 12-30 days) or Riverside fairy shrimp (i.e., 30-60 days) and have been surveyed for versatile fairy shrimp to the satisfaction of the Service and the Corps. If versatile fairy shrimp and San Diego and/or Riverside fairy shrimp are detected in the restored or enhanced pools, no additional action will be required. If versatile fairy shrimp are present but no San Diego and/or Riverside fairy shrimp are detected, off site inoculum will not be introduced until measures approved by the Service and the Corps are implemented in attempt to remove the versatile fairy shrimp from the pools. Inoculum from the Lonestar Ridge Conservation Area may be allowed, subject to confirmation from the Service and the Corps. Inoculum will be placed in a manner that preserves, to the maximum extent possible, the orientation of the San Diego and Riverside fairy shrimp cysts within the surface layer of soil (e.g., collected inoculum will be shallowly distributed within the pond so that cysts have the potential to be brought into solution upon inundation). No inoculum collected off site will be placed in occupied pools unless it is determined through mtDNA sequencing that they are genetically similar;
- k) Plant palettes (species, size, and number/acre) and seed mix (species and pounds/acre) will be included in the restoration/enhancement plan. The plant palette will include native species specifically associated with the onsite habitat type(s). If native plant

---

<sup>2</sup> All three project proponents will work together to identify a common set of control pools that will be used by all three restoration efforts in order to minimize any potential impacts from monitoring the control pools.

species (no cultivars) cannot be obtained within Otay Mesa, an alternate site will be used only upon approval by the Service and the Corps. The source and proof of local origin of all plant material and seed will be provided to the Service and the Corps;

- l) Native plants and animals will be established within the restored/enhanced pools, their watersheds and surrounding uplands. This establishment can be accomplished by redistributing topsoil containing seeds, spores, bulbs, eggs, and other propagules from affected pools and adjacent vernal pool and upland habitats; by the translocation of propagules of individual species from offsite habitats; and by the use of commercially available native plant species and/or any vernal pool inoculum or plant material from an offsite source approved by the Service and the Corps. Topsoil and plant materials from the native habitats to be affected on site will be applied to the watersheds of the enhanced and restored pools to the maximum extent practicable. Nonnative invasive weed control will be implemented within the restoration areas to protect and enhance habitat remaining on site;
- m) Any artificial watering of the restored/enhanced pool watersheds will be done in a manner that prevents water from entering into the pools. Any water to be used will be identified and documented to be free of contaminants that could affect the water quality of the pools and harm San Diego fairy shrimp. Upland plant species will need to demonstrate independence from artificial water sources for at least 2 years in order to meet the success criteria;
- n) All weeding within and immediately adjacent to the restored/enhanced pools will be performed by hand. No herbicide will be used within the restored/enhanced pools. Herbicide may be used in the uplands adjacent to pools only as approved by the Service and the Corps (e.g., using the “glove” method<sup>3</sup>). All workers conducting weed removal activities will be educated to distinguish between native and nonnative species so that local native plants are not inadvertently killed by weed removal activities;
- o) A final implementation schedule that indicates when all vernal pool impacts and vernal pool restoration/enhancement grading and planting will begin and end. Any temporal loss of vernal pools caused by delays in restoration will be offset by additional habitat preservation and/or restoration as determined in coordination with the Service and the Corps, unless the delays were caused by unforeseeable circumstances or were beyond the reasonable control of the project proponent;
- p) A minimum commitment to 5 years of monitoring of vernal pool and upland habitat restoration/enhancement areas post completed installation. The final success criteria

---

<sup>3</sup> The “glove” method refers to using absorbent-type gloves that are soaked in herbicide, which is then applied to weed species by hand. When carefully done, this method allows for very effective weed control along the margins of the pools, with a low risk of affecting the native flora and fauna because the gloves allow for very accurate placement of the herbicide.

methodology will include quantitative hydrological, vegetation transects, viable cyst, hatched San Diego fairy shrimp, and gravid female measurements; complete flora and fauna inventories; and photographic documentation. To minimize impacts to the soil surface of the vernal pool during restoration, enhancement, and monitoring activities, cobbles will be oriented within the restored vernal pools to serve as stepping stones;

- q) Restoration success, as determined by the final success criteria, for San Diego fairy shrimp and Riverside fairy shrimp will be determined by measuring the ponding of water and density of viable cysts, presence of hatched San Diego and Riverside fairy shrimp, and gravid females within the restored pools. Water measurements will be taken in the restored pools to determine the depth, duration and quality (e.g., pH, temperature, total dissolved solids, salinity) of ponding. Dry samples will be taken from a subset of restored and control pools known to support fairy shrimp in the fall of each year to determine the density of viable cysts in the soils. The sampling will consist of three core samples (approximately 1.5 - 2 cubic inches in volume) taken in the deepest portion of each sampled pool. The samples will be analyzed by a –Service-approved biologist to determine the genus and density of cysts collected. Wet samples will also be taken in the restored pools to estimate the number of hatched San Diego and Riverside fairy shrimp and gravid females. Final success criteria will be set such that the pools must pond for a period of time similarly to reference vernal pools during an average rainfall year and at an appropriate depth and quality to support San Diego and Riverside fairy shrimp. The average viable cyst, hatched fairy shrimp, and gravid female data from the restored pools must show that the populations are stable or increasing, relative to the control pools. If both the restored and control pool shrimp populations decline in any given year, then it will be assumed that there are other outside, seasonal effects driving the change, as opposed to specific factors at the restoration site. Otherwise, the restored pool population numbers should either be stable or show an increasing trend from reference pools for at least 3 wet seasons before a determination of success can be made. Vernal pools selected as reference or control pools for evaluating restoration success will be identified and described in the restoration plan as per Conservation Measure 3(h). Alternate methods of determining success will only be used if approved by the Service and the Corps;
- i. SR-11 and Port of Entry success criteria include the establishment of 1.30 acres and 0.22 acre of basin area that will support the San Diego fairy shrimp and Riverside fairy shrimp, respectively. In addition, 54 pools will support San Diego button-celery.
  - ii. Otay Crossings success criteria include the establishment of 232 square feet of basin area that support San Diego and Riverside fairy shrimp.
  - iii. Otay Business Park success criteria include the establishment of 0.36 acre and 0.06 acre of the restored vernal pools that will support San Diego fairy shrimp

and Riverside fairy shrimp, respectively. In addition, two pools will support San Diego button celery and spreading navarretia.

- r) Monitoring and success criteria for vernal pool and upland restoration/enhancement areas for the Quino checkerspot butterfly will include; species richness and cover criteria for all 5 years of monitoring, zero percent cover for weed species categorized as High or Moderate in the California Invasive Plant Council's (Cal-IPC) Invasive Plant Inventory (excluding common non-native grassland species present prior to restoration/enhancement), and relative cover of all other weed species is no more than 15 percent coverage for other nonnative invasive weed species for all 5 years of the 5-year monitoring period. Restored/created pools will have less than 1 percent absolute cover of exotic plant species. Container plant survival will be 70 percent of the initial plantings for the first 5 years. At the first and second anniversary of plant installation, all dead plants will be replaced unless their function has been replaced by natural recruitment. The method used for monitoring will be described and a map of proposed sampling locations will be included. Photo points will be used for qualitative monitoring and stratified-random sampling will be used for all quantitative surveys;
  - s) A commitment by the project proponents agreeing that restoration/enhancement of the vernal pools and uplands will be deemed complete once the final success criteria are met and only after written sign-off by the Service and the Corps. Specifically, if a performance criterion is not met for any of the restored/enhanced vernal pools or upland habitat in any year, or if the final success criteria are not met, the project proponent will prepare an analysis of the cause(s) of failure and, if deemed necessary by the Service and the Corps, propose remedial actions for approval. If any of the restored/enhanced vernal pools or upland habitat have not met a performance criterion during the initial 5-year period, the maintenance and monitoring obligations will continue until the Service and the Corps deem the restoration/ enhancement successful, or contingency measures are implemented. Restoration/ enhancement will not be deemed successful until at least 1 year after any contingency measures related specifically to success criteria are implemented, as determined by the Service and the Corps; and
  - t) Annual reports will be submitted to the Service and the Corps by January 31 of each year. Those reports will assess both the attainment of yearly success criteria and progress toward the final success criteria. The reports will also summarize the project's compliance with the conservation measures committed to as part of the project, terms and conditions included in the biological opinion.
4. Restoration grading activities at the Lonestar Ridge East and West conservation parcels will be timed to avoid wet weather to minimize potential impacts (e.g., siltation) to the extant vernal pools unless the area to be graded is at an elevation below the pools. To achieve this goal, each project proponent will comply with the following:

- a) Grading will occur only when the soil is dry to the touch at the surface and 1 inch below. A visual check for color differences (i.e., darker soil indicating moisture) in the soil between the surface and 1 inch below indicates the soil is dry;
  - b) After a rain of greater than 0.2 inches, grading will occur only after the soil surface has dried sufficiently as described above, and no sooner than 2 days (48 hours) after the rain event ends;
  - c) Grading will commence only when no rain is forecast during the anticipated grading period;
  - d) To prevent erosion and siltation from storm water runoff due to unexpected rains, Best Management Practices (i.e., silt fences) will be implemented as needed during grading;
  - e) If rain occurs during grading, work will stop and resume only after soils are dry, as described above; and
  - f) Grading will be done in a manner to prevent run-off from entering extant vernal pools.
5. Each of the project proponents will staff a restoration biologist with a minimum 3 years of previous experience with implementing successful upland and wetland restoration projects<sup>4</sup> with an emphasis on coastal sage scrub, native perennial grassland, and vernal pool restoration. The restoration biologist must also have 5 years of local field experience with vernal pool vegetation, hydrology, and soils, as well as Quino checkerspot habitat. The restoration biologist will be responsible for implementation of the vernal pool and Quino checkerspot butterfly restoration work as well as overseeing compliance with protective measures for listed species on the restoration site and will be approved by the Service and the Corps. The project proponents will submit the restoration biologist's name, address, telephone number, and work schedule on the project to the Service and the Corps at least 30 days prior to initiating project impacts. The restoration biologist will perform the following duties:
- a) Allow salvage of live plants and collection of inoculum for transplant to pools, watersheds, and surrounding uplands to be restored/enhanced as practicable and approved by the Service;
  - b) Be on the restoration site during work and/or grading adjacent to vernal pools and unvegetated pools supporting listed vernal pool species to be preserved to ensure compliance with all conservation measures;

---

<sup>4</sup> A successful restoration project is a restoration project that has achieved its success criteria and been accepted by the resource agencies after at least a 5-year monitoring period.

- c) Oversee installation of and inspect the fencing and erosion control measures within or up-slope of vernal pool restoration/enhancement and/or preservation areas a minimum of once per week and daily during all rain events to ensure that any breaks in the fence or erosion control measures are repaired immediately;
  - d) Periodically monitor the work area to ensure that work activities do not generate excessive amounts of dust;
  - e) Train all contractors and construction personnel on the biological resources associated with this project and ensure that training is implemented by construction personnel. At a minimum, training will include: 1) the purpose for resource protection; 2) a description of the listed vernal pool species, Quino checkerspot butterfly, and their habitat(s); 3) the conservation measures given in the biological opinion that should be implemented during project construction to avoid and/or minimize impacts to listed species, including strictly limiting activities, vehicles, equipment, and construction materials to the fenced project footprint to avoid sensitive resource areas in the field (i.e., avoided areas delineated on maps or on the project site by fencing); 4) environmentally responsible construction practices as outlined in measure 8; 5) the protocol to resolve conflicts that may arise at any time during the construction process; and
  - f) Halt work, if necessary, for any project activities that are not in compliance with the conservation measures committed to as part of the project and specified in this biological opinion. The restoration biologist will report any non-compliance issues to the Service and the Corps within 24 hours of its occurrence and confer with the Service and the Corps to ensure the proper implementation of species and habitat protection measures.
6. Otay Crossings and Otay Business Park will post a performance bond or letter of credit with the Corps for grading, planting, and 5 years of maintenance and monitoring of the vernal pool and upland restoration/enhancement areas (including a 20 percent contingency to be added to the total cost). This financial assurance is to guarantee the successful implementation of the vernal pool/upland restoration/enhancement. The project proponents will submit a draft financial assurance instrument with an itemized cost list to the Service and the Corps for approval at least 60 days prior to initiating project impacts. The project proponents will submit the final bond or letter of credit for the amount approved by the Service and the Corps within 30 days of receiving Agency approval of the draft financial insurance instrument.
7. Each project proponent will execute and record perpetual biological conservation easements over their respective on- and offsite conservation lands.

- a) FHWA and Caltrans will be responsible for recording a perpetual biological conservation easement or other conservation mechanism acceptable to the Service over the areas preserved, restored, and/or enhanced by the project within the Lonestar Ridge West conservation parcel and their two additional conservation parcels located within the greater Lonestar Ridge property (Figure 3). The conservation mechanism will specify that no easements or activities (e.g., fuel modification zones, public trails, drainage facilities, walls, maintenance access roads) that will result in soil disturbance and/or vegetation removal will be allowed within the biological conservation easement areas. Caltrans anticipates that they will not be able to place the conservation easements or other conservation mechanisms, or transfer management endowments for their Lonestar Ridge conservation parcels prior to initiating project impacts; however, annual reports will be provided on their status until the conservation mechanisms have been placed and the endowment funds have been transferred; and
  - b) The project proponents for Otay Crossings and Otay Business Park will be responsible for recording perpetual conservation easements over their respective conservation areas in favor of an entity approved by the Service and the Corps. The Service will be named as third party beneficiary in the conservation easement, and the terms of the easement will be approved by the Service and the Corps prior to its execution. This easement will state that no other easements or activities (e.g., fuel modification zones, public trails, drainage facilities, walls, maintenance access roads) that will result in soil disturbance and/or vegetation removal will be allowed within the biological conservation easement area. The project proponents will submit a draft conservation easement agreement to the Service and the Corps for review and approval at least 90 days prior to initiating project impacts and will not initiate project impacts until the easement is approved by the Service and the Corps. The project proponents will submit the final easement and evidence of its recordation to the Service and the Corps within 90 days of recordation of the final map.
8. Each project proponent will implement a perpetual long-term management, maintenance and monitoring plan (e.g., Habitat Management Plan or County Resource Management Plan) for their respective biological conservation easement areas. The plan should include, but not be limited to, the following: method of protecting the resources in perpetuity (e.g., conservation easement); monitoring schedule; measures to prevent human and exotic species encroachment; funding mechanism; and contingency measures should problems occur. In addition the plan will include the proposed land manager's name, qualifications, business address, and contact information. The project proponent will also establish a non-wasting endowment in an amount approved by the Service and the Corps based on a Property Analysis Record (PAR; Center for Natural Lands Management ©1998) or similar cost estimation method to secure the ongoing funding for the perpetual long-term management, maintenance, and monitoring of the biological conservation easement area by an agency, non-profit organization, or other entity approved by the Service and the Corps. The project proponent will submit a draft plan including a description of perpetual

management, maintenance, and monitoring actions and the PAR or other cost estimation results for the non-wasting endowment to the Service and the Corps for approval at least 90 days prior to initiating project impacts. The project proponent will submit the final plan to the Service and the Corps and transfer the funds for the non-wasting endowment to a non-profit conservation entity within 60 days of receiving approval of the draft plan. For Otay Crossings and Otay Business Park, the project proponent will not initiate project impacts until the plan is approved, a manager is identified, and a funding mechanism acceptable to the Service and the Corps is in place. For Caltrans/FHWA, it is anticipated that a plan will not be prepared prior to initiating project impacts; however, annual reports will be provided on their status until a final plan has been provided.

***Best Management Practices, Fencing, Monitoring, Preventing the Spread of Invasive Species***

The following measures will be implemented by each of the project proponents unless otherwise specified.

9. The project proponents will install permanent protective fencing along any interface with developed areas, and/or use other measures approved by the Service and the Corps, to deter human and pet incursion into the biological conservation easement areas. Fencing will have no gates (except to allow access for maintenance and monitoring of the biological conservation easement areas). Signage for the biological conservation easement areas will be posted and maintained at conspicuous locations. Plans for fencing and/or other preventative measures will be submitted to the Service and the Corps for approval at least 60 days prior to initiating project impacts. Fencing, as approved by the Service and the Corps, will be installed within 60 days of execution of the conservation easement.
10. The project proponents for Otay Crossings and Caltrans/FHWA will ensure that development landscaping adjacent to the biological conservation easement area in the south east corner of the project site does not include exotic plant species that may be invasive to native habitats. Exotic plant species not to be used include any species listed on the California Invasive Plant Council's (Cal-IPC) "Invasive Plant Inventory" List. This list includes such species as pepper trees, pampas grass, fountain grass, ice plant, myoporum, black locust, capeweed, tree-of-heaven, periwinkle, sweet alyssum, English ivy, French broom, Scotch broom, and Spanish broom. A copy of the complete list can be obtained from Cal-IPC's web site at <http://www.cal-ipc.org>. Plants that require intensive irrigation, fertilizers, or pesticides should not be used in landscaping adjacent to preserve areas. Water runoff from landscaped areas should be directed away from the biological conservation easement areas and contained and/or treated within the development footprint.
11. Any planting stock to be brought onto the project site for landscape or habitat creation/restoration/enhancement will be first inspected by a qualified pest inspector to ensure it is free of pest species that could invade natural areas, including but not limited to, Argentine ants (*Iridomyrmex humil*), fire ants (*Solenopsis invicta*), and other insect pests.

Any planting stock found to be infested with such pests will not be allowed on the project site or within 300 feet of natural habitats unless documentation is provided to the Service that these pests already occur in natural areas around the project site. The stock will be quarantined, treated, or disposed of according to best management principles by qualified experts in a manner that precludes invasions into natural habitats. The project proponents will ensure that all temporary irrigation will be for the shortest duration possible, and that no permanent irrigation will be used for landscape or habitat creation/restoration/enhancement.

12. Temporary fencing (with silt barriers) will be installed at the limits of project impacts (including construction staging areas and access routes) to prevent additional sensitive habitat impacts and to prevent the spread of silt from the construction zone into adjacent habitats to be avoided. Fencing will be installed in a manner that does not impact habitats to be avoided. The project proponents will submit to the Service and the Corps for approval, at least 30 days prior to initiating project impacts, the final plans for initial clearing and grubbing of sensitive habitat and project construction. These final plans will include photographs that show the fenced limits of impact and all areas to be impacted or avoided. If work occurs beyond the fenced or demarcated limits of impact, all work will cease until the problem has been remedied to the satisfaction of the Service and the Corps. The project proponents agree to provide additional conservation at a minimum 5:1 ratio for any habitat impacts that occur beyond the approved fence. Temporary construction fencing will be removed upon project completion.
13. A monitoring biologist approved by the Service and the Corps will be on the project site during clearing and grubbing of habitat that occurs within 200 feet of the grading limits. The monitoring biologist will conduct weekly site visits during rough grading to ensure that the grading limits have been respected. The biologist will be knowledgeable of local wildlife and vegetation resources including the Quino checkerspot butterfly and vernal pool species. The project proponents' will submit the biologist's name, address, telephone number, and work schedule on the project to the Service and the Corps at least 7 days prior to initiating project impacts.
14. The monitoring biologist will periodically monitor adjacent habitats for excessive amounts of dust and will recommend remedial measures to address dust control if necessary. The monitoring biologist will implement a contractor training program to insure compliance with permit conditions. Any non-compliance issues will be reported to the Service and the Corps within 24 hours.
15. The monitoring biologist will submit a final report to the Service and the Corps within 60 days of project completion that includes: as-built construction drawings with an overlay of pools that were impacted or preserved, photographs of the preserved pools, and other relevant information documenting that authorized impacts were not exceeded and that

general compliance with the project as described in this biological opinion, including the conservation measures, was achieved.

16. Employees will strictly limit their activities, vehicles, equipment, and construction materials to within the fenced project footprint.
17. All equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other such activities will occur in designated areas.
18. The Construction Manager will keep the monitoring biologist up-to-date with current plans for each phase. A pre-construction meeting will be conducted with the monitoring biologist, vernal pool restoration biologist, and construction supervisors prior to all earthwork. The Service and the Corps will be invited to the pre-construction meeting with 14 days advance notice. The contractors will be informed that the fenced areas are “no-entry” areas for the duration of construction. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program that will be presented by the vernal pool restoration and monitoring biologist(s), prior to working on the proposed project. At a minimum, the program will include the following topics:
  - a) The purpose for resource protection;
  - b) A description of Quino checkerspot butterfly, San Diego fairy shrimp, Riverside fairy shrimp, and their habitats;
  - c) The conditions of the Corps permits and the conservation measures described in the Service’s biological opinion that should be implemented during project construction to conserve Quino checkerspot butterflies, San Diego fairy shrimp, and Riverside fairy shrimp including strictly limiting activities, vehicles, equipment, and construction materials to the fenced project footprint to avoid sensitive resource areas in the field (i.e., avoided areas delineated on maps or on the project site by fencing);
  - d) Project features designed to reduce impacts to these species and promote their persistence/survival within the project area;
  - e) The protocol to resolve conflicts that may arise at any time during the construction process;
  - f) The general provisions of the Act, the need to adhere to the provisions of the Act, and the penalties associated with violating the Act; and
  - g) A fact sheet that includes color photographs of the listed species, which will be shown to the employees. Following the education program, the fact sheet will be posted in the contractor and Resident Engineer’s office, where they will remain through the duration

of the project. The project proponents and the biologist(s) will be responsible for ensuring that employees are aware of the listed species.

### *Action Area*

According to 50 CFR Section 402.02 pursuant to Section 7 of the Act, the “action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (e.g., Corps jurisdictional areas proposed to be filled). Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area as determined by the Service. For the purposes of this biological opinion, we have defined the action area to include the areas encompassed by the three projects (i.e., SR-11 and Port of Entry project, Otay Crossings project, and Otay Business Park project), including the on- and offsite improvement areas, vernal pool and Quino checkerspot butterfly habitat immediately adjacent to the east of the project sites, and the conservation lands (Figures 1, 2, and 4).

## STATUS OF THE SPECIES

In order to facilitate our discussion on the status of listed species addressed by this biological opinion that are associated with vernal pools, we are providing the following generalized discussion. Further information regarding the status of the individual species is provided below including additional information on habitat affinities and threats/conservation needs where warranted.

### **Habitat Affinities and Threats/Conservation Needs of Vernal Pool Species**

Vernal pools are ephemeral wetlands that occur from southern Oregon through California into northern Baja California, Mexico (Service 1998a). They require a unique combination of climatic, topographic, geologic, and evolutionary factors for their formation and persistence. They form in regions with Mediterranean climates where shallow depressions fill with water during fall and winter rains and then dry up when the water evaporates in the spring (Collie and Lathrop 1976; Holland 1976; Holland and Jain 1977, 1988; Thorne 1984).

Downward percolation of water within the pools is prevented by an impervious subsurface layer consisting of claypan, hardpan, or volcanic stratum (Holland 1976, 1988). Seasonal inundation makes vernal pools too wet for adjacent upland plant species adapted to drier soil conditions, while rapid drying during late spring makes pool basins unsuitable for typical marsh or aquatic species that require a more persistent source of water.

For convenience of reference, groups of vernal pools are sometimes referred to as vernal pool complexes that may include two to several hundred individual vernal pools (Keeler-Wolf *et al.* 1998). Vernal pool complexes are defined as a series of vernal pool groups that are hydrologically connected with similar soil types and species compositions. Within San Diego

County, they were first described and surveyed by Beauchamp and Cass (1979) and subsequently updated in 1986 (Bauder) and 2004 (City of San Diego). Local upland vegetation communities associated with vernal pools include needlegrass grassland, annual grassland, coastal sage scrub, maritime succulent scrub, and chaparral (Service 1998a).

Threats to vernal pools and associated species can be divided into three major categories:

1) direct destruction of vernal pools from construction, vehicle traffic, grazing, dumping, and deep plowing; 2) indirect threats that degrade or destroy vernal pools (e.g., altered hydrology, draining, competition by introduced species, habitat fragmentation); and 3) potential long-term, cumulative impacts such as the effects of isolation on genetic diversity and locally adapted genotypes, air and water pollution, drastic climatic variations, and changes in nutrient availability (Bauder 1986).

Global climate change is well-documented (IPCC 2007). Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, IPCC 2007). Although predictions of climatic conditions for smaller sub-regions such as southern California remain uncertain, factors associated with climate change that could affect vernal pool species include: 1) drier conditions that may result in fewer suitable pool complexes, lower percent germination (plant species)/hatching (fairy shrimp species) rates, smaller population sizes, and fewer and less reliable recovery cycles of abundant individuals; 2) higher temperatures may inhibit germination/hatching, speed desiccation of pools, and affect pollinator services for plant species; 3) a shift in the timing of the annual rainfall may favor nonnative species; 4) the timing of pollinator life-cycles may become out-of-sync with the timing of flowering vernal pool plant species; and 5) drier conditions may result in increased fire frequency, making the ecosystems in which vernal pool species rely more vulnerable to the threats of subsequent erosion and nonnative/native plant invasion (Bauder et. al. 2002, Bauder 2005, Hathaway and Simovich 1996).

Conservation of vernal pool species is dependent on maintaining pool hydrology and the surrounding watershed, as well as protecting adjacent upland habitats including pollinators (for vernal pool plant species). Extant populations need to be preserved and managed to reduce stressors from on site and adjacent activities, and regular monitoring is essential to gauging population trends and stressor effects. For some vernal pool species, re-establishment of populations within extant unoccupied or restored pools may be warranted.

### **San Diego Button-Celery**

#### *Listing Status*

The Service listed the San Diego button-celery as endangered on August 3, 1993 (58 FR 41384). The *Recovery Plan for Vernal Pools of Southern California* (“vernal pool recovery plan”) (Service 1998a) addresses the San Diego button-celery. A 5-Year Review for San Diego button-

celery was completed September 1, 2010 (Service 2010). The 5-Year Review recommended no change in the status of the San Diego button-celery. No critical habitat has been designated for this species.

### *Species Description*

San Diego button-celery is a biennial or longer lived perennial gray-green herb that has a storage tap-root. It has a spreading shape and reaches a height of 16 inches (Constance 1993). The stems and lanceolate leaves give the plant a prickly appearance.

### *Habitat Affinities*

San Diego button-celery is a vernal pool obligate taxon. Zedler (1987) hypothesizes that the patchy distribution of button-celery may be attributed to the extreme desiccation which vernal pools undergo in summer; hence, the species favors pools with a deep clay subsoil that do not dry as rapidly or as completely as those with shallower or more coarsely textured soils.

### *Life History*

San Diego button-celery blooms from April to June; the small white flowers vary in length from 0.067 to 0.11 inch (Munz 1974, Constance 1993). Species-specific studies have not been conducted for San Diego button-celery regarding pollination, dispersal, population ecology, and genetics. It survives the dry summer and autumn months through dormant seeds and perenniating vegetative structures. San Diego button-celery is presumably insect-pollinated (Zedler 1987), potentially by bee flies (*Bombyliids*) (Schiller et al. 2000) and solitary bees (*Apoidea*), as are many vernal pool species (Thorpe 2007). San Diego button-celery seems more tolerant of peripheral vernal pool habitat than most obligate vernal pool species. It is specifically adapted to surviving in vernal wet conditions due to the presence of aerenchyma tissue (air channels in the roots) that facilitates necessary gas exchange in submerged plants (Keeley 1998).

### *Status and Distribution*

The historical distribution of San Diego button-celery included a coastal swath from Mesa de Colonet and San Quintín in Baja California, Mexico, north to Los Angeles County, California in the U.S. San Diego button-celery currently occurs in 14 geographic areas in Riverside and San Diego counties. There are four sites on the Santa Rosa Plateau (Western Riverside County MSHCP 2003) in Riverside County. Within San Diego County, San Diego button-celery occurs in 10 regional locations including Camp Pendleton, Carlsbad, San Marcos, Ramona, Del Mar Mesa, Carmel Mountain, Mira Mesa, Marine Corps Air Station (MCAS) Miramar, Otay Lakes, and Otay Mesa. Current status of the species in Mexico is unknown.

San Diego button-celery can be locally abundant in remnant vernal pools; however, the distribution of this variety has been dramatically reduced due to loss of most (95 to 97 percent) of

the vernal pool habitat in San Diego County (Oberbauer and Vanderwier 1991). Little data relative to population counts and trends are extant. In 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction. These surveys revealed that of the 69 sites surveyed, 28 contained San Diego button-celery. The taxon was found on 20 of 36 acres of basin habitat (City of San Diego 2004). Based on survey data at MCAS Miramar that incorporates survey efforts since 1993, San Diego button-celery was found in 20 of 45 vernal pool complexes located on the installation (Black 2004a, 2007).

## **Spreading Navarretia**

### Status of the Species

#### *Listing Status*

Spreading navarretia was listed as threatened on October 13, 1998 (63 FR 54975). The vernal pool recovery plan (Service 1998a) addresses spreading navarretia. A 5-Year Review for spreading navarretia was completed on August 10, 2009 (Service 2009a). Critical habitat was designated on October 7, 2010 (75 FR 62192).

#### *Species Description*

Spreading navarretia, a member of the Polemoniaceae (phlox family), is a low, mostly spreading or ascending annual plant, 4 to 6 inches tall. The leaves are 0.4 to 2 inches long and finely divided into slender spine-tipped lobes. The lower portions of stems are mostly hairless (glabrous). The flowers are arranged in flat-topped, compact, leafy heads. The white to lavender-white petals (corolla) are joined at their bases to form a tube, although the tips (lobes) are free. The fruit is an ovoid, two-chambered capsule. Each seed is covered by a layer that becomes sticky and viscous when the capsule is moistened.

#### *Habitat Affinities*

Spreading navarretia is considered an obligate wetland species (found almost always in wetland areas) but is more tolerant of the ephemeral inundation of vernal pool habitat than a true wetland plant. Within San Diego County, spreading navarretia is typically found in vernal pools and depressions and ditches in areas that once supported vernal pools (Tierra Madre Consultants 1992, Day 1993, Reiser 1996).

#### *Life History*

Spreading navarretia depends on the inundation and drying cycles of its habitat for survival. This regime allows for germination and other life history phases of the plant. This annual species germinates from seeds left in the seed bank. For many vernal pool plant species, temperature and moisture affect the timing of plant germination (Myers 1975). Although not proven, it is likely

that this species uses these same cues for germination. Most *Navarretia* species have indehiscent fruit or fruit with fibers that absorb water and expand to break open the fruit after a substantial rain (Spenser and Riesberg 1998). The timing of germination is important so that the plant germinates under favorable conditions in the spring rather than the summer, autumn, or winter.

The plant usually flowers in May and June as the vernal pool dries out. No studies have been conducted for this species regarding reproduction. Specific data regarding pollinators and seed viability are lacking. The species is capable of self-pollination, but it can also outcross to other plants. Outcrossing can be an important factor in regaining the genetic diversity lost with the disappearance of occurrences. Upon fruiting, this species fades rapidly and can be difficult to detect late in the dry season or in dry years. The number of individuals of spreading navarretia at a given population site varies annually in response to the timing and amount of rainfall and temperature.

### *Status and Distribution*

Spreading navarretia is distributed from northwestern Los Angeles County and western Riverside County, south through coastal San Diego County, California to San Quintín in northwestern Baja California, Mexico, from near sea level to 4,200 feet (Day 1993, Munz 1974). Currently there are 48 extant occurrences of spreading navarretia in the U.S. Nearly 60 percent of the known populations are concentrated in three locations: Otay Mesa in southern San Diego County; along the San Jacinto River in western Riverside County; and near Hemet in Riverside County (Bauder 1986, Bramlet 1993, CNDDDB 1999). Smaller populations are scattered in southern Riverside County, Los Angeles County, and coastal San Diego County. In Mexico, spreading navarretia is known from fewer than 10 populations clustered in three areas: along the international border; on the plateaus south of the Rio Guadalupe; and on the San Quintín coastal plain (Moran 1977).

Rangewide, comprehensive surveys for spreading navarretia have not occurred. The 5-year review includes a summary of the known occurrences and estimates of population numbers, where available. As an example, in 2003, the City of San Diego conducted a survey of vernal pools within their jurisdiction; revealing that of the 1,142 vernal pools surveyed, spreading navarretia was found in 99 with a mean percent cover per pool of 2.4 percent (City of San Diego 2004). Surveys are disjointed across space and time and lack uniform variables that quantify the extent and precise location of occurrences, thus making it difficult to comprehensively evaluate the status and trend of the species.

## **San Diego Fairy Shrimp**

### *Listing Status*

The Service listed the San Diego fairy shrimp as endangered on February 3, 1997, (62 FR 4925). The vernal pool recovery plan (Service 1998a) addresses the San Diego fairy shrimp. Critical habitat for the San Diego fairy shrimp was designated on December 12, 2007 (72 FR 70648). On

September 20, 2010, the District Court of the District of Columbia (D.C. Court) vacated 151 acres of designated critical habitat as mandated by the United States Court of Appeals for the District of Columbia Circuit on September 14, 2011, and its underlying Opinion and Judgment dated July 22, 2011 (*Otay Mesa Property L.P. et al. v U.S. Department of the Interior, et al.* 1:08-CY-00383).

In September 2008, the Service completed a 5-Year Review addressing the status of the San Diego fairy shrimp (Service 2008a). The 5-Year Review recommended no change in the status of the San Diego fairy shrimp.

### *Species Description and Critical Habitat Description*

The San Diego fairy shrimp is a small, freshwater crustacean in the family Branchinectidae of the Order Anostraca. The species was originally described by Fugate (1993) from samples collected on Del Mar Mesa, San Diego County. Male San Diego fairy shrimp are distinguished from males of other *Branchinecta* species by differences found at the distal (located far from the point of attachment) tip of the second antennae. Females are distinguishable from females of other species of *Branchinecta* by the shape and length of the brood sac, the length of the ovary, and by the presence of paired dorsolateral (located on the sides, toward the back) spines on five of the abdominal segments (Fugate 1993). Adult male San Diego fairy shrimp range in size from 0.35 to 0.63 inch, and adult females are 0.31 to 0.55 inch long. A genetic study based on mtDNA sequencing of San Diego fairy shrimp across its range found two evolutionary significant units (genetic clades A and B) (Bohonak 2005).

Five critical habitat units (with 29 subunits) on 2,931 acres of land in Orange and San Diego counties are included in the designation of critical habitat for San Diego fairy shrimp. The individual units contain essential habitat for the San Diego fairy shrimp and help to identify special management considerations for the species. The project site is located within Subunit 5D (Otay Mesa, Southeast) and the Lonestar Ridge Conservation Area is located within Subunit 5B (Otay Mesa, North) of the final critical habitat designation (Figure 7). Unit 5 includes 1,634 acres and is the southernmost unit of critical habitat and is essential to the conservation of San Diego fairy shrimp because it helps to maintain the ecological distribution and genetic diversity of the species, as well as continuity in the range between the United States and Mexico. This unit contains vernal pools that support San Diego fairy shrimp populations in the “Group A” genetic clade (Bohonak 2005). Subunit 5B consists of 304 acres of habitat and Subunit 5D consists of 240 acres.

PCEs are the physical and biological features essential to the conservation of the species that may require special management considerations or protection. The PCEs for San Diego fairy shrimp are:

1. Vernal pools with shallow to moderate depths (2 to 12 inches) that hold water for sufficient lengths of time (7 to 60 days) necessary for incubation, maturation, and reproduction of the San Diego fairy shrimp, in all but the driest years;
2. Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described in PCE 1, providing for dispersal and promoting hydroperiods of adequate length in the pools (i.e., the vernal pool watershed); and
3. Flat to gently sloping topography and any soil type with a clay component and/or an impermeable surface or subsurface layer known to support vernal pool habitat (including Carlsbad, Chesterton, Diablo, Huerhuero, Linne, Olivenhain, Placentia, Redding, and Stockpen soils).

Please refer to the final critical habitat rule (72 FR 70648) for detailed information on the units, including their sizes, locations, and special management considerations.

#### *Habitat Affinities*

San Diego fairy shrimp are restricted to vernal pools and vernal pool-like depressions (e.g., ruts in dirt roads). This species tends to inhabit shallow, small vernal pools and vernal pool-like depressions that range in temperature from 50 to 79 degrees Fahrenheit. They are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors that likely include specific salinity, conductivity, dissolved solids, and pH levels (Gonzalez et al. 1996, Hathaway and Simovich 1996, Holtz 2003).

San Diego fairy shrimp may also be found in disturbed vernal pool habitats where basins have been compacted or artificially deepened. Although basins supporting populations often appear to be artificially created or enhanced, such basins are located within soils that are capable of seasonal ponding and are often surrounded by naturally occurring vernal pool complexes. These “artificial basins” (sometimes referred to as road pools) function in the same manner as naturally occurring vernal pools by filling with late fall, winter and/or spring rains that gradually dry up during the spring and/or summer (Service 1998a).

#### *Life History*

San Diego fairy shrimp are non-selective particle feeding filter-feeders, or omnivores. Detritus, bacteria, algal cells, and other items between 0.3 to 100 microns may be filtered and ingested (Eriksen and Belk 1999). Adult fairy shrimp are usually observed from January to March; however, in years with early or late rainfall, the hatching period may be extended (Service 2008a). Like most vernal pool fairy shrimp, San Diego fairy shrimp have a two-stage life cycle

and spend the majority of their life cycle in the cyst stage (Templeton and Levin 1979, Schaal and Leverich 1981, Herzig 1985, Hairston and De Stasio 1988, Venable 1989). After hatching, San Diego fairy shrimp reach sexual maturity in about 7 to 17 days, depending on water temperature, and persist for about 4 to 6 weeks (Hathaway and Simovich 1996). Fairy shrimp mate upon reaching maturity, and female San Diego fairy shrimp produce between 164 and 479 cysts (eggs) over their lifetime (Simovich and Hathaway 1997). The cysts are either dropped by the females to settle into the mud at the bottom of the pool, or they remain in the brood sac until the female dies and sinks to the bottom (Eriksen and Belk 1999). Fairy shrimp cysts may persist in the soil for several years until conditions are favorable for successful reproduction (Simovich and Hathaway 1997). The cysts will hatch in 3 to 5 days when water temperatures are between 50 to 68 degrees Fahrenheit (Hathaway and Simovich 1996). Not all cysts are likely to hatch in a season, thus providing a mechanism for survival if water quality and ponding conditions are not favorable in a given year (Simovich and Hathaway 1997, Ripley et al. 2004).

#### *Status and Distribution*

The range of the San Diego fairy shrimp includes Orange and San Diego counties in southern California and northwestern Baja California, Mexico (Brown et al. 1993, Service 1998a). In Baja California, San Diego fairy shrimp have been recorded at two localities: Valle de Palmas, south of Tecate and Baja Mar, north of Ensenada. A single isolated female was previously reported from vernal pools in Isla Vista, Santa Barbara County, California; however, directed surveys have not located any additional individuals (62 FR 4934).

In Orange County, the San Diego fairy shrimp has been documented at Fairview Park, Newport Banning Ranch, Irvine Ranch Lands Reserve (within an area formerly known as the North Ranch Policy Plan Area), and within the San Juan Creek watershed at Chiquita Ridge and Radio Tower Road.

In San Diego County, the species occurs in vernal pools from Marine Corps Base Camp Pendleton (MCBCP) inland to Ramona and south through Del Mar Mesa, Proctor Valley, and Otay Mesa. A minimum of 246 pools on MCBCP are known to be occupied by San Diego fairy shrimp. Based on surveys of the 2,856 vernal pool basins currently mapped on MCAS Miramar, 1,303 are occupied by San Diego fairy shrimp (MCAS Miramar 2006). Of the 62 vernal pool complexes mapped by the City of San Diego, 29 were found to be occupied by San Diego fairy shrimp and occur at the following localities: Del Mar Mesa (1), Carmel Mountain (1), Mira Mesa (6), Nobel Drive (3), Kearny Mesa (3), Mission Trails Regional Park (1), and Otay Mesa (14) (City of San Diego 2004). The City of San Diego conducted non-protocol surveys for San Diego fairy shrimp. Therefore, this inventory may under-represent the true number of vernal pools with occurrences of San Diego fairy shrimp.

Additional vernal pool complexes with occurrences of San Diego fairy shrimp located in San Diego County but not included in the City of San Diego's Inventory include: Carlsbad, San

Marcos, Ramona, Poway, Santee, Rancho Santa Fe, Murphy Canyon, Otay Lakes, Imperial Beach, East Otay Mesa, Marron Valley, and Proctor Valley.

A summary of occupied vernal pool complexes is provided in Appendix 1 of the *San Diego Fairy Shrimp (Branchinecta sandiegonensis) 5-Year Review: Summary and Evaluation* (Service 2008a).

### *Threats and Conservation Needs*

The loss and modification of vernal pool habitat continues to be a significant threat to the San Diego fairy shrimp, especially in areas where urbanization is expected to expand. Of the estimated 137 vernal pool complexes now occupied by San Diego fairy shrimp, Service files show that approximately 38 percent are on military land where they are managed for conservation under Integrated Natural Resource Management Plans or protected by other means, and approximately 25 percent are at least partially conserved on other lands. Approximately 20 percent of occupied complexes have lost some pools to development, 2 percent have been completely developed, and 18 percent are proposed for development. Acquisition of land and conservation easements have resulted in the preservation of vernal pool habitat for the species, but the trend of habitat loss, fragmentation, and degradation continues, particularly on private lands. Additionally, even preserved lands are often subject to impacts such as invasion by non-native plants, off-highway vehicle use, trespassing, and other conditions that contribute to lower-quality habitat for San Diego fairy shrimp (Service 2008a).

San Diego fairy shrimp habitat is also threatened to some degree by indirect impacts resulting from the proximity of San Diego fairy shrimp habitat to development, including human access and disturbance impacts, runoff, dumping of trash and litter, and water and air pollution. Off-highway vehicle use for recreation, law enforcement (including Border Patrol), and by the military threatens this species throughout much of its range. Non-native plants also threaten San Diego fairy shrimp habitat throughout its range. San Diego fairy shrimp habitat is naturally fragmented, but development projects continue to further fragment and isolate vernal pools within and between complexes, which may disrupt the population dynamics of the species. Conservation measures beyond habitat preservation, such as habitat and species management and monitoring, are necessary to ensure the long-term sustainability and persistence of this species throughout its range (Service 2008a).

Impacts to vernal pools from development have been offset through the restoration, enhancement, and management of habitat. In some cases, due to security of the site and the active management of the vernal pools, the species status has improved. In addition, grants have been awarded to restore habitat in several areas including Otay Mesa, the San Diego National Wildlife Refuge (NWR), and Sweetwater Authority lands. Sites that have been restored benefit from fencing and management, which further removes threats from the site that were occurring prior to the restoration efforts (Service 2008a).

## **Riverside Fairy Shrimp**

### *Listing Status*

The Service listed the Riverside fairy shrimp as endangered on August 3, 1993 (58 FR 41391). The vernal pool recovery plan (Service 1998a) addresses the Riverside fairy shrimp.

In September 2008, the Service completed a 5-Year Review addressing the status of the Riverside fairy shrimp (Service 2008b). The 5-Year Review recommended no change in the status of the Riverside fairy shrimp. Critical habitat was designated for the species on April 12, 2005 (70 FR 19154), and on June 1, 2011, we proposed to revise critical habitat for the Riverside fairy (76 FR 31686).

### *Species Description*

The Riverside fairy shrimp is a small freshwater crustacean in the Family Streptocephalidae of the Order Anostraca. The species was first collected in 1979 by Clyde Eriksen and formally described as a new species in 1990 (Eng et al. 1990). The Riverside fairy shrimp is distinguished from similar species by its red-colored cercopods (anterior appendages), which occur on all of the ninth and 30 to 40 percent of the eighth abdominal segments (Eng et al. 1990). Adult Riverside fairy shrimp may grow to a length of 0.5 to 1.0 inches (Eng et al. 1990).

### *Habitat Affinities*

Riverside fairy shrimp are restricted to vernal pools and vernal pool-like ephemeral basins (e.g., ruts in dirt roads and stockponds). In contrast to San Diego fairy shrimp, Riverside fairy shrimp prefer deep, greater than 9 inches in depth, vernal pools that range in temperature from 50 to 77 degrees Fahrenheit and remain filled for extended periods of time (Eng et al. 1990, Eriksen and Belk 1999). Water within pools supporting Riverside fairy shrimp may be clear, but more commonly it is moderately turbid (Eriksen and Belk 1999). Typically, pools supporting this species have low total dissolved solids and alkalinity (means of 77 and 65 parts per million, respectively), in association with pH at neutral or just below (7.1 to 6.4) (Eng et al. 1990, Gonzalez et al. 1996, Eriksen and Belk 1999).

Riverside fairy shrimp may also be found in disturbed vernal pool habitats where basins have been compacted or artificially deepened and therefore hold water for longer periods of time. Although basins supporting populations often appear to be artificially created or enhanced, such basins are located within soils that are capable of seasonal ponding and are often surrounded by naturally occurring vernal pool complexes. These “artificial basins” function in the same manner as naturally occurring vernal pools by filling with late fall, winter and/or spring rains that gradually dry up during the spring and/or summer (Service 1998a).

### *Life History*

Riverside fairy shrimp are non-selective filter-feeders that filter suspended solids from the water column. Detritus, bacteria, algal cells, and other items between 0.3 to 100 microns may be filtered and ingested. Riverside fairy shrimp are preyed upon by a wide variety of wildlife, including beetles, dragonfly larvae, other arthropods, frogs, salamanders, toad tadpoles, shorebirds, ducks and other migratory birds, and even other fairy shrimp (Eriksen and Belk 1999).

Freshwater crustaceans, including Riverside fairy shrimp, have a two-stage life cycle and spend the majority of their life cycle in the cyst stage (Templeton and Levin 1979, Schaal and Leverich 1981). After hatching, Riverside fairy shrimp require 48 to 56 days to reach sexual maturity in contrast with other fairy shrimp that can reach maturity in less than 2 weeks (Hathaway and Simovich 1996). Fairy shrimp mate upon reaching maturity, and female Riverside fairy shrimp produce between 17 and 427 cysts (eggs) over their lifetime (Simovich and Hathaway 1997). The cysts are either dropped by the females to settle into the mud at the bottom of the pool, or they remain in the brood sac until the female dies and sinks to the bottom (Eriksen and Belk 1999). The cysts will hatch in 7 to 12 days when water temperatures are between 50 to 77 degrees Fahrenheit (Hathaway and Simovich 1996). A small percentage of cysts are likely to hatch in a season, thus providing a mechanism for survival if the inundation period is too short in a given year (Simovich and Hathaway 1997). Fairy shrimp cysts may persist in the soil for several years until conditions are favorable for successful reproduction (Simovich and Hathaway 1997).

### *Status and Distribution*

The range of the Riverside fairy shrimp includes Ventura, Los Angeles, Orange, San Diego, and Riverside counties in southern California, and Bajamar in Baja California, Mexico (Brown *et al.* 1993, Service 1998a). With the exception of populations in Riverside and Ramona, all populations are within 10 miles of the coast over a north-south distance of approximately 125 miles.

In Ventura County, Riverside fairy shrimp were previously known from a single large pool in a grassland area within the Tierra Rejada Vernal Pool Preserve. However, wet season surveys conducted each season between 2002 and 2006 failed to locate any adults (Mountains Recreation and Conservation Authority 2006).

Riverside fairy shrimp habitat located on approximately 198 acres of open space in Los Angeles County was removed in conjunction with the Los Angeles International Airport Master Plan Project (Service 2004b) and Operations and Maintenance Activities Project (Service 2005) at Los Angeles International Airport (LAX). Cysts from LAX may be transferred to Madrona Marsh Preserve in the City of Torrance once pools have been restored for this species. A small number of Riverside fairy shrimp cysts, but no adults, have been found in Madrona Marsh (Angelos

2003). The species was previously reported from Cruzan Mesa; however, recent surveys found only vernal pool fairy shrimp (*Branchinecta lynchi*) at this location (Glenn Lukos Associates 2004).

In Orange County, extant pools create a chain of Riverside fairy shrimp habitat along the Orange County foothills. These pools are generally formed by depressions in slumping earth or impounded ephemeral streams (Riefner and Pryor 1996). From north to south, Riverside fairy shrimp occur on the former MCAS, El Toro (HELIX 2005a); Southern California Edison's Viejo Substation (PCR 1998); Live Oak Plaza (Glenn Lukos Associates 1997); Saddleback Meadows (Urban Vision 1997, HELIX 2000); adjacent to the northern boundary of O'Neill Regional Park, Tijeras Creek (Glenn Lukos Associates 2001); and within the San Juan Creek watershed at Chiquita Ridge and Radio Tower Road (Dudek and Associates 2001a).

In Riverside County, the species has been documented at the Skunk Hollow Pool in the Barry Jones Wetland Mitigation Bank (CNLM 2006); the Field Pool near the Skunk Hollow Pool (Eriksen 1988); the Australia Pool in Lake Elsinore back basin (RECON 1998); the Schleuniger Pool, north of La Estrella Road (Hayworth 1998); March Air Reserve Base (Patterson and Ayers 1998); Scott Pool, northeast of the intersection of Scott Road and Menifee Road (HELIX 2002); a stockpond and another basin at the Rancho California Road property (Black 2004b); Rainbow Canyon (Tom Dodson and Associates 2003a, 2003b); Pechanga Pool on the Pechanga Indian Reservation (Wegscheider 2006); two pools on Warm Springs Ranch (HELIX 2006a); and within created pools on Johnson Ranch (Neudecker 2003). In addition, Riverside fairy shrimp will be introduced to created pools on Clayton Ranch once habitat conditions are adequate to support the species (Service 2003a).

Occupied pools in Riverside County at Grizzle Ranch (Wegscheider 2004), the Garbani property (Michael Brandman Associates 2006), and Temecula Education Complex Project site (Western Riverside County Regional Conservation Authority 2006) will be filled in conjunction with approved development projects. The Garbani and Temecula Education Complex projects made a voluntary donation to the Western Riverside County Vernal Pool Conservation Fund. We are unaware of any measures taken to offset impacts at Grizzle Ranch.

In north coastal San Diego County, the Riverside fairy shrimp occurs in vernal pools on MCBCP (RECON 2001, Black 2004c, URS 2005) and at the Poinsettia Land Station in the City of Carlsbad (Dudek and Associates 1998). In central San Diego County, a single occupied pool occurs within MCAS Miramar (Branchiopod Research Group 1996). In southern San Diego County, the species occurs in pools on Otay Mesa near the U.S.-Mexico border (City of San Diego 2004). Of the 62 vernal pool complexes mapped by the City of San Diego's Vernal Pool Inventory (2002 to 2003), 10 were found to be occupied by Riverside fairy shrimp. The City of San Diego conducted non-protocol surveys for Riverside fairy shrimp. Therefore, this inventory may under-represent the true number of vernal pools with occurrences of Riverside fairy shrimp. In inland San Diego County, the Riverside fairy shrimp was observed once in the Ramona T

complex, in a vernal pool in Ramona partially on Ramona Airport property, and partially in preserved land adjacent to Ramona Airport (RECON 2007).

Many populations of Riverside fairy shrimp have been extirpated or have experienced drastic declines due to the substantial loss of habitat in southern California. The majority of the vernal pools within the range of the Riverside fairy shrimp were lost prior to 1990 (Service 1998a). Though extensive vernal pool habitat historically occurred on the coastal plain of Los Angeles and Orange counties (Mattoni and Longcore 1997), such habitat largely has been eliminated from these areas (Keeler-Wolf *et al.* 1998). Loss of habitat in San Diego County is estimated at 95 to 97 percent (Bauder 1986, Oberbauer 1990). Significant losses of vernal pools supporting this species have also occurred in Riverside County (66 FR 29385).

At the time of listing, Riverside fairy shrimp were known to inhabit nine vernal pool complexes within Riverside, Orange, and San Diego counties, and Baja Mexico, including four vernal pools in Riverside County, a population in Orange County, two areas in San Diego County, and two locations in Baja California, Mexico (58 FR 41385). However, we now believe the type locality (Murrieta Golf Course) for this species was likely already lost to development prior to listing (Eriksen and Belk 1999). In addition, the one population in Orange County referenced in the listing rule has never been confirmed. Thus, at listing, it is likely that there were only three extant occurrences of Riverside fairy shrimp known from Riverside County, two occurrences known from San Diego County, and two occurrences known from Mexico (i.e., five in the U.S. and two in Mexico) (Service 2008b).

Since listing, as many as 52 additional occupied complexes have been identified, some complexes have been extirpated, and we are unsure whether the species persists in three complexes. Hence, currently 45 known occupied vernal pool complexes (approximately 200 occupied pools) exist, which includes a man-made complex at Johnson Ranch in western Riverside County. More than half of all extant complexes known to contain Riverside fairy shrimp are in San Diego County, including eight complexes on MCBCP. These eight complexes are of particular interest as they support approximately 56 percent of all identified individual vernal pools known to be occupied by the Riverside fairy shrimp (RECON 2001, 2007; MCBCP 2007). Approximately 24 percent of extant known occupied complexes are in Riverside County, and approximately 17 percent are in Orange County. We have no information on the current status of the two occurrences known in Mexico at the time of listing.

A summary of occupied vernal pool complexes is provided in Appendix 1 of the *Riverside Fairy Shrimp (Streptocephalus woottoni) 5-Year Review: Summary and Evaluation* (Service 2008b).

### *Threats and Conservation Needs*

The loss and modification of vernal pool habitat continues to be a significant threat to the Riverside fairy shrimp, especially in areas where urbanization is expected to expand. Of the estimated 45 vernal pool complexes known to be occupied, Service files show that approximately

27 percent are on military land where they are managed for conservation under Integrated Natural Resource Management Plans or protected by other means, and approximately 36 percent are at least partially conserved on other lands. At least nine complexes known to be occupied by the Riverside fairy shrimp at or since its listing have been developed and the status of many more is uncertain but likely extirpated. Of the estimated 45 occupied vernal pool complexes, 10 complexes have been partially lost to development (approximately 7 acres of habitat lost), and 8 additional complexes contain pools that have been impacted [damaged, but not totally impacted (Appendix 1 of Service 2008b)]. Acquisition of land and conservation easements have resulted in the preservation of vernal pool habitat for the species, but the trend of habitat loss and degradation continues, particularly on private lands. Additionally, even preserved lands are often subject to invasion by non-native plants and other impacts that lower the quality of habitat for Riverside fairy shrimp (Service 2008b).

Riverside fairy shrimp habitat is also threatened by indirect effects of development (including human access and disturbance impacts, runoff, dumping of trash and litter, and water and air pollution) resulting from the proximity of Riverside fairy shrimp habitat to development. Non-native plants also threaten Riverside fairy shrimp throughout the range of the species. Off-highway vehicle use for recreation, law enforcement (including Border Patrol), and the military threatens this species throughout much of its range. Riverside fairy shrimp habitat is naturally fragmented, but development projects continue to further fragment and isolate vernal pools within and between complexes, which may disrupt the population dynamics of the species. Conservation measures beyond habitat preservation, such as habitat and species management and monitoring, are necessary to ensure the long-term sustainability and persistence of this species throughout its range (Service 2008b).

Impacts to Riverside fairy shrimp habitat from development have been offset through the creation, restoration, enhancement, and management of habitat. In some cases, due to security of the site and the active management of the vernal pools, the species status has improved. In addition, grants have been awarded to restore habitat in several areas including Otay Mesa, the San Diego NWR, and Sweetwater Authority lands. Sites that have been created, restored, or enhanced benefit from fencing and management, which further removes threats from the site that were previously occurring at these sites (Service 2008b).

## **Quino Checkerspot Butterfly**

### *Listing Status*

The Quino checkerspot butterfly was listed as endangered on January 16, 1997 (62 FR 2313). The Service published a final revised critical habitat rule on June 17, 2009 (74 FR 28776). The *Quino Checkerspot Butterfly (Euphydryas editha quino) Recovery Plan* (“Quino recovery plan”) was completed in 2003. On August 18, 2009, the Service completed a 5-Year Review and recommended no change in the status of the Quino checkerspot butterfly (Service 2009b).

### *Species Description*

The Quino checkerspot butterfly is a recognized subspecies of Edith's checkerspot butterfly (*Euphydryas editha*) and is a member of the Nymphalidae family, the brush-footed butterflies. The Quino checkerspot butterfly differs from the other Edith's checkerspot subspecies in size, wing coloration, and larval and pupal phenotypes (Mattoni et al. 1997). Among the other subspecies of Edith's checkerspot, the Quino checkerspot butterfly is moderate in size with a wingspan of approximately 1.5 inches. The dorsal (top) side of its wings is covered with a red, black, and cream colored checkered pattern; the ventral (bottom) side is mottled with tan and gold. Its abdomen generally has bright red stripes across the top. Quino checkerspot butterfly larvae are black and have a row of nine, orange-colored tubercles (fleshy/hairy extensions) on their back. Pupae are extremely cryptic and are mottled black and blue-gray.

### *Habitat Affinities*

The primary larval food sources or host plants for the Quino checkerspot butterfly are dot-seed plantain, woolly plantain, thread-leaved bird's beak, white snapdragon, and Chinese houses. Larval Quino checkerspot butterfly may also use other species of plantain and annual owl's clover as primary or secondary host plants and are thought to diapause in or near the base of native shrubs. While the use patterns of primary and secondary larval host plants are not fully understood, there is evidence that both may be necessary for the survival of Quino checkerspot butterfly larvae (Service 2003b). Quino checkerspot butterfly larvae, particularly in the early instars, have a very limited capacity for dispersion. Therefore, high local host plant density is necessary for high larval survival rates (Service 2003b). As adults, Quino checkerspot butterflies use a number of flowering plants as nectar sources (Service 2003b, Mattoni et al. 1997).

Habitat patch suitability is determined primarily by larval host plant density, topographic diversity, nectar resource availability, and climatic conditions (Service 2003b). Quino checkerspot butterflies are generally found in open areas and ecotone situations within a variety of plant communities, including grasslands, chaparral, and coastal sage scrub, and vernal pools. Open areas within a given vegetation community seem to be critical landscape features for Quino checkerspot butterfly populations. Optimal habitat appears to contain little or no invasive exotic vegetation and a well-developed cryptogamic crust. Sustained drought conditions can lead to extirpation of local populations, and broad scale climate anomalies may lead to phenological incompatibility between Quino checkerspot butterfly and their host plants.

### *Life History*

The life cycle of the Quino checkerspot butterfly typically entails one generation of adults per year, with a 4 to 6 week flight period occurring between January and May, depending on weather conditions (Service 2003b). During the flight period, adult butterflies move about and search for nectar sources, mates, and oviposition sites. Females lay multiple masses of 20 to 150 eggs with a single female capable of producing more than 1,000 eggs (Service 2003b).

After hatching from eggs, the small, cryptic, larvae normally consume the plant on which they hatch and then migrate in search of additional plants (Service 2003b). Food plants dry up as summer approaches. In their third or fourth instar, larvae enter into an obligatory diapause. Diapause is a low-metabolic resting state that may last for a year or more, depending on conditions. Diapause allows larvae to survive the regular seasonal climatic extremes and also to better survive times of extended adverse conditions, such as drought. After termination of diapause, larvae become active and feed. They then enter their pupal stage and within 2 to 6 weeks, transform into the adults and emerge as butterflies. The butterflies feed, disperse, mate, reproduce, and then die. Adults live for approximately 10 to 14 days.

Adult Quino checkerspot butterflies are sedentary by nature and generally fly close to the ground. Evidence from the Bay checkerspot butterfly suggests that although some individuals are capable of dispersing over 3 miles, dispersal is essentially random if individuals are more than 164 feet from suitable habitat, and successful long-distance dispersal is rare (Harrison 1989). For the Quino checkerspot butterfly, many experts familiar with the species believe that populations separated by more than 2 miles may be demographically isolated. However, responses to abiotic factors, such as weather, may increase the distance butterflies would move (Ehrlich and Murphy 1987). Plant resources shift over time, and Quino checkerspot butterfly populations have evolved to respond to shifting habitat patch suitability in space and time (67 FR 18359). Additionally, adult Quino checkerspot butterfly are known to “hilltop.” Hilltopping is a behavior where male, and to a lesser extent female, butterflies form territories on hilltops, ridgelines, and other prominent geographic features in order to locate mates. Therefore, hilltops and ridgelines may be crucial for population survival, even in the absence of nearby larval host plants.

Quino checkerspot butterfly population density appears to fluctuate drastically in response to annual climate variability (Murphy and White 1984). This population variability likely leads to extirpation and recolonization of local populations or metapopulation structure. Metapopulation dynamics have been studied extensively for the Bay checkerspot butterfly (Harrison et al. 1988), and at least some Quino checkerspot butterfly locations are thought to be governed by metapopulation dynamics (Murphy and White 1984). Because local populations of Quino checkerspot butterfly are likely susceptible to extirpation, it is important to maintain connectivity among local populations to allow for recolonization from nearby local populations (Service 2003b).

### *Status and Distribution*

The Quino checkerspot butterfly was historically found from the coastal slopes of Los Angeles, Orange and San Diego counties as well as northern Baja California east to southwestern San Bernardino County and the western edge of the upper Anza-Borrego desert. The Quino checkerspot butterfly is now known only from western Riverside County, southern San Diego County, and northern Baja California, Mexico.

The Quino checkerspot butterfly may have once been one of the most abundant butterflies in coastal southern California, but by the 1970s most of the coastal bluff and mesa habitats in southern California had been urbanized or otherwise disturbed. The butterfly still occupied known habitat locations inland and at higher elevations including Dictionary Hill, Otay Lakes, and San Miguel Mountain in San Diego County and the Gavilan Hills in Riverside County. By the middle 1980s the species was thought to have disappeared from the known locations, and the petition to list the species in 1988 suggested that it might be extinct. Current information suggests that the butterfly has been extirpated from Los Angeles, Orange, and San Bernardino counties and the North County MSCP planning area in San Diego County. New populations were discovered in portions of Riverside and San Diego counties, and the species continues to survive in northern Baja California, Mexico. Overall, more than 75 percent of the Quino checkerspot butterfly's historical range has been lost (Brown 1991, Service database), and more than 90 percent of the subspecies' coastal mesa and bluff habitat, where most historical records are located, has been destroyed by habitat fragmentation, degradation, and development (Service database).

For a detailed discussion of the current distribution of the Quino checkerspot butterfly within these areas, please refer to the Quino recovery plan (Service 2003b). The Quino recovery plan identifies six recovery units throughout Riverside and San Diego counties and describes the known extant occurrence complexes (or metapopulations) throughout the range of the subspecies.

Significant areas of remaining Quino checkerspot butterfly habitat have recently been protected through inclusion in habitat conservation plan preserve areas, the San Diego NWR, and habitat acquisition initiatives as described below.

The MSCP did not list the Quino checkerspot butterfly as a covered species at the time it was developed. However, the City of Chula Vista did cover the Quino checkerspot butterfly in its MSCP Subarea Plan conserving 2,806 acres of Quino checkerspot butterfly habitat. Chula Vista also provides active Quino checkerspot butterfly management in their preserve areas. Lands placed into the Service's San Diego NWR also provide for the conservation of the Quino checkerspot butterfly. The Rancho San Diego and Las Montañas Occurrence Complexes are located on the Otay/Sweetwater Unit of this refuge with approximately 9,000 acres of Quino checkerspot butterfly habitat conserved. The California Department of Fish and Game (CDFG) manages over 10,000 acres of occupied Quino checkerspot butterfly habitat within the current San Diego regional MSCP preserve. In addition, the Service provided the State of California with funding for the additional acquisition of 824 acres of Quino checkerspot butterfly habitat in the Proctor Valley area of the Southwest San Diego Recovery Unit.

The Western Riverside County Multiple Species Habitat Conservation Plan supports approximately 209,551 acres of potential Quino checkerspot butterfly habitat. To offset impacts to Quino checkerspot butterfly, approximately 52,502 acres or 25 percent of this potential habitat within western Riverside County will be conserved and managed to benefit the Quino

checkerspot butterfly. The conservation anticipated by this plan includes acquiring habitat supporting known occurrences of the subspecies.

### *Threats and Conservation Needs*

The Quino checkerspot butterfly is threatened primarily by urban and agricultural development, non-native plant species invasion, off-road vehicle use, grazing, and fire management practices (62 FR 2313). These threats destroy and degrade the quality of habitat and result in the extirpation of local Quino checkerspot butterfly populations. Also, enhanced nitrogen deposition, elevated atmospheric carbon dioxide concentrations, and climate change may have contributed to Quino checkerspot butterfly population declines (Service 2003b). Other threats to the species identified in the final listing rule (62 FR 2313) include illegal trash dumping and predation.

Non-native invasive plants may directly out-compete native plants, including butterfly host-plant species. This effect has been documented in a native plant community that supports the Bay checkerspot butterfly (*Euphydryas editha bayensis*) in the San Francisco Bay area (Weiss 1999). Not only does the increase in non-native plants degrade the quality of the native habitat, it may also increase the frequency or severity of wildfires, further adversely impacting the vegetation community and butterfly species.

Conservation needs include protecting habitat supporting known current populations (occurrence complexes) and landscape connectivity among them; conducting research to refine recovery criteria; and managing and enhancing Quino checkerspot butterfly habitat.

## **Otay Tarplant Critical Habitat**

### *Listing Status*

The Service published a final rule designating critical habitat for Otay tarplant on December 10, 2002 (67 FR 76030).

### *Critical Habitat Description*

Three critical habitat units have been designated for Otay tarplant on 6,330 acres in San Diego County, California. Designated critical habitat includes sufficient habitat to maintain self-sustaining populations of Otay tarplant throughout its range. The individual units contain essential habitat for Otay tarplant and help to identify special management considerations for the species. The proposed Otay Crossings project includes portions of Unit 3 (Otay Valley/Big Murphy's Unit) of the final critical habitat designation. Unit 3 encompasses approximately 2,250 acres and contains populations in the southern and eastern extent of the species' historical distribution (Figure 8). Unit 3 was designated because it contains multiple large Otay tarplant populations that are capable of producing large numbers of individuals in good years, which is

important for this species to survive through a variety of natural and environmental changes, as well as stochastic (random) events (67 FR 76042).

PCEs are the physical and biological features essential to the conservation of the species that may require special management considerations or protection. The PCEs for Otay tarplant critical habitat are soils with a high clay content (generally greater than 25 percent) or clay intrusions or lenses that are associated with grasslands, open coastal sage scrub, or maritime succulent scrub communities between 80 and 1,000 feet elevation (67 FR 76040).

Please refer to the final critical habitat rule (67 FR 76030) for detailed information on the units, including their sizes, locations, and special management considerations.

### *Threats and Conservation Needs*

When designating critical habitat, we assess whether the areas within the geographical area occupied at the time of listing contain the PCE that may require special management considerations or protection. Examples of special management actions that may be necessary to protect essential habitat features and thus prevent further declines and loss of populations of tarplant include: 1) actions to prevent the degradation and/or type conversion of grasslands, open coastal sage scrub, or maritime succulent scrub into other unsuitable habitats, and 2) actions to restore degraded habitat areas. The PCE contained within Unit 3 may require special management considerations or protection to minimize impacts associated with habitat type conversion and degradation occurring in conjunction with urban and agricultural development (67 FR 76042).

### ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of State and private actions that are contemporaneous with the consultation in progress.

### **Project Site Characteristics and Surrounding Land Uses**

The project site is generally bounded by Otay Mesa Road to the north, the U.S. – Mexico international border to the south, Otay Mountain foothills to the east, and the future SR-11/SR-905 Interchange and SR-905 to the west. The land in the vicinity of the project sites is mostly private property, with the exception of a narrow strip along the southern boundary that is owned by the federal government and includes the border fence and associated roads. The land to the east is currently undeveloped, while much of the land to the north and west is developed or in the process of being developed. Land use to the south in Tijuana, Mexico is developed.

Topography on the project site is generally flat, with areas to the east sloping up towards Otay Mountain. Several drainages cross the site that convey water south into Mexico. An area of mima mound topography occurs on a small hill that extends north from the border near the central part of the Otay Business Park portion of the site. Soils on the project site include Salinas clay, Diablo clay, and Huerhuero loams (Bowman 1973), which typically support vernal pools when they occur in flat areas such as Otay Mesa.

Historically, much of the project site was used for agriculture, and while no longer supporting agricultural uses, much of the site is disturbed due to frequent U.S. Border Patrol and military training activities and illegal off-road vehicle use. Sixteen vegetation communities occur on the project site, including vernal pools, freshwater marsh, mule fat scrub, tamarisk scrub, native grassland, Diegan coastal sage scrub, non-native grassland, and eucalyptus woodland; however, non-native grasslands predominate with a small area of coastal sage scrub on the eastern edge of the Otay Crossings project boundary. Wetland resources on the project site include a network of small drainages, road pools and vernal pools<sup>5</sup>. Most of the vernal pools are located on the small mesa with mima mound topography. Collectively the site supports 0.14 acre of vernal pools and 0.10 acre of road pools occupied by fairy shrimp; and 1.02 acre of unoccupied road (0.97) and vernal (0.05) pools.

### **Relationship to MSCP**

The MSCP is a comprehensive habitat conservation plan that addresses multiple species' needs and the preservation of native vegetation communities within the southwestern subregion of San Diego County. The MSCP is assembling a landscape preserve system rather than using a project by project approach to biological mitigation. The proposed project site is located within the County's Subarea Plan for the MSCP and is designated as a Minor Amendment area defined as "properties that contain habitat that could be partially or completely eliminated (with appropriate mitigation) without significantly affecting the overall goals of the County's Subarea Plan." Caltrans is not a permittee under the MSCP; therefore, their project (SR-11 and Port of Entry) is not subject to the requirements of the MSCP. However, the MSCP requirements apply to the Otay Crossings and Otay Business Park projects.

The Service and CDFG concurred with Minor Amendment for these two projects in letters to the County dated March 31, 2011 (FWS-SDG-10B0091-11TA0341 and 09B0264-11TA0342). In our letters to the County, we concurred with the County's determination that the projects were consistent with the County's Biological Mitigation Ordinance and the overall goals of the County's Subarea Plan for the MSCP, provided that our recommended conditions were included into the County's conditions for approval of the projects.

---

<sup>5</sup> "Vernal pools" are distinguished from "road pools" in that they support vernal pool flora, whereas road pools are devoid of vegetation but may be occupied by San Diego and/or Riverside fairy shrimp.

The Lonestar Ridge property is located within the City of San Diego's Subarea Plan for the MSCP (City of San Diego 1997). The Lonestar Ridge Conservation Area, which is part of the greater area known as the Lonestar Ridge property, was originally a hardlined project that included both development and open space areas. The other offsite conservation site, the O'Neal Canyon property, was purchased by Otay Crossings and incorporated into the County's MSCP preserve.

### Species and Critical Habitats within the Project Site

Multiple biological surveys have been conducted for the three proposed projects between 2000 and 2009 (Table 5). HELIX Environmental Planning, Inc. (HELIX) prepared Biological Technical Reports for Otay Crossings (HELIX 2010a) and Otay Business Park (HELIX 2010b) and the Tier II Natural Environmental Study for the SR-11 and the Port of Entry project (HELIX 2010c). These reports include a summary of the environmental work that was completed for each of the projects. Each project conducted vegetation mapping, rare plant surveys, fairy shrimp surveys, burrowing owl (*Athene cucicularia*) surveys, coastal California gnatcatcher surveys, Quino checkerspot butterfly surveys, and a jurisdictional delineation. Please refer to the biological technical reports for each of the projects for detailed information regarding these survey efforts.

Table 5. Biological surveys conducted for the SR-11 and Port of Entry, Otay Crossings, and Otay Business Park projects between 2000 and 2009.

Type of Survey	2000	2001	2004	2005	2006	2008	2009
General botanical/wildlife	X	X		X	X	X	X
Map vegetation	X		X	X		X	X
Update mapped vegetation					X	X	
Basin/vernal pool mapping		X		X	X	X	X
Watershed mapping				X	X		X
Special status plants	X			X	X		X
Wet season fairy shrimp		X	X	X	X	X	X
Dry season fairy shrimp	X	X		X	X	X	X
Quino checkerspot butterfly		X		X	X		X
Coastal California gnatcatcher		X		X	X		X
Burrowing owl	X	X	X	X	X		X

### Vernal Pool Species

Surveys consistent with the Service's recommended protocol have been conducted on the three project sites between 2000 and 2009 (Table 5). During these surveys, San Diego fairy shrimp

were detected in 11 pools, Riverside fairy shrimp were detected in 2 pools, and both species were detected in 3 pools. In addition, 1.02 acres of un-occupied vernal/road pools were mapped on site. Spreading navarretia and San Diego button celery were observed in one pool on the Otay Business Park project site. Table 6 summarizes the vernal pool resources by project site (i.e., number of basins and acreage of basins and critical habitat).

The vernal pool species addressed in this biological opinion historically occurred in vernal pool complexes throughout the Otay Mesa ecosystem, which is part of the San Diego Southern Coastal Mesa Management Area identified in the vernal pool recovery plan (Service 1998a). Many of these vernal pool complexes, including the pool complexes within the three project sites, have been developed, converted to agriculture, and/or degraded by off-highway vehicle use. The vernal pool recovery plan (Service 1998a) identifies several vernal pool complexes on Otay Mesa, including the complexes within the Lonestar Ridge Conservation Area as important for the recovery of these species. The vernal pool recovery plan does not include any information about the vernal pools within the three project sites; thus, we assume they were not known at the time the recovery plan was issued.

Table 6. Summary of vernal pool resources on the project site.

Habitat	SR-11 and POE (Basins/acres)	Otay Crossings (Basins/acres)	Otay Business Park (Basins/acres)	Total Impacts (Basins/acres)
Road Pool	10 / 0.42	25 / 0.16	47 / 0.39	82 / 0.97
Road Pools w/ Riverside fairy shrimp	0/0	0/0	1 / 0.004	1 / 0.004
Road Pools w/ San Diego fairy shrimp	0/0	0/0	10 / 0.081	10 / 0.081
Road Pools w/ both species of shrimp	0/0	1 / 0.0027	2 / 0.017	3 / 0.0173
Vernal Pools with no listed species	0/0	0/0	2 / 0.05	2 / 0.05
Vernal Pool w/ Riverside fairy shrimp	0/0	0/0	1 / 0.009	1 / 0.009
Vernal Pool w/ San Diego fairy shrimp, San Diego button celery, and spreading navarretia	0/0	0/0	1 / 0.083	1 / 0.083
San Diego fairy shrimp critical habitat	0 / 89.07	0 / 12.97	0 / 98.01	0 / 200.05

The overlapping project sites are located within Subunit 5D of designated critical habitat for the San Diego fairy shrimp, which is one of 8 subunits included in Unit 5. As described above under the *Status of the Species* section of this biological opinion, PCEs for San Diego fairy shrimp designated critical habitat include shallow basins within a matrix of surrounding uplands that are on clay soils. PCEs are found throughout the overlapping project sites.

### Quino Checkerspot Butterfly

Recent Quino checkerspot butterfly observations in southwestern San Diego County are concentrated in lower elevation areas surrounding east Otay Valley, Otay Mountain, the Jamul Mountains, and San Miguel Mountain. Historic population distributions extended across Otay Mesa, with high densities reported in the vicinity of Brown Field (Murphy and White 1984). The overlapping project sites are located along the western edge of the occupied areas surrounding Otay Mountain and the restoration sites (i.e., Lonestar Ridge East and West conservation parcels) are located within the historical habitat adjacent to Brown Field. The overlapping project sites, the offsite restoration sites within the Lonestar Ridge Conservation Area, and O'Neal Canyon are located within the Southwest San Diego recovery unit and the West Otay Mountain occurrence complex. Each recovery unit is composed of several named "occurrence complexes," which can be defined as presumed metapopulations for which not enough data are available to definitively classify population structure (Service 2003b).

There is no estimate of suitable habitat for Quino checkerspot butterfly on the three overlapping project sites. Numerous nectar sources [e.g., goldfields (*Lasthenia californica*), ground pink (*Linanthus dianthiflorus*), and popcorn flower (*Cryptantha/Plagiobothrys spp*) and larval host plants (dot-seed plantain and annual owl's clover) were found in disjunct areas across the three overlapping project sites in surveys conducted by Caltrans in 2009; however, these resources were not mapped. In the absence of a map identifying specific areas of nectar sources and host plants, we included the onsite areas of coastal sage scrub, native grassland, and non-native grassland to represent suitable Quino checkerspot butterfly habitat as these vegetation types typically support nectar sources and host plants.

Focused surveys to determine the presence/absence of Quino checkerspot butterfly were conducted four times between 2001 and 2009 (Table 5). A total of four individual butterflies have been observed within the project sites including three on the Otay Business Park project site and one within the SR-11 and Port of Entry project site. Within the three overlapping project sites, the best remaining habitat for Quino checkerspot butterfly is located on the upper slopes of the hill in the south-central portion of the Otay Business Park project site where one of the butterflies was observed (HELIX 2010b).

There is high quality habitat occupied by Quino checkerspot butterfly to the east of the project sites along the lower slopes of Otay Mountain, and individuals may disperse from those areas and use resources on the project sites. The overlapping project sites may support small populations of Quino checkerspot butterfly from year to year; however, it is unlikely the project sites support a large population of Quino checkerspot butterfly based on the present habitat conditions. Overall, the project site contains marginal habitat for the Quino checkerspot butterfly. This conclusion is supported by the low number of butterflies that have been observed on site despite the numerous surveys that have been conducted.

### Otay Tarplant Critical Habitat

The Otay Crossings project site includes 32 acres of designated critical habitat for the Otay tarplant within Subunit 3C (316 acres), which is one of 3 subunits included in Unit 3 (2,250 acres). Based on our review of aerial photographs, we estimate that approximately 55 acres of designated critical habitat has already been lost from this unit, just north of the project site. Seven acres of designated critical habitat, including all of the plants (97 plants) observed on site, will be conserved within the onsite open space areas in the northeasterly portion of the project site (Figure 9). As described above under the *Status of the Species* section, the PCEs for Otay tarplant critical habitat includes soils with a high clay content that are associated with grasslands, open coastal sage scrub, or maritime succulent scrub communities. PCEs for this species occur within all of the 32-acre area designated as critical habitat for the Otay tarplant within the Otay Crossings project site.

### **Proposed Offsite Conservation Areas**

The proposed restoration sites support much higher quality habitat and are contiguous with the regional preserve system that is being established for the MSCP. The Lonestar Ridge Conservation Area is undeveloped with habitat consisting primarily of non-native grasslands over the mesa top and high-quality Diegan coastal sage scrub in the canyons. Vernal pools and mima mound topography are present throughout much of the Lonestar Ridge Conservation Area and include portions of the J 29, 30, and 31 vernal pool complexes (Bauder 1986; City of San Diego 2004). Quino checkerspot butterfly were historically found within the Lonestar Ridge Conservation Area.

The Lonestar Ridge Conservation Area includes approximately 254 acres of designated critical habitat for San Diego fairy shrimp (Subunit 5b); 196 acres for Quino checkerspot butterfly (Unit 8); and 152 acres for spreading navarretia (Subunit 5I). The Lonestar Ridge Conservation Area also includes approximately 296 acres of proposed critical habitat for the Riverside fairy shrimp.

In addition to their contribution to conservation of the Lonestar Ridge Conservation Area, the project proponent for the Otay Crossings project purchased property in O'Neal Canyon that is also designated critical habitat for the Quino checkerspot butterfly within Unit 8. The Otay Business Park project proponent has an additional offsite requirement of the MSCP to conserve non-native grasslands; however, they have not identified a site to fulfill this obligation. Table 7 provides the acreage of critical habitat designated on the Lonestar Ridge Conservation Area by species, habitat acreages, and a summary of number of species locations at the site. The proposed offsite conservation lands for each of the proposed projects are discussed in more detail below.

Table 7. Critical habitat designations (acres), habitats (acres), and species occurrences at the Lonestar Ridge Conservation Area.

Habitat	SR-11/POE Lonestar Ridge West	Otay Crossings Lonestar Ridge East	Otay Business Park Lonestar Ridge East	Total Conservation
San Diego Fairy Shrimp CH	155.4	36.8	62.2	254.4
Proposed Riverside Fairy Shrimp CH	155.4	76.7	63.5	295.6
Quino Checkerspot CH	87.0	40.4	68.7	196.2
Spreading Navarretia CH	85.0	17.8	49.4	152.2
Non-native grassland	169.0	74.7	56.8	300.5
Coastal sage scrub	12.0	7.2	11.3	30.5
Otay Mesa Mint (# of pools)	0	0	2	2
SD Button-Celery (# of pools)	25 <sup>1</sup>	11 <sup>3</sup>	32	64
San Diego Fairy Shrimp (# of pools)	14 <sup>1</sup>	4 <sup>4</sup>	1	14
Riverside Fairy Shrimp (# of pools)	1 <sup>1</sup>	0	0	1
Quino Checkerspot Locations	4 <sup>2</sup>	0	0	4

<sup>1</sup> Surveys conducted in 2011 (Caltrans 2011)

<sup>2</sup> Surveys conducted in 2004 (HELIX 2004)

<sup>3</sup> Surveys conducted in 1992 (Dudek 1992)

<sup>4</sup> Surveys conducted in 2008 (HELIX 2008a)

### Lonestar Ridge West Conservation Parcel (SR-11 and Port of Entry Project)

The Lonestar Ridge West conservation parcel <sup>6</sup> totals 184 acres and supports approximately 169 acres of non-native grassland, 12 acres of Diegan coastal sage scrub, 0.5 acre of eucalyptus woodland, a 0.25- acre stock pond, 0.85 acre of vernal pool basins, and 0.1 acre of unvegetated basins (HELIX 2009). San Diego button-celery has been observed in 25 pools, San Diego fairy shrimp in 14 pools, and Riverside fairy shrimp in 1 pool (Caltrans 2011; Table 7). The western parcel includes 155.4 acres of designated critical habitat (Subunit 5D) for the San Diego fairy shrimp and proposed critical habitat (Subunit 5D) for the Riverside fairy shrimp.

In 2004, the southwest portion of the Lonestar Ridge West conservation parcel was surveyed and four Quino checkerspot butterflies were observed (Helix 2004).. Subsequent surveys conducted by HELIX across the entire Lonestar Ridge West conservation parcel (2005, 2006, and 2007) did not detect any Quino checkerspot butterflies. In addition, no butterflies were detected during biological surveys conducted by Caltrans in 2010. Although it is likely that most areas of the Lonestar Ridge West conservation parcel is unsuitable for the Quino checkerspot butterfly due to the presence of non-native grasses, there are small areas of nectar sources and larval host plants scattered throughout the proposed restoration sites.

<sup>6</sup> The two small disjunct parcels located east of SR-125 are included in the summary of habitat types.

### Lonestar Ridge East Conservation Parcels (Otay Crossings Project)

Lonestar Ridge East conservation parcels totaling 82 acres were purchased by the project proponents for the Otay Crossings project and support approximately 75 acres of non-native grassland, 7 acres of Diegan coastal sage scrub, and 0.34 acre of vernal/road pool basins. Although San Diego button-celery had been previously observed in 11 pools (Dudek 1992), the species was not detected in the more recent surveys (HELIX 2009). The San Diego fairy shrimp has been observed in 4 pools (HELIX 2008a). An individual Quino checkerspot butterfly was observed during surveys conducted in 2001 (Dudek 2001b) within the SR-125 restoration site that is contiguous with the Lonestar Ridge East Conservation parcels. An individual was also observed in both 2003 and 2004 (HELIX 2003; 2004) within the 23 acres of conservation lands that are not a part of the proposed project (Figure 3). However, as with Lonestar Ridge West, not all areas of Lonestar Ridge East were surveyed in 2003 and 2004. Subsequent surveys across the entire Lonestar Ridge East parcels did not detect any Quino checkerspot butterflies (HELIX 2005b; 2005c; 2006b; 2006c; 2007a; 2007b). Although it is likely that most areas within the Lonestar Ridge East conservation parcels (i.e., specific areas purchased for the Otay Crossings project) are unsuitable for the Quino checkerspot butterfly due to the presence of non-native grasses, there are small areas of nectar sources and larval host plants scattered throughout the proposed restoration sites.

The Lonestar Ridge East conservation parcels, including areas along Johnson Canyon and the portion of the site acquired by the Otay Crossings project, support habitat suitable for Otay Tarplant. Over 330,000 individuals of Otay tarplant were observed in the 23-acre area that Otay Crossings is reserving for future projects (HELIX 2009).

### Lonestar Ridge East Conservation Parcels (Otay Business Park)

Lonestar Ridge East conservation parcels totaling 69 acres were purchased by the project proponents for the Otay Business Park project and support approximately 57 acres of non-native grassland, 11 acres of Diegan coastal sage scrub, and 0.66 acre of vernal and/or road pool basin area (HELIX 2011). San Diego button-celery has been observed in 32 pools, Otay Mesa mint in one pool, and San Diego fairy shrimp in one pool. Although it is likely that most areas within the Lonestar Ridge East conservation parcels (i.e., specific areas purchased for the Otay Business Park project) are unsuitable for the Quino checkerspot butterfly due to the presence of non-native grasses, there are small areas of nectar sources and larval host plants scattered throughout the proposed restoration sites. There is no available Quino checkerspot butterfly survey data documenting presence at this site.

### O'Neal Canyon

The project proponents for the Otay Crossings project also purchased two parcels (84 acres) in O'Neal Canyon (Figure 2) and transferred ownership to the Bureau of Land Management (BLM) who has assumed the long-term management responsibilities for the site. The parcels are located

east of Alta Road and north and south of the Otay Mountain Truck Trail. The parcels abut other lands owned by BLM on the north and east. Habitats on site include southern mixed chaparral, chamise chaparral, and Diegan coastal sage scrub. Host and nectaring plants in sufficient quantities to support the Quino checkerspot butterfly occur on both parcels. Surveys in 2008 detected at least five Quino checkerspot butterflies on site (HELIX 2008b).

## EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, which will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Construction and operation of the proposed action will result in impacts to San Diego button-celery, spreading navarretia, Quino checkerspot butterfly, Riverside fairy shrimp, San Diego fairy shrimp and its designated critical habitat, and Otay tarplant designated critical habitat (Table 8). Direct effects to habitats located within the three overlapping project footprints are considered permanent.

Table 8. Summary of potential impacts to listed species and designated critical habitat from the SR-11 and Port of Entry, Otay Crossings, and Otay Business Park projects. (Note: Basins may support more than one listed species and therefore are not additive.)

	SR-11 and Port of Entry	Otay Crossings	Otay Business Park
San Diego button celery	25 basins <sup>1</sup>	0	1 basin (3 individuals)
Spreading navarretia	0	0	1 basin (3 individuals)
Quino checkerspot butterfly	3 butterflies/175 acres	163 acres	1 butterfly/111 acres
Riverside fairy shrimp	1 basin <sup>1</sup>	1 basin	4 basins
San Diego fairy shrimp	14 basins <sup>1</sup>	5 basin <sup>2</sup>	14 basins <sup>3</sup>
San Diego fairy shrimp critical habitat	89.07 acres	12.97 acres	98.01 acres
Otay tarplant critical habitat	0	25.04 acres	0

<sup>1</sup> Impacts are limited to temporary impacts during restoration of the Lonestar Ridge West site.

<sup>2</sup> Includes impacts to four basins from potential restoration activities on Lonestar Ridge East.

<sup>3</sup> Includes impacts to one basin from potential restoration activities on Lonestar Ridge East.

A general description of the proposed impacts to habitat<sup>7</sup>, federally listed species, and designated critical habitat for each project is provided followed by a cumulative impact analysis. The cumulative impact analysis addresses the effects of all three projects on each federally listed species and designated critical habitat.

<sup>7</sup> Habitat for listed species includes vernal pools/basins, native and non-native grassland, and Diegan coastal sage scrub.

*SR-11 and Port of Entry*

The SR-11 and Port of Entry project will impact approximately 176 acres of habitat at the project site, including the loss of habitat supporting the 3 Quino checkerspot butterfly locations. All of the PCEs within the 89 acres of San Diego fairy shrimp critical habitat at the site will also be destroyed to facilitate the development, as well as 0.42 acre of unoccupied road pools.

*Otay Crossings*

On- and offsite development and required traffic improvements for the Otay Crossings project will impact approximately 164 acres of habitat in addition to the impacts on site from the SR-11 and Port of Entry project. One of the two basins supporting Riverside and San Diego fairy shrimp totaling 116 square feet will be destroyed to facilitate the project, as well as 0.16 acre of unoccupied road pools. All of the PCEs within 12.97 acres of designated critical habitat for San Diego fairy shrimp and within 25.04 acres of designated critical habitat for Otay tarplant will be destroyed by the proposed development.

*Otay Business Park*

Proposed development of the Otay Business Park will impact approximately 111 acres of habitat, including 16 acres off site for road improvements. All of the PCEs within 98 acres of designated critical habitat for the San Diego fairy shrimp, including 10 vernal pools and 14 road pools with a combined surface area of 0.14 acre and 0.10 acre, respectively, will be destroyed with development of the site. Of the 24 pools that will be destroyed, San Diego button-celery and spreading navarretia were observed in one pool, San Diego fairy shrimp were observed in 13 pools (10 on site and 3 off site), and Riverside fairy shrimp were observed in 4 pools (2 on site and 2 off site). In addition, 47 unoccupied road pools (0.39 acre) and habitat supporting the one Quino checkerspot butterfly location on site will be destroyed. Table 9 provides a summary of impacts by habitat type for the three individual projects included in the proposed action.

Table 9. Summary of proposed impacts by habitat type for the SR-11 and Port of Entry, Otay Crossings, and Otay Business Park projects.

Habitat	SR-11/Port of Entry	Otay Crossings	Otay Business Park	Total Impacts
Vernal Pool	0.00	0.00	0.14	0.14
Basin with Fairy Shrimp	0.00	116 sq ft	0.10	0.10
Diegan Coastal Sage Scrub (including disturbed and restoration)	0.0	1.9	0.0	1.9
Native Grassland	0.2	0.1	0.0	0.3
Non-native Grassland	171.9	161.1	110.7	443.7
Grassland Restoration	3.2	0.0	0.0	3.2
<b>Total</b>	<b>175.3</b>	<b>163.1</b>	<b>110.9</b>	<b>449.3</b>

## Vernal Pool Species

### *Direct Effects*

Implementation of the three overlapping projects will grade and fill 1 pool occupied by San Diego button-celery, spreading navarretia, and San Diego fairy shrimp, 10 additional pools occupied by just the San Diego fairy shrimp, 2 pools (i.e., 1 road and 1 vernal pool) occupied by just Riverside fairy shrimp, and 3 pools occupied by both San Diego and Riverside fairy shrimp for a combined basin surface area of 0.19 acre. In addition, 1.02 acres (ponded water) of unoccupied, road pools and vernal pools will be impacted (Table 6).

Based on discussions with the Service, the project footprints for Otay Crossings and the Port of Entry were reduced from that originally proposed to avoid existing and restorable vernal pool habitat on the southeastern edge of the project site. Alternatives were also evaluated to avoid and minimize direct impacts to the pools on Otay Business Park site. However, alternatives that provided for reasonable development would have rendered the avoided pools surrounded by the development and subject to future indirect impacts that would have threatened their long-term viability. Thus, we determined that offsite conservation efforts (i.e., enhancement and restoration of vernal pool habitat) would provide a greater chance of achieving sustainable vernal pool habitat capable of supporting viable populations of San Diego fairy shrimp, Riverside fairy shrimp, San Diego button-celery, and spreading navarretia. At our recommendation, the three project proponents collaborated to purchase the Lonestar Ridge Conservation Area, which was identified in the vernal pool recovery plan as necessary to stabilize the listed vernal pool species. Direct and indirect impacts to vernal pools, federally listed species, and designated critical habitat for San Diego fairy shrimp will be offset through the conservation, restoration, and management of vernal pools and designated critical habitat for San Diego fairy shrimp as summarized above in Tables 2, 3, and 4 within the *Project Description* section of this biological opinion and Table 7 in the *Environmental Baseline* section.

To assist in the offsite enhancement and restoration efforts and to preserve some of the genetic variation found within each of the species impacted at the project sites, seeds of San Diego button-celery and spreading navarretia and cysts of San Diego fairy shrimp and Riverside fairy shrimp will be salvaged from the project site prior to impacts. Seeds will be collected directly from the San Diego button-celery and spreading navarretia (if plants can be located), and soil containing fairy shrimp cysts will be salvaged from the pools to be graded and filled for use as inoculum in the vernal pools to be restored and enhanced.

In accordance with the restoration plans identified in Conservation Measure 3, inoculum will be collected when dry to avoid damaging or destroying fairy shrimp cysts, and no more than 10 percent of the basin area of any offsite donor pool will be used for collection of inoculum. Hand tools (i.e., shovels and trowels) will be used to remove the first 2 inches of soil from the pools. Whenever possible, the trowel will be used to pry up intact chunks of soil, rather than loosening the soil by raking and shoveling, which can damage the cysts. The soil from each pool will be

placed in individually labeled boxes that are adequately ventilated and kept out of direct sunlight to prevent the occurrence of fungus or excessive heating of the soil and stored off site at an appropriate facility for vernal pool inoculum.

The restoration plans also include a requirement that inoculum will not be introduced into the restored/enhanced pools until after the pools have been demonstrated to retain water for the appropriate amount of time to support San Diego fairy shrimp [i.e., at least 30 days (Hathaway and Simovich 1996, Ripley et. al. 2004)] or Riverside fairy shrimp [i.e., at least 60 days (Hathaway and Simovich 1996)] and have been surveyed for versatile fairy shrimp to the satisfaction of the Agencies. If versatile fairy shrimp are detected in the restored pools, inoculum will not be introduced until measures approved by the Service and Corps are implemented to minimize potential threats (e.g., hybridization) to San Diego fairy shrimp from the presence of versatile fairy shrimp. Measures to be considered may include removal of the versatile fairy shrimp from the pools. In addition, no inoculum will be placed in pools occupied by either species of shrimp unless it is determined that the extant population and shrimp to be introduced are genetically similar. Inoculum will be placed in a manner that preserves, to the maximum extent possible, the orientation of the fairy shrimp cysts within the surface layer of soil (e.g., collected inoculum will be shallowly distributed within the pond so that cysts have the potential to be brought into solution upon inundation).

Despite all of the efforts described, we expect at least some seeds and cysts salvaged from the project sites will be destroyed during the collection, storage, translocation, and seeding process. In addition, any San Diego and Riverside fairy shrimp cysts not salvaged for use in the restoration effort and any remaining individual San Diego button-celery and spreading navarretia plants will be destroyed during project clearing, grading, and construction activities.

Impacts to the vernal and road pools with listed vernal pool species will be offset by preserving, enhancing, and restoring 5.68 acres of vernal pool basin area within the Lonestar Ridge Conservation Area. San Diego button-celery, San Diego fairy shrimp, and Riverside fairy shrimp are located within the offsite conservation lands where enhancement and restoration efforts will occur, and some individuals could be harmed or destroyed to achieve the long-term benefits of the enhancement and restoration efforts. Table 10 summarizes the vernal pool restoration efforts by project and a discussion of impacts anticipated to individual species from the enhancement and restoration efforts associated with each project follows.

Table 10. Vernal and/or road pool basin area to be preserved/enhanced and restored within the Lonestar Ridge Conservation Lands.

<b>Conservation</b>	<b>SR-11 and POE</b>	<b>Otay Crossings</b>	<b>Otay Business Park</b>
Preservation/Enhancement	14 pools (0.6 acre)	28 Pools (0.34 acre)	82 Pools (0.66 acre)
Creation/Restoration	111 pools (3.6 acres)	2 Pools (232 sq ft)	52 Pools (0.48 acre)

SR-11 and Port of Entry Project: Lonestar Ridge West Conservation Parcel

Caltrans observed San Diego fairy shrimp in 14 pools and Riverside fairy shrimp in 1 pool during surveys in 2010 at the Lonestar Ridge West conservation parcel. They also found San Diego button-celery at 25 locations containing a total of 955 individuals during the vegetation cover surveys conducted between March and June of 2011. As part of the restoration plan, Caltrans is proposing to enhance the extant pools. Enhancement activities include re-contouring, mowing, dethatching, and weeding. All of these activities may crush a minimal number of fairy shrimp cysts and seeds from San Diego button-celery. Caltrans has included specific measures in their restoration plan to minimize impacts to these three species.

In accordance with the restoration plan for this site, seed of San Diego button-celery within the Lonestar Ridge West conservation parcel will be collected before grading in the summer of 2012. The collected seed will be broadcast in enhanced and created vernal pools within the Lonestar Ridge West conservation parcel. The locations were delineated as environmentally sensitive areas with stakes and orange lathe flagging to minimize impacts to San Diego button-celery from weeding activities.

Prior to the start of grading activities associated with restoration within the Lonestar Ridge West conservation parcel, soil will be collected from all of the basins to be re-contoured to collect the shrimp cyst bank. This vernal pool soil (inoculum) will be collected when dry to avoid damaging or destroying fairy shrimp cysts. A hand trowel or similar instrument will be used to collect the inoculum. Whenever possible, the soil will be collected in chunks, rather than loosening the soil by raking and shoveling. The soil from each basin will be stored individually in labeled boxes that are adequately ventilated and kept out of direct sunlight to prevent the occurrence of fungus or excessive heating of the soil. The boxes will be stored off site at an appropriate facility for vernal pool inoculum. Soil will not be collected from any basins without approval by the Service.

Following grading activities (see below), shrimp cyst soil will be placed back into the basins from which it was removed. Twenty-five of the 100 shallower pools will be inoculated with onsite San Diego fairy shrimp cysts and 3 of the 11 deeper pools will be inoculated with Riverside fairy shrimp cysts from the cattle stockpond on site to establish additional populations. Soil will be placed in dry pools only, preferably before the first rains of the fall-winter season. Soil will not be placed into basins that are already ponding, as the shock of instant cyst inundation may reduce the success of the cyst hatch.

Although a few individuals of San Diego fairy shrimp, Riverside fairy shrimp, and San Diego button-celery may be killed or destroyed during restoration activities, we expect that the resulting restoration will provide a long-term net benefit to these species by expanding the available habitat (ponded area) and reducing threats to the species from lack of management.

Otay Crossings Project: Lonestar Ridge East Conservation Parcels

San Diego button-celery has not been observed onsite since 1992 (Dudek 1992). HELIX observed San Diego fairy shrimp in four pools during surveys conducted in 2008 (HELIX 2008a). These locations are located outside of the 5-acre area where the vernal pool restoration work will occur. As part of the specific measures in the restoration plan, vernal pool grading (i.e., re-contouring of existing basins and creation of new basins) will be carried out under the supervision of the restoration specialist who will mark all areas to be graded and flag sensitive habitats and plants to be avoided. Access routes will be identified and marked, and no access will occur through the adjacent Caltrans preserve. Grading will be implemented when the soil is dry using rubber-tired loaders with ripping tines and slope boards. Therefore, we do not anticipate any impacts to the extant resources from the restoration activities.

The vernal pool watershed enhancement for the 28 preserved pools will occur throughout the entirety of the non-native grasslands including the areas where the listed vernal pool species were observed. In the event enhancement of the vernal pool watersheds does not result in additional ponding in the 28 preserved pools, the project proponent may implement remedial measures within some of the basins, including re-contouring and weeding. In addition, these pools may be the source of inoculum for the restored pools. Therefore a small number of San Diego fairy shrimp cysts could be harmed as a result of these activities. Prior to the watershed enhancement, areas supporting native plants will be flagged for avoidance, which will ensure impacts to the extant population of San Diego button-celery is avoided.

Otay Business Park Project: Lonestar Ridge East Conservation Parcels

HELIX observed San Diego button-celery in 32 pools, the endangered Otay Mesa mint in 1 pool, and San Diego fairy shrimp in 1 pool during surveys in 2009 (HELIX 2009). These observations are all outside of the 4.7-acre area that will be re-contoured to support the 0.48 acre of restored vernal pool basin area. There is currently no ponding within the area to be restored; therefore, we do not anticipate any impacts to the extant resources from the restoration activities. Vernal pool grading will be carried out under the supervision of the restoration specialist who will mark all areas to be graded and flag sensitive habitats and plants to be avoided. A minimum of 52 new pools will be created in this area. Grading will be implemented when the soil is dry using rubber-tired loaders with ripping tines and slope boards.

The vernal pool watershed enhancement for the 82 preserved pools will occur throughout the entirety of the non-native grasslands including the areas where the listed vernal pool species were observed. In the event dethatching of the vernal pool watersheds does not result in additional ponding in the 82 preserved pools, the project proponent may implement remedial measures within some of the basins, including re-contouring and weeding. In addition, these pools may be the source of inoculum for the restored pools. Therefore a small number of San Diego fairy shrimp cysts could be harmed as a result of these activities. Otay Business Park has included specific measures in their restoration plan to minimize impacts to listed species. Prior to

dethatching, areas supporting native plants will be flagged for avoidance, which will ensure impacts to the extant population of Otay Mesa mint and San Diego button-celery are avoided. In addition, access routes will be identified and marked, and no access will occur through the adjacent Caltrans preserve.

### Summary

Activities that alter hydrology, increase vernal pool habitat fragmentation, or decrease land types suitable for vernal pool formation have the potential to limit the survivability and recovery of San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp (Service 1998a). Vernal pool restoration can reestablish the physical and biotic characteristics of vernal pool habitat such that critical functions are restored. The restored habitat should resemble reference habitat in regard to the following attributes: soil properties, water quality, topography, hydrology, nutrient cycling, species diversity and species interactions. Based on positive data from ongoing monitoring programs it appears that restoration can provide self-sustaining vernal pool ecosystems with clear and significant benefits to San Diego fairy shrimp and Riverside fairy shrimp, especially when cyst translocation occurs from existing (conserved) occupied pools (RECON 2005; Black 2000a, 2000b; EDAW 2005 and 2010).

Benefits of restoration to the listed vernal pool species include increasing the amount of available vernal pool habitat and increasing the quality of existing vernal pool habitat. These benefits, when supplemented by long-term monitoring and management, can reduce threats to the listed vernal pool species and maintain and improve the habitat quality and regional distribution of them. Since 1997, several projects have documented success in the translocation of San Diego fairy shrimp and Riverside fairy shrimp and in the establishment of populations of listed plant species including spreading navarretia and San Diego button-celery. These include California Terraces on Otay Mesa (RECON 2005), San Diego Spectrum at Kearny Mesa (Glen Lukos Associates 2005), and other vernal pool restoration projects on Otay Mesa, MCAS Miramar, and MCBCP.

Besides the enhancement and restoration efforts described, project proponents will also implement several other conservation measures to minimize impacts to the listed vernal pool species during the construction and restoration activities to help ensure the success of vernal pool restoration, enhancement, and preservation and the upland habitat preservation efforts. Those efforts include: fencing the limits of impacts; staffing a qualified biologist on site to ensure compliance with all conservation measures and submitting reports that document such compliance; grading all surrounding areas to drain away from the preserves; posting a financial assurance (e.g. Otay Business Park and Otay Crossings) approved by the Agencies to ensure successful implementation of vernal pool restoration and enhancement, upland restoration and maintenance, and overall monitoring; conserving a 334-acre preserve that includes the vernal pools and their watersheds and surrounding upland habitat in biological conservation easements; and implementing and funding a perpetual management, maintenance and monitoring plan. Implementation of these and the other proposed conservation measures discussed above will

avoid, minimize, and offset the direct effects of the project on listed vernal pool species and their habitats and are expected to ensure the long-term viability of these species on Otay Mesa.

The vernal pools on the project site are highly degraded and subject to ongoing threats due to lack of management and their proximity to the international border. While some vernal pools will be permanently impacted, the identified restoration and enhancement is expected to achieve a “no net loss” of vernal pool habitat including viable populations of San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp. The proposed restoration site at the Lonestar Ridge Conservation Area is part of a large block of conserved habitat within the MSCP preserve, including the Otay River Valley, the SR-125 restoration site, and Johnson Canyon. Upon project completion, the enhanced and restored pools will be within a 334-acre conservation area that is connected to the MSCP preserve in a configuration that maintains habitat functions and species viability.

Importantly, two areas, previously approved for development, will be conserved. These two areas support the vernal pool species addressed by this biological opinion and suitable restoration habitat. The conservation of these two areas removes the threat of development, increases the MSCP preserve by approximately 100 acres, and increases the distance between what was originally contemplated for conservation under the MSCP and the adjacent development. Therefore, despite the loss of occupied vernal pool habitat at the overlapping project sites, no appreciable reduction in the numbers, reproduction, or distribution of San Diego button-celery, spreading navarretia, San Diego fairy shrimp, or Riverside fairy shrimp is expected.

#### *Indirect Effects*

The proposed project will introduce development adjacent to extant pools occupied by the San Diego and/or Riverside fairy shrimp to the west of Otay Business Park and to pools proposed by this project to be preserved (i.e., Otay Crossings onsite preserve). Indirect effects of particular concern to the four vernal pool species are changes to hydrology and water quality, erosion and sedimentation into the vernal pool basins, and the invasion of non-native vegetation within the basin and/or the adjacent watershed. Modifications to the hydrology of vernal pools can alter the distribution of other vernal pool flora and fauna that are influenced by the length and frequency of water inundation (Bauder 1987, 2000). For instance, non-native plant species can become more prevalent in disturbed vernal pools when the periods of water inundation are reduced, while freshwater marsh species can expand into disturbed vernal pools when the periods of inundation are increased.

Modification of a pool’s hydrology can also affect germination, flowering, and seed production of San Diego button-celery and spreading navarretia and the reproductive cycle of San Diego and Riverside fairy shrimp. As an example, irrigation of artificial landscapes adjacent to vernal pools can saturate the soils and alter the timing and duration of inundation in vernal pools, causing hatching of cysts or germination of seeds at inappropriate times for their phenology. Artificial landscapes may also be laden with fertilizers and pesticides that can alter the specific water

chemistry (Gonzalez et al. 1996) and temperature (Hathaway and Simovich 1996) required by San Diego and Riverside fairy shrimp and negatively affect their ability to mature and reproduce (Gonzalez et al. 1996, Holtz 2003). San Diego fairy shrimp and Riverside fairy shrimp are “osmoregulators” that maintain constant internal chemical concentrations, but they cannot tolerate wide extremes in sodium or bicarbonate concentrations so they are vulnerable to contaminants in runoff waters and watershed quality that alter levels of salts and alkalinity (Service 1998a).

Implementation of the conservation measures summarized in the *Project Description* section of this biological opinion are anticipated to avoid, minimize, and offset the indirect impacts associated with development of the three projects. Conservation Measures 9 through 12 include actions that will be taken to avoid and minimize indirect effects. Permanent fencing and signs will be installed around the development footprint to reduce human encroachment into the onsite conservation areas. Best management practices will be implemented to address erosion, sedimentation, and contaminants during construction. Temporary fencing (with silt barriers) will be installed at the limits of project impacts (including construction staging areas and access routes) to prevent additional sensitive habitat impacts and to prevent the spread of silt from the construction zone into adjacent habitats to be avoided. No non-native plant species, that may be invasive to native habitats, will be used in the landscaping adjacent to any conserved areas. In addition, to ensure that these measures are implemented, biological monitors will be on site during construction.

Indirect impacts are also of concern at the Lonestar Ridge Conservation Area. Vernal pool restoration/enhancement will occur in and around extant pools within this conserved site. In addition to these extant pools, the SR-125 restoration site is located adjacent to the two areas proposed to be actively restored by the project proponents for the Otay Business Park and Otay Crossings projects. However, the restoration will not impact the watersheds of extant pools and is expected to result in an increase in the amount of vernal pool basin area occupied by San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp. In addition, Conservation Measure 4 requires the restoration grading activities at the Lonestar Ridge East and West conservation parcels to be timed to avoid wet weather in order to minimize potential impacts (e.g., siltation) to the extant vernal pools. Overall, the potential indirect impacts of the proposed development on listed vernal pool species and their habitat is expected to be addressed by the conservation measures committed to by the project proponents.

#### *San Diego Fairy Shrimp Critical Habitat*

The three overlapping projects when fully implemented will result in the permanent loss of 200 acres of designated critical habitat, including 1.2 acres of basin area (PCE 1) and approximately 199 acres of associated uplands (PCE 2), for the San Diego fairy shrimp within Subunit 5D (Figure 10). Subunit 5D is 240 acres and is one of 8 subunits that comprise Unit 5 (San Diego, Southern Coastal Mesa). Designated critical habitat for the San Diego fairy shrimp totals 2,931 acres of which 1,634 acres are within Unit 5. The loss of 200 acres represents an 83 percent

reduction in the extent of Subunit 5D and an approximately 12 percent reduction in Unit 5. The impact to the overall designation is less, but still represents a 7 percent reduction.

In addition to the direct loss of PCEs, the project will fragment the 40 acres of remaining critical habitat into 28 acres of critical habitat on the west of the overall project site and 13 acres to the east (within the Otay Crossings onsite open space). Fragmentation and isolation of vernal pools can threaten the important ecological and mutualistic processes that link vernal pools to each other and the surrounding uplands (Service 1998a). Such ecological and mutualistic processes involve insects that pollinate the vernal pools plants and mammals and birds that disperse flora and fauna between vernal pools, including fairy shrimp.

Vernal pool organisms are typically defined by the complex in which they occur, in part because gene flow between complexes appears to be extremely low (Fugate 1993, Davies 1996). Isolation of pools or modification of the natural watershed potentially compromises gene flow, resulting in a loss of genetic variability and an increased susceptibility to extinction and reduced fitness (Bohonak 2005, Soulé 1986). Further, because a large number of endemic species occur within vernal pool complex assemblages due to local adaptations to climate and environmental variables, a high degree of genetic differentiation exists among complex assemblages (Bohonak 2005).

The primary function of Unit 5 is to maintain the ecological distribution and genetic diversity of the species, as well as continuity in the range between the U.S. and Mexico. Impacts to 200 acres of designated critical habitat and the associated PCEs will be offset through the preservation and enhancement of PCEs within 254 acres of designated critical habitat in Subunit 5B (Lonestar Ridge) and 13 acres located in Subunit 5D (Otay Crossings onsite open space).

A minimum of 5.68 acres of vernal pool basin area (PCE 1) will be enhanced and restored within the Lonestar Ridge Conservation Area. In addition, approximately 250 acres of the surrounding upland areas (PCE 2) within the Lonestar Ridge Conservation Area will be enhanced by the removal of non-native grasses and the establishment of native shrubs, grasses, and forbs. Minimal enhancement is proposed for the open space area on Otay Crossings; however, the site will be preserved and managed, thereby preserving the opportunity to enhance the PCEs in the future. Genetic diversity will be maintained through the salvage and translocation of cysts from the project site. Therefore, we expect that the primary functions of Unit 5 will be maintained and enhanced through the proposed preservation, enhancement, and salvage efforts. Table 7 summarizes the extent of critical habitat being conserved by each project and Table 10 summarizes the acreage of basin area to be enhanced and restored by each project within the Lonestar Ridge Conservation Area.

Overall, following project implementation, we expect an increase in the area and function of occupied vernal pool habitat within Unit 5. In particular, the acreage of ponded water (PCE 1) will be more than doubled and the function (e.g., duration of ponding) will be improved through the restoration and enhancement of the vernal pool basins and supporting watersheds (PCE 2)

within critical habit Subunit 5B ( Lonestar Ridge). Subunit 5B where the restoration will occur and Subunit 5D where project impacts will occur are both subunits within overall critical habitat Unit 5.

The increase in PCEs within Subunit 5B will offset the loss in Subunit 5D and ensure that the overall function of Unit 5 is maintained and improved. Furthermore, the Lonestar Ridge Conservation Area is adjacent to an existing Caltrans vernal pool restoration site, which is also within Subunit 5B of designated critical habitat for the San Diego fairy shrimp. Conservation of designated critical habitat at the Lonestar Ridge Conservation Area significantly increases the amount of designated critical habitat for San Diego fairy shrimp that will be assured long-term protection and management. Thus, we conclude that the proposed action, including construction of the SR-11 and the Port of Entry, Otay Crossings, and Otay Business Park projects, will not appreciably diminish the capability of designated critical habitat for the San Diego fairy shrimp to satisfy the requirements essential to the survival and recovery of this species.

#### *Effect on Recovery*

Habitat favorable for vernal pool formation consists of coastal terraces with an underlying iron-silica impervious soil layer or layers with undulating landscapes, where soil mounds are interspersed with basins, swales, and drainages (Service 1998a). The three overlapping project sites support at least 200 acres of habitat favorable for vernal pools. As stated above, approximately 95 to 97 percent of vernal pool habitat within San Diego County has been destroyed; therefore, the loss of remaining habitat that facilitates vernal pool formation will reduce the amount of suitable land available for restoration and re-introduction opportunities of vernal pools, potentially limiting the recovery of listed vernal pool species.

Although the vernal pools on the project sites are highly disturbed, they do support populations of San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp. The site also supports considerable areas of restorable habitat, including at least 1 acre of unoccupied basin area. Unoccupied pools represent restorable habitat for all four species. Thus, the onsite habitat has value to the recovery of vernal pool species because it supports the life cycle functions (e.g., soils, hydrology) of these species in some areas and also contains the appropriate soils needed to restore these critical functions in other areas.

The vernal pool recovery plan has not yet been updated to address and clarify the suite of vernal pool complexes now known to support these four species; therefore, we are evaluating potential impacts to vernal pool complexes occupied by listed vernal pool species on a project-specific basis to determine the impact of the project on the recovery of these species. For complexes that are not identified specifically in the vernal pool recovery plan, such as the complexes on the project site, the Service has supported a conservation strategy<sup>8</sup> that allows impacts to disturbed, unmanaged vernal pools in exchange for preservation, restoration, and management of vernal

---

<sup>8</sup> For other projects using this approach, please refer to the Robinhood Ridge biological opinion (Service 1998b) and California Terraces biological opinion (Service 1997).

pools in a biologically defensible configuration (e.g., substantial connection to biological open space minimizes edge effects) that helps ensure their long-term viability and supports recovery of the species. Because the onsite habitat at the project site is highly disturbed with no management actions in existence or planned, the Service determined that following this same conservation approach would not preclude recovery of the San Diego button-celery, spreading navarretia, San Diego, and Riverside fairy shrimp.

Specifically, to avoid, minimize, and offset the project impacts, including eliminating 200 acres of occupied and restorable habitat (i.e., Salinas clay, Diablo Clay, and Huerhuero soils on Otay Mesa), the project proponent for the Otay Crossings project reduced the project footprint such that some of the restorable vernal pool habitat will be maintained and managed within designated open space at the Otay Crossings project site (Figures 2 and 4). The eastern portion of the site was considered more suitable for restoration and enhancement actions because it is adjacent to undeveloped areas that abut Otay Mountain Wilderness Areas. In addition, significant vernal pool resources will be preserved, restored, and enhanced within the Lonestar Ridge Conservation Area, an area identified in the vernal pool recovery plan as necessary to stabilize San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp. Preservation of the Lonestar Ridge West and East conservation parcels increases the value of the existing conserved habitat in the area. In addition, by eliminating the two permitted development 'bubbles', the configuration of the MSCP preserve is greatly improved (Figure 11).

The proposed restoration and enhancement will be consistent with the vernal pool recovery plan Task 2 (i.e., to reestablish vernal pool habitat to historic structure and composition, and Task 3 (i.e., to rehabilitate and enhance secured vernal pool habitats and their constituent species). The vernal pool recovery plan also emphasizes the need to manage and monitor protected habitat (see Recovery Tasks 4 and 5). Consistent with these tasks, the restoration and enhancement areas will be preserved and managed in perpetuity by a natural lands manager after the initial installation and 5-year monitoring period. The project is expected to result in a net increase in the acreage and quality of vernal pool habitat occupied by San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp on Otay Mesa. Thus, the life cycle functions (e.g., soils, hydrology) of the existing onsite habitat to the four listed vernal pool species will be replaced and improved, and the overall project will be consistent with the habitat protection and management goals outlined in the vernal pool recovery plan for these species.

## **Quino Checkerspot Butterfly**

### *Direct Effects*

Implementation of the three overlapping projects will impact approximately 450 acres of suitable habitat for the Quino checkerspot butterfly (see Table 2). This is likely an overestimate of the occupied habitat on site since most of the impact area is low quality and only a small number of individual Quino checkerspot butterflies have been observed on the project sites.

Quantifying the number of Quino checkerspot butterflies within the project impact areas is difficult for a number of reasons. The exact distribution and population size is difficult to estimate due to the fluctuations in population numbers from year to year in response to weather patterns and other biotic and abiotic factors. Furthermore, the species is hard to detect due to its small body size and diapause life stage. Due to these constraints, the precise number of Quino checkerspot butterfly that may be supported within the project areas is not known. As discussed above in the *Environmental Baseline* section, multiple surveys for this species have been completed for the Quino checkerspot butterfly (Table 5); however, butterflies have only been observed in 2001 (three butterflies) and 2005 (one butterfly) within the project footprints. Nonetheless, butterflies may occasionally occupy the site given its proximity to high quality occupied habitat; therefore, we anticipate that some individual Quino checkerspot butterfly eggs, larvae, and pupae will be crushed as a result of vegetation clearing and grading activities to facilitate construction of the three projects. In addition, any adult Quino checkerspot butterflies supported by the sites (i.e., using available nectar sources and host plants for foraging and reproduction) will be harmed by the habitat loss/degradation caused by the development of the sites.

Impacts to Quino checkerspot butterfly habitat will be offset through the preservation and enhancement of 196 acres of suitable habitat within the Lonestar Ridge Conservation Area and an additional 10 acres of suitable habitat on site at the Otay Crossings project site for a total of 203 acres (Figures 3 and 4). Caltrans will preserve and enhance 87 acres of suitable habitat for the species within the Lonestar Ridge West conservation parcel, and the project proponents for the Otay Business Park will preserve and enhance 69 acres within the Lonestar Ridge East conservation parcels. Otay Crossings will preserve and manage 10 acres on site and enhance an additional 40 acres within the Lonestar Ridge East parcels.

In addition to the preservation and enhancement efforts, all three projects have committed to restore Quino checkerspot butterfly habitat within the Lonestar Ridge Conservation Area. The goal for these restoration efforts is to preserve existing stands of the native flora important to the butterfly (host plants and adult nectar sources), seed the sites with additional native host plants and nectar plants, and control nonnative plant species growth and reproduction so that non-native species do not out-compete native flora. The project proponents for the SR-11 and Port of Entry project will establish 17 focused planting areas<sup>9</sup> for the butterfly within their restoration site as well as control the non-native grasses on site. The project proponents for the Otay Crossings project will focus their efforts within a 5-acre area on one of their Lonestar Ridge East conservation parcels adjacent to an area where the Quino checkerspot butterfly has been observed in the past. The project proponents for the Otay Business Park will establish six focused planting areas within their Lonestar Ridge East conservation parcels.

---

<sup>9</sup> Focused planting areas are approximately 30 feet in diameter, will have compacted soils that retard the invasion of weeds and allow for Quino checkerspot butterfly basking areas, and are heavily seeded to have large amounts of host and nectar plants for the butterfly.

Restoration of Quino checkerspot butterfly habitat is still experimental. We have only a few sites that have attempted to restore habitat for the butterfly, and no restoration sites that have been subsequently occupied by butterflies. Nonetheless, we believe that the revegetation program has a high potential to successfully restore or create habitat suitable for Quino checkerspot butterfly and thus, over the long term, will possibly increase the extent of suitable habitat for the species within the Lonestar Ridge Conservation Area and onsite at the Otay Crossing project site. The three restoration projects will benefit from the lessons learned by Caltrans on their adjacent SR-125 restoration site regarding techniques that were successful and those that were not successful. In addition, several ongoing research projects are being conducted in San Diego to test different methods of controlling weeds and enhancing habitat for the Quino checkerspot butterfly. Preliminary results from these studies should be available before the restoration work is complete.

Similar to the restoration efforts for the vernal pool species, restoration of Quino checkerspot butterfly habitat has the potential to affect individual butterflies occupying the proposed restoration sites. Quino checkerspot butterflies have not been observed within the Lonestar Ridge Conservation Area since 2004 (HELIX 2004), when butterflies were observed on the Caltrans-owned Lonestar Ridge West conservation parcel and on the Lonestar Ridge East conservation parcels purchased by the project proponents for the Otay Crossing project. During subsequent surveys, no individuals were observed (HELIX 2005b; 2005c; 2006b; 2006c; 2007a; 2007b; Caltrans 2011); however, the butterflies are difficult to detect when they occur in low numbers. Therefore, there is a small likelihood that Quino checkerspot butterflies may inhabit the proposed restoration areas.

To verify the absence of the Quino checkerspot butterfly from the restoration areas within the Lonestar Ridge West conservation parcel, Caltrans will conduct preconstruction surveys for this species prior to initiating any ground disturbing activities. In addition, beginning the first spring following restoration implementation and occurring each consecutive year thereafter during the 5 years of restoration monitoring, Caltrans will conduct protocol level surveys for adult Quino checkerspot butterflies at the Lonestar Ridge West restoration site.

In the event Quino checkerspot butterfly adults are observed at the restoration sites within the Lonestar Ridge West conservation parcel during the restoration monitoring period, Caltrans will initiate cluster webbing surveys for pre-diapause Quino checkerspot butterfly larvae at both the Quino checkerspot butterfly and vernal pool restoration areas 4 weeks after the first reported adult is observed (per the Service website for Quino protocol level surveying). These pre-diapause surveys will be conducted once a week for 4 weeks. To avoid potential impact to Quino checkerspot larvae, areas where webbing is detected will be flagged, and only hand weeding will occur within 30 feet of the flagging. In addition, the Lonestar Ridge West restoration site will be monitored for post-diapause Quino checkerspot butterfly caterpillars (i.e., larvae) by an experienced Service-approved biologist. The monitoring will occur at the initiation of weeding during the post-diapause season. If Quino checkerspot butterfly caterpillars are detected, the biologist will assist weed control crews with caterpillar detection. Crews will look

for caterpillars while weeding and will avoid trampling caterpillars or dot-seed plantain plants. Areas where Quino checkerspot butterfly caterpillars are detected will be flagged, and only hand weeding will occur within 100 feet of the flagging. In addition, all personnel conducting restoration activities will be trained by a Service-approved biologist to recognize Quino checkerspot butterfly caterpillars. The Service-approved biologist will be on site during all weeding operations to assist weed control crew with Quino checkerspot butterfly caterpillar identification. Because most of the restoration site is likely unsuitable habitat for the Quino checkerspot butterfly and avoidance measures will be implemented in the event the species is detected, the restoration activities are not expected to result in the death or injury of individual Quino checkerspot butterfly.

Although nectar and host plants for the Quino checkerspot butterfly are present on the Lonestar Ridge East conservation parcels, these areas are dominated by non-native grasslands, and there are no available Quino checkerspot butterfly surveys that document the species presence within these areas. Thus, the restoration activities conducted by the project proponents for Otay Crossings and Otay Business Park within the Lonestar East conservation parcels are not expected to impact Quino checkerspot butterfly.

#### *Indirect Effects*

Indirect effects to Quino checkerspot butterfly from construction activities may include fugitive dust and the introduction of non-native plant species. The prevailing winds blow from the west, thus any indirect effects associated with increased dust and non-native plant introductions will most likely occur on the habitat to be conserved on the eastern edge of Otay Crossings and on the higher quality habitat located on the lower slopes of Otay Mountain.

Fugitive dust produced by construction could disperse onto native vegetation, including nectar resources and larval host plant for the Quino checkerspot butterfly, which may reduce the overall vigor of individual plants by reducing their photosynthetic capabilities and increasing their susceptibility to pests or disease. This in turn could affect individual Quino checkerspot butterflies dependent on these plants for food and reproduction. To minimize impacts from dust during construction, active construction areas and unpaved surfaces will be sprayed with water in accordance with Conservation Measure 14.

Disturbed areas that are invaded by non-native vegetation can promote the spread of non-native vegetation outside of direct impact areas. Non-native plants have been shown to displace Quino checkerspot butterfly host plants, which appear to be poor competitors against non-native grasses (Service 2003b). In addition to displacing larval host plants, nonnative annuals have been shown to replace nectar sources (Service 2003b). Because nearly all three overlapping project sites and most of the surrounding area is already characterized by non-native grassland, a detectable increase in the spread of non-native species, which can be linked to construction of the three projects, is not anticipated. In addition, the three project proponents have committed to prevent

any Cal-IPC Invasive Plant Inventory species (see Conservation Measure 10) from being used in their landscaping plant palettes.

### *Effect on Recovery*

Plan implementation does not conflict with the goals and objectives of the Quino checkerspot butterfly recovery plan which are to: 1) protect and manage habitat supporting known occurrence complexes and connectivity between them, 2) maintain or create resilient populations, and 3) conduct research. The habitat to be impacted is marginal habitat for Quino checkerspot butterfly, only a few butterflies have been observed in any one survey, and no butterflies were observed during the most recent surveys. Higher quality habitat is being conserved and managed on Otay Mountain and within the Lonestar Ridge Conservation Area, which is consistent with the goals of the recovery plan. Moreover, development of the three projects will have a negligible effect on the distribution of habitat that supports Quino checkerspot butterfly occurrence complexes or the viability of local metapopulations.

### **Otay Tarplant Critical Habitat**

The Otay Crossing project site includes 32 acres of designated critical habitat for the Otay tarplant within Subunit 3C, which is one of three subunits included in Unit 3 of the designation. None of the areas identified as critical habitat on the project site support individuals of the species, although PCEs including appropriate elevation, clay soils, and grassland and open sage scrub habitats are present within portions of the site. All PCEs within approximately 25 acres of the 316-acre subunit will be removed during construction of the Otay Crossings project, which is about 8 percent of Subunit 3C. The impact occurs along the southwest corner of this subunit, contiguous with adjacent development along this subunit's western border. Thus, while the loss of 25 more acres of this subunit reduces the overall area remaining to about 236 acres, this impact will not further fragment the overall subunit. In addition, 7 acres of the subunit will be conserved within the onsite open space, which will provide at least some buffer between the Otay Crossing development and the remaining central and eastern portions of the subunit. Designated critical habitat for Otay tarplant includes 6,330 acres of which 2,250 acres is located within Unit 3. Therefore, the loss of 25 acres represents 0.4 percent of the original designation and about 1 percent of Unit 3.

Critical habitat was designated for Otay tarplant using a 100-meter UTM grid. The use of a grid and the mapping scale used to define critical habitat for Otay tarplant captures some areas not essential to the conservation of the species. Some of the acreage to be impacted by the Otay Crossings project fall into this category as they are located in the outermost corner of Unit 3 and include areas that do not contain PCEs (e.g., drainages). As stated above, under the *Status of the Species* section of this biological opinion, Unit 3 was designated because it contains multiple large Otay tarplant populations that are capable of producing large numbers of individuals in good years. Due to the small extent and location of the impact at the edge of the unit and because no known "large populations capable of producing large numbers of individuals" will be impacted by development of the Otay Crossings project, the loss of PCEs within up to 25 acres of Otay tarplant

designated critical habitat will not appreciably diminish the role or function of Unit 3, or the overall critical habitat designation, to support recovery of the Otay tarplant.

The Lonestar Ridge East conservation parcels, including areas along Johnson Canyon and the portion of the site acquired by the Otay Crossings project, support suitable habitat for Otay tarplant. While these areas are not designated critical habitat for Otay tarplant, they provide the essential habitat features necessary to support the species, as evidenced by the major occurrence of this plant within the 23-acre area of conserved lands (Figure 3) that are contiguous with Otay Crossings Lonestar Ridge East parcels. The conservation and long-term management of these areas will more than offset the small loss of designated critical habitat for the Otay tarplant within subunit 3C.

## 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. We are unaware of any future non-Federal actions that are reasonably certain to occur within the action area and may affect the San Diego button-celery, spreading navarretia, Riverside fairy shrimp, San Diego and its designated critical habitat, Quino checkerspot butterfly, or designated critical habitat for Otay tarplant.

## CONCLUSION

After reviewing the current status of the San Diego button-celery, spreading navarretia, Riverside fairy shrimp, San Diego fairy shrimp and its designated critical habitat, Quino checkerspot butterfly, and designated critical habitat for the Otay tarplant; the environmental baseline for the action area; effects of the proposed action; and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the San Diego button-celery, spreading navarretia, San Diego fairy shrimp, Riverside fairy shrimp, or Quino checkerspot butterfly and is not likely to result in the destruction or adverse modification of designated critical habitat for the San Diego fairy shrimp or Otay tarplant. We reached these conclusions by considering the following:

### All Species

- Adverse effects to all federally listed species will be reduced with implementation of the avoidance and minimization measures identified in the *Project Description* section of this biological opinion.

- With implementation of the proposed conservation measures, project-related impacts to federally listed species will be fully offset by conservation and restoration consistent with the recovery goals of the species.
- Conservation of approximately 100 acres of lands previously authorized for development will increase the size of the MSCP preserve thereby supporting recovery of the federally listed species addressed in this biological opinion.

### **Vernal Pool Species and San Diego Fairy Shrimp Critical Habitat**

- All of the individual pools to be impacted are highly degraded and subject to ongoing threats due to lack of management.
- The loss of 0.19 acre of basin area, including 1 pool occupied by San Diego button-celery, spreading navarretia, and San Diego fairy shrimp, 10 pools occupied just by San Diego fairy shrimp, 2 pools occupied by Riverside fairy shrimp, and 3 pools occupied by both San Diego and Riverside fairy shrimp, will be offset through preservation, restoration, enhancement and perpetual management of 5.68 acres of vernal pool basin area within the 334-acre Lonestar Ridge Conservation Area. Approximately 1.66 acres and 0.28 acre of the restored and enhanced vernal pools will support San Diego fairy shrimp and Riverside fairy shrimp, respectively. In addition 56 basins will be seeded with San Diego button celery and 2 basins will be seeded with spreading navarretia. This action is expected to result in over seven times the amount of San Diego fairy shrimp and Riverside fairy shrimp vernal pool habitat being impacted.
- The restoration and enhancement actions proposed are expected to be successful because the restoration/enhancement will be implemented in an area that likely supported vernal pools historically (soil types necessary to sustain vernal pool habitat are present) and the methods proposed for this restoration/enhancement effort have been successful on an adjacent site.
- The conservation anticipated by the three projects support recovery of the San Diego button-celery, spreading navarretia, San Diego fairy shrimp, and Riverside fairy shrimp because it is consistent with the overall habitat protection and management goals outlined in the vernal pool recovery plan (Service 1998a); specifically, the project is expected to result in a net increase in the acreage and quality of the vernal pools occupied by these four species on Otay Mesa through the preservation, restoration, enhancement, and management of a total of 5.6 acres of vernal pools within the Lonestar Ridge Conservation Area in a configuration that maintains habitat function and species viability.
- Development of the three overlapping projects will result in the loss of PCEs within 200 acres or 83 percent of Subunit 5D of designated critical habitat for San Diego fairy shrimp; however, 254 acres of designated critical habitat for San Diego fairy shrimp

within Subunit 5B will be preserved in perpetuity at the Lonestar Ridge Conservation Area where PCEs will be enhanced and managed. In addition, 13 acres of designated critical for San Diego fairy shrimp within Subunit 5D will be preserved within the Otay Crossing's onsite open space.

- The Lonestar Ridge Conservation Area is adjacent to an existing Caltrans vernal pool restoration site, which is also within Subunit 5B of designated critical habitat for the San Diego fairy shrimp; thus, the conservation of designated critical habitat at the Lonestar Ridge Conservation Area significantly increases the amount of designated critical habitat for San Diego fairy shrimp that will be assured long-term protection and management.
- Because the loss of 200 acres of San Diego fairy shrimp designated critical habitat within critical habitat Unit 5 (1,634 acres) will be fully offset by conservation efforts with a high success of improving the overall status of the species, this loss is not expected to appreciably diminish the role or function of the overall critical habitat designation (2,931 acres) to support recovery of the San Diego fairy shrimp.

### **Quino Checkerspot Butterfly**

- Relatively few Quino checkerspot butterflies have been observed on the three project sites, which constitute a very small portion of the rangewide distribution of the species.
- Nectar resources and larval host plants will be enhanced and managed within the Lonestar Ridge Conservation Area.
- The proposed conservation measures will minimize potential direct and indirect impacts to Quino checkerspot butterfly and help protect habitat within the Lonestar Ridge Conservation Area that may be important to regional metapopulation dynamics and recovery of the species.

### **Otay Tarplant Critical Habitat**

- The loss of 25 acres of designated critical habitat for the Otay tarplant within Unit 3 (2,250 acres) will be offset by the conservation of areas supporting the essential habitat features necessary to support the species; thus, this small loss of designated critical habitat is not expected to appreciably diminish the role or function of the overall critical habitat to support recovery of the Otay tarplant.

### **INCIDENTAL TAKE STATEMENT**

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage

in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Corps, FHWA, and/or the Applicants (i.e., Caltrans; Otay Crossings Commerce Park, LLC; or Otay Business Park, LLC) in order for the exemption in section 7(o)(2) to apply. FHWA has the continuing duty to regulate the SR-11 and Port of Entry activity that is covered by this incidental take statement. The Corps has the continuing duty to regulate the Otay Crossings and Otay Business Park project activities that are covered by this incidental take statement. If the Corps or FHWA, as specified above for the individual projects, or the Applicant for each project (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

To monitor the impact of incidental take, the Corps or FHWA, as specified above for the individual projects, or the Applicant for each project must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

#### AMOUNT OR EXTENT OF TAKE

##### **San Diego and Riverside Fairy Shrimp**

It is not possible to determine the precise number of San Diego or Riverside fairy shrimp that will be impacted by the proposed project. The exact population size of fairy shrimp species is difficult to estimate due to the dynamic conditions associated with their habitat. The reproductive success of fairy shrimp is dependent on seasonal fluctuations in their habitat, such as presence or absence of water during specific times of the year, duration of inundation, and other environmental factors that likely include specific salinity, conductivity, dissolved solids, and pH levels. Therefore, the population of fairy shrimp in any given pool varies dramatically.

We anticipate that San Diego fairy shrimp and Riverside fairy shrimp cysts in vernal pool habitat within the project footprint of Otay Crossings and Otay Business Park will be taken in the form of harm by grading, excavating, and filling the basins they occupy and their watersheds. We

anticipate that some of the translocated cysts will survive in the restored pools, but many will be destroyed during the process of collecting and transferring them to the restored pools. In addition, cysts will be salvaged from pools within the Lonestar Ridge Conservation Area, stored, and re-introduced into restored or enhanced pools. It is anticipated that some cysts will be killed during the salvage and restoration/monitoring effort. Because the precise number of individual San Diego fairy shrimp and Riverside fairy shrimp cysts harmed or killed cannot be determined, take exemptions are set as follows:

#### Project Sites

1. Eleven pools occupied by San Diego fairy shrimp, two pools occupied by Riverside fairy shrimp, and three pools occupied by both species within the Otay Crossings and Otay Business Park project sites will be impacted. The amount or extent of incidental take exempted at the project sites will be exceeded if more than 14 pools (0.337 acre) of occupied San Diego fairy shrimp or 5 pools of occupied Riverside fairy shrimp (0.186 acre) are impacted. These thresholds are further defined for each project as follows:
  - a) The incidental take exemption for the Otay Crossings project will be exceeded if more than one pool [116 square feet (0.003 acre)] supporting both San Diego and Riverside fairy shrimp is impacted.
  - b) The incidental take exemption for Otay Business Park project will be exceeded if more than 13 pools (0.334 acre) occupied by San Diego fairy shrimp or more than 4 pools (0.183 acre) occupied by Riverside fairy shrimp are impacted.

No incidental take of San Diego or Riverside fairy shrimp is anticipated at the project site for the SR-11 and Port of Entry project, and none is exempted;

#### Restoration Site

2. Restoration activities may result in mortality of a small number of cysts within 17 pools that are occupied by San Diego fairy shrimp and one pool that is occupied by Riverside fairy shrimp at Lonestar Ridge Conservation Area. The amount or extent of incidental take at the restoration site will be exceeded if more than 17 pools of occupied San Diego fairy shrimp or 1 pool occupied by Riverside fairy shrimp are recontoured. These take exemptions are further defined for each project as follows:
  - a) The incidental take exemption for the SR-11 and Port of Entry project will be exceeded if more than 14 pools supporting San Diego fairy shrimp or 1 pool supporting Riverside fairy shrimp are impacted.
  - b) The incidental take exemption for Otay Crossings project will be exceeded if more than 4 pools supporting San Diego fairy shrimp are impacted.

- c) The incidental take exemption for the Otay Business Park project will be exceeded if more than 1 pool supporting San Diego fairy shrimp is impacted.

### **Quino Checkerspot Butterfly**

Quantifying the precise number of individual Quino checkerspot butterflies that may be incidentally taken is not possible because the butterfly's small body size and diapause life stage make the observation or detection of mortality highly unlikely and actual numbers and losses of future population cohorts will fluctuate unpredictably in response to weather patterns and other biotic and abiotic factors across the life of the project. Because we cannot provide the precise number of individual Quino checkerspot butterflies that are likely to be taken with implementation of the proposed action, take exemptions are provided as follows:

- 3. Death or injury of Quino checkerspot butterfly eggs, larvae, and pupae from crushing, trampling, or burial during habitat clearing activities within up to 450 acres of Quino checkerspot butterfly habitat during construction of the SR-11 and Port of Entry, Otay Crossings, and Otay Business Park projects; and harm to adult Quino checkerspot butterflies supported within this same 450-acre impact area. The amount or extent of incidental take will be exceeded if more than 450 acres of Quino checkerspot butterfly habitat is impacted during construction of the proposed projects. These take exemptions are further defined for each project as follows:
  - a) The incidental take exemption for SR-11 and the Port of Entry project will be exceeded if more than 175 acres of Quino checkerspot butterfly habitat is impacted.
  - b) The incidental take exemption for the Otay Crossings project will be exceeded if more than 163 acres of Quino checkerspot butterfly habitat is impacted.
  - c) The incidental take exemption for the Otay Business Park project will be exceeded if more than 111 acres of Quino checkerspot butterfly habitat is impacted.

No take of Quino checkerspot butterfly is anticipated in association with restoration activities at the Lonestar Ridge Conservation Area, and none is exempted.

### **EFFECT OF THE TAKE**

In the accompanying biological opinion, the Service determined that this level of take is not likely to result in jeopardy to the San Diego fairy shrimp, Riverside fairy shrimp, or the Quino checkerspot butterfly.

## REASONABLE AND PRUDENT MEASURES

The Corps, FHWA, and/or Applicants will implement numerous conservation measures as part of the proposed action to avoid, minimize, and offset the incidental take of San Diego fairy shrimp, Riverside fairy shrimp, and Quino checkerspot butterfly during construction and implementation of the proposed projects, including during enhancement and restoration activities. Our evaluation of the proposed action is based on the assumption that the actions as set forth in the “Conservation Measures” section of this biological opinion will be implemented. Any changes to the conservation measures proposed by the Corps, FHWA, and/or Applicants, or in the conditions under which project activities were evaluated, may constitute a modification of the proposed action. If this modification causes an effect to the San Diego fairy shrimp, Riverside fairy shrimp, or Quino checkerspot butterfly that was not considered in this biological opinion, reinitiation of formal consultation pursuant to the implementing regulations of section 7(a)(2) of the Act (50 CFR § 402.16) may be warranted. In addition to these conservation measures, the following reasonable and prudent measures are necessary and appropriate to monitor and report the incidental take of San Diego fairy shrimp, Riverside fairy shrimp and Quino checkerspot butterfly to provide a trigger for reinitiation of consultation, if necessary.

1. The Corps or FHWA, as specified above for the individual projects, or Applicant for each project will monitor and report on compliance with the established take exemptions for the San Diego fairy shrimp and Riverside fairy shrimp prior to and following construction impacting occupied pools at the project site.
2. The Corps or FHWA, as specified above for the individual projects or Applicant for each project will monitor and report on compliance with the established take exemptions for the Quino checkerspot butterfly on the Lonestar Ridge East conservation parcels.

## TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Corps, FHWA, and/or the Applicants (project proponents) must comply with the following terms and conditions, which implements the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

- 1.1 If construction of the SR-11 and POE, Otay Crossings Park, or Otay Business Park is not initiated within 2 years of issuance of this biological opinion, the Corps, FHWA and/or Applicants will submit documentation to the Service prior to the initiation of project construction demonstrating that the distribution of San Diego fairy shrimp and Riverside fairy shrimp has not changed from the baseline condition described in this biological opinion (i.e., the number and distribution of pools occupied by San Diego fairy shrimp and Riverside fairy shrimp has not changed).

- 1.2 The Corps, FHWA, and/or Applicants will provide reports to the Service consistent with Conservation Measures 5g documenting the total number and acreage of pools occupied by the San Diego fairy shrimp and Riverside fairy shrimp within the project footprint at the SR-11 and Port of Entry, Otay Crossings Park, and Otay Business Park project sites and demonstrating that authorized impacts to these species were not exceeded.
- 2.1 Prior to initiation of any restoration activities on the Lonestar Ridge East conservation parcels, the Corps and/or the Applicants for the Otay Business Park and Otay Crossings projects will demonstrate that the distribution of Quino checkerspot butterfly has not changed from the condition described in this biological opinion.

### **CONSERVATION RECOMMENDATIONS**

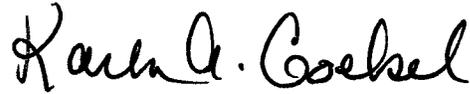
Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We have not identified any conservation recommendations beyond the conservation measures already being implemented by the project proponents that would provide further benefit to the San Diego button-celery, spreading navarretia, San Diego fairy shrimp, Riverside fairy shrimp, or Quino checkerspot butterfly in the action area of the project.

### **REINITIATION NOTICE**

This concludes formal consultation regarding the SR-11 and Port of Entry, Otay Crossings Park, and Otay Business Park projects as outlined in materials submitted to us. 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 retained (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 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 by any one of the three individual projects, the operations of the individual project causing such take must cease pending a determination and discussion between the Service and the responsible federal agency(s) (Corps and/or FHWA) regarding reinitiation.

If you have any questions regarding this biological opinion, please contact Fish and Wildlife Biologist Susan Wynn of this office at 760-431-9440, extension 216.

Sincerely,



Jim A. Bartel  
Field Supervisor

### LITERATURE CITED

- Angelos, M. 2003. Madrona Marsh fairy shrimp report, July 2003. Prepared for the Carlsbad Fish and Wildlife Office: 39.
- Bauder, E.T. 1986. San Diego vernal pools: Recent and projected losses; their condition; and threats to their existence, 1979-1990. Report prepared for Endangered Plant Project, California Department of Fish and Game, Sacramento, California.
- Bauder, E. T. 1987. Threats to San Diego vernal pools and a case study in altered pool hydrology. *In: Conservation and Management of Rare and Endangered Plants*. T. S. Elias (ed.). California Native Plant Society, Sacramento, California : 209-213.
- Bauder, E. T. 2000. Inundation effects on small-scale plant distributions in San Diego, California vernal pools. *Aquatic Ecology*. 34:43 - 61.
- Bauder, E. T. 2005. The effects of an unpredictable precipitation regime on vernal pool hydrology. *Freshwater Biology*. 50: 2129-2135.
- Bauder E.T., J. Snapp-Cook J. and J. Sakrison. 2002. A study of *Agrostis avenacea* in vernal pools on Marine Corps Air Station Miramar, San Diego, California. Final report to Southwest Division, Naval Facilities Engineering Command, San Diego, CA.
- Beauchamp, M. L. and T. Cass. 1979. San Diego Vernal Pool Survey. California Department of Fish and Game Non-Game Wildlife Investigations. Endangered Plant Program 145, Job 1-10.
- Black, C. H. 2000a. Restoration and Enhancement of the Vernal Pools at the AA4-7, F (north), F16, U15, and U19 Vernal Pool Groups at Marine Corps Air Station Miramar. Contract N68711-97-M-4004, Final Implementation Report. Ecological Restoration Service, San Diego, California.
- Black, C. H. 2000b. Restoration and Enhancement of the Vernal Pools at the 2/X1-4, 3Z1-3, 8/EE1, and 8/HH3+ Vernal Pool Groups at Marine Corps Air Station Miramar. Contract N68711-97-M-4005, Final Implementation Report. Ecological Restoration Service, San Diego, California.
- Black, C. H. 2004a. Vernal pool delineation, rare plant and fairy shrimp survey reports on Miramar vernal pools, 2000-2001 through 2002-03 seasons, comprehensive findings. Ecological Restoration Service, San Diego, California.
- Black, C. H. 2004b. Focused sampling for listed Branchiopod species at three sites in Riverside County.

- Black, C. H. 2004c. Dry sampling of vernal pools on Cocklebur Mesa, Camp Pendleton, California, for fairy shrimp cyst presence: September 2004. Contract No. N68711-98-LT-80050. Draft report.
- Black, C.H. 2007. Vernal pool regulatory surveys, Marine Corps air station Miramar, San Diego, California. Ecological Restoration Service, San Diego, California.
- Bohonak, A. J. 2005. MSCP vernal pool inventory City of San Diego (USFWS) conservation genetics of the endangered fairy shrimp species *Branchinecta sandiegonensis*. August 12, 2005.
- Bowman, R. H. 1973. Soil survey of San Diego Area, California. USDA. Soil Conserv. Serv., Washington, DC. 104 pp. + Appendices.
- Bramlet, D. 1993. Plant Species of Special Concern in the Alkaline Sinks of the San Jacinto River and Old Salt Creek Tributary Area. Unpublished.
- Branchiopod Research Group 1996. The Vernal Pool Faunal Survey Naval Air Station Miramar 1996. University of San Diego, San Diego, California.
- Brown, J. 1991. Sensitive and Declining Butterfly Species (Insecta: Lepidoptera) in San Diego County, California. Dudek and Associates, Encinitas, California.
- Brown, J. W., H. A. Wier, and D. Belk. 1993. New records of fairy shrimp (Crustacea: Anostraca) from Baja California, Mexico. *Southwestern Naturalist*. 38(4):389-390.
- California Department of Transportation (Caltrans). 2011. Lonestar Ridge Habitat Restoration Plan.
- California Natural Diversity Database (CNDDDB). 1999. *Navarretia fossalis*, unpublished report, Natural Heritage Division, California Department of Fish and Game, Sacramento, California.
- Cayan, D., M. Dettinger, I. Stewart, and N. Knowles. 2005. Recent changes towards earlier springs: early signs of climate warming in western North America? U.S. Geological Survey, Scripps Institution of Oceanography, La Jolla, California.
- Center for Natural Lands Management (CNLM). 2006. Annual report for the fiscal year 2005 (October 2004 - September 2005) on the Barry Jones Wetlands Mitigation Bank (S028 Skunk Hollow). Prepared for U.S. Fish and Wildlife Service and California Department of Fish and Game.

City of San Diego. 1997. Multiple Species Conservation Program – City of San Diego Subarea Plan.

City of San Diego. 2004. Vernal pool inventory 2002-2003. Planning Department, City of San Diego, California.

Collie, N. and E. W. Lathrop. 1976. Chemical characteristics of the standing water of a vernal pool on the San Rosa Plateau, Riverside County, California. In: S. Jain (ed.), *Vernal pools: Their ecology and conservation*. University of California, Davis, Institute of Ecology Publication, No. 9, Davis, California: 27-31.

Constance, L. 1993. Apiaceae in The Jepson Manual, Higher Plants of California, J. C. Hickman, ed., University of California Press, Berkeley, California.

County of San Diego 1997. Multiple Species Conservation Program – County of San Diego Subarea Plan.

Davies, C. P. 1996. Population genetic structure of a California endemic Branchiopod, *Branchinecta sandiegonensis*. Masters Thesis, University of San Diego. San Diego, California: 92.

Day, A. G. 1993. *Navarretia* in The Jepson Manual, Higher Plants of California, J. C. Hickman, ed., University of California Press, Berkeley, California.

Dudek & Associates, Inc. 1992. Report on the flora of the Otay Ranch vernal pools, 1990-1991, San Diego County, California. Prepared for Baldwin Vista Associates. March 12.

Dudek & Associates, Inc. 1998. Presence/absence survey for vernal pool branchiopods – Poinsettia Shores, San Diego, California.

Dudek & Associates, Inc. 2001a. Wet season presence/absence survey for vernal pool branchiopods for the San Juan Creek/San Mateo Creek SAMP, Orange County, California.

Dudek & Associates, Inc. 2001b. 45-day report for the State Route 125 Quino checkerspot butterfly and vernal pool mitigation site, Quino checkerspot butterfly survey, City of San Diego, California.

EDAW, Inc. 2005. Final Fifth Year Maintenance and Monitoring Report for the A4, AA8, AA9, and AA10 Vernal Pool Groups at Marine Corps Air Station Miramar. Navy Contract #N68711-99-C-6650. Prepared for MCAS Miramar and Southwest Division, Naval Facilities Engineering Command, San Diego, California.

EDAW, Inc. 2010. Year 5 Monitoring Report for the State Route 125 South Vernal Pool and Quino Checkerspot Butterfly Habitat Restoration Site (November 2009 – October 2010). December 2010.

Eng, L. L., D. Belk, and C. H. Eriksen. 1990. California Anostraca: distribution, habitat and status. *Journal of Crustacean Biology* 10:247-277.

Eriksen, C. 1988. Letter to the Service reporting the occurrence of Riverside fairy shrimp in the Field Pool in Riverside County.

Eriksen, C. and D. Belk. 1999. Fairy Shrimps of California's Puddles, Pools, and Playas. Mad River Press, Inc., Eureka, California.

Erlich, P. R. and D. D. Murphy. 1987. Conservation lessons from long-term studies of checkerspot butterflies. *Conservation Biology* 1: 122-131.

Field, C.B., G.C. Daily, F.W. Davis, S. Gaines, P.A. Matson, J. Melack, and N.L. Miller. 1999. Confronting Climate Change in California. Ecological Impacts on the Golden State. A Report of the Union of Concerned Scientists and the Ecological Society of America. 62 pages.

Fugate, M. 1993. *Branchinecta sandiegonensis*, a new species of fairy shrimp (Crustacea: Anostraca) from western North America. *Proceedings of the Biological Society of Washington* 106: 296-304.

Glenn Lukos Associates. 1997. Results of dry- and wet-season surveys fairy shrimp surveys for Live Oak Plaza, Orange County, California.

Glenn Lukos Associates. 2001. Results of wet-season surveys for the federally listed endangered Riverside fairy shrimp, Tijeras Creek Park Site, Orange County, California.

Glenn Lukos Associates. 2004. Results of dry-season and wet season fairy shrimp surveys for Mystery Mesa, Los Angeles County, California.

Glenn Lukos Associates. 2005. Fourth and Fifth Annual Monitoring Report for Impacts to Areas Within the Jurisdiction of the United States Army Corps of Engineers Pursuant to Section 404 of the Clean Water Act and Pursuant to the Federal Endangered Species Act, San Diego Spectrum, San Diego California. Dated August 26, 2005.

Gonzalez, R. J., J. Drazen, S. Hathaway, B. Bauer, and M. Simovich. 1996. Physiological correlates of water chemistry requirements in fairy shrimps (Anostraca) from southern California. *Journal of Crustacean Biology* 16:315-322.

Hairston, Jr., N. G. and B. T. De Stasio. 1988. Rate of evolution slowed by a dormant propagule pool. *Nature* 336:239-242.

Harrison, S. 1989. Long-distance dispersal and colonization in the bay checkerspot butterfly, *Euphydryas editha bayensis*. *Ecology* 70:1236-1243.

Harrison, S., D. D. Murphy, and P. R. Erlich. 1988. Distribution of the bay checkerspot butterfly, *Euphydryas editha bayensis*: Evidence for a metapopulation model. *American Naturalist* 132: 360-382.

Hathaway, S. A. and M. A. Simovich. 1996. Factors affecting the distribution and co-occurrence of two southern California anostracans (Branchiopoda), *Branchinecta sandiegonensis* and *Streptocephalus woottoni*. *Journal of Crustacean Biology* 16(4):669-677.

Hayworth, A. 1998. Presence/Absence Survey for Vernal Pool Branchiopods for the Scheluniger Property, County of Riverside, California.

HELIX Environmental Planning, Inc. 2000. 2000 Annual report U.S. Fish and Wildlife Service protocol level dry season survey for San Diego and Riverside fairy shrimp (*Branchinecta sandiegonensis* and *Streptocephalus woottoni*).

HELIX Environmental Planning, Inc. 2002. 2002 Annual report U.S. Fish and Wildlife Service protocol level dry season survey for San Diego and Riverside fairy shrimp (*Branchinecta sandiegonensis* and *Streptocephalus woottoni*).

HELIX Environmental Planning, Inc. 2003. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium Project Site. May.

HELIX Environmental Planning, Inc. 2004. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium Project Site. May.

HELIX Environmental Planning, Inc. 2005a. 2005 Annual report U.S. Fish and Wildlife Service protocol level wet season survey for San Diego and Riverside fairy shrimp (*Branchinecta sandiegonensis* and *Streptocephalus woottoni*). Prepared for Former Marine Corps Air Station El Toro Site 1 Explosive Ordnance Disposal (EOD) Training Range, Marine Corps Air Station, California.

HELIX Environmental Planning, Inc. 2005b. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (150-acre Open Space) Project Site. May 23.

HELIX Environmental Planning, Inc. 2005c. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (220-acre Impact Area) Project Site. May 23.

HELIX Environmental Planning, Inc. 2006a. Wet season survey report for Riverside fairy shrimp for Warm Springs Ranch property.

HELIX Environmental Planning, Inc. 2006b. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (150-acre Open Space) Project Site. May.

HELIX Environmental Planning, Inc. 2006c. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (170-acre Development Area) Project Site. May.

HELIX Environmental Planning, Inc. 2007a. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (143-acre Open Space) Project Site. May.

HELIX Environmental Planning, Inc. 2007b. U.S. Fish and Wildlife Service protocol level presence/absence survey report for the Quino checkerspot butterfly (*Euphydryas editha Quino*). Prepared for New Millennium (170-acre Development Area) Project Site. May.

HELIX Environmental Planning, Inc. 2008a. U.S. Fish and Wildlife wet season protocol level survey for San Diego and Riverside fairy shrimp (*Branchinecta sandiegonensis* and *Streptocephalus woottoni*). Lonestar Ridge.

HELIX Environmental Planning, Inc. 2008b. O'Neal Canyon Protocol Level Presence/Absence Surveys for the Quino Checkerspot Butterfly (*Euphydryas editha quino*). For U.S. Fish and Wildlife Service. May 13.

HELIX Environmental Planning, Inc. 2009. Biological Technical Report of Lonestar Industrial Park. May 22.

HELIX Environmental Planning, Inc. 2010a. Biological Technical Report for Otay Crossings Commerce Park. October 2.

HELIX Environmental Planning, Inc. 2010b. Biological Technical Report for Otay Business Park.

HELIX Environmental Planning, Inc. 2010c. Tier II Natural Environmental Study for State Route 11 and Otay Mesa Port of Entry. August.

- HELIX Environmental Planning, Inc. 2010d. Onsite Revegetation Plan for Otay Crossings Commerce Park. March 10.
- HELIX Environmental Planning, Inc. 2010e. Offsite Vernal Pool Revegetation Plan for Otay Crossings Commerce Park. October 2.
- HELIX Environmental Planning, Inc. 2010f. Quino Checkerspot Butterfly and Burrowing Owl Mitigation Plan for Otay Crossings Commerce Park.
- HELIX Environmental Planning, Inc. 2011. Otay Business Park vernal pool preserve restoration plan. October 17, 2011.
- Herzig, A. 1985. Resting eggs-a significant stage in the life cycle of crustaceans *Leptodora kindti* and *Bythotrephes longimanus*. *Verhandlungen der Internationalen Vereinigung für theoretische und angewandte Limnologie* 22:3088-3098.
- Holland, R. F. 1976. The vegetation of vernal pools: A survey. In: S. Jain (ed.), *Vernal pools: Their Ecology and Conservation*. University of California, Davis, Institute of Ecology Davis, California: 9
- Holland, R. F. 1988. Vernal pools. In: M.G. Barbour and J. Major (eds.). *Terrestrial vegetation of California*. California Native Plant. Soc., Special Pub. # 9.
- Holland, R. F. and S. Jain. 1977. Vernal pools. In: M. G. Barbour and J. Major (eds.), *Terrestrial Vegetation of California*. John Wiley and Sons, New York
- Holland, R. F. and S. Jain. 1988. Vernal pools. In: M.G. Barbour and J. Major (eds), *Terrestrial Vegetation of California*. California Native Plant Society Special Publication Sacramento, California. 9:515-531.
- Holtz, J. 2003. A life history study of the San Diego fairy shrimp (*Branchinecta sandiegonensis*). Master's thesis, University of San Diego.  
<http://www.sandiego.gov/planning/mscp/vpi/pdf/fairyshrimpreport.pdf>.
- [IPCC] Intergovernmental Panel on Climate Change. 2007. Climate change 2007: the physical science basis. Summary for policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC Secretariat, World Meteorological Organization and United Nations Environment Programme, Geneva, Switzerland.

- Keeler-Wolf, T., D. R. Elam, K. Lewis, and S. A. Flint. 1998. California vernal pool assessment. Preliminary report. California Department of Fish and Game. Wetlands Inventory and Conservation Unit, Sacramento, California.  
<http://www.dfg.ca.gov/biogeodata/wetlands/pdfs/VernalPoolAssessmentPreliminaryReport.pdf>.
- Keeley, J. E. 1998. CAM photosynthesis in submerged aquatic plants. *Botanical Review* 64:121-175.
- Marine Corps Air Station Miramar. 2006. Vernal pool GIS data for MCAS Miramar provided to Carlsbad Fish and Wildlife Office in 2007; Carlsbad, California.
- Mattoni, R. and T. R. Longcore. 1997. Down memory lane: The Los Angeles coastal prairie, a vanished community. *Crossosoma* 23(2):71-102.
- Mattoni, R., G. F. Pratt, T. R. Longcore, J. F. Emmel, and J. N. George. 1997. The endangered Quino checkerspot, *Euphydryas editha quino* (Lepidoptera: Nymphalidae). *Journal of Research on the Lepidoptera* 34: 99-118.
- MCB Camp Pendleton (MCBCP). 2007. Marine Corps Integrated Natural Resources Management Plan. U.S. Marine Corps Base, Camp Pendleton, California.
- Michael Brandman Associates, Inc. 2006. Riverside fairy shrimp surveys prepared for Granite Homes Garbani Property, TTN 28206, 81.4-acre, Menifee Area, March.
- Moran, R. 1977. New or Renovated Polemoniaceae from Baja California, Mexico (*Ipomopsis*, *Linanthus*, *Navarretia*). *Madroño* 24: 141-159.
- Mountains Recreation and Conservation Authority. 2006. Fifth annual monitoring report Tierra Rejada Vernal Pool Preserve. Prepared for USFWS, CDFG, and CRWQCB.
- Munz, P.A. 1974. A Flora of Southern California. University of California Press, Berkeley, California.
- Murphy, D. D. and R. R. White. 1984. Rainfall, resources, and dispersal in southern populations of *Euphydryas editha* (Lepidoptera: Nymphalidae). *Pan-Pacific Entomologist* 60: 350-355.
- Myers, E. L. 1975. Seed germination of two vernal pool species: *Dowlingia cuspidate* and *Plagiobothrys leptocladus*. A thesis presented to the faculty of San Diego State University, San Diego, California.

- Neudecker, S. 2003. Partial release of performance guarantee for Redhawk Communities' Incidental Take Permit (TE 051895-0). Letter to K. Goebel, Carlsbad Fish and Wildlife Office, dated March 31, 2003, Carlsbad, California.
- Oberbauer, T. A. 1990. Areas of vegetation communities in San Diego County, Department of Planning and Land Use, County of San Diego, California.
- Oberbauer, T. A. and J. M. Vanderwier. 1991. The vegetation and geologic substrate association and its effect on development in southern California. In: P.L. Abbott and W. J. Elliott (Eds.). Environmental perils San Diego Region. San Diego Association of Geologists.
- Patterson, C. and T. Ayers. 1998. Fairy shrimp surveys at March Air Reserve Base, Riverside County, California. Recon Number 2965B.
- PCR (Planning Consultants Research). 1998. Wetland delineation and vernal pool technical report. Prepared for Southern California Edison, Rosemead, California.
- RECON. 1998. Final first year fairy shrimp survey report for a 60-acre area of the back basin of Lake Elsinore 1997-1998.
- RECON. 2001. Final fairy shrimp survey report: Results of two consecutive years of wet season surveys on Camp Pendleton, California.
- RECON. 2005. Year 5 Annual Report for Dennery Canyon Vernal Pool, Coastal Sage Scrub, and Mule Fat Scrub Restoration and Preservation Plan. September 7.
- RECON. 2007. Results of 2004-2005 vernal pool surveys and summary of available vernal pool data on MCB Camp Pendleton, San Diego, California.
- Reiser, C. 1996. Rare Plants of San Diego County, 1996 edition. Unpublished. Aquafir Press, San Diego, California.
- Riefner, R. E. and D. R. Pryor. 1996. New locations and interpretations of vernal pools in Southern California. *Phytologia*. 80(4):296-327.
- Ripley, B. J., J. Holtz, and M. A. Simovich. 2004. Cyst bank life-history model for a fairy shrimp from ephemeral ponds. *Freshwater Biology*. 49:221-231.
- Roberts, F. 2004. Peer review comments from Fred Roberts, botanist, regarding proposed critical habitat for *Atriplex coronata* var. *notarior* (San Jacinto Valley Crownscale).

- Schaal, B. A. and W. J. Leverich. 1981. The demographic consequences of two-stage life cycles: survivorship and the time of reproduction. *American Naturalist*. 118(1):135-138.
- Schiller, J.R., P.H. Zedler, and C.H. Black. 2000. The effect of density-dependent insect visits, flowering phenology, and plant size on seed set of the endangered vernal pool plant *Pogogyne ambramsii* (Lamiaceae) in natural compared to created vernal pools. *Wetlands* 20:386–396.
- Simovich, M. A. and S. Hathaway. 1997. Diversified bet-hedging as a reproductive strategy of some ephemeral pool anostracans (Branchiopoda). *Journal of Crustacean Biology*. 17(1):38-44
- Soulé, M. E. 1986. *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer and Associates, Inc., Sunderland, Massachusetts: 584.
- Spenser, S. C. and L. H. Rieseberg. 1998. Evolution of amphibious vernal pool specialist annuals: putative vernal pool adaptive traits in *Navarretia* (Polemoniaceae). Pages 76-85 in C. W. Withim et al. (editors), *Ecology, conservation and management of vernal pool ecosystems – proceedings from a 1996 conference*. California Native Plant Society, Sacramento, California.
- Templeton, A. R. and D. A. Levin. 1979. Evolutionary consequences of seed pools. *American Naturalist*. 114(2):232-249.
- Tierra Madre Consultants, Inc. 1992. Eastern Municipal Water District, Hemet-Winchester Interceptor Sewer, Mitigation Plan for Chenopod Scrub and Vernal Pool. Unpublished.
- Thorne, R. F. 1984. Are California's vernal pools unique? In: S. Jain and P. Moyle (eds.), *Vernal Pools and Intermittent Streams*. University of California, Davis Institute of Ecology, Publication No. 28, Davis, California: 1-8
- Thorpe, R. W. 2007. Biology of specialist bees and conservation of showy vernal pool flowers. A review. In: R. A. Schlising and D.G. Alexander (Eds.). *Vernal pool landscapes*. Studies from the Herbarium, # 14. California State University, Chico.
- Tom Dodson & Associates. 2003a. 90-letter report of vernal pool branchiopod sampling at the Rainbow Canyon project in Riverside County, California, conducted under the Endangered Species Act section 10(a)(1)(A), permit # TE-038716-0.
- Tom Dodson & Associates. 2003b. 90-letter report of dry-season vernal pool branchiopod sampling at the Rainbow Canyon project in Riverside County, California, conducted under the Endangered Species Act section 10(a)(1)(A), permit # TE-038716-0.

Urban Vision. 1997. Draft Subsequent Environmental Impact Report No. 566: Saddleback Meadows Recorded Tract Map 10692, Grading Application GA 960048. Prepared for Orange County Planning and Development Services Department.

URS Corporation. 2005. Year 2005 90-day report, vernal pool branchiopod surveys MCB Camp Pendleton, California, URS Project No. 27653033.00060.

U.S. Fish and Wildlife Service. 1997. Biological opinion for Pardee Construction Company, California Terraces and Otay Corporate Center, San Diego County, California (1-6-95-F-35). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service. 1998a. Vernal pools of southern California recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 113+ pp.

U.S. Fish and Wildlife Service. 1998b. Biological opinion for Robinhood Homes residential project, San Diego County, California (1-6-97-F-57). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service. 2003a. Biological opinion for the Highpointe Communities, Clayton Ranch Project, Riverside County, California (FWS-WRIV-2415.5). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service (Service). 2003b. Quino Checkerspot Butterfly (*Euphydryas editha quino*) Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2004a. Biological opinion for State Route 905 extension project, San Diego County, California (1-6-04-F-2296.5). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service. 2004b. Biological opinion for Los Angeles International Airport Master Plan, City of Los Angeles, Los Angeles County, California (FWS-LA-1012.5). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service. 2005. Biological opinion for operations and maintenance activities at Los Angeles International Airport, City of Los Angeles, Los Angeles County, California (FWS-LA-1012.7). On file at U.S. Fish and Wildlife Service Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service (Service). 2008a. San Diego Fairy Shrimp (*Branchinecta sandiegonensis*) 5-year Review: Summary and Evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 56 pp. + Appendices.

U.S. Fish and Wildlife Service. 2008b. Riverside fairy shrimp (*Streptocephalus woottoni*) 5-year review: Summary and evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 57 pp. + Appendices.

U.S. Fish and Wildlife Service. 2009a. Spreading navarretia (*Navarretia fossalis*) 5-year Review: Summary and Evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 59 pp.

U.S. Fish and Wildlife Service (Service). 2009b. Quino checkerspot butterfly (*Euphydryas editha quino*) 5-year review: Summary and evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 54 pp.

U.S. Fish and Wildlife Service. 2010. San Diego button-celery 5 year review: Summary and Evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 43 pp. + Appendices.

Venable, D. L. 1989. Modeling the evolutionary ecology of seed banks. In: M. A. Leck, V. T. Parker, and R. L. Simpson (eds), *Ecology of Soil Seed Banks*. Academic Press, San Diego, California. 67-87.

Weiss, S. B. 1999. Cars, cows, and butterflies: Nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13:1476-1486.

Wegscheider, F. 2004. Notification of presence of a listed species on the Grizzle Ranch Property in Winchester Hills, Riverside County, California.

Wegscheider, F. 2006. Memorandum on the presence of an endangered species at the Pechanga Indian Reservation.

Western Riverside MSHCP. 2003. Species Account; *Eryngium aristulatum* var. *parishii* pp. 47-51. Western Riverside County Multiple Species Habitat Conservation Plan.

Western Riverside County Regional Conservation Authority. 2006. RCA Joint Project Review#05 09 06 03, dated February 6, 2006.

Zedler, P.H. 1987. The ecology of southern California vernal pools: a community profile. U.S. Fish and Wildlife Service. Biol. Report 85(7.11). May. 136 pp.