

VISTA DEL MAR ELEMENTARY VERNAL POOL MITIGATION SITE

Year 4 Annual Report

Prepared for
Michael Baker International

September 23, 2015



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Table of Contents

Vista Del Mar Year 4 Annual Report

	Page
1.0 Introduction	1
1.1 Overview	1
1.2 Purpose	4
1.3 Goals	4
1.4 Project Background	5
1.4.1 Permit Requirements	5
1.4.2 Monitoring Requirements	5
2.0 Methods	8
2.1 Qualitative Monitoring	8
2.2 Quantitative Monitoring	8
2.2.1 Vernal Pool Branchiopod Monitoring	9
2.2.2 Hydrological Monitoring	9
2.2.3 Vernal Pool Vegetation Monitoring	9
2.2.4 Upland Vegetation Monitoring	11
2.3 Vernal Pool CRAM Monitoring	11
3.0 Results	15
3.1 Qualitative Monitoring	15
3.2 Quantitative Monitoring	15
3.2.1 Vernal Pool Branchiopod Monitoring	15
3.2.2 Hydrological Monitoring	17
3.2.3 Vernal Pool Vegetation Monitoring	20
3.2.4 Upland Vegetation Monitoring	22
3.3 Vernal Pool CRAM	22
4.0 Discussion	23
4.1 Vernal Pool Branchiopods	23
4.2 Hydrology	23
4.3 Vernal Pool Vegetation	24
4.4 Upland Vegetation	26
4.5 Conclusions	26
5.0 References	27

Appendices

- A. Vernal Pool Restoration Plan (2011)
- B. Selected Permits and Biological Opinion
- C. J26 Vernal Pool Complex Programmatic Reference Pool Monitoring Protocol
- D. Fairy Shrimp Survey Report
- E. Qualitative Site Photographs
- F. Photodocumentation at Quantitative Vegetation Transects

Figures

Figure 1.	Regional Location	2
Figure 2.	Site Location	3
Figure 3.	Restoration Pools.....	12
Figure 4.	Adjacent (San Ysidro High School) Reference Pools	13
Figure 5.	J26 Reference Pools.....	14
Figure 6.	Fairy Shrimp Occupancy.....	18

Tables

Table 1.	Agency Permit Requirements	5
Table 2.	Summary of Restoration and Monitoring Activities during Reporting Period	6
Table 3.	Fairy Shrimp Survey Results in Restoration Site.....	16
Table 4.	Fairy Shrimp Survey Results in Adjacent (SYHS) Reference Site.....	17
Table 5.	Restoration Site Hydrological Monitoring Results	19
Table 6.	Reference Pool Hydrological Monitoring Results	20
Table 7.	Percent Cover of Vernal Pool Indicator Species	21
Table 8.	Percent Cover of Non-native Species.....	21
Table 9.	Species Richness (Vernal Pool Indicator Species)	21
Table 10.	Upland Vegetation Monitoring Results	22
Table 11.	Vernal Pool Vegetation Monitoring Success Criteria and Performance.....	25
Table 12.	Upland Vegetation Monitoring Success Criteria and Performance	25

1.0 Introduction

1.1 Overview

The construction of the Vista Del Mar Elementary School and associated extension of Del Sol Boulevard on a 20-acre project site in Otay Mesa, California resulted in impacts to 0.02 acre of vernal pool basins and associated federally listed species. To mitigate these impacts, offsite restoration/enhancement¹ and creation² (collectively referred to as “restoration” in this report) of vernal pool habitat was implemented according to a Vernal Pool Restoration Plan (Helix, 2011; as amended by TAIC, 2011; Appendix A), which was approved by the U.S. Fish and Wildlife Service (USFWS) and U.S. Army Corps of Engineers (USACE) on February 2, 2011.

The vernal pool restoration site (restoration site) is located within a 1.05-acre parcel, under the ownership of the City of San Diego (City), that makes up a portion of the City’s Otay Mesa West Preserve—Parcel B in Otay, California (Figure 1), on the east side of Assessor’s Parcel Number 645-061-01-00. It occupies a portion of Section 31 in Township 18 South, Range 1 West of the U.S. Geological Survey 7.5-minute Imperial Beach Quadrangle (Figure 2). The restoration site occurs approximately 2,700 feet south of the Vista Del Mar Elementary School (impact) site on a mesa that is situated between Moody Canyon to the south and the San Diego Gas and Electric substation on Otay Mesa Road to the north. The restoration site historically supported low quality vernal pools that were disturbed by off-road vehicle activity. This area was previously managed by The Environmental Trust (TET), and then deeded to the City after TET declared bankruptcy. The existing Conservation Easement (CE) for the City’s Otay Mesa West Preserve is currently being amended by the USACE and California Department of Fish and Wildlife (CDFW) legal offices to address the restoration site, and the CE will continue to show CDFW as third-party beneficiary.

The total impact to vernal pools from the construction of Vista Del Mar Elementary included the removal of 10 existing vernal pool basins, three of which supported the federally endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*). The USFWS, which regulates impacts to federally listed species, issued a Biological Opinion (BO) in response to impacts to the San Diego fairy shrimp (USFWS, 2011; Appendix B). The BO gave specific guidance regarding the allowable impacts and required mitigation for those impacts. A USACE Section 404 permit (Appendix B) allowing the fill of these vernal pools mirrored the mitigation requirements outlined in the BO, which requires restoration of vernal pools at a 5:1 ratio with at least 16 of 18

¹ Restoration is defined in the Water Quality Certification No. 09C-017 (WDID 9-000001990) as re-establishment and rehabilitation. Re-establishment is the return of natural/historic functions to a site where vegetated or unvegetated waters of the U.S./State previously existed. Rehabilitation is the improvement of the general suite of functions of degraded vegetated or unvegetated waters of the U.S./State. “Enhancement” is defined in the Water Quality Certification as the improvement to one or two functions of existing vegetated or unvegetated waters of the U.S./State.

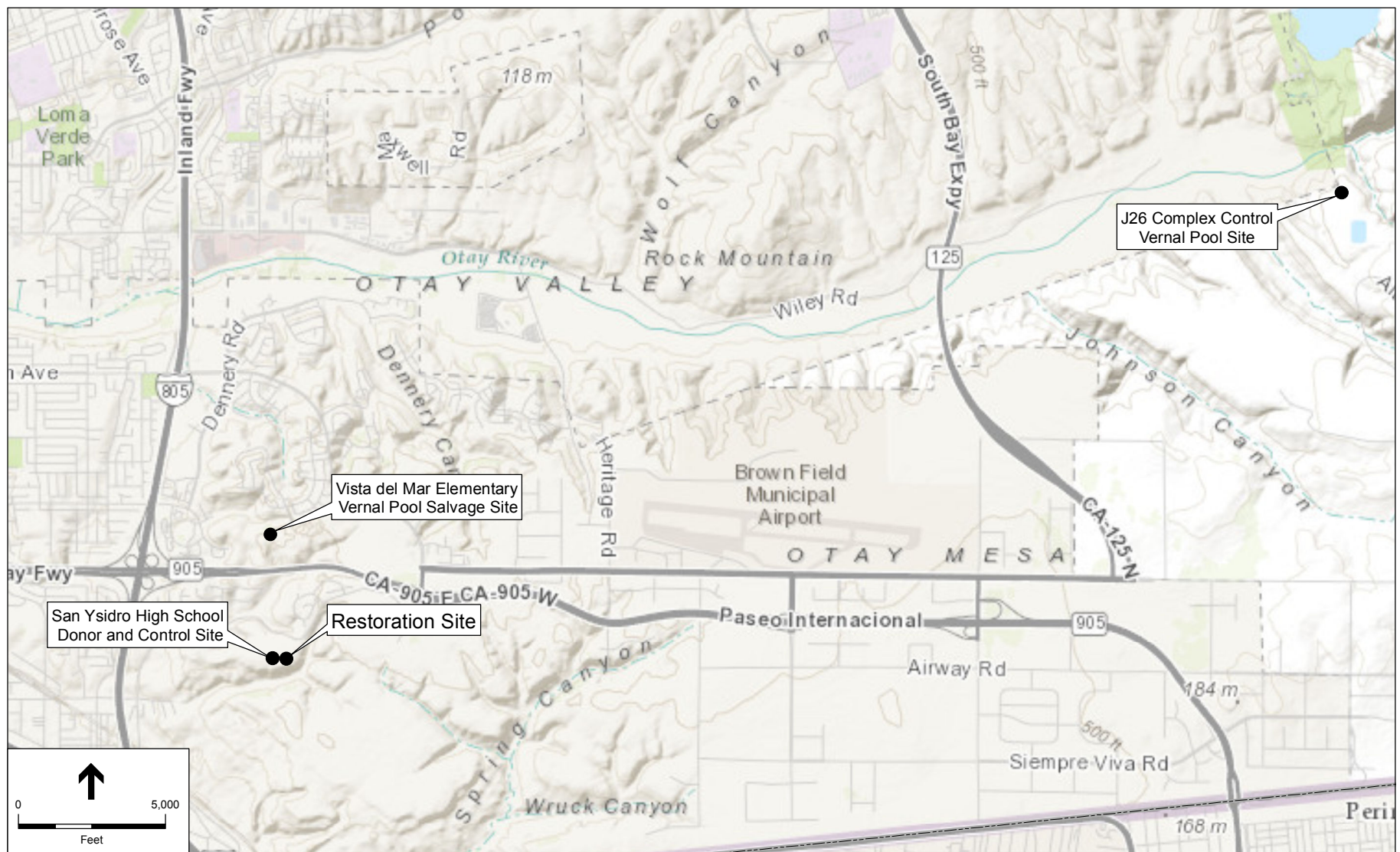
² Also defined as “establishment” in the Water Quality Certification No. 09C-017 (WDID 9-000001990).



SOURCE: Landiscor, 2010; ESRI

Vista Del Mar Elementary School . 211685

Figure 1
Regional Location



SOURCE: USGS; RBF, 2012; ESA, 2013

Vista Del Mar Elementary School . 211685

Figure 2
Site Map

restored (created) pools supporting San Diego fairy shrimp. The Regional Water Quality Control Board (RWQCB) issued a Section 401 Water Quality Certification that is consistent with the USACE's mitigation requirements.

The mitigation effort included the restoration of a vernal pool system which consisted of enhancing 14 existing, degraded pools and creating 18 pools within the single 1.05-acre restoration site. Restoration included inoculum and plant material collection, grading, invasive species control, inoculation with salvaged materials, installation of salvaged plants and seeds, and installation of four artificial burrowing owl (*Athene cunicularia*) burrows, herpetological cover-boards, and bee blocks. Vernal pool inoculum, seeds and plant materials were salvaged from the impact and restoration sites, and collected from both the San Ysidro High School (SYHS) vernal pool site (adjacent to the west side of the restoration site and within the Otay Mesa West Preserve) and a road rut adjacent to the east side of the restoration site.

1.2 Purpose

The purpose of this annual report is to document the post-restoration success of restoration activities to date and to monitor and report on progress towards mitigation goals, as identified in the Vernal Pool Restoration Plan (Helix, 2011; as amended by TAIC, 2011; Appendix A), and specific permit requirements. Annual reports are a requirement of all permits for impacts to vernal pools and vernal pool species.

The vernal pool restoration project is being implemented in compliance with the following regulatory agency authorizations: USACE Permit No. SPL-2009-00028-LLC, the BO (FWS-SDG-09BO258-11F0076), and the RWQCB Water Quality Certification No. 09C-017 (WDID 9-000001990). In accordance with these authorizations, a 1.05-acre vernal pool restoration site has been installed within the City's West Otay Mesa Parcel B Vernal Pool Preserve. Installation was completed on March 23, 2012.

1.3 Goals

Per the Vernal Pool Restoration Plan (Helix, 2011; as amended by TAIC, 2011; Appendix A), the overall goal of this mitigation effort is to increase the functions and services of pre-existing degraded vernal pool habitat and create additional high quality vernal pools to an extent that would, at a minimum, replace the functions and services lost by removal of vernal pools due to construction of Vista Del Mar Elementary School. An additional goal is the restoration of San Diego fairy shrimp habitat at the restoration site. At the conclusion of this five-year restoration effort, it is expected that functions and services (e.g., water filtration, sensitive wildlife and plant habitat) that were being performed by the pre-existing degraded pools prior to restoration would be improved. The condition of the restored vernal pools would be documented by monitoring: (1) fairy shrimp, by wet season sampling, (2) hydrology, (3) surrounding upland vegetation, (4) vernal pool flora, and (5) condition of vernal pool wetlands, by conducting a California Rapid Assessment Method (CRAM) assessment. Specific permit requirements are detailed below.

1.4 Project Background

1.4.1 Permit Requirements

The permitting agencies (i.e., USACE, USFWS, and RWQCB) have included specific criteria which must be met in order for mitigation to be deemed successful. The general mitigation requirements are included in Table 1. Mitigation requirements identified in the Section 404 and 401 permits and the BO, including specific success criteria and required methods, were incorporated into the Vernal Pool Restoration Plan (Helix, 2011; as amended by TAIC, 2011; Appendix A). These permit documents are appended (Appendix B).

Table 1. Agency Permit Requirements

Agency	Permit No.	Impact	Mitigation
USACE	SPL-2009-00028-LLC	Fill of 0.02 acre of vernal pool wetlands (10 vernal pools total).	Enhance 0.218 acre of vernal pool habitat (a total of 32 vernal pools) within a 1.05 acre parcel as described in the final approved HMMP: “ <i>Vista Del Mar Elementary School: Vernal Pool Preserve Restoration Plan</i> ” (dated April 29, 2011, and prepared by HELIX Environmental Planning). The mitigation site shall include a minimum of 16 restored pools, totaling a minimum of 0.10 acre, AND a minimum of 4,455 square feet of the restored pools proposed within the mitigation site shall support San Diego fairy shrimp.
USFWS	FWS-SDG-09B0258-11F0076	Removal of 0.02 acre of San Diego fairy shrimp habitat (10 vernal pools).	Restore and enhance 32 vernal pools with a basin area of 0.218 acre on the 1.05-acre West Otay Mesa B parcel; 0.10 acre of restored and enhanced vernal pool basin must support San Diego fairy shrimp.
RWQCB	Water Quality Certification No. 09C-017	Impact to 0.02 acre of vernal pools.	Mitigate at a 5:1 ratio with at least 0.02 acre of vernal pool restoration (re-establishment) and 0.08 acre of vernal pool restoration and/or enhancement at the West Otay Mesa Parcel B Preserve and as described in <i>Vista Del Mar Elementary School, Vernal Pool Preserve Restoration Plan</i> , February 2, 2011, Helix Environmental Planning, Inc.

1.4.2 Monitoring Requirements

The restoration of the 32 vernal pools on the mitigation site extended from November 2011 through March 2012. The long-term monitoring period began in February 2012 (concurrent with final seeding in order to capture a portion of the 2011/2012 wet season for the purpose of branchiopod sampling). The Year 4 post-restoration monitoring period extends from September 1, 2014 through August 31, 2015; pursuant to USACE Permit No. SPL-2009-00028-LLC (Appendix B).

As identified in the Vernal Pool Restoration Plan (Helix, 2011; as amended by TAIC, 2011; Appendix A), qualitative monitoring and maintenance visits are required monthly during Year 1, every other month during Year 2, and every three months for the remainder of the monitoring

period. Fairy shrimp surveys are required to occur during the wet season for the duration of the monitoring period to determine the presence or absence, as well as population estimates, of San Diego fairy shrimp populations. Additionally, hydrological monitoring is required every other week following rain events to measure depth, extent, and duration of inundation of all restoration site and control pools. Annual monitoring of the upland enhancement, including species cover, richness, and weed cover, is required by qualitative assessment in Years 1 and 2, and by qualitative and quantitative assessment for the remainder of the monitoring period. Table 2 details the restoration and maintenance activities and qualitative and quantitative site visits conducted during the Year 4 monitoring period.

Table 2. Summary of Restoration and Monitoring Activities during Reporting Period

Date	Type¹	Personnel	Notes
9/5/14; 9/18/14; 9/26/15	Qualitative – maintenance visit	D&D Habitat Restoration	Weeded vernal pools and removed native upland plants in pool basins 1-5; watered all areas; hauled debris; spot sprayed for weeds; photos.
10/3/14; 10/13/14; 10/23/14; 10/24/14	Qualitative – maintenance visit	D&D Habitat Restoration	Watered uplands; spot weeded; photos.
11/14/14; 11/17/14; 11/24/15	Qualitative – maintenance visit	D&D Habitat Restoration	Spot weeding; watered uplands; photos.
12/05/14; 12/16/14; 12/31/14	Quantitative – hydrological monitoring	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Monitored the depth and duration of vernal pool inundation.
12/11/14; 12/23/14;	Qualitative – maintenance visit	D&D Habitat Restoration	Inspected all vernal pools; spot weeding around basin perimeters; photos.
12/16/14; 12/31/14	Quantitative – fairy shrimp	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Conducted USFWS protocol-level fairy shrimp surveys of inundated restoration pools and San Ysidro High School reference site pools ¹ .
1/9/15; 1/14/15; 1/15/15; 1/26/15	Qualitative – maintenance visit	D&D Habitat Restoration	Inspected all vernal pools; spot weeded upland areas and basin perimeters; hauled debris; photos.
1/13/15; 1/27/15	Quantitative – hydrological monitoring	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Monitored the depth and duration of vernal pool inundation.
2/5/15; 2/6/15; 2/20/15; 2/27/15	Qualitative - maintenance visit	D&D Habitat Restoration	Weeded around vernal pool perimeters; sprayed weeds within uplands; weeded restoration area perimeter; photos.
2/10/15; 2/25/15	Quantitative – hydrological monitoring	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Monitored the depth and duration of vernal pool inundation.
3/9/15; 3/24/15	Quantitative – hydrological monitoring	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Monitored the depth and duration of vernal pool inundation.
3/13/15; 3/31/15	Qualitative - maintenance visit	D&D Habitat Restoration	Inspected vernal pools for weeds and species growth; watered container plants; spot sprayed; photos.

Date	Type	Personnel	Notes
4/6/15	Quantitative – hydrological monitoring	Lee Ripma, Melanie Rocks and Shannon Walsh, Rocks Biological	Monitored the depth and duration of vernal pool inundation.
4/13/15; 4/30/15	Qualitative - maintenance visit	D&D Habitat Restoration	Inspected all areas; uplands; hauled debris; manual weed removal; photos.
04/15/15; 4/21/15	Quantitative-vegetation transects	Rosanne Humphrey, ESA Alanna Bennett, ESA	Vernal pool and upland vegetation transect surveys of restoration site and reference sites (J26 and SYHS).
5/22/15	Qualitative - maintenance visit	D&D Habitat Restoration	Spot weeded all areas; hauled debris; photos.
6/5/15; 6/19/15	Qualitative - maintenance visit	D&D Habitat Restoration	Spot weeded all areas; watered upland plants; spot sprayed for weeds; hauled debris; photos.
7/3/15; 7/31/15; 7/24/15	Qualitative - maintenance visit	D&D Habitat Restoration	Removed tarplant from vernal pool basins; spot weeded; watered all plants in upland areas; hauled debris; Inspected site after 1.5 inches of rain (7/19/15) photos.
8/3/15; 8/5/15	Qualitative - maintenance visit	D&D Habitat Restoration	Inspected all fencing and site; watered uplands; spot weeded; removed herbivore fencing ; photos.

¹ Although late season rains occurred in May, July and August, fairy shrimp sampling and hydrological monitoring were not conducted during these months, as they are considered to be outside of the “rainy season” which has been defined as October 1 – April 31.

2.0 Methods

2.1 Qualitative Monitoring

Qualitative monitoring efforts were conducted on the restoration site and were focused on broad spectrum restoration progress outside of the scope of quantitative monitoring efforts. During the site visits, the overall health and vigor of plants, signs of natural recruitment, survivorship of container plantings, and presence or signs of wildlife were evaluated within the vernal pool basins and surrounding upland habitat. Potential threats were also noted, including presence of trash, signs of trespass or vandalism, presence of non-native species, erosion problems, and signs of herbivory. Qualitative monitoring efforts were conducted during all monitoring and maintenance visits on the restoration site, including quantitative monitoring surveys (Table 2).

2.2 Quantitative Monitoring

Quantitative monitoring efforts conducted at the restoration site (Figure 3) and the SYHS (Figure 4) and J26 complex (Figure 5) reference (control) sites during the Year 4 monitoring period were focused on measuring specific characteristics pertaining to achievement of success criteria, as outlined in the Vernal Pool Restoration Plan (Appendix A). The purpose of control pools is to provide a reference to which the restored pools can be compared. Typically, control pool monitoring measures the San Diego fairy shrimp populations, vernal pool plant germination and abundance, and levels of inundation in healthy natural vernal pool systems, which can vary dramatically from year to year. Fluctuations in vernal pool conditions that are due to weather patterns or other abiotic conditions are visible in control pools and then used as a metric with which to measure the success of the restored vernal pools.

A vernal pool monitoring protocol was developed to guide the programmatic monitoring process established for the efficient and biologically sound monitoring of the Vista del Mar Elementary Project in association with other vernal pool restoration projects in progress or planned on Otay Mesa (Appendix C). Vernal pool monitoring generally requires frequent access to vernal pool complexes for the purpose of data collection. Vernal pool ecosystems are sensitive to disturbance; therefore, limited access to monitoring and control pools is desirable. In accordance with the programmatic BO developed for State Route 11, Otay Mesa East Port of Entry, Otay Crossing Commerce Park and Otay Business Park, the USFWS recommended that a common reference pool complex be chosen for many, if not all, vernal pool restoration projects on the Otay Mesa. The J26 complex reference site (Figure 2 and Figure 5) was identified as one of the last remaining naturally functioning vernal pool complexes on the mesa that is reasonably accessible and would provide acceptable baseline vernal pool functions to be used as a reference for most restoration projects on the mesa. Monitoring data will be housed within the San Diego Management and Monitoring Program (SDMMP) South Coast Multi Taxa database. The development of this database is in progress and data entry will be coordinated directly with SDMMP.

In addition to vernal pools, Year 4 monitoring also included quantitative monitoring of the upland habitat areas surrounding the pools. Quantitative upland habitat monitoring was conducted on the restoration site and the adjacent SYHS reference site. Details of the monitoring methods are included below.

2.2.1 Vernal Pool Branchiopod Monitoring

Branchiopod surveys were conducted within pools that were inundated for a sufficient amount of time and depth to support fairy shrimp, based on the results of hydrological monitoring that was being conducted within the restoration site and reference pools. Sampling was conducted by Rocks Biological Consulting biologists Melanie Rocks (TE-082908-1) and Lee Ripma (TE-221290-3) on December 16 and December 31, 2015 according to the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (USFWS, 1996). A post-survey report was submitted to the USFWS on June 19, 2015 (Appendix D).

The protocol requires that depressions be examined 24 hours after a storm event to determine if the depressions are inundated (defined as holding more than three centimeters of water). If the depressions are still inundated after two weeks, protocol fairy shrimp surveys must be conducted. All pools that were inundated to levels (i.e., extent, depth, and duration) sufficient to support fairy shrimp were sampled using a hand-held net, which was swept through the water, and the net contents were examined for invertebrates. San Diego fairy shrimp were collected and identified with the aid of a dissecting microscope after the surveys were completed. Special attention was given to differentiate hybrids from pure species. The collected voucher specimens will be accessioned to the Los Angeles Natural History Museum, Crustacea Section, Invertebrate Zoology, 900 Exposition Boulevard, Los Angeles, California 90007.

2.2.2 Hydrological Monitoring

Quantitative hydrological monitoring was conducted on the restoration site and reference sites to measure specific aspects of vernal pool hydrology, as outlined in the Vernal Pool Restoration Plan (Appendix A). Hydrological monitoring was initiated within 24 hours after a rain event, and continued every two weeks until the pools dried out. Depth and extent of inundation were measured during each site visit where pools were noted to be inundated, and duration of inundation was measured from the onset of inundation until all pools were dry. Note that although there was sufficient rainfall in the months of May, July and August to fill pools on the restoration site, hydrological monitoring and fairy shrimp sampling were not conducted during this time, as this was considered to be outside of the “rainy season,” which extends from October 1 to April 31.

2.2.3 Vernal Pool Vegetation Monitoring

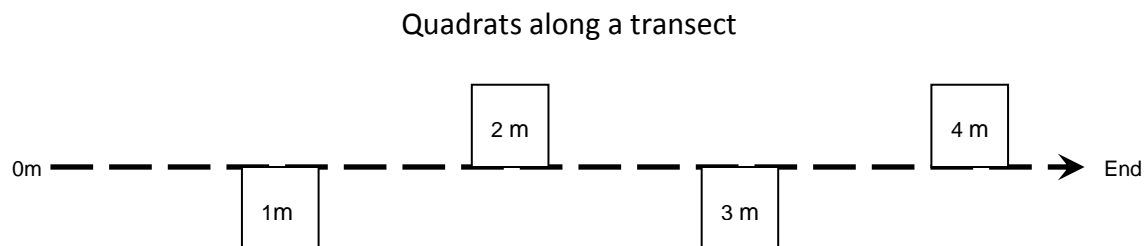
Vegetation monitoring transects on the restoration site and reference sites were monitored on April 15 and 21, 2015 by ESA biologists Rosanne Humphrey and Alanna Bennett (Table 2). Sample pools were selected using stratified sampling technique to achieve a representative sample of all pools on the respective sites. A sample of six pools – four sentinel (i.e., permanent)

and two rotating (i.e, changed every year) – was selected for the restoration site; a sample of two pools – both sentinel – was selected for the SYHS reference site; and a sample of four pools – two sentinel and two rotating – was selected for the J26 complex reference site.

Percent cover of native and non-native plant species was determined through quadrat sampling (described below). Species richness (i.e., total number of species) was determined by recording all plant species observed within the basin of each sampled pool. In addition, standard photographs were taken from the transect origin (starting point) facing toward the end point of each transect, and general photographs were taken throughout each site. Transect photographs were taken from the same vantage point as in previous years, including angle, height, direction, and focal range so that overall vegetation growth could be compared from year to year.

Transects were established within each sampled pool from one edge of the basin to the other along the greatest length of the pool, passing through the point of greatest depth; therefore, each transect was a different length, depending on the size of the pool. Spatial coordinates using a hand-held GPS unit with sub-foot accuracy were taken at the beginning and end points for all transects. During the initial monitoring period, the sentinel transects were marked in the field with rebar stakes at both ends. The origin (i.e., starting point) for each transect was marked with a PVC cap over the rebar and labeled with the pool number.

A 0.25-meter squared quadrat was used to conduct quadrat sampling along each transect to determine percent cover of each species within the pool basin. Measurements were taken every meter on alternating sides along the extent of the transect (see diagram below). Starting on the right side of the transect line (facing the end point), the quadrat was placed on the ground at the one-meter mark. One side of the quadrat was in line with the measuring tape. The final quadrat was placed at the end point and extended beyond the extent of the staked transect.



Two measurements were taken within each quadrat: (a) absolute percent cover (not to exceed 100 percent) of non-plant ground cover, and (b) relative cover of individual plant species. Ground cover types consisted of litter, bare ground, or rock. Plant species were recorded using a six letter code, which consisted of the first three letters of the genus and first three letters of the species name (i.e., POGNUD was used for *Pogogyne nudiuscula*, Otay Mesa mint). Unknown species were collected and labeled with the date, plot number, and a unique number. Collected specimens were later identified using the Jepson Manual (Baldwin et al., 2012). Cover data for quadrats within individual transects were pooled to calculate overall native and non-native species cover for each pool as well as cover of vernal pool indicator species.

2.2.4 Upland Vegetation Monitoring

Quantitative upland vegetation monitoring was conducted within the restoration site and adjacent SYHS reference site. The purpose of the monitoring is to assess the status of restored upland habitat that surrounds the created and enhanced vernal pools. Data from the restoration site was compared to data from the SYHS reference site to help evaluate the effects of climatic conditions, such as drought on the restoration site (e.g., to determine whether the observed changes in the vegetation were due to natural variability or restoration efforts).

Two belt transects within each location were established by extending a centerline 25 meters out from a randomly selected point of origin in a direction that would cover the greatest amount of upland habitat without crossing into any vernal pools (the pools are close together and the areas of upland habitat surrounding the pools are narrow). A rectangular survey area was established for each transect by extending out 2.5 meters on either side of the center line, thereby creating a belt along the length of the transect. Species richness was obtained for each transect by recording all species within each belt. The point intercept method was used to calculate percent cover by recording “hits” (i.e., when a plant touches a vertical wooden rod that is placed perpendicular to the measuring tape) along the centerline every 0.5 meter. The following information was collected for each hit: (a) species, (b) native or non-native, and (c) herbaceous or shrub. In addition, photographs were taken from the origin to the end point of each transect. Percent cover was estimated by counting the total number of hits for a given species, divided by the total number of hits possible, and multiplying by 100.

2.3 Vernal Pool CRAM Monitoring

A CRAM evaluation is not required for Year 4.



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SOURCE: Landiscor, 2010; RBF, 2012; ESA, 2014

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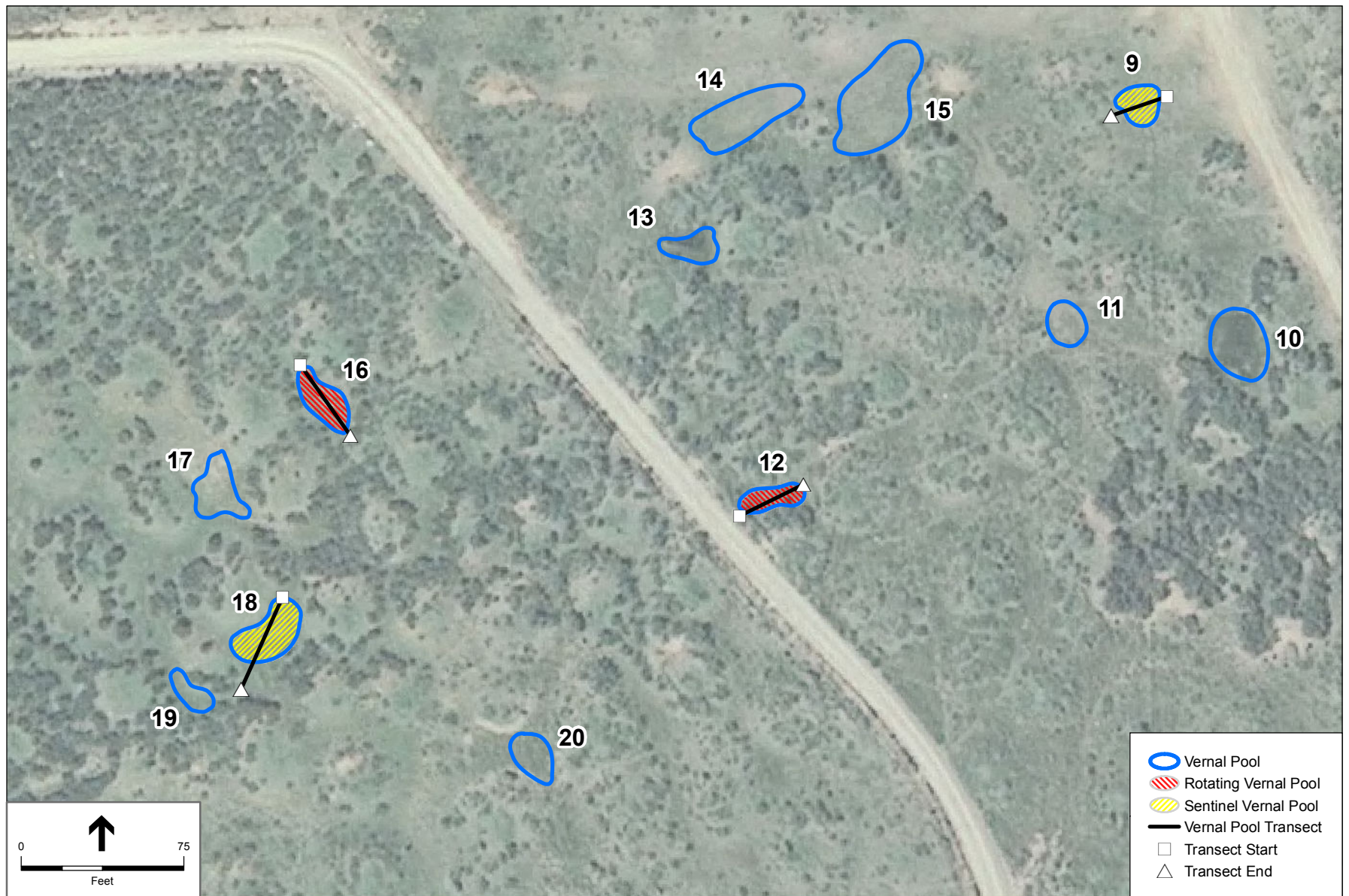
Figure 3
Restoration Site Vegetation Monitoring Transects



SOURCE: Landiscor, 2010; RBF, 2012; ESA, 2014

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Figure 4
San Ysidro High School Reference Site Vegetation Monitoring Transects



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SOURCE: LandisCor, 2010; RBF, 2012; ESA, 2014

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Figure 5
J26 Reference Site Vegetation Monitoring Transects

3.0 Results

3.1 Qualitative Monitoring

General health and vigor of the vernal pool basins and surrounding uplands were observed to be robust, with continued growth of seeded and planted vegetation and signs of natural recruitment during the Year 4 monitoring period. Survivorship of container stock plantings within the upland restoration was satisfactory, as no mortality was observed. Maintenance staff provided occasional supplemental watering and trimming of plantings when necessary. Unseasonably late rain, which occurred in May, July, and August, kept the plants in good condition throughout the summer months. Additional seeding of upland areas was not necessary this year. Herbivory of transplanted coast cholla (*Cylindropuntia prolifera*) by rabbits was held in check with herbivory cages. The cages were removed at the end of this year, as the plants were considered large enough to withstand occasional herbivory. Non-native plant species, including stinknet (*Oncosiphon piluliferum*) and filaree (*Erodium* sp.) were observed within the upland restoration area, and were actively removed by maintenance staff (Table 2). No problems with vandalism or trespass were noted. Observations of wildlife within the immediate vicinity of the restoration site included red-tailed hawk (*Buteo jamaicensis*), common raven (*Corvus corax*), greater roadrunner (*Geococcyx californianus*), rufous-crowned sparrow (*Aimophila ruficeps*), wrentit (*Chamaea fasciata*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), and orange-throated whiptail (*Aspidoscelis hyperythrua beldingi*). In addition, a San Diego night snake (*Hypsiglena ochrorhyncha klauberi*) was observed under a cover board that was installed onsite to provide habitat for invertebrates, lizards and snakes. Representative photographs showing the overall condition of upland habitat are included in this report for reference (Appendix E).

3.2 Quantitative Monitoring

3.2.1 Vernal Pool Branchiopod Monitoring

Rainfall was fairly sparse during Year 4 (see Section 3.2.2 for more details). Rainfall in December, 2014 was sufficient to inundate pools in the restoration area and the adjacent SYHS reference pools and therefore sampling was conducted on December 16 and December 31. All but two of the restoration pools (18 and 23) held San Diego fairy shrimp when sampled, and the majority supported a population of hundreds to thousands (Table 3). Of the four SYHS reference site pools sampled, none held fairy shrimp (Table 4). The J26 reference pools did not inundate for a sufficient amount of time to support fairy shrimp; therefore no sampling was conducted within these pools.

The 90-day report, which includes the USFWS Vernal Pool Data Sheets for Wet Season Surveys (USFWS, 1996) and site photographs, is included in Appendix D.

Table 3. Fairy Shrimp Survey Results in Restoration Site

Pool	Description	Water Temp. (°C)	Depth (cm)	Size (m ²)	Fairy Shrimp	Population Estimate
1	Enhanced	11.9	2.0	8.0	<i>B. sandiegonensis</i>	100s
2	Created	11.8	5.0	25.0	<i>B. sandiegonensis</i>	100s
3	Enhanced	11.8	3.0	20.0	<i>B. sandiegonensis</i>	100s
4	Enhanced	11.8	5.0	20.0	<i>B. sandiegonensis</i>	1000s
5	Created	11.8	5.0	18.0	<i>B. sandiegonensis</i>	100s
6	Created	12.1	4.5	6.0	<i>B. sandiegonensis</i>	100s
7	Created	16.5	10.0	28.0	<i>B. sandiegonensis</i>	1000s
8	Created	11.2	8.0	12.0	<i>B. sandiegonensis</i>	1000s
9	Created	15.8	9.0	30.0	<i>B. sandiegonensis</i>	1000s
10	Created	16.2	9.0	35.0	<i>B. sandiegonensis</i>	1000s
11	Enhanced	11.7	4.0	16.0	<i>B. sandiegonensis</i>	100s
12	Created	16.1	6.0	16.0	<i>B. sandiegonensis</i>	1000s
13	Created	17.3	10.0	42.0	<i>B. sandiegonensis</i>	1000s
14	Created	16.6	8.0	60.0	<i>B. sandiegonensis</i>	1000s
15	Created	11.6	3.0	15.0	<i>B. sandiegonensis</i>	1000s
16	Enhanced	11.9	3.0	16.0	<i>B. sandiegonensis</i>	100s
17	Enhanced	17.9	9.0	30.0	<i>B. sandiegonensis</i>	1000s
18	Enhanced	12.1	4.0	6.0	none	0
19	Enhanced	17.1	8.0	25.0	<i>B. sandiegonensis</i>	1000s
20	Enhanced	12.1	4.0	16.0	<i>B. sandiegonensis</i>	1000s
21	Enhanced	15.8	12.0	25.0	<i>B. sandiegonensis</i>	1000s
22	Created	15.5	13.0	25.0	<i>B. sandiegonensis</i>	1000s
23	Created	16.1	0.5	2.0	none	0
24	Enhanced	16.8	9.0	24.0	<i>B. sandiegonensis</i>	1000s
25	Enhanced	11.9	6.0	6.0	<i>B. sandiegonensis</i>	100s
26	Enhanced	17.4	10.0	20.0	<i>B. sandiegonensis</i>	100s
27	Created	18.0	10.0	24.0	<i>B. sandiegonensis</i>	1000s
28	Created	17.6	5.0	12.0	<i>B. sandiegonensis</i>	10s
29	Created	15.3	16.5	40.0	<i>B. sandiegonensis</i>	1000s
30	Enhanced	12.1	5.0	36.0	<i>B. sandiegonensis</i>	100s
31	Created	18.3	4.5	8.0	<i>B. sandiegonensis</i>	10s
32	Created	17.7	8.0	12.0	<i>B. sandiegonensis</i>	1000s

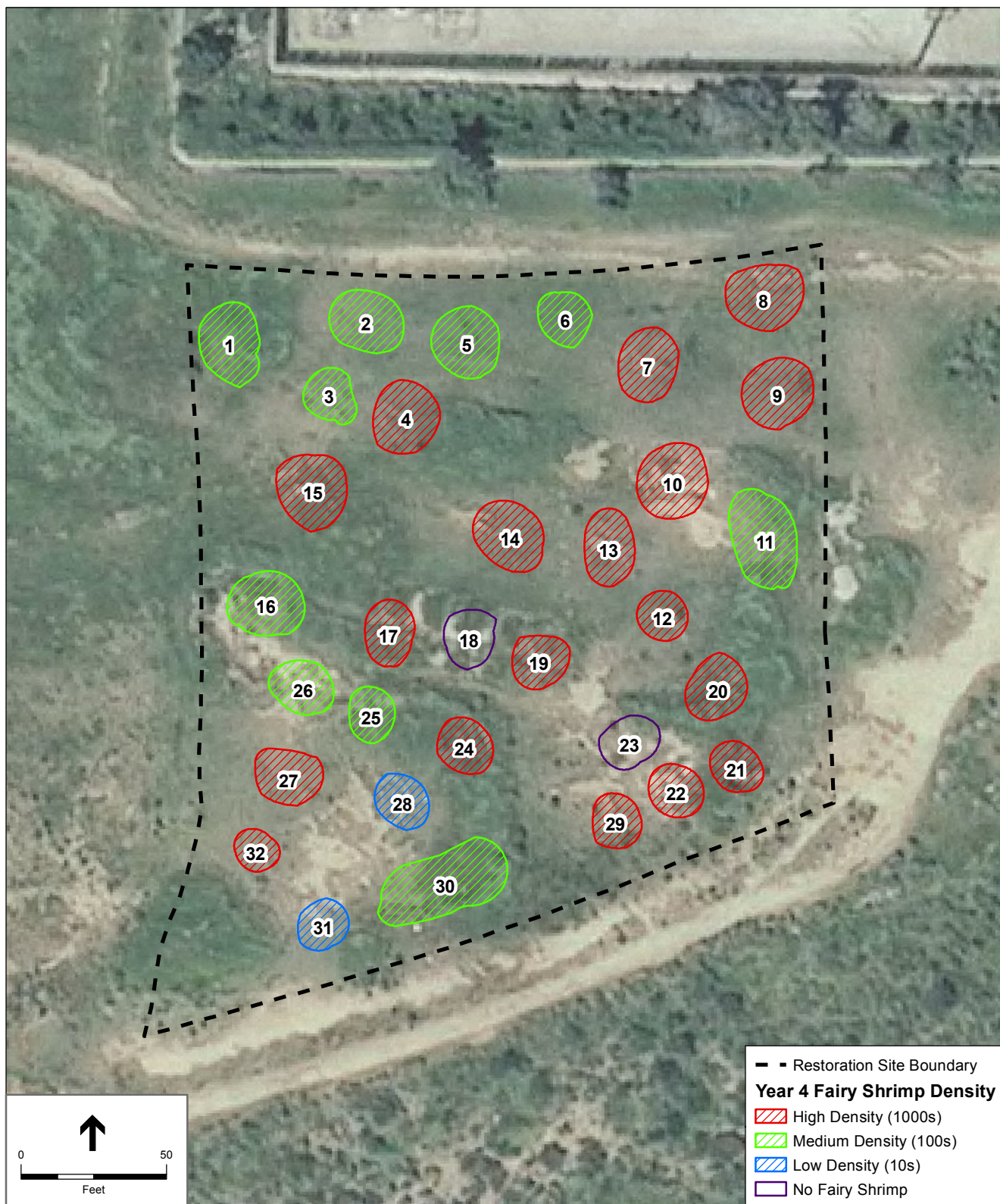
Table 4. Fairy Shrimp Survey Results in Adjacent (SYHS) Reference Site

Pool Number	Description	Water Temp. (°C)	Maximum Depth (cm)	Size (m ²)	Presence of Fairy Shrimp	Population Estimate
A-9	Reference	13.2	4.5	15.0	none	0
A-12	Reference	12.7	5.0	1.0	none	0
A-13	Reference	12.9	2.0	2.0	none	0
A-14	Reference	12.4	3.0	8.0	none	0

3.2.2 Hydrological Monitoring

During the monitoring period, southern San Diego County continued to experience drier than normal conditions during the rainy season (October 2014 through April 2015). A total of only 16.5 cm (6.5 inches) fell in the project vicinity during that time, compared to an historical average of 30.5 (12.0 inches) based on Brown Field Airport climate data (NOAA 2015). However, rainfall events in May, July, and August were substantial enough inundate some of the vernal pool basins within the restoration site. Significant rainfall (i.e., greater than 3 cm during a single rainfall event) during these months is quite atypical in this region. Average monthly rainfall totals during the dry season typically range between 0.25 and 0.5 cm (0.1 and 0.2 inches) of rain. Because May, July and August fall outside of the defined rainy season, hydrological monitoring and fairy shrimp monitoring were not conducted during those months.

During hydrological monitoring conducted during the Year 4 wet season, all 32 pools on the restoration site were observed to hold ponding water, the majority of which (i.e., 26) were inundated for at least 56 days (Table 5). Pool depth ranged from 1 to 17 cm. Within the adjacent SYHS reference site, only 4 of the 8 sampled pools inundated during the rainy season (Table 6). The duration of ponding varied between 1 and 42 days. Pool depth ranged from 2 to 5 cm. Only 1 pool on the J26 reference site was observed to hold water, and only for less than 14 days (Table 6). The depth was measured at 2 cm. Representative photographs of vernal pool monitoring efforts were taken during each site visit, and are included in this report for reference (Appendix E).



SOURCE: Landis, 2010; RBF, 2012; ESA, 2014

Vista Del Mar Elementary School . 211685

Figure 6
Presence of Fairy Shrimp in Restoration Site Pools

Table 5. Restoration Site Hydrological Monitoring Results

Pool Number	Description	Max. Depth (cm)	Ponding Duration (days)
1	Enhanced	3	56-70
2	Created	6	56-70
3	Enhanced	3	28-42
4	Enhanced	6	56-70
5	Created	7	56-70
6	Created	5	42-56
7	Created	11	56-70
8	Created	8	70-84
9	Created	9	56-70
10	Created	9	56-70
11	Enhanced	6	56-70
12	Created	6	56-70
13	Created	10	70-84
14	Created	8	56-70
15	Created	3	42-56
16	Enhanced	4	42-56
17	Enhanced	10	70-84
18	Enhanced	5	42-56
19	Enhanced	8	56-70
20	Enhanced	5	56-70
21	Enhanced	15	98-112
22	Created	13	98-112
23	Created	1	28-42
24	Enhanced	9	70-84
25	Enhanced	6	56-70
26	Enhanced	10	70-84
27	Created	10	56-70
28	Created	6	56-70
29	Created	17	112-126
30	Enhanced	7	56-70
31	Created	5	56-70
32	Created	8	56-70

Table 6. Reference Pool Hydrological Monitoring Results

Pool Number ¹	Description	Size (m ²)	Max. Depth (cm)	Ponding Duration (days)
RefA-9	Reference	143.51	5	28-42
RefA-10	Reference	7.27	0	0
RefA-11	Reference	8.44	0	0
RefA-12	Reference	18.61	5	1-14
RefA-13	Reference	85.79	2	28-42
RefA-14	Reference	138.58	4	28-42
RefA-15	Reference	105.23	0	0
RefA-16	Reference	62.60	0	0
J26-9	Reference	26.79	0	0
J26-10	Reference	64.15	0	0
J26-11	Reference	27.11	0	0
J26-12	Reference	25.19	0	0
J26-13	Reference	27.30	2	1-14
J26-14	Reference	80.88	0	0
J26-15	Reference	124.54	0	0
J26-16	Reference	36.62	0	0
J26-17	Reference	43.51	0	0
J26-18	Reference	53.94	0	0
J26-19	Reference	18.74	0	0
J26-20	Reference	30.44	0	0

¹ RefA-# pools are the San Ysidro High School Reference Pools

3.2.3 Vernal Pool Vegetation Monitoring

The average estimated cover of vernal pool indicator species within the reference sites during the monitoring period was 11.6 and 7.3 percent cover in the SYHS and J26 sites, respectively, and 28.8 percent in the restoration site (Table 7). Percent cover of non-native species rated by the California Invasive Plant Council (Cal-IPC) as moderate to high risk ranged from 0.3 (J26 site) to 2.3 (SYHS) in the reference sites. There was zero percent cover of these species within the restoration site. The estimated cover of *all* non-native species was 6.0 and 22.8 percent cover in the SYHS and J26 reference sites, respectively, and 0.8 percent cover in the restoration site (Table 8). Species richness (i.e., number of vernal pool indicator species) within a given pool (i.e., transect) varied from 1 to 4 within the reference sites and from 2 to 7 within the restoration site. Overall, species richness per site was 4 to 5 (in J26 and SYHS sites, respectively) within reference the sites and 7 in the restoration site (Table 9).

Vernal pool indicator species observed within the SYHS reference site included San Diego button celery (*Eryngium aristulatum*), popcorn plant (*Plagiobothrys acanthocarpus*), Otay Mesa mint (*Pogogyne nudiuscula*), woolly marbles (*Psilocarphus brevissimus*), and pygmy weed (*Crassula*

aquatica). Many of the same species were observed within J26 reference site, including San Diego button celery, popcorn plant, Otay Mesa mint, and woolly marbles. The restoration site had a few species in common with the reference sites, including pygmy weed, Otay Mesa mint, and woolly marbles, but was also observed to support American pillwort (*Pilularia americana*), toad rush (*Juncus bufonius*), slender mousetail (*Myosurus minimus*) and slender plantain (*Plantago elongata*).

Table 7. Percent Cover of Vernal Pool Indicator Species

<u>Control-SYHS</u>		<u>Control-J26</u>		<u>Restoration Pools</u>	
Transect	% Cover	Transect	% Cover	Transect	% Cover
RefA-S-11	11.6	RefJ26-S-09	6.2	Resto-S-05	12.8
RefA-S-16	11.5	RefJ26-S-18	17.5	Resto-S-13	10.0
		RefJ26-R-12	5.5	Resto-S-18	50.8
		RefJ26-R-16	0.1	Resto-S-30	10.3
				Resto-R-01	53.0
				Resto-R-19	35.9
Site Average	11.6	Site Average	7.3	Site Average	28.8

Table 8. Percent Cover of Non-native Species

<u>Type of Non-Native Species</u>	<u>Percent Cover</u>		
	<u>Control-SYHS</u>	<u>Control-J26</u>	<u>Restoration Site</u>
Cal-IPC moderate/high spp.	2.3	0.3	0
Other non-native spp.	3.7	22.5	0.8
Total cover for all non-native spp.	6.0	22.8	0.8

Table 9. Species Richness (Vernal Pool Indicator Species)

	<u>Control-SYHS¹</u>		<u>Control-J26²</u>		<u>Restoration Pools³</u>	
	<u>Pool</u>	<u>NIS⁴</u>	<u>Pool</u>	<u>NIS⁴</u>	<u>Pool</u>	<u>NIS⁴</u>
Per Transect (Pool)	RefA-S-11	4	RefJ26-S-09	4	Resto-S-05	6
	RefA-S-16	4	RefJ26-S-18	2	Resto-S-13	2
			RefJ26-R-12	1	Resto-S-18	4
			RefJ26-R-16	1	Resto-S-30	7
					Resto-R-01	3
					Resto-R-19	5
Average/Transect (Pool)		4		2		4.5
Total (All Transects)		5		4		7

¹ Vernal pool indicator species observed within the SYHS reference site: San Diego button celery (*Eryngium aristulatum*), popcorn plant (*Plagiobothrys acanthocarpus*), Otay Mesa mint (*Pogogyne nudiuscula*), woolly marbles (*Psilocarphus brevissimus*), and pygmy weed (*Crassula aquatica*).

² Vernal pool species observed within J26 reference site: San Diego button celery, popcorn plant, Otay Mesa mint, and woolly marbles.

³ Vernal pool plants observed within restoration site: pygmy weed (*Crassula aquatica*), toad rush (*Juncus bufonius*), little mousetail (*Myosurus minimus*), American pillwort (*Pilularia americana*), slender plantain (*Plantago elongata*), Otay Mesa mint, and woolly marbles.

⁴ NIS = Number of Indicator Species.

3.2.4 Upland Vegetation Monitoring

Success of the upland vegetation areas that surround the vernal pools is based on species richness and native species cover, as compared to the SYHS reference site, overall non-native species cover, and presence of target weed species (Table 10). Target weed species, as defined in the Vernal Pool Restoration Plan (Helix 2011, as amended by TAIC 2011; Appendix A), are: Australian saltbush (*Atriplex semibaccata*), black bustard (*Brassica nigra*), tocalote (*Centaurea melitensis*), garland daisy (*Glebionis coronaria*), fennel (*Foeniculum vulgare*), short-pod mustard (*Hirschfeldia incana*), Italian ryegrass (*Lolium perenne*), and crystalline iceplant (*Mesembryanthemum crystallinum*).

Overall species richness within the SYHS reference site was 25, 15 of which (60 percent) were native. Species richness in the restoration site was 19; 15 of which (79 percent) were native. Percent cover of native species in the SYHS reference site (44.1%) was quite a bit higher than in the restoration site (27.5%). Non-native species cover was slightly higher in the SYSH reference site (5.9%) than in the restoration (2.0), but still relatively low in both areas, and no target weed species were observed on either site.

Table 10. Upland Vegetation Monitoring Results

	Species Richness	Native % Cover	Non-native % Cover	Target Weed Species
SYHS Reference Site	25	44.1	5.9	0
Restoration site	19	27.5	2.0	0

3.3 Vernal Pool CRAM

CRAM evaluation is not required for Year 4, and therefore, there are no CRAM results to report.

4.0 Discussion

4.1 Vernal Pool Branchiopods

Since monitoring began (i.e., Years 1-4), none of the reference site pools have supported fairy shrimp. Within the restoration site, all but two of the vernal pools held water long enough to support fairy shrimp, and all 30 of these inundated pools were positive for San Diego fairy shrimp during Year 4. Sixty percent of the inundated pools supported a high density (i.e., 1000s) of the fairy shrimp and thirty three percent supported a moderate density (i.e., 100s). Despite severe drought conditions during Year 3, 14 of the 32 pools within the restoration site held water long enough to support fairy shrimp, and 14 pools that were sampled supported fairy shrimp in much greater densities than observed in Year 2 (hundreds or thousands, as compared to ones, tens or hundreds). These data show a steady increase in the density of fairy shrimp within the restoration site.

Note that the federally endangered San Diego fairy shrimp and the more common versatile fairy shrimp (*Branchinecta lindahli*) are closely related species that are known to hybridize; such hybridization is an increasing concern due to the expanding presence of versatile fairy shrimp from human disturbance. Co-occurrence of these species happens more frequently in disturbed pools and restored/created basins, and creates the potential for hybridization (Simovich et al., 2013). Permitted biologists at Rocks Biological Consulting are aware of this problem, and have identified potential hybridized individuals at other restoration sites (i.e., Proctor Valley ORV-B vernal pool restoration site). Though genetic analysis would be required to fully assess genetic purity, no versatile fairy shrimp markers were observed in San Diego fairy shrimp samples from the Vista Del Mar site.

To meet the success criteria for San Diego fairy shrimp, the shrimp should recur in each year that there is enough rainfall to produce ponding, and shrimp should also be present in the control pools. If both the restored and control pool shrimp populations decline in any given year, then it would 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 over the 5-year monitoring period to be considered successful. Based on these parameters, the restoration site appears to be on track with respect to providing high quality habitat for San Diego fairy shrimp.

4.2 Hydrology

Despite continued historic drought conditions yielding significantly lower than average rainfall during the monitoring period, the restoration site vernal pools continued to perform better hydrologically than the pools at the reference sites. During Year 4, all 32 pools inundated during the rainy season, and 81 percent of the pools held water for at least 56 days. In contrast, the reference sites performed poorly, as only 2 of 20 reference pools (10 percent) were observed to inundate to a depth (i.e., at least 3 cm) and duration (i.e., at least approximately 30 days) sufficient to support fairy shrimp. All three pools were within the SYHS site. To meet the

success criteria, the depth, duration, and extent of ponding within the restoration site must be equivalent or better than that of the reference sites. The pools must pond for a sufficient amount of time to support San Diego fairy shrimp during 2 winters in a 5-year period. The relative success of the hydrological regime within the restoration site indicate that the site is functioning appropriately, and is expected to meet or exceed all hydrological success criteria next year, which is the final year of restoration monitoring.

It should be noted that hydrological regimes of restoration sites following installation often outperform reference sites because of the recently compacted soils and initial sparse vegetative cover and the resulting increased hydrological gradient into the vernal pool basins. It is expected that the hydrological regime of the restoration site for this project will continue to outperform the SYHS and J26 complex reference sites over the next several years.

4.3 Vernal Pool Vegetation

Vernal Pool Species Richness

The success criterion for vernal pool indicator species richness is determined as a percentage of the species richness values in the control pools. During Year 4, species richness within the restoration site should be at least 80 percent of the values of the reference sites (Table 11). The average per-pool species richness for the SYHS and J26 sites was 3.0; therefore the restoration site should have an average species richness value of at least 2.4. The actual average species richness per pool for the restoration site (4.5) greatly exceeded this target value. Over the last four years, there has been a steady trend toward increasing within-pool species diversity. In addition, the overall species richness (i.e., total number of vernal pool indicator species across the entire site) within the restoration site was higher (7) than the other two sites (4 at the J26 site, and 5 at the SYHS site), suggesting that the restoration site supports a high diversity of vernal pool species overall.

Vernal Pool Species Cover

The estimated cover of vernal pool indicator species for the two reference sites combined was 9.3 percent in Year 4, which is substantially higher than in Year 3 (0.9 percent) during severe drought conditions, but quite a bit lower than in Years 1 and 2 (17.0 and 28.4 percent, respectively). Cover within the restoration site was quite a bit higher than the reference sites in Year 4 at 28.8 percent. These results were similar to the cover observed in Year 2 (26.9 percent), and almost nine times higher than in Year 3 (Table 11). Based on the Year 4 success criteria, the percent cover of vernal pool indicator species within the restoration site must be at least 70 percent of the estimated cover of the reference pools, which calculates to 6.5 percent cover. The Year 4 results in the restoration pools were 310 percent of the reference value, which far exceeds the required minimum value.

Non-native Species Cover

The Year 4 success criteria for non-native species cover require that the cover of Cal-IPC medium to high risk species be less than five percent and the cover of non-native species overall be less than ten percent (Table 11). The estimated Year 4 cover of Cal-IPC moderate/high risk species within the restoration site was zero, and the overall cover of non-native species was 0.8,

Table 11. Vernal Pool Vegetation Monitoring Success Criteria and Performance

	<u>Combined Reference Sites</u> <u>Results</u>				<u>Combined Reference Sites</u> <u>Success Criteria</u>				<u>Restoration Site</u> <u>Results</u>			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Vernal pool indicator species richness ¹	1.4	2.5	3.25	3	≥35%	≥50%	≥65%	≥80%	0.2/14%	3.3/132%	3.5/108%	4.5/150%
Percent cover vernal pool indicator spp. ²	17.0	28.4	0.9	9.5	≥25%	≥35%	≥50%	≥70%	1.6/9%	26.9/95%	3.4/380%	28.8/305%
Percent cover Cal-IPC mod./high spp.	0.0	13.4	0.1	1.3	N/A	N/A	N/A	<5	0.0	0.0	0.0	0.0
Percent cover for all non-native spp.	3.4	62.1	1.8	14.4	N/A	N/A	<10	<10	0.0	1.1	0.0	0.8

¹ Species richness relative to average within sampled control pools. Note that a minimum of 1 vernal pool species in the restoration site is required in Years 1 and 2, and at least 2 species are required for Year 3, regardless of the reference site values.

² Percent cover relative to average within sampled control pools; The restoration site must have a cover of 70% of 9.45% cover (i.e. 6.62 % cover).

Table 12. Upland Vegetation Monitoring Success Criteria and Performance

	<u>SYHS Reference Site</u> <u>Results</u> ¹				<u>SYHS Reference Site</u> <u>Success Criteria</u> ¹				<u>Restoration Site</u> <u>Results</u>			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Upland species richness ²	N/A	N/A	11.0	25.0	≥10%	≥20%	≥30%	≥50%	N/A	N/A	26.0	19.0
Percent cover of native species ²	N/A	N/A	20.0	44.1	UG ⁴	≥15%	≥40%	≥50%	UG ⁴	N/A	19.0	27.5
Percent cover Cal-IPC mod./high spp. ³	N/A	N/A	0.0	0.0	<1	<1	<1	<1	N/A	N/A	7.0	0.0
Percent cover for all non-native spp. ³	N/A	N/A	0.0	5.9	<5	<5	<5	<5	N/A	N/A	0.0	2.0

¹ No success criteria for Years 1 and 2

² Percent value relative to control site.

³ Absolute value (not relative/e to control site).

⁴ UG = uniform germination

which is well below the target values. The Year 4 non-native species cover within the reference sites averaged 1.3 percent for Cal-IPC moderate/high risk species and 14.4 percent for non-native species overall. The restoration site continues to be well managed for invasive species, outperforming the reference sites.

Photomonitoring

Photomonitoring shows that overall growth of vegetation in both the restoration site and reference sites during Year 4 was substantially more robust than during the previous year when only 4.3 inches of rain fell during the rainy season, which is 37 percent of normal (Appendix G). Although the rainfall during Year 4 was also well below normal rainfall levels, the vernal pools showed healthy growth and vigor.

4.4 Upland Vegetation

Table 12 summarizes the success criteria for restored upland vegetation that surrounds the vernal pools. For Year 4, species richness and native species cover must be at least 50 percent of the reference values. Upland species richness within the restoration site was 19, which is 76 percent of the average species richness in the reference site (25.0). Upland native species cover within the restoration site was 27.5 percent, which is 62 percent of the average cover in the reference site. As such, both species richness and native species cover values exceeded Year 4 success criteria. Non-native species cover was 2 percent in the restoration site, compared to 5.9 percent in the reference site. Cover of Cal-IPC moderate/high risk species was 0 percent in both the restoration site and the reference site. The restoration site met the Year 4 success criteria for non-native species cover, which require less than 5 percent non-native species cover and less than 1 percent Cal-IPC moderate/high risk species cover.

4.5 Conclusions

Although the rainfall during Year 4 was well below normal rainfall levels, the vernal pools and surrounding uplands showed robust growth and vigor, which is substantiated by the site photographs and quantitative vegetation data. Late rains in May, July and August helped sustain the vegetation throughout the monitoring period. Vernal pool hydrology appears to be functioning quite well on the restoration site, as all pools held water for a substantial amount of time despite the low overall rainfall during the rainy season. This helped sustain a healthy population of San Diego fairy shrimp in 30 of the 32 pools.

No remedial actions are deemed necessary at this time. Regularly scheduled monitoring and maintenance will continue, and remedial actions taken as needed. Due to the proximity of the restoration site to disturbed lands, aggressive non-native species control should continue. Trash and trespass should continue to be monitored for regularly and corrected as necessary, specifically relative to the location of the site along access routes for the SYHS and the frequency of U.S. Customs and Border Patrol actions within the immediate vicinity of the restoration site. With scheduled maintenance and monitoring, the restoration site is expected to meet all of the Year 5 success criteria next year.

5.0 References

- Baldwin, Bruce G. ed. 2012. *The Jepson Manual, Vascular Plants of California: Second Edition*. University of California Press, Berkeley and Los Angeles, California.
- California Wetlands Monitoring Workgroup (CWMW). 2013. California Rapid Assessment Method Vernal Pool Systems Field Book, Version 6.1. Prepared April, 2013.
- Eriksen, C.H. and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas*. Mad River Press
- Helix Environmental Planning, Inc. 2001 (Amended by TAIC in 2011). *Vista del Mar Elementary School Vernal Pool Restoration Plan*. Prepared for the San Ysidro School District.
- National Oceanic and Atmospheric Administration (NOAA). 2015. Weather data for Brown Field Airport, San Diego, California.
- O'Connor, K. ed. 2012. *California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas, User's Manual, Version 6, a product of the Level 2 Committee of the California Wetlands Monitoring Workgroup*.
- Simovich, M., K. Davis, and A. Bohohak. 2013. Landscape homogenization threatens the genetic integrity of the endangered San Diego fairy shrimp *Branchinecta sandiegonensis* (Branchiopoda: anostraca). *Journal of Crustacean Biology*, 33(5): 730-740.
- The Planning Center. 2009. *Vista Del Mar Elementary School Subsequent Environmental Impact Report*, July 2009, Screencheck No. 2004111054. Los Angeles, California.
- U.S. Fish and Wildlife Service (USFWS). 1996. Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods.
- U.S. Fish and Wildlife Service (USFWS). 2011. Formal Section 7 Consultation on the San Ysidro School District's Vista Del Mar Elementary School Project (Biological Opinion).

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Appendix A

Vernal Pool Restoration Plan (2011)

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Vista Del Mar Elementary School

Vernal Pool Restoration Plan
for the Off-Site Preserve

February 2, 2011
Amended July 28, 2011

Prepared for:
San Ysidro School District
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San Ysidro, CA 92173

Prepared by:
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VERNAL POOL PRESERVE RESTORATION PLAN FOR VISTA DEL MAR ELEMENTARY SCHOOL

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	INTRODUCTION	1
2.0	PROJECT DESCRIPTION.....	1
2.1	Development Project Location.....	1
2.2	Development Project Summary.....	1
2.3	Project Impacts	1
2.3.1	Vernal Pools	1
2.3.2	San Diego Fairy Shrimp.....	2
2.3.3	Sensitive Plants.....	2
2.3.4	Functions and Services.....	2
3.0	MITIGATION REQUIREMENTS.....	3
4.0	MITIGATION SITE DESCRIPTION	3
4.1	Mitigation Location.....	3
4.2	Ownership Status.....	4
4.3	Environmental Setting.....	4
4.4	Existing Functions and Services of Mitigation Area	5
4.5	Mitigation Site Suitability	6
5.0	MITIGATION DESIGN CONCEPT.....	6
5.1	Mitigation Design.....	6
5.1.1	Vernal Pool Restoration and Watershed Enhancement.....	6
5.1.2	San Diego and Riverside Fairy Shrimp Mitigation	7
5.1.3	Rare Plant Enhancement	7
5.2	Target Functions and Services	7
5.3	Rationale for Expecting Implementation Success.....	8
6.0	IMPLEMENTATION PLAN	9
6.1	Responsible Parties.....	9
6.1.1	Project Proponent	9
6.1.2	Restoration Specialist.....	9
6.1.3	Installation/Maintenance Contractor	10
6.2	Restoration Implementation Schedule.....	10
6.2.1	Vernal Pool Restoration Implementation and Enhancement Implementation Schedule.....	10

TABLE OF CONTENTS (cont.)

6.0	IMPLEMENTATION PLAN (cont.)	
6.2.2	Rare Plant Seed Translocation Schedule.....	11
6.2.3	Upland Planting and Seeding	11
6.3	Restoration Site Preparation.....	11
6.3.1	Initial Restoration Site Weeding	13
6.3.2	Vernal Pool Inoculum Salvage.....	13
6.3.3	Rare Plant Seed Salvage.....	14
6.3.4	Vernal Pool Grading.....	14
6.3.5	Fencing and Signage	16
6.4	Vernal Pool Restoration Area Planting Plan/Installation.....	17
6.4.1	Vernal Pool Inoculation.....	17
6.4.2	Vernal Pool Restoration Area Planting Plan.....	17
6.5	Irrigation Plan.....	19
6.6	Wildlife Habitat Enhancement	19
6.6.1	Small Animal Cover	19
6.6.2	Pollinator Support.....	20
7.0	MAINTENANCE PLAN.....	20
7.1	Habitat Maintenance Activities.....	20
7.1.1	Trash Removal	20
7.1.2	Weed Control	21
7.1.3	Container Stock Irrigation.....	21
7.1.4	Fence Repair.....	21
7.2	Habitat Maintenance Schedule.....	22
8.0	SUCCESS CRITERIA.....	22
8.1	Control Pools.....	22
8.1.1	Vernal Pool Indicator Species Richness.....	24
8.1.2	Vegetative Cover of Vernal Pool Indicator Species.....	24
8.1.3	Non-native Cover in Restored Vernal Pools	25
8.2	CRAM Reference Site/Target Values	26
8.3	Fairy Shrimp.....	29
8.4	Target Hydrological Regime	29
8.5	Upland Restoration in Vernal Pool Restoration Area	30
8.6	Success Criteria Summary.....	31
9.0	MONITORING PLAN	32
9.1	Monitoring Methods.....	32
9.1.1	Vernal Pools	32
9.1.2	Upland Habitat	33
9.2	Annual Reports/Invitation	33
9.3	Adaptive Management	34
9.4	Schedule	34

TABLE OF CONTENTS (cont.)

10.0	COMPLETION OF MITIGATION.....	34
	10.1 Notification of Completion	34
	10.2 Agency Confirmation	35
	10.3 Long-term Management	35
11.0	CONTINGENCY MEASURES	35
	11.1 Initiating Procedures	35
	11.2 Funding Mechanism	35
	11.3 Responsible Parties.....	35
12.0	LIST OF PREPARERS.....	36
13.0	REFERENCES	37

LIST OF TABLES

<u>No.</u>	<u>Title</u>	<u>Page No.</u>
1	Mitigation for Impacts to Vernal Pool Habitat	3
2	Summary of Existing Pool Conditions at Restoration Site.....	4
3	Vernal Pool Restoration Plan Checklist.....	12
4	Specific Enhancement/Restoration Activities by Pool	15
5	Upland Enhancement Container Stock Plant Palette	18
6	Upland Enhancement Seed Mix.....	18
7	Control Vernal Pool Plant Species.....	23
8	Vernal Pool Species Richness Success Criteria.....	24
9	Vernal Pool Plant Cover Success Criteria	25
10	Cover Limits for Non-Native Species in Vernal Pools.....	25
11	California Invasive Plant Council Moderately to Highly Invasive Plant Species	26
12	CRAM Data Summary.....	28
13	Diegan Coastal Sage Scrub Restoration Species Richness Success Criteria.....	30
14	Diegan Coastal Sage Scrub Restoration Vegetative Cover Success Criteria	30
15	Targeted Upland Weed Species	31
16	Vernal Pool Success Criteria Summary	31
17	Diegan Coastal Sage Scrub Success Criteria Summary	31

TABLE OF CONTENTS (cont.)

LIST OF FIGURES

<u>No.</u>	<u>Title</u>	<u>Follows Page No.</u>
1	Regional Location Map	1
2	Project Location Map.....	1
3	Restoration Project Site	3
4	Vista Del Mar Impacts	4
5	Vernal Pool Restoration Area	4
6	Existing Vernal Pools	4
7	Post-Construction Hydrologic Analysis	8

APPENDICES

A	CRAM Assessment Data
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1.0 INTRODUCTION

This plan provides measures to mitigate for vernal pool and San Diego fairy shrimp (*Branchinecta sandiegonensis*) associated with the Vista Del Mar Elementary School Project (proposed project). The mitigation measures identified herein are based on those contained in the Vista Del Mar Draft Subsequent Environmental Impact Report (The Planning Center [TPC] 2009). The proposed mitigation is intended to meet the requirements of the proposed project's expected U.S. Fish and Wildlife Service (USFWS) Biological Opinion (pending), U.S. Army Corps of Engineers (Corps) Section 404 Individual Permit, and Regional Water Quality Control Board (RWQCB) Section 401 Water Quality Certification. All restoration associated with this plan will occur at the West Otoy Mesa Parcel B Preserve (Assessor's Parcel Number 64506102).

2.0 PROJECT DESCRIPTION

2.1 DEVELOPMENT PROJECT LOCATION

The approximately 20-acre project site is located at the western terminus of Del Sol Boulevard in the Otoy Mesa community of the City of San Diego (City). The site is located in Section 30, Township 18 South, Range 1 West as shown on the U.S. Geological Survey 7.5-minute Imperial Beach quadrangle (Figures 1 and 2).

2.2 DEVELOPMENT PROJECT SUMMARY

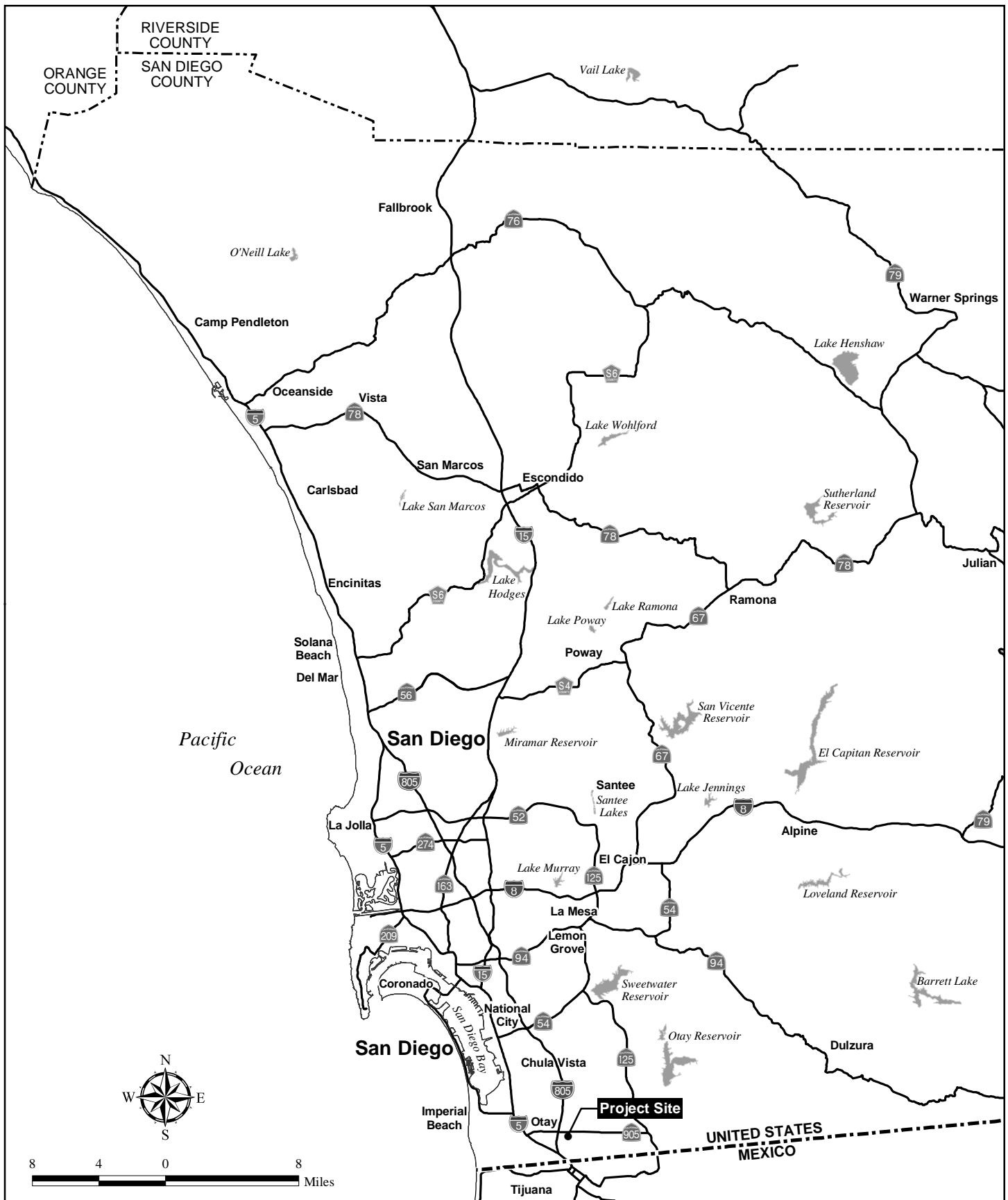
The project consists of two components: 1) the construction and operation of Vista Del Mar Elementary School on the southernmost 10.08 acres of the project site and 2) the extension of Del Sol Boulevard from its current terminus near Surf Crest Drive to the western property line of the project site.

2.3 PROJECT IMPACTS

The proposed project would cause direct and indirect impacts to sensitive vegetation communities, jurisdictional areas, and sensitive plant and animal species. The Planning Center prepared a Draft Subsequent Environmental Impact Report that details all of the biological impacts and required mitigation for the Vista Del Mar Elementary School project (TPC 2009). This current plan details project-related impacts to vernal pool habitat and associated sensitive plants and animals.

2.3.1 Vernal Pools

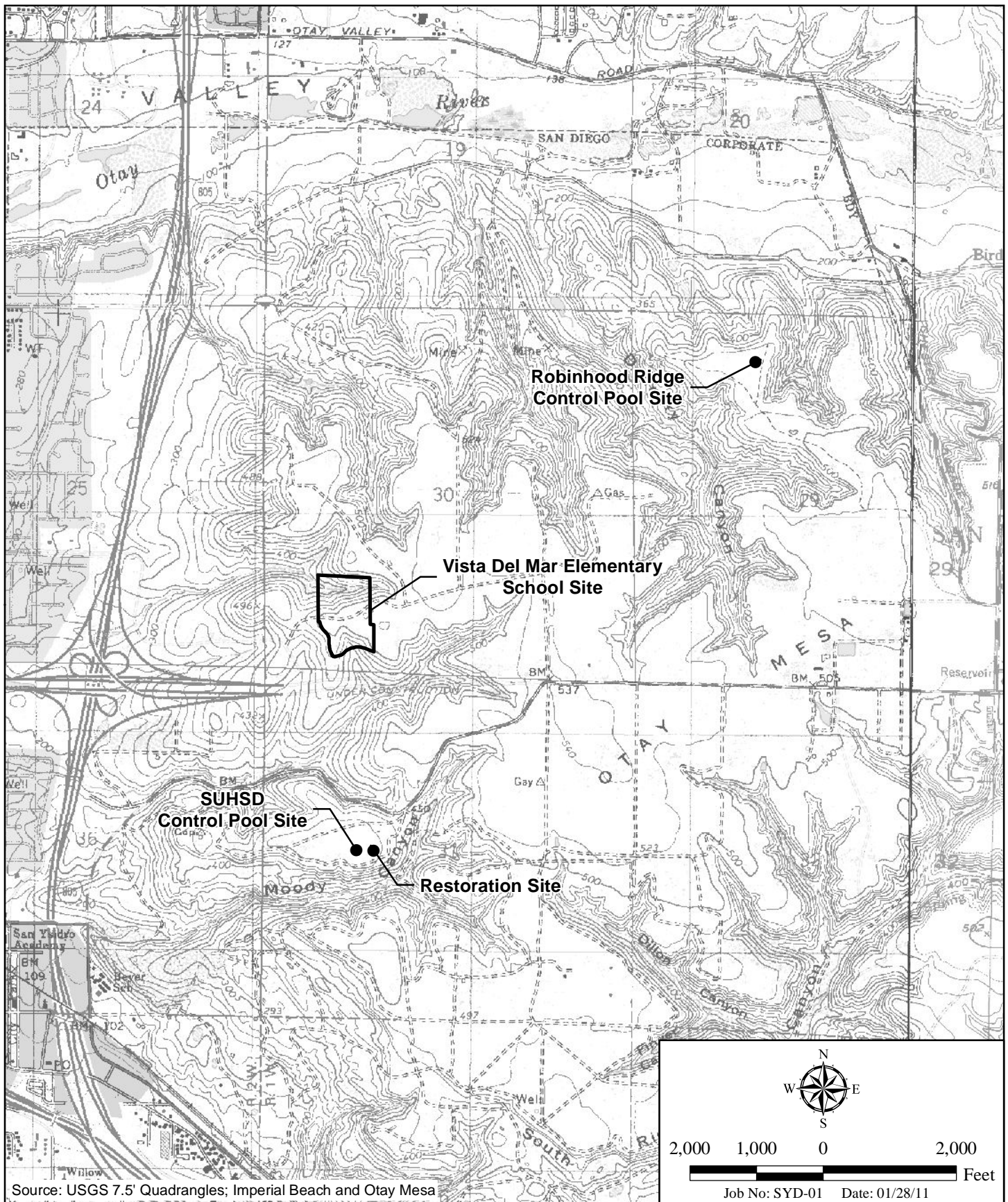
Implementation of the proposed project would impact a total of 10 vernal pools with a combined surface area of 0.02 acre (891 ft²; Figure 4). These pools occur within non-native grassland, disturbed habitat, and disturbed Diegan coastal sage scrub habitats. Most of the vernal pools are associated with dirt roads. Throughout the site, three vernal pool plant indicator species (Corps 1997) were observed: woolly marbles (*Psilocarphus brevissimus*), dwarf plantain (*Plantago*



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Regional Location Map

VERNAL POOL RESTORATION PLAN FOR DEL MAR VISTA ELEMENTARY SCHOOL



Project Location Map

VERNAL POOL RESTORATION PLAN FOR VISTA DEL MAR ELEMENTARY SCHOOL

elongata), and adobe popcorn flower (*Plagiobothrys acanthocarpa*). Each pool had at least one of the three indicator species present. No federally, state, or CNPS listed (CNPS 2010) plant species were observed in any of the pools.

2.3.2 San Diego Fairy Shrimp

Vernal pools A and E support the federally and state listed endangered San Diego fairy shrimp and would be impacted by the proposed project. Fairy shrimp surveys in the remaining pools were negative.

2.3.3 Sensitive Plants

No federally or state listed endangered or threatened vernal pool plants would be impacted by the proposed project.

2.3.4 Functions and Services

The existing functions and services of the impacted vernal pools were assessed using the Individual Vernal Pool Fieldbook of the California Rapid Assessment Method (CRAM) for Wetlands v. 5.0.3 (March 2009). The purpose of the CRAM assessment is to provide a rapid, standardized, and scientifically defensible assessment of the status of a wetland. To conduct this assessment, 2 CRAM practitioners conducted a CRAM assessment according to the User's Manual: California Rapid Assessment Method for Wetlands v. 5.0.2 (Collins et. al., 2008) and other training materials located on the CRAM web site (www.cramwetlands.org). As part of this assessment, a variety of landscape context, hydrology, and structure attributes and metrics were assessed. The CRAM for individual vernal pools has not been fully calibrated; however, it represents a view into the condition of the pools that would otherwise not be represented in the monitoring efforts. Therefore, the CRAM scores will be used primarily for informational purposes and to potentially further the calibration effort on-going in central California. Results of the pre-project and pre-restoration CRAM assessments will be used for later comparison with post-restoration CRAM scores to determine how functions and services were replaced by the rehabilitation effort. Additional monitoring data will also be collected in order to evaluate success off the rehabilitation effort (see Section 8.0).

All of the 10 pools proposed to be impacted by project development were assessed on August 24, 2010 by HELIX biologists Sally Trnka and Dale Ritenour. CRAM scores varied between 49 and 57 at the assessed pools, with a mean score of 53 (Appendix A). The Buffer and Landscape Context attribute score was between 42 and 46 for all of the pools as a result of little surrounding wetland habitat but good-sized buffer habitat, dominated by non-native grassland and disturbed habitat, particularly to the north and west. The Hydrology attribute score was high (100) for all of the pools, since they all receive water as precipitation, follow the natural patterns of filling and drying, and do not indicate that dry season conditions are substantially controlled by artificial water sources (e.g., urban runoff). The Physical Structure attribute score was low for all of the pools (between 25 and 37.5) since they are simple depressions with one main slope and without many structural patch types, as defined by the CRAM fieldbook. All of the pools, except Pool B, also had very low scores for the Biotic Structure attribute (between 25 and 37.5) as a result of few

native species and fewer vernal pool indicator species. As described above, a total three vernal pool indicator plant species were observed throughout the study area. Most pools only contained one vernal pool indicator species. Pool G was the only pool to contain a second indicator plant species. Although higher, Pool B still scored low on the Biotic Structure attribute (50), but higher than the other pools because it contained 2 co-dominant native species and only one co-dominant invasive species.

3.0 MITIGATION REQUIREMENTS

Pursuant to discussions with the resource agencies, the restoration proposed in this plan is intended to meet the RWQCB required 5:1 mitigation ratio for impacts to vernal pools. Therefore, impacts to 0.02 acre of vernal pool habitat would require 0.10 acre of mitigation, with at least 0.02 acre of pool restoration and 0.08 acre as vernal pool enhancement or restoration (Table 1).

Table 1
MITIGATION FOR IMPACTS TO VERNAL POOL HABITAT

Total Impacts (acre)	Mitigation Requirements	
	Ratio	Acreage
0.02	5:1	0.10

To ensure no-net-loss of jurisdictional areas, as well as associated functions and services, the Corps requires compensatory mitigation for jurisdictional impacts. Jurisdictional impacts and mitigation are assessed by using a function-based assessment tool such as CRAM coupled with more typical data such as richness of vernal pool flora, presence of target fauna, extent and duration of ponding, and percent cover of native and non-native flora. The Corps encourages the use of this type of function-based assessment for evaluating impacts to aquatic resources as well as for aiding in establishing appropriate mitigation ratios and determining success criteria.

4.0 MITIGATION SITE DESCRIPTION

The vernal pool mitigation would occur off site at the City of San Diego's Otay Mesa West Preserve. This restoration plan deals only with the off-site restoration and enhancement.

4.1 MITIGATION LOCATION

The vernal pool mitigation would occur within an approximately 1.05-acre area within the Otay Mesa West Preserve. This mitigation site is located approximately 2,700 feet of the south of the Vista Del Mar school impact site on a mesa top owned by the City (Figures 2 and 3). The Preserve is adjacent to Moody Canyon to the south and the San Diego Gas and Electric substation on Old Otay Mesa Road to the north. The preserve is located on the east side of



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Restoration Project Site

VERNAL POOL RESTORATION PLAN FOR VISTA DEL MAR ELEMENTARY SCHOOL

HELIX

Figure 3

Assessor's Parcel Number 645-061-01-00, and occupies portion of Sections 31 in Township 18 South, Range 1 West of the U.S. Geological Survey 7.5-minute Imperial Beach quadrangle.

Vernal pool restoration would occur in an approximately one acre area within Parcel B of the Otay Mesa West Preserve (Figures 4 and 5) in an area that currently supports low quality vernal pools. Vernal pool watershed enhancement would occur throughout the entirety of the uplands within the designated restoration area.

4.2 OWNERSHIP STATUS

The section of the Otay Mesa West Preserve where mitigation is proposed to occur was previously owned and managed by The Environmental Trust; however, the proposed restoration area was never used as mitigation for any project. The area is now owned by the City of San Diego and managed by their Park and Recreation Department as permanent open space. While being managed by the Environmental Trust, the site was protected under a conservation easement. When the City took possession of the site, it was placed under a new conservation easement, along with the surrounding mesa top. The City would allow the San Ysidro School District to conduct its vernal pool mitigation in this area.

4.3 ENVIRONMENTAL SETTING

The proposed vernal pool mitigation area is located within the City's Multi-habitat Planning Area (MHPA) and currently supports non-native grassland and disturbed habitat over the mesa top, with high-quality maritime succulent scrub and Diegan coastal sage scrub in the adjacent canyons. A total of 18 highly disturbed vernal pools with a combined area of approximately 0.048 acre have been mapped in the restoration area (Figure 6), two of which are known to support the San Diego fairy shrimp. Vernal pool indicator plant species occurring in these pools include woolly marbles, dwarf plantain, and popcorn flower, all at low densities (Table 2). In addition, little mousetail (*Myosurus minimus* ssp. *apus*), a CNPS Lit 3.1 species, was detected in 2003 in some of the pools (City of San Diego, written comm.). No other sensitive or listed plant species occur within the pools. Overflow from the pools would drain into an unnamed ephemeral drainage in Moody Canyon. This drainage ultimately empties into the Tijuana River.

TABLE 2
SUMMARY OF EXISTING VERNAL POOL CONDITIONS AT RESTORATION SITE

Pool	Pool Area (sq. ft.)	Vernal Pool Cover*	Fairy Shrimp Observed†
1	272	< 1 %	SDFS
3	202	< 1 %	--
4	245	0	--
11	468	5 %	--
16	245	0	--
17	471	10 %	--











32°34'21" N, 117°1'47" W


Surf Crest Drive

Del Sol Boulevard

32°34'10" N, 117°1'37" W

LEGEND

-  Project Site
- Vegetation Habitat**
-  Vernal Pool (Corps jurisdictional)
-  Southern Willow Scrub
-  Maritime Succulent Scrub
-  Diegan Coastal Sage Scrub
-  Diegan Coastal Sage Scrub - Disturbed
-  Developed and Disturbed
-  Vernal Pool Watershed
-  San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)
-  Undelineated Drainage



120 60 0 120 Feet

Job No: SYD-01 Date: 01/28/11

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Vista Del Mar Impacts

VERNAL POOL RESTORATION PLAN FOR VISTA DEL MAR ELEMENTARY SCHOOL



Figure 4



Vernal Pool Restoration Area

VERNAL POOL RESTORATION PLAN FOR DEL MAR VISTA ELEMENTARY SCHOOL



Figure 5



Existing Vernal Pools

TABLE 2
SUMMARY OF EXISTING VERNAL POOL CONDITIONS AT RESTORATION SITE

Pool	Pool Area (sq. ft.)	Vernal Pool Cover*	Fairy Shrimp Observed†
18	299	< 1 %	--
19	481	< 1 %	--
20	374	< 5 %	--
21	128	< 5 %	--
24	251	< 1 %	--
25	68	< 1 %	--
26	214	0	SDFS
30	752	5 %	--

* = total cover of vernal pool indicator plant species (Corps 1997)

**= number of vernal pool indicator plant species

†= SDFS- San Diego fairy shrimp

The vernal pools in this area are the result of the construction of a BMX track more than 12 years ago. The vernal pools are situated within and adjacent to the created jumps, berms, mounds, and turnouts. These pools exhibit a low diversity of vernal pool plant indicator species and are characterized as having steep slope edges and tire ruts. The dirt used to create the BMX features has been slowly eroding back into the pools, such that over time many of the pools will fill in and cease to function.

4.4 EXISTING FUNCTIONS AND SERVICES OF MITIGATION AREA

This section provides a brief overview of the functions and services currently provided by the proposed mitigation area based on a review of site maps, numerous site visits, and an initial CRAM assessment. The latter assessment will be used for comparison with post-rehabilitation CRAM assessments to measure the change in the system as a result of habitat restoration.

The pre-restoration CRAM assessment was conducted on August 24, 2010 by Ms. Trnka and Mr. Ritenour on 5 of the 32 pools that will be restored or enhanced. The sampled pools were specifically selected as a representative sampling of the varied size and quality of pools currently located at the site. The CRAM scores of these individual pools varied between 45 and 54, with a mean CRAM score of 50 (actually 49.5) being used for comparisons between the impact site and the post-restoration mitigation site scores (Appendix A). As a result of low structural patch richness and topographic complexity, the pools had low scores for the Physical Structure attribute (25 to 37.5). Biotic Structure scores were low to moderate (25 to 50) because the pools had few co-dominant species and fewer vernal pool endemics combined with the presence of non-native grasses and filaree (*Erodium* spp). The Buffer and Landscape Context attribute was also moderate (48 for all pools), largely as a result of low scores for Landscape Connectivity (i.e., few wetlands within 500m of the pools) and Buffer Condition (because of the abundance of non-native vegetation). The Hydrology attribute scores were high (83 or 100) for all pools

because the water source for the pools is mainly from rainfall coming directly into the basins, which fill and drain in natural cycles, and flow from the pools is largely unrestricted (with the exception of areas where a dirt berm is located along the edge of a pool). Data forms for the assessment areas (AAs) are included in Appendix A.

The existing pools currently provide low to moderate habitat functions and services because of their heavily disturbed state. Due to their proximity to adjacent, higher quality pools, there is some potential for long-term dispersal of sensitive plants and animals into these degraded pools; however, as noted above, many of the pools are filling in over time as the adjacent BMX features erode. The long term survival of these pools, without restoration/enhancement is in question.

4.5 MITIGATION SITE SUITABILITY

The proposed mitigation area is considered suitable for vernal pool restoration due to the presence of appropriate soils and topography on site, and the presence of existing, successfully restored vernal pools immediately adjacent to the site. The site is flat to gently sloping, with less than a 2 percent grade. Soils within the site are mapped as Huerohuero loam (Bowman 1973), a type with a clay subsoil, which is one of the 5 primarily soil types associated with vernal pools in San Diego County (Bauder 1998). The adjacent restoration site contains nine vernal pools; has sensitive animals, including San Diego fairy shrimp, Riverside fairy shrimp (*Streptocephalus wootoni*), and spadefoot toad (*Spea hammondi*); and rare vernal pool plants, including Otay mesa mint (*Pogogyne nudiuscula*), San Diego button-celery (*Eryngium aristulatum*), spreading navarretia (*Navarretia fossalis*), and little mousetails (*Myosurus minimus* ssp. *apus*) (HELIX 2004). A total of 13 vernal pool plant indicator species have been observed within the adjacent preserve.

5.0 MITIGATION DESIGN CONCEPT

To meet Corps, USFWS, and RWQCB (hereafter referred to as “resource agencies”) mitigation requirements, as appropriate, this plan recommends measures to restore vernal pool habitat by expanding and enhancing existing degraded pools and enhancing the adjacent upland watershed habitat. It is anticipated that the functions and services of wetland habitat within the target area would be increased with the proposed mitigation measures.

5.1 MITIGATION DESIGN

5.1.1 Vernal Pool Restoration and Watershed Enhancement

Mitigation for impacts to 0.02 acre of vernal pools and San Diego fairy shrimp would occur through vernal pool preservation, enhancement, and restoration (re-establishment) on the Otay Mesa West Preserve. All of the preserved pools (0.048 acre) on site will be enhanced to improve their quality and function. All but 2 of the preserved pools on site also will be expanded to provide additional surface area. The preserved and enhanced vernal pool surface area is intended to provide the City with additional, higher quality vernal pool habitat within the

MHPA. It is not being used to directly meet the project's vernal pool habitat mitigation requirements. An additional 18 pools with a combined surface area of approximately 0.111 acre will be restored to satisfy the project's mitigation requirements. Upon completion of the restoration effort there will be a total of approximately 0.218 acre of restored/enhanced vernal pools on site. Of this area, only 0.125 acre would be counted toward mitigation for the Vista Del Mar elementary school project. This includes the required 0.10 acre plus a 25 percent contingency in excess of mitigation requirements.

The restored vernal pools would support vernal pool plant indicator species (Corps 1997) and function as viable, self-sustaining vernal pool basins. In addition to pool restoration and enhancement, approximately one acre of watershed would also be enhanced in upland habitat surrounding the restored pools. Watershed enhancement would consist of the control of invasive non-natives, and seeding and planting of native upland species.

5.1.2 San Diego and Riverside Fairy Shrimp Mitigation

The project applicant proposes to mitigate impacts to San Diego fairy shrimp at a 5:1 ratio in conjunction with the vernal and road pool mitigation identified above. This mitigation would include the salvage of soil containing fairy shrimp cysts in the impacted pools and the use of this inoculum within a minimum of 0.10 acre of enhanced/restored pools.

5.1.3 Rare Plant Enhancement

While not a resource agency requirement, the project applicant proposes to mitigate impacts to uncommon and rare plants through the following measures:

- Seed collection from impacted populations and placement at the vernal pool restoration area for: San Diego bur-sage, south coast saltbush, seaside calandrinia, Orcutt's bird's beak, Palmer's grapplinghook, Robinson's peppergrass, and golden-rayed pentstemon
- Inclusion of San Diego barrel cactus, south coast saltbush, and San Diego bur-sage in the vernal pool uplands planting plan. These plant species may be acquired through collection from the impact area of the Vista del Mar Elementary School project, or by purchasing container plants at a qualified native plant nursery.

5.2 TARGET FUNCTIONS AND SERVICES

The overall goal of this mitigation effort is to increase the functions and services of existing vernal pool habitat and create additional high quality vernal pools to an amount that would, at a minimum, replace the functions and services lost by project implementation. With the completed restoration, it is expected that functions and services (water filtration, sensitive wildlife and plant habitat, etc.) that are currently being performed by the existing pools would be improved by the end of the 5-year mitigation effort. This increase would be documented by conducting CRAM assessments prior to impacts, post-rehabilitation, and at the end of Years 3 and 5 of the mitigation effort.

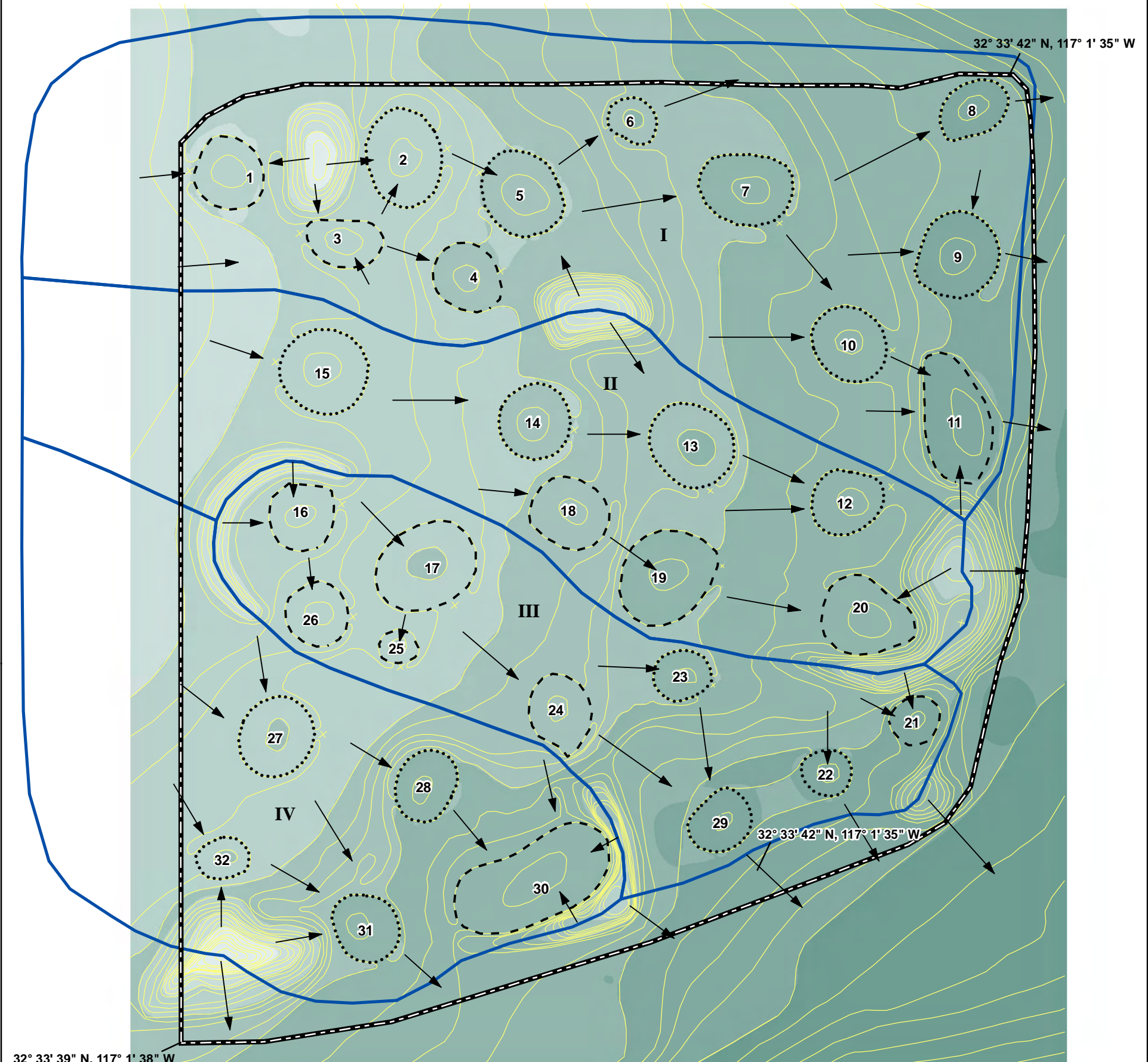
5.3 RATIONALE FOR EXPECTING IMPLEMENTATION SUCCESS

The mitigation site is adjacent to an existing, successful pool restoration/enhancement mitigation area. The mitigation site currently supports non-native grassland habitat with vernal pools. This plan would enhance the watersheds of existing pools, restore vernal pools, salvage and transfer rare plant seed, and implement habitat enhancements for other wildlife species.

A watershed analysis of several mound and basin vernal pool complex maps from Kearny Mesa and Otay Mesa found watershed to pool surface area ratios as low as 4:1, and commonly 6:1 or 7:1 (RECON 1997). Studies have shown that direct precipitation plays a more important role in pool filling than watershed contributions in more porous soils (Hanes and Stromberg 1998), while subsurface flow may have an effect on the duration of ponding.

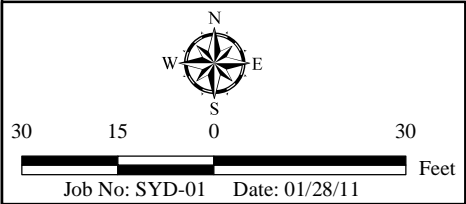
A hydrological analysis of the proposed vernal pools and surrounding watershed area was conducted to determine the appropriateness of the proposed restoration. This analysis included a delineation of the specific watershed areas (micro-basins) for each proposed pool complex and models inter-pool surface flows. The micro-basins delineation and modeled surface flows were obtained with a Geographic Information System (GIS) using the hydrological modeling capabilities of ArcView 9.2, and the Spatial Analyst and Arc Hydro GIS tools. A digital elevation model (DEM) was derived from the linear hypsography (6-inch contours) resulting in a raster surface model with 1-foot resolution. This DEM acts as the surface upon which all subsequent hydrological modeling was performed. The micro-basin delineation was the result of employing flow direction, flow accumulation, stream channel modeling, and basin modeling in Arc Hydro, the Environmental Systems Research Institute GIS tool for hydrological and water resource analysis. The delineated micro-basins represent a generalization of the output of the GIS analysis, with a number of the modeled lines removed for clarity. The resulting micro-basin delineations (Figure 7) represent “break-lines” that would not likely be crossed by surface flows, thus illustrating the spatial limits (watershed) of potential contributing surface flows for an area. Also derived through hydrological modeling techniques are the flow lines included in the analysis. These lines were derived using the tools in Arc Hydro. The flow lines are not meant to show the location of channelized flow, as might be expected from stream channel modeling in GIS; rather, these lines show the path or direction that water would take from a specific point on a surface. While the flow lines are specific paths that overland flow would follow from a single one foot by one foot location in the study area, they provide a good indication of the general direction and path that flows would follow from a potentially much larger area, until of course they infiltrate into the soil, enter a vernal pool, or channelize, ultimately becoming part of a stream network. Channelization is not anticipated to occur on site because of the small size and general flat character of the site.

The overall watershed to pool ratio of 6:1 is similar to other successful pool complexes and would be sufficient to support the restored vernal pools. Additionally, the project team is comprised of a number of individuals who have been involved in the successful implementation of several vernal pool restoration efforts in San Diego and Riverside counties.



12	Vernal Pool Number	Elevation Range (feet above mean sea level)
I	Watershed Unit	< 480
	Mitigation Area	480 - 482
	Approximate Limits of Watershed	482 - 484
	Direction of Water Flow*	484 - 486
	Proposed Contours	486 - 488
	Vernal Pool Enhancement	488 - 490
	Vernal Pool Establishment	490 +

* Based on GIS hydrologic modeling.



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Post-Construction Hydrologic Analysis

VERNAL POOL RESTORATION PLAN FOR DEL MAR VISTA ELEMENTARY SCHOOL

6.0 IMPLEMENTATION PLAN

Vernal pool mitigation at the Otay Mesa West preserve will consist of several components, including:

- The restoration of 0.17 acre of vernal pools in an approximately one-acre vernal pool restoration area;
- The enhancement of 0.048 acre of existing pools;
- The avoidance or mitigation of impacts to on-site little mousetail plants
- The addition of Diegan coastal sage scrub plantings and seeding adjacent to the restored/enhanced pools;
- Translocation of rare plant seed to the vernal pool restoration area; and
- Enhancement of wildlife habitat.

The site preparation, installation, and maintenance of these areas are described in detail in sections 5.4 and 5.5.

6.1 RESPONSIBLE PARTIES

6.1.1 Project Proponent

San Ysidro School District would be responsible for financing the installation, maintenance, monitoring, and long-term management of the restoration effort. The City of San Diego Park and Recreation Department or an approved alternative management entity would be responsible for long-term management upon completion of the 5-year maintenance and monitoring period with Corps, USFWS, and RWQCB signoff verifying the successful completion, and acceptance of the non-wasting endowment received by the San Ysidro School District.

6.1.2 Restoration Specialist

Overall supervision of the installation, maintenance, and monitoring of this mitigation project would be the responsibility of a restoration specialist with vernal pool restoration experience. The restoration specialist would educate all participants with regard to mitigation goals and requirements and directly oversee grading, excavation, and placement of salvaged topsoil for vernal pool restoration, installation of vernal pool watershed enhancement, rare plant translocation, and maintenance during the minimum 5-year restoration effort. In addition, the specialist would conduct all CRAM assessments, other monitoring data collection, and annual assessments, and prepare all required reports. If necessary, the restoration specialist would provide the permittee and contractor with a brief report, including a written list of items in need of attention following each monitoring visit. The contractor would be responsible for carrying out all required measures in a timely manner. The restoration specialist would notify the contractor and responsible party if any requested remediation is not addressed.

6.1.3 Installation/Maintenance Contractor

The installation and maintenance contractor(s) will: have wetland habitat restoration experience; be under direction of the restoration specialist; be responsible for completion of grading, pre-planting weed control, translocation, planting, seeding, and maintenance of the restored and enhanced vernal pools and watersheds. The restoration specialist would educate the contractor(s) on the installation and maintenance of vernal pools and native plant species.

After the installation contract is completed, the project proponent(s) would hire a maintenance contractor for the duration of the minimum 5-year monitoring period. The maintenance contractor and the installation contractor may be the same entity. The project proponent may change contractors at its discretion. The maintenance contractor will be educated as to the maintenance of native plant habitat and the difference between native plants and weeds. The maintenance contractor would service the entire restoration area at least once per month. Service would include, but not be limited to weed control, trash removal, watering, fence repair, dead plant replacement, and re-seeding. If large scale trespassing occurs and the mitigation areas are destroyed by digging or otherwise reconfiguring the pools, mounds, or watersheds for the purposes of off-roading, dirt biking, or other unauthorized use, the affected area will be fully restored. All activities conducted would be seasonally appropriate and approved by the restoration specialist. The maintenance contractor would meet the restoration specialist at the site when requested and would perform all checklist items in a timely manner, as directed by the project proponent.

6.2 RESTORATION IMPLEMENTATION SCHEDULE

6.2.1 Vernal Pool Restoration and Enhancement Implementation Schedule

The schedule for implementation of the mitigation program has not yet been set. Implementation would only occur if weather and soil conditions are dry enough to conduct the vernal pool restoration without causing irreparable damage to the surrounding habitat. No activities would be conducted within the vernal pools unless approved by the Corps, USFWS, and City. In order to obtain this approval, the following conditions must be met:

1. Grading will occur only when the soil is dry to the touch both at the surface and one inch below, and a visual check for color differences (i.e., darker soil indicating moisture) in the soil between the surface and one inch below indicates that the soil is dry.
2. After a rain of greater than 0.2 inch, 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.
3. Grading would commence only when no rain is forecast during the anticipated grading period.
4. To prevent erosion and siltation from stormwater runoff due to unexpected rains, Best Management Practices (i.e., silt fences and fiber rolls) would be implemented as needed during grading.

5. If rain occurs during grading, work would stop and only resume after soils are dry, as described above.

Initial vernal pool restoration and enhancement activities would include demarcating all restoration areas, little mousetail plants, impacted pool inoculum salvage, weed and trash removal, and vernal pool grading. Grading of the restored vernal pools would start once the site has been weeded. Grading would avoid little mousetail plants as feasible. If avoidance is not possible, little mousetail plants will be salvaged and transplanted on-site, or added to the seed mix during restoration. Seeding and planting of the vernal pool enhancement areas would begin when vernal pool grading is complete. The entire restoration is anticipated to be complete within 4 weeks of starting. Pool grading cannot be conducted while the pool soils are wet or damp, so it is expected that pool grading could not be conducted before June or July of a given year. Monitoring of the restoration effort would begin immediately following installation. The monitoring program would continue for a minimum 5-year period and until the success criteria are met and the resource agencies agree with the success of the site. Field surveys would be completed every other week during the rainy season and monthly during the dry season each year, with an annual report being prepared and distributed by October 1. The results of the annual reports would be used to determine the success of the restoration effort and to determine any remedial actions necessary. When success criteria are achieved, a site visit will be offered to the resource agencies and a final report would be produced for agency review and approval. A general checklist showing the phases and responsible parties is included in Table 3.

6.2.2 Rare Plant Seed Translocation Schedule

Rare plant seed would be collected before any project site grading occurs, and would be placed at the restoration site concurrent with restoration site seeding.

6.2.3 Upland Planting and Seeding

Installation of container stock will not occur until after vernal pool site grading is completed. Container stock will be installed in the fall, as generally cooler, shorter days will help reduce plant mortality. Seeding will not be conducted until after container stock are installed, to avoid trampling of seeds and seedlings. To take advantage of the rainy season and minimize seed predation, seeding will occur between November 15 and January 15.

6.3 RESTORATION SITE PREPARATION

Site preparation would be accomplished by: weeding the non-native grasslands in the mitigation site; salvaging topsoil from vernal pools in the project site and the enhancement area; salvaging rare plants and seed in the proposed project site; grading restored vernal pools; and protecting the restoration area from intrusion.

Table 3
VERNAL POOL RESTORATION PLAN CHECKLIST

Construction Phase	Restoration Task	Applicable Parties				
		Project Proponent ¹	Grading Contractor	Installation Contractor	Maintenance Contractor	Restoration Specialist
Pre-construction	Order seed ¹			X		
	Attend pre-construction meeting	X	X	X		X
	Document pre-impact conditions, including a CRAM assessment					X
	Document pre-installation site conditions, including CRAM					X
	Salvage vernal pool topsoil			X		X ²
	Salvage rare plant seed					X
Installation	Delineate mitigation boundaries			X		X ²
	Remove non-native vegetation			X		X ²
	Restore vernal pool topography		X			X ²
	Install container stock and seed and replace vernal pool topsoil			X		X ²
	Conduct post-installation CRAM assessment					X
	Prepare/submit as-built report					X
Five-year Maintenance & Monitoring Period	Conduct maintenance monitoring and annual monitoring;					X
	Conduct Year 3 and Year 5 CRAM assessments					
	Maintain site for remainder of 5 years - until signed off by resource agencies				X	X ²

¹ Must provide all source locations and receive authorization of final seed and plant lists prior to ordering

² Inspecting or overseeing work related to this task

6.3.1 Initial Restoration Site Weeding

All non-native grassland areas within the mitigation site would be weeded before any other restoration activities occur, and the plant material would be raked up by hand and disposed of in a legal manner.

6.3.2 Vernal Pool Inoculum Salvage

Restoration of the native vernal pool habitat on site requires the reintroduction of plants and animals in addition to the physical construction described above. Partly because vernal pools recur reliably in the same location year after year, many vernal pool species are adapted for a strategy of non-dispersal (Zedler 1990). As a result, the restoration of vernal pool habitat can be greatly accelerated by the active transport of propagules from donor sites into the restored pools (Scheidlinger et al. 1985).

Prior to project site development, vernal pool topsoil would be collected, placed into boxes, and stored until the restoration site is ready. Hand tools (i.e., shovels and trowels) would be used to remove the first one to 2 inches of soil from the existing pools. Soil would be placed in boxes of sturdy, moving grade cardboard, with lids. Typically, the size of each box is 12 inches by 15 inches by 10 inches (depth). Butcher paper (or similar) should be placed in the bottom of the boxes to reduce leaks. Boxes should only be filled to 3/4 of capacity or approximately 3/4 cubic feet each, to allow for safe movement. The collected inoculum from each pool would be labeled and kept separate from inoculum collected from other pools. The amount of inoculum collected from a given pool depends upon its size, slopes, and quality. Each box must be labeled with the pool number, box number, and date of collection. Boxes would be moved to a secure, dry, enclosed storage facility. Boxes should be stored off the floor, on pallets or similar.

Prior to vernal pool enhancement within the restoration area, vernal pool topsoil would be collected, and stored until pool grading is complete, as per above. Topsoil would be returned to the pools that it was drawn from.

Off-site seed inoculum would be required to supplement the salvaged soils to achieve reasonable vernal pool cover because of the low cover and diversity of plants within the impacted pools. Potential sources of inoculum include other vernal pool restoration projects that have been conducted by HELIX on Otay Mesa, including Robinhood Ridge Vernal Pool Preserve, Otay Mesa West Preserve, and Arnie's Point Vernal Pool Preserve. These locations provide a large surface area of pools, with a variety of vernal pool indicator plant species. Care would be taken to minimize the introduction of weed seeds into the restored vernal pools. Prior to the use of off-site inoculum, the restoration specialist would contact the appropriate resource agency for approval.

The successfully completed Sweetwater Union High School District vernal pool habitat restoration is located west of the proposed mitigation site. Portions of the watershed for the proposed mitigation is in this off-site area, which supports native upland habitat and minimal cover by invasive, non-native species.

6.3.3 Rare Plant Seed Salvage

Seed collection will occur in June and would attempt to collect as much seed as possible. Seed collection would be conducted by the restoration specialist or a qualified seed collector. Seed would be stored in a cool, dry, dark, well ventilated location in paper bags until they can be placed in the receptor site. The seed collector would also gather seed of any chocolate lily observed and include these in the seed mix used for the restoration site.

6.3.4 Vernal Pool Grading

The restored and enhanced pools (Figure 5) would be formed to replicate hydrologic conditions of existing vernal pool habitat in Otay Mesa. The post-construction hydrologic analysis depicts the vernal pool restoration area and its topography and watershed following project implementation and vernal pool restoration (Figure 6). Pools would be graded to have maximum depths of 4 to 6 inches, with the goal of having appropriate hydrology for San Diego fairy shrimp (i.e. ponding for 30 days in an average rainfall year). Pools are planned to have slopes of 12:1 to 15:1 to provide smooth, micro-topographic variance for vernal pool plants. Material removed during pool excavation would be used to enhance and restore adjacent mima mounds.

Vernal pool grading would be carried out under the supervision of the restoration specialist. The restoration specialist would mark all areas to be graded. Existing sensitive habitats and plants would be marked as avoidance areas. Access routes would be identified and marked. An on-site meeting would be held with the restoration specialist and all installation personnel to identify sensitive areas and devise a strategy for avoidance prior to initiation of restoration activities. A staging area would be established outside of the on-site vernal pool restoration area. Grading shall be implemented using rubber-tired loaders with ripping tines and slope boards. Skid-steer loaders would not be used because of their high impact on soil. All vehicles and construction equipment would be restricted to the staging areas when not required for restoration activities.

All of the existing vernal pools will be enhanced by implementing the activities listed in Table 4. Existing ponding area has been delineated and mapped as the normal high water mark for the pools, and is often discernable by changes in vegetation composition, the presence of a dried algal mat, or micro-topographical changes. All restored pools would be created and inoculated with appropriate vernal pool flora and fauna (Table 4).

Table 4
SPECIFIC ENHANCEMENT/RESTORATION ACTIVITIES BY POOL

Vernal Pool Enhancement			
Pool	Existing Pool Area[†]	Planned Size After Grading[†]	Activity
1	67	272	Deepen basin and smooth edges
3	30	202	Deepen basin and smooth edges
4	91	248	Deepen basin and smooth edges
11	386	468	Remove wetland weeds and berm, and smooth edges
16	105	245	Remove berm, deepen basin, and smooth edges
17	196	471	Remove mounds, merge ruts, and smooth edges
18	117	299	Remove mounds, merge ruts, and smooth edges
19	190	481	Remove mounds, merge ruts, and smooth edges
20	137	374	Remove wetland weeds and berm, and smooth edges
21	116	128	Remove wetland weeds and berm, and smooth edges
24	90	251	Deepen basin and smooth edges
25	62	68	Deepen basin and smooth edges
26	59	214	Deepen basin and smooth edges
30	455	752	Remove wetland weeds and berm, and smooth edges
Subtotal	2,101	4,473	--

Vernal Pool Restoration			
Pool	Existing Pool Area[†]	Planned Size After Grading[†]	Activity
2	0	397	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
5	0	368	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
6	0	118	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
7	0	369	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
8	0	207	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
9	0	374	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
10	0	296	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species

Table 4
SPECIFIC ENHANCEMENT/RESTORATION ACTIVITIES BY POOL

Vernal Pool Restoration			
Pool	Existing Pool Area[†]	Planned Size After Grading[†]	Activity
12	0	249	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
13	0	373	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
14	0	288	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
15	0	398	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
22	0	123	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
23	0	156	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
27	0	317	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
28	0	231	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
29	0	201	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
31	0	241	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
32	0	117	Restore new basin and inoculate with SDFS [‡] and vernal pool indicator species
Subtotal	0	4,823	--
TOTAL	2,101	9,296	--

[†]Area presented in square feet.

[‡]San Diego fairy shrimp

6.3.5 Fencing and Signage

A non-barbed, 3-wire fence would be constructed around boundary of the vernal pool restoration area, tying into the existing fence along the adjacent preserve. A vehicle-access gate would be included in the fence to allow maintenance personnel to access the site.

Aluminum signs would be posted adjacent to the dirt road on the north and south boundary of the site, providing notice in both English and Spanish that the area is an ecological preserve and that trespassing is prohibited.

6.4 VERNAL POOL RESTORATION AREA PLANTING PLAN/ INSTALLATION

6.4.1 Vernal Pool Inoculation

After the pools are successfully graded, each of the restored pools would receive a share of the total collected pool material proportionate to its surface area. The collected soils would be spread out and raked into the bottoms of the restored pools.

6.4.2 Vernal Pool Restoration Area Planting Plan

Restoration of upland habitat is critical to the overall success of this vernal pool restoration plan. Without native vegetative cover to prevent erosion, the pools may fill with materials washed in from the adjacent upland areas or become overrun by annual grass weeds. Adjacent areas are managed by the City, which has recently assumed responsibility for all of Otay Mesa Parcels A and B. The City and SANDAG are developing management approaches for vernal pool areas within the MHPA, and are seeking various sources of funding for future restoration efforts. This restoration plan represents a step toward overall improvement and management of the entire mesa top.

Disturbed upland areas within the one-acre restoration site will be enhanced. Upland restoration will involve a number of techniques including installing: (1) salvaged rare plant seed, (2) container stock plantings, and (3) commercially obtained seed mix. No seeding or planting will occur within restored pools (besides salvaged inoculum).

The planting palette for the vernal pool uplands will include a mix of Diegan coastal sage scrub and maritime succulent scrub plant species (Table 5). The amount of container stock for each species is dependent upon availability from local nurseries. The seed palette includes a mix of shrub, forb, and native bunchgrass species (Table 6). All of the species in the planting and seeding palettes have been observed on south facing slopes in the immediate vicinity. All plantings would be one-gallon pots, except purple needlegrass (*Nassella pulchra*) which would be plugs. Root bound container stock would not be accepted from the nursery. Container stock placement would be overseen by the restoration specialist, and plants would be positioned prior to planting. Planting holes should be excavated to 1.5 times the planting depth, to loosen the soil. Prior to installing container stock, the planting hole would be filled with water and allowed to drain, to build soil moisture. Container stock should be planted so that after soil settling, the crown of the root ball is one-inch above finish grade. The deep watering pipe would be installed at the same time that the container stock is planted. The holes should be backfilled around the container stock and pipe with native soil, and the holes will be watered immediately after planting, to settle the soil. Any voids or settlement should be filled with additional native soil, and the watering repeated.

Table 5
UPLAND ENHANCEMENT CONTAINER STOCK PLANT PALETTE*

Scientific Name	Common Name	Spacing on Center (ft)	Grouping Size	Number Per Acre	Number to be Ordered†
<i>Euphorbia misera</i>	cliff spurge	4	8	10	10
<i>Isomeris arborea</i>	bladderpod	5	3	10	10
<i>Malosma laurina</i>	laurel sumac	6	4	5	5
<i>Opuntia littoralis</i>	coastal prickly pear	4	4	10	10
<i>Opuntia prolifera</i>	cholla	4	4	10	10
<i>Rhus integrifolia</i>	lemonadeberry	6	4	5	5
<i>Simmondsia chinensis</i>	jojoba	6	4	20	20
<i>Yucca schidigera</i>	Mojave yucca	5	3	5	5
<i>Artemisia californica</i>	California sage brush	5	3	20	20
<i>Eriogonum fasciculatum</i> var. <i>fasciculatum</i>	California buckwheat	5	3	20	20
TOTAL				115	115

*All container stock would be 1 gallon

†Based on 1 acre

Table 6
UPLAND ENHANCEMENT SEED MIX

Scientific Name	Common Name	Pound/Acre†	Amount to be Ordered*
<i>Ambrosia chenopodifolia</i>	San Diego bur-sage	3	3
<i>Artemisia californica</i>	California sage brush	2	2
<i>Deinandra fasciculata</i>	fascicled tarweed	5	5
<i>Encelia californica</i>	California encelia	3	3
<i>Eriogonum fasciculatum</i> var. <i>fasciculatum</i>	California buckwheat	2	2
<i>Eriophyllum confertiflorum</i>	golden yarrow	2	2
<i>Isomeris arborea</i>	bladderpod	1	1
<i>Lasthenia californica</i>	goldfields	1	1
<i>Lotus scoparius</i>	deerweed	3	3
<i>Nassella pulchra</i>	purple needlegrass	3	3
<i>Salvia columbariae</i>	chia	1	1
<i>Salvia mellifera</i>	black sage	2	2
<i>Simmondsia chinensis</i>	jojoba	4	4
<i>Viguiera laciniata</i>	San Diego sunflower	3	3
TOTAL		35	35

†Seeding rates are dependent on availability of seed material

*Based on 1 acre

6.5 IRRIGATION PLAN

No broadcast irrigation is planned or considered appropriate for this project. Runoff from any spray irrigation could alter the hydrology or water chemistry of the surrounding vernal pools. Irrigation runoff entering pools could cause vernal pool plant seed germination or fairy shrimp cysts to leave diapause at a time of year not appropriate, and therefore cause the death of these individuals.

Deep pipe irrigation would be utilized for establishment of the container stock. In this method, a perforated pipe is placed in the soil next to each planting and watered by hand (Soil Ecology Restoration Group 2001). Specifically, a 3-inch diameter PVC plastic pipe will be placed vertically in the soil approximately 12-inches deep, immediately adjacent to each container stock planting. Each pipe should be approximately 16-inches long, and be either commercially available French drain pipe, or PVC pipe with a quarter inch diameter holes drilled every 3 to 4 inches. A screen cap of 1/8 inch hardware cloth would be glued onto the top of each pipe with silicone caulk to prevent animal entry.

Container stock and grass plugs will be watered at the time of planting, and then periodically during the installation and maintenance period. A water truck will be brought to the site and water will be moved to the container stock by hose or watering can. The water truck will remain on designated roads and will not enter the restoration site. Each planting will be individually watered by hand, in a way such that runoff from the planting does not occur. If hoses are used, care will be taken to avoid damaging establishing seedlings or container stock. During installation, the entire planting hole will be watered, but afterwards, only the deep pipe will be watered. During each watering visit, each deep pipe will be filled, allowed to naturally drain, and then filled again.

6.6 WILDLIFE HABITAT ENHANCEMENT

In addition to seeding and planting, the restoration effort will include additional measures intended to increase the potential for wildlife usage of the site, particularly in the early years prior to full establishment.

6.6.1 Small Animal Cover

In order to encourage wildlife establishment and use of the restoration area, and document small animal presence, shelter for small mammal and reptile species will be created on site. These shelters include placement of 10 half-inch thick plywood boards, measuring 2 by 4 feet, within the site. These boards will provide shade, cover, and nesting locations for species including mice, lizards, snakes, and numerous invertebrate species (insects, spiders, etc.). The boards also provide an opportunity to monitor the wildlife usage of the site. During regular monitoring visits, the project biologist will be able to lift each board and note the species present. The data collected during these monitoring visits will be summarized in the annual reports prepared during the 5-year restoration monitoring period.

Additionally, shrub vegetation will be salvaged and collected from the project site and used for brush piles within the restoration site. Shrubs will be collected by hand before site grading,

transferred to the restoration site, and stacked into low brush piles to provide additional cover for small animals.

6.6.2 Pollinator Support

Pollinator species are integral in a diverse, self sustaining habitat. Pollinators may include bats, birds, and a host of insects. The restoration seed mixes include a variety of forbs and other plants with overlapping flowering periods to support a wide-range of pollinators that will stimulate continued seed production and provide pollen and nectar sources for foraging wildlife. In addition, 10 bee blocks will be prepared and scattered throughout the restoration area to provide nesting locations for native wood and cavity-nesting bees. Bee species from the Apidae, Colletidae, Halictidae, and Megachilidae families are expected. The bee blocks will consist of an untreated 4 inch by 8 inch by 12 inch block of wood. Numerous holes ranging in size from 3/32 inch to 3/8 inch in diameter will be drilled approximately 3/4 inch on center on the 4-inch wide face of the block. The depths will be approximately 3 to 4 inches for holes less than 1/4 inch in diameter and 5 to 6 inches for holes greater than 1/4 inch in diameter. The varying hole sizes and depths should attract a variety of native solitary bee species. The bee blocks will be positioned such that they face the morning sun (east to southeast).

The restoration effort also will include support for ground-nesting bees in the form of small, shallow sand pits (Sarver 2007). A total of 4 sand pits will be installed within the restoration area. Each pit will be approximately one foot deep and 4 feet in diameter. The pits will be filled with a mix of sand, native soil, and organic material (plant chippings). In addition to ground nesting bees, several other insect species may use these pits as foraging and nesting areas. Birds also may use the pits for taking dust baths for feather maintenance, parasite control, and temperature regulation.

7.0 MAINTENANCE PLAN

7.1 HABITAT MAINTENANCE ACTIVITIES

A 5-year maintenance program is proposed to ensure the successful establishment and persistence of the restored habitat. The maintenance program would involve removal of trash, weed control, fence repair, and any remedial measures deemed necessary for restoration program success (e.g., re-seeding and re-contouring).

7.1.1 Trash Removal

The maintenance contractor would remove any trash encountered within the restoration area and dispose of it in a legally acceptable fashion.

7.1.2 Weed Control

Particular emphasis in the vernal pool restoration area will be placed on pro-active weed control. All weed species observed within the vernal pool restoration area during restoration activities would be considered invasive and targeted for removal. All workers conducting weed removal activities would be educated to distinguish between native and non-native species, with special attention paid to rare and endangered plant species. All weeding within the restored/enhanced pools would be performed by hand and with hand tools. Care would be taken within pools to avoid removing vernal pool plant species and to reduce soil disturbance. Weeds would be removed from the restoration limits and disposed of in a legal manner. All weeds would be removed prior to reaching 12 inches in height or before reaching seed. Leaf and branch drop of native species should be left in place and not removed from the site.

Weeds in the uplands of the vernal pool restoration area will be removed by hand tools whenever possible; however, focused herbicide application is recommended if manual removal does not fully control invasive species. Pesticides would only be applied by workers licensed to use those chemicals. Additionally, no herbicide will be used within 5 feet of any vernal pools. Herbicides will not be used during wet or windy conditions. Care will be taken not to saturate the soils with herbicide, and any herbicide used will not be allowed to be blown into pools.

Mechanical removal of weed species with a line trimmer or other such device in the upland areas may also be necessary. However, no mechanical weed removal devices will be used in any pool. Weeding will not occur in the pools while the pools are wet. Pools may be recontoured if necessary to increase the hydrologic ponding period, which helps exclude upland weed species.

As the Southern California region is already impacted by nitrogen deposition, no fertilizers will be used in the restoration site.

7.1.3 Container Stock Irrigation

Container stock, native grass plugs, and transplanted sensitive plants will be hand watered at least twice a month, if necessary, during the first 2 years of maintenance and monitoring. Hand watering may not be necessary during the rainy months. Water will be applied to the deep pipe adjacent to each container stock planting, and will be watered in such a way that run off does not occur.

Dead container stock will be replaced by the maintenance contractor at the request of the vernal pool restoration specialist, if container stock is not meeting survival goals.

Deep pipes will remain in the soil until the vernal pool restoration specialist decides that hand watering is no longer necessary. Deep pipes will then be removed and backfilled with native soil.

7.1.4 Fence Repair

The 3-strand wire fence will be maintained in good order by the maintenance contractor. Wiring and fence posts will be repaired within one month of the initial observation if damaged. If

unauthorized access threatens the restoration site, fencing will be repaired within one week of the initial observation.

7.2 HABITAT MAINTENANCE SCHEDULE

Regular maintenance, trash removal, and weed control of the vernal pool restoration area would be conducted during the first 5 years following implementation of the mitigation program or until the mitigation program is deemed successful. Maintenance personnel would visit the site at least monthly for the entire duration of the 5-year restoration effort. Additional visits would be conducted as directed by the restoration specialist during the rainy season (generally December through May) each year to keep non-native species under control.

8.0 SUCCESS CRITERIA

As discussed in Section 3.0, mitigation for impacts to 0.02 acre of vernal pools with and without fairy shrimp would be at a 5:1 ratio, and would consist of at least 0.10 acre of vernal pool restoration and enhancement.

The following sections provide performance standards to determine the successful completion of the 5-year mitigation and monitoring program. Attainment of these standards indicates the mitigation area is progressing toward the habitat functions and services specified for this plan. Methods used to measure these success criteria are described in the following text. If the restored areas fail to meet the Year 5 standards after the full monitoring term, a specific set of remedial measures would be implemented, and the monitoring and maintenance period would be extended until all Year 5 standards are met or as otherwise provided in this document. Only areas failing to meet the success standards would require additional work (i.e., not all of the areas originally restored), and only when the entire mitigation site is meeting the Year 5 standards will the entire site be signed off.

8.1 CONTROL POOLS

In order to measure the success of the restored vernal pools, 10 off-site pools in Otay Mesa would serve as control pools. Five pools are located in the adjacent West Otay Mesa vernal pool preserve (Figures 2 and 3). Three control pools are located at the San Ysidro High School on-site preserve, immediately adjacent to the high school and approximately 0.2 mile east of the San Ysidro School #8 mitigation area. The remaining 2 control pools are located on the Robinhood Ridge vernal pool preserve, west of Heritage road in north central Otay Mesa (Figure 2). The Robinhood Ridge control pools are preserved pools that have not been restored or enhanced, but are protected from trespass and have been weeded at times over the last 10 years, and are associated with nearby vernal pool restoration. The West Otay Mesa preserve and San Ysidro High School on-site preserve are both restoration sites that were associated with the high school. All of the control pools at these sites have average or better ponding, high cover and diversity of vernal pool indicator plant species, and the presence of some vernal pool fauna, including endangered fairy shrimp.

The control pools are of high quality and are of similar depth and vegetative makeup as those proposed for the mitigation site. A total of 14 vernal pool plant indicator species and 2 native vernal pool associated species have been observed in the control pools (Table 7). During the hydrological year of 2003 to 2004, the control pools had species richness values (the number of species in a given area) ranging from 3 to 11 species with an average of 6.9. In 2004, vernal pool plant cover varied from one to 60 percent, with an average of 13.5 percent. The 2004/2005 hydrological year was the final year of restoration monitoring for the West Otay Mesa and San Ysidro pools, and was the third wettest year on record. Pools had excellent hydrology during this year and exhibited high amounts of cover. In 2005, the vernal pool plant richness varied from 4 to 15 species per pool with a mean of 8.5. The vernal pool plant cover in the control pools ranged from 29 to 100 percent with an average of 60 percent.

Table 7
CONTROL VERNAL POOL PLANT SPECIES

Vernal Pool Indicators*	
SCIENTIFIC NAME	COMMON NAME
<i>Callitriche marginata</i>	long-stalk water-starwort
<i>Centunculus minimus</i>	chaffweed
<i>Crassula aquatica</i>	water pygmyweed
<i>Deschampsia danthonoides</i>	annual hairgrass
<i>Elatine brachysperma</i>	smooth waterwort
<i>Eryngium aristulatum</i> var. <i>parishii</i>	San Diego button-celery
<i>Lilaea scilloides</i>	flowering quillwort
<i>Myosurus minimus</i>	little mousetail
<i>Navarretia fossalis</i>	spreading navarretia
<i>Pilularia americana</i>	American pillwort
<i>Plagiobothrys acanthocarpus</i>	adobe popcornflower
<i>Plantago elongata</i>	dwarf plantain
<i>Pogogyne nudiuscula</i>	Otay mesa mint
<i>Psilocarphus brevissimus</i>	woolly marbles
Other Native Vernal Pool Associated Species	
SCIENTIFIC NAME	COMMON NAME
<i>Eleocharis macrostachya</i>	pale spike-sedge
<i>Juncus bufonius</i>	common toad-rush

*Based on Corps Vernal Pool Plant Indicator List (Corps 1997)

Success of the restored vernal pools would be determined by comparing species richness and vegetative cover with the control pools. A transect/quadrat sampling method would be used to monitor the restored pools (described in Section 8.1). Permanent transects and decimeter quadrats have been established within the off-site control pools and would be established in the onsite control pools and the restored pools. Each year, species richness and vegetative cover within the quadrats would be measured and recorded. This data would be used to determine if the restored pools have met the success criteria described below.

8.1.1 Vernal Pool Indicator Species Richness

Only native vernal pool indicator species (Corps 1997) and selected native vernal pool associates (Table 7) would be included in species richness (the number of species in a given area) in the monitored vernal pool quadrats. Annual performance goals expressed as a percent of vernal pool indicator species in control pools are addressed in Table 8. Acceptable species richness within each restored pool at the end of the 5-year monitoring period is 100 percent of the average control pool vernal pool species richness. Meeting the 100 percent criterion by Year 5 would show that pools are functioning and that they would be expected to continue functioning. If the species richness criterion for a given year is not met, corrective measures (e.g., reseeding, excavation of a portion of a basin, introducing new inoculum, berming of a pool edge, etc.) may be taken to ensure eventual achievement of long-term goals.

Table 8
VERNAL POOL SPECIES RICHNESS SUCCESS CRITERIA

Year	Number of Indicator Species Relative to Control Pools (percent)	Minimum Number of Indicator Species Present in each pool
1	35	1
2	50	1
3	65	2
4	80	3
5	100	3

8.1.2 Vegetative Cover of Vernal Pool Indicator Species

In addition to species richness, cover of native vernal pool and associated wetland plants within the pools would be used to determine project success. At the end of the 5-year monitoring period, the total cover of vernal pool plant species in each restored vernal pool should be 100 percent of the average total cover value for the control pools. Yearly performance goals have been set to track the progress of the mitigation effort (Table 9). After the first year, the relative cover in each of the restored vernal pools should be at least 25 percent of the average relative cover measured in the control pools for the same year. This percentage is expected to increase annually relative to the control pools. For Years 2 through 5, the percentage should be 35, 50, 70, and 90 percent, respectively. If the annual goals for relative cover are not being met,

additional measures would be taken as necessary to ensure final success including the addition of supplemental inoculum.

Table 9
VERNAL POOL PLANT COVER SUCCESS CRITERIA

Year	Cover of Indicator Species Relative to Control Pools (percent)
1	25
2	35
3	50
4	70
5	90

8.1.3 Non-native Cover in Restored Vernal Pools

Non-native weed species anticipated to encroach upon the vernal pools include Italian ryegrass (*Lolium multiflorum*), Pacific bent grass (*Agrostis avenaceae*), grass poly (*Lythrum hyssopifolia*), African brass buttons (*Cotula coronopifolia*), rabbitsfoot grass (*Polypogon monspeliensis*), Boccone's sand spurry (*Spergularia bocconi*), and nit grass (*Gastridium ventricosum*). Of these weed species, Italian ryegrass is considered to be the most significant competitor to native vernal pool species. Elimination of this species would be the main focus of the vernal pool weed control effort. Relative cover of Italian ryegrass shall not exceed one percent during the 5-year monitoring period. Control of weed species categorized as High or Moderate in the California Invasive Plant Council (Cal-IPC) 2006 Invasive Plant Inventory shall be conducted such that at the end of the 5-year monitoring period the total cover of such weed species in each restored vernal pool is less than one percent and total cover of any other weed species does not exceed 5 percent (Table 10). If weed cover criteria are not being met, additional maintenance effort would be required. Table 11 includes Cal-IPC listed species likely to occur within the mitigation area.

Table 10
COVER LIMITS FOR NON-NATIVE SPECIES IN
VERNAL POOLS

Description	Max Percent Cover
Cal-IPC Moderate or High species	<1%
Other non-native species	<5%
Absolute cover for all non-native species (Cal-IPC and others combined)	<5%

Table 11
CALIFORNIA INVASIVE PLANT COUNCIL
MODERATELY TO HIGHLY INVASIVE PLANT SPECIES*

Scientific Name	Common Name
<i>Avena</i> spp.	wild oats
<i>Brassica nigra</i>	black mustard
<i>Bromus diandrus</i>	ripgut brome
<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome
<i>Centaurea melitensis</i>	tocalote
<i>Chrysanthemum coronarium</i>	garland daisy
<i>Foeniculum vulgare</i>	fennel
<i>Hirschfeldia incana</i>	shortpod mustard
<i>Lolium multiflorum</i>	Italian ryegrass
<i>Lythrum hyssopifolia</i>	grass poly
<i>Vulpia myuros</i>	rattail fescue

*California Invasive Plant Council (Cal-IPC) 2006 Invasive Plant Inventory

8.2 CRAM REFERENCE SITE/TARGET VALUES

A CRAM reference site was selected in order to compare the final restoration effort goals to existing, healthy vernal pools. The reference site assessment was conducted by Ms. Trnka and Mr. Ritenour on August 27, 2010. The site, located at Robinhood Ridge in Otay Mesa, contains a number of previously enhanced/restored pools of moderate to high quality vernal pool habitat. Three of these pools (19, 28, and 79) were selected to represent the variety of pool size and quality present at the site.

The final CRAM scores for the reference site pools was 58, 63, and 66, mean of 62 (Appendix A). For all 3 pools, the Buffer and Landscape Context attribute score was moderate (50-54) because of the site's location in an area containing little wetland habitat other than the on-site pools and the presence of development to the north and southeast. The Hydrology attribute score for all 3 pools was very high (100) which is a result of the pools undergoing regular annual cycles of filling and drying, unaffected by urban runoff or other artificial water sources. The Physical Structure attribute score was low (50) for all 3 pools because they have simple structural patch richness and topography; however, these pools contain features that are common to healthy vernal pool systems on Otay Mesa, where pools tend to be smaller, relatively simple, and uniform in structure. Although the assessed pools were of good quality and included vernal pool indicator species as well as some sensitive and/or endemic species, the overall number of co-dominant and endemic species was low, which resulted in low scores for these parameters, and negatively affected the overall Biotic Structure attribute score. Overall, these pools are healthy stable systems containing several sensitive native plant species that are endemic to vernal pool habitat. The scores attained at these pools are reasonable to expect from a

restoration effort located at a site with similar buffer and landscape context features (which cannot be altered during the restoration process).

Typically, to fulfill the minimum requirement for no net loss of wetland functions and services, the net gain in CRAM scores at a mitigation site must be equal to or greater than the loss at the impact site. The mean CRAM score for the selected reference site is 62, 11 points higher than the mean CRAM score for pre-restoration mitigation site and 9 points higher than the CRAM score for the impact site (Table 12). Based on the reference site and pre-restoration mitigation site data, the maximum possible CRAM score for the mitigation site was estimated to be 66, a minimum score of 62 within each pool is required (based on the mean for the control pools) and a mean of 64 across all mitigation pools (Table 12). This assumes an increase in the quality of the buffer condition as a result of upland enhancement, improvement in hydrologic connectivity as a result of berm removal, an increase in the patch richness and topography of some of the pools as well as the number of native and endemic pool species, and a decrease in non-native species within the pools. Achieving a functional lift at the mitigation site of 14 points (from 50 to 64) would require that the mitigation ratio be 3.8:1 (mean of 53 at the impact site divided by 14-point increase at the mitigation site equals approximately 3.8). It should be noted that using the CRAM scores in this very simplified way and as the only factor in determining the mitigation ratio is not typical for the Corps. The Corps currently utilizes 6 factors to establish mitigation ratios including mitigation site location, type, type conversion, uncertainty, and temporal loss. Several of these factors may weigh heavily in determining the Corps mitigation ratio for a project affecting vernal pools because they are a difficult aquatic resource to replace. However, for the purposes of this project only, the Corps is deferring to the 5:1 ratio, as requested by the RWQCB.

Table 12
CRAM DATA SUMMARY

CRAM Attributes	METRICS	Impact Site	BASELINE SCORES ¹		Reference Site	TARGET SCORES	
			Pre-Restoration	Post-Restoration ²		Year 3	Year 5
Buffer and Landscape Context	Landscape Connectivity	3	3		3	3	3
	Buffer Sub-metrics:						
	- Percent of Assessment Area with Buffer	12	12		12	12	12
	- Average Buffer Width	7	12		8	9	12
	- Buffer Condition	6	6		9	8	9
	Attribute Score (Raw/Final)	10/43	11.5/48		13/53	12/50	13/54
Hydrology	Water Source	12	12		12	12	12
	Hydroperiod	12	12		12	12	12
	Hydrologic Connectivity	12	8		12	10	12
	Attribute Score (Raw/Final)	36/100	32/90		36/100	34/94	36/100
Physical Structure	Structural Patch Richness	3	3		6	5	6
	Topographic Complexity	5	4		6	5	6
	Attribute Score (Raw/Final)	8/34	7/28		12/50	10/42	12/50
Biotic Structure	Plant Community Sub-metrics:						
	- Number of Co-dominant Species	5	4		5	5	6
	- Percent Invasion	8	6		9	8	12
	- Endemic Species Richness	3	3		4	5	6
	Horizontal Interspersion and Zonation	4	4		5	5	6
	Attribute Score (Raw/Final)	9/37	9/36		11/46	11/46	14/58
Overall AA Score		53	51		62	58	66

¹ Mean scores calculated from CRAM scores conducted on 10 impact site pools, 5 mitigation site pools, and 3 reference site pools.

² To be conducted immediately following restoration installation

8.3 FAIRY SHRIMP

Although all of the restored and enhanced vernal pools are intended to provide habitat for San Diego fairy shrimp, only 0.10 acre of the restored pools will be required to support San Diego fairy shrimp populations pursuant to the USFWS Biological Opinion.

Fairy shrimp sampling would be conducted each season, and the number of shrimp present in each pool would be estimated. The number of gravid females also would be estimated. Fairy shrimp data also would be collected in the control pools to help gauge the success of the restoration effort. In order for the fairy shrimp portion of the project to be considered successful, the shrimp should recur in each year that there is enough rainfall to produce ponding, and shrimp should also be present in the control pools. If both the restored and control pool shrimp populations decline in any given year, then it would 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 over the 5-year monitoring period to be considered successful. If the restored pools exhibit appropriate hydrology but do not have sufficient presence of fairy shrimp, additional inoculum would be added.

8.4 TARGET HYDROLOGICAL REGIME

As previously stated, vernal pools restored under this mitigation program are primarily designed to emulate the conditions found in existing vernal pools on Otay Mesa. The restored pools would be excavated and situated to capture rainfall and runoff from the open space preserve. Restoration of the natural topography and the removal of weeds would restore the normal hydrological functions within the restored vernal pool complex.

During the 5-year monitoring period, water depth in the control pools and the restored vernal pools on site would be measured. Measurements would be taken every 2 weeks during each rainy season throughout the monitoring period. The depth and extent of ponding (surface area) would be recorded during each site visit in each restored vernal pool. This data would be used to create graphs showing extent, depth and duration of ponding. At the end of the 5-year monitoring period, the monitored pools would demonstrate hydrologic patterns similar to those of the control pools. The monitoring period will be extended if a drought period prevents the pools from demonstrating the desired hydrologic patterns. The pools must pond for sufficient time (estimated to be 30 days) to support San Diego fairy shrimp during 2 winters in a 5-year monitoring period or 3 winters in a 10-year monitoring period. This allows the resource agencies to be confident that the pools physical and chemical structure support a viable population of fairy shrimp versus the possibility of cysts inoculated emerging a single time.

8.5 UPLAND RESTORATION IN VERNAL POOL RESTORATION AREA

During annual monitoring, species richness in the uplands in the vernal pool restoration area would be determined only by visual assessment in Years 1 and 2 and by visual assessment and transect data in Years 3, 4, and 5. No specific richness criteria are established for Years 1 or 2, but annual success criteria for species richness in Years 3, 4, and 5 are provided in Table 13. Species richness will be compared to a reference transect within the Otay Mesa West preserve. If the species richness goal for a given year is not met, corrective measures (including reseeding and planting) would be implemented to ensure achievement of long-term restoration goals.

TABLE 13
DIEGAN COASTAL SAGE SCRUB RESTORATION
SPECIES RICHNESS SUCCESS CRITERIA

Year*	Species Richness **
3	30
4	50
5	75

*No success criteria for Years 1 and 2

** Percent of richness relative to control transects. Greater than or equal to amount shown.

In addition to species richness, project success would be determined based on native and non-native (weed) plant cover. Table 14 presents vegetative cover success criteria for Years 3, 4, and 5 in the Diegan coastal sage scrub restoration area. No specific richness criteria are established for Years 1 or 2 in the upland enhancement area. However, container plantings would achieve at least 80 percent survival at the end of each year, unless their functions are replaced by plants from seed. Several species of weeds are particularly problematic in the vicinity of the restoration site. Control of these target, invasive, site specific, weed species (Table 15) shall be conducted such that at the end of the 5-year monitoring period, the total cover of these weed species within the uplands of the vernal pool restoration area is less than one percent and total cover of all weed species does not exceed 5 percent (Table 14). If annual goals for vegetative cover are not met, remedial measures, including reseeding, planting, and weeding, may be implemented to ensure final success.

TABLE 14
DIEGAN COASTAL SAGE SCRUB RESTORATION
VEGETATION COVER SUCCESS CRITERIA

Year	Native Cover	Non-native Cover	Target Weeds
3	≥ 40	< 5	< 1
4	≥ 50	< 5	< 1
5	≥ 70	< 5	< 1

*No success criteria for Years 1 and 2

** percent relative to reference transect

† total cover – not relative to reference

**TABLE 15
TARGET UPLAND WEED SPECIES**

Scientific Name	Common Name
<i>Atriplex semibaccata</i>	Australian saltbush
<i>Brassica nigra</i>	black mustard
<i>Centaurea melitensis</i>	tochalote
<i>Chrysanthemum coronarium</i>	garland daisy
<i>Foeniculum vulgare</i>	fennel
<i>Hirschfeldia incana</i>	shortpod mustard
<i>Lolium multiflorum</i>	Italian ryegrass
<i>Mesembryanthemum crystallinum</i>	crystalline iceplant

8.6 SUCCESS CRITERIA SUMMARY

A summary of the project's success criteria is presented below in Tables 16 and 17.

**Table 16
VERNAL POOL SUCCESS CRITERIA**

Year	No. Indicator Spp. Relative to Control Pools (spp. richness; %)	Min. # Indicator Spp. in each pool (spp. richness)	Cover of Indicator Spp. Relative to Control Pools (%)	Cover limits for Non-native spp. in vernal pools	CRAM scores Min. score for each pool/ Ave. across pools
1	35	1	25	--	--
2	50	1	35	--	--
3	65	2	50	<10% total	56/58
4	80	3	70	<5% Cal-IPC, <10% total	--
5	100	3	90	<1% Cal-IPC, <5% total	62/64

**TABLE 17
DIEGAN COASTAL SAGE SCRUB RESTORATION SUCCESS CRITERIA**

Year	Species Richness*	Native Cover*	Non-native Covert†	Target Weedst
1	≥ 10%	uniform seed germination	<5%	<1%
2	≥ 20%	≥ 15%	<5%	<1%
3	≥ 30%	≥ 40%	<5%	<1%
4	≥ 50%	≥ 50%	<5%	<1%
5	≥ 75%	≥ 70%	<5%	<1%

* Percent of richness relative to control transects. Greater than or equal to amount shown.

† total cover - not relative to reference

9.0 MONITORING PLAN

9.1 MONITORING METHODS

Monitoring would be carried out by the restoration specialist to assess the progress of the restoration effort and determine any appropriate remedial measures. Monitoring by the restoration specialist allows for the identification of action items and the implementation of adaptive strategies to achieve high functioning habitat and reach final performance standards. Quantitative success criteria presented above (Section 7) would be used to measure mitigation success. Final and yearly success criteria are included to measure interim and ultimate habitat development.

9.1.1 Vernal Pools

Maintenance Monitoring

Monthly inspections of the restoration and maintenance efforts would be performed during Year 1, every other month during Year 2, and every 3 months during the remainder of the monitoring period. As conditions warrant, additional site visits may be required during the initial installation/establishment period. In addition, monitoring visits would be conducted every other week during the rainy season of each year to monitor pool hydrology and conduct wet season fairy shrimp surveys. During each of these visits, depth, extent, and duration of inundation of all pools (mitigation and control) would be measured. Depth measurements would be taken following the onset of winter rains and would continue until May 15 or until all pools are dry. Plant and animal species observed in each pool during the monitoring visits would be recorded.

The purpose of the fairy shrimp surveys is to determine presence/absence of San Diego fairy shrimp in the restored pools, in particular the estimated population size of hatched fairy shrimp, and estimates on the number of gravid female. Survey methodology will be consistent with the most current USFWS protocol for fairy shrimp. The presence of other faunal species occupying the pools also would be noted during the surveys. The results of the fairy shrimp surveys would be included in the annual monitoring reports.

Annual Monitoring

An annual monitoring visit would be conducted each year near the end of the rainy season when most vernal pool species are visible. The exact timing of annual monitoring would be dependent upon the time and amount of rainfall received each year. Monitoring would use standard techniques and be based on transect/quadrat sampling. Permanent transects would be established from pool edge to pool edge through the deepest portion of each pool. Each transect would be marked with rebar stakes at both ends and labeled with caps indicating the pool number. Decimeter quadrats would be measured at regular intervals along each transect. Each plant species present within each quadrat would be recorded, with the cover of each species estimated. Furthermore, the total vernal pool, native, and non-native covers for each quadrat would be estimated. A species list would be recorded for each pool, consisting of all species observed in

the annual sampling transect and any other species observed in each pool during annual monitoring events. This species list will be used to determine pool species richness.

Photo documentation points shall be established for the preserve area, and photographs would be taken of each pool during the annual monitoring event. Representative photos would be provided in the annual monitoring report.

9.1.2 Upland Habitat

The status of the upland enhancement would be noted during each monitoring visit throughout the year. Overall health and vigor of the upland habitat would be qualitatively recorded. Species cover, richness, and weed cover would be visually estimated.

During annual monitoring, species richness in would be determined by visual assessment only in Years 1 and 2 and by visual assessment and quantitative transect data in Years 3, 4, and 5.

Quantitative measurements of plant growth would be taken along transects using the point intercept line transect sampling methods described in the California Native Plant Society's Field Sampling Protocol (Sawyer and Keeler-Wolf 1995). Two 25-meter (m) long by 5-m wide sampling transects would be established in Year 3. Each transect end would be physically marked, and have its' location recorded with a Global Positioning System (GPS) unit. With this transect sampling method, a point would be projected into the vegetation at 50-centimeter (cm) intervals along each transect and each species intercepted by the point would be recorded. For this site, plants would be divided into three height categories: herb layer (between 0 and 60 cm), shrub layer (between 61 cm and 3 m), and tree layer (greater than 3 m).

To calculate total vegetation percent cover, the number of points that intercept live plant material is summed and divided by the total number of intercepts possible along that transect. Multiple hits of plants at a single point resulting from overlap of 2 or more species were counted as a single hit for this calculation. To calculate the percent cover contributed by each species, the number of intercepts by each species is divided by the number of possible intercepts for the transect (i.e., 100).

All plant species observed within the 25 m by 5 m belt transect (excluding those within vernal pools) would be recorded, and used to calculate the species richness. All plants observed would be categorized by origin (native/non-native) and stratum (herb, shrub).

Photographs would be taken each year from the same locations to monitor change over time, and would be included in each annual report. Photo points would be physically marked, and have their locations recorded with a GPS unit.

9.2 ANNUAL REPORTS/INVITATION

As part of the monitoring program, annual reports prepared by the restoration specialist would be submitted to the regulatory agencies and the City Parks and Recreation Department evaluating the success of the vernal pool mitigation effort to date, along with any recommendations for

future work that may be deemed necessary. Annual monitoring reports would provide comparisons of the annual monitoring data to the control site for that year. To detect the overall trend of the site, the annual monitoring report would contain comparisons of the monitoring data for the years that data are collected. As part of the annual reporting, the CRAM data and vernal pool boundaries will be uploaded to the cramwetlands.org website and the data provided in the annual monitoring report. This data can then be used to further the calibration of CRAM for vernal pools such that if the method is updated during the monitoring period, the data can be cross-walked easily by the project restoration specialist and by the CRAM managers.

9.3 ADAPTIVE MANAGEMENT

If annual goals are not being met, or the restoration specialist observes that some aspect of the restoration program requires attention, adaptive measures would be implemented. Adaptive measures for vernal pool restoration projects may include but are not limited to: importing new soil inoculum from an off-site source, recontouring of non-functioning pools, increasing weed maintenance frequency or intensity, and re-seeding with commercially available or collected seeds from the immediate area.

If maintenance monitoring indicates that the restoration program is not progressing towards meeting its performance standards as anticipated, the restoration specialist must notify the regulatory agencies as soon as possible, suggest site specific recommendations, and work with the regulatory agencies to address deficiencies. The goal of adaptive management is to ultimately provide vernal pool habitat functions consistent with those described in this restoration plan.

9.4 SCHEDULE

As described above, monthly inspections of the restoration and maintenance effort would be performed during Year 1, every other month during Year 2, and every 3 months for the remainder of the monitoring period. Monitoring events that focus on botanical data collection (i.e., percent cover, density, phenology, etc.) would occur annually for 5 years. Reports would be prepared and submitted to the City Parks and Recreation Department, USFWS, Corps, and RWQCB by October 1 of each year to ensure that adequate time remains in the dry season to make any necessary alterations to the preserve areas.

10.0 COMPLETION OF MITIGATION

10.1 NOTIFICATION OF COMPLETION

The permittee shall notify the USFWS, Corps, RWQCB, and City of completion of the mitigation effort through submittal of a final (Year 5) monitoring report. The final monitoring report would include an as-built map of the mitigation area. The report must show that the goals of the mitigation program (as described in Section 3) have been met. The Permittee will set up a site visit with all the resource agencies and only once the permittee receives a written confirmation from the resource agencies that the site has met its success criteria will maintenance and monitoring cease.

10.2 AGENCY CONFIRMATION

After receipt of the final monitoring report, the regulatory agencies will inspect the mitigation site to determine the success of the restoration effort. After evaluating the final report, the agencies shall determine if the restoration effort is acceptable. Once the restoration is considered successful by the regulatory agencies, a letter of final acceptance will be submitted by the agencies to the City Parks and Recreation Department.

10.3 LONG-TERM MANAGEMENT

The City of San Diego Park and Recreation Department will maintain ownership of the restoration area and the San Ysidro School District will establish a non-wasting endowment to fund the long-term management of this site. Once the restoration project has been successfully completed, the City will accept responsibility for long-term management upon receipt of a letter from the resource agencies stating that they accept the restoration effort as complete.

The Permittee shall prepare and submit at least 90 days prior to impacts to waters of the U.S. a draft detailed long-term management, maintenance and monitoring plan for the vernal pool mitigation site on the West Otay Mesa B parcel. The Permittee will submit the final Plan to the Corps and transfer the funds for the non-wasting endowment to the City, within 60 days of receiving approval of the draft plan. The Long-term Management Plan shall be placed as an appendix to this Plan. The Long-term Management Plan should include, but not limited to long-term management needs, monitoring schedule, measures to prevent human and alien species encroachment, annual cost estimates, Funding mechanism (endowment amount established by a PAR analysis), and contingency measures should problems occur.

11.0 CONTINGENCY MEASURES

11.1 INITIATING PROCEDURES

If the regulatory agencies determine upon receipt of any of the annual monitoring reports that the restoration effort is not meeting success standards for the project, they shall notify the project proponent in writing (letter or via email) that the restoration effort may require augmentation for successful implementation. The project proponent shall then have 30 days to respond to the notification. During this period, the project proponent may discuss alternatives to the suggestions of the regulatory agencies.

11.2 FUNDING MECHANISM

The permittee (Section 4.3) shall be responsible for all costs associated with any remedial measures.

11.3 RESPONSIBLE PARTIES

The permittee shall be the responsible party for any remedial measures.

12.0 LIST OF PREPARERS

The following individuals contributed to the preparation of this report.

Greg Mason	B.S., Natural Resources Planning & Interpretation, Humboldt State University, 1992
Dale Ritenour	B.S., Biology (emphasis in Ecology), San Diego State University, 1998
Sally Trnka	M.S., Biology, San Diego State University, 1997

13.0 REFERENCES

- Bauder, E. 1986. San Diego Vernal Pools: Recent and projected losses; their condition; and threats to their existence 1979-1990. Vols. 1 & 2. Prepared for the Endangered Plant Project, CDFG.
- Bauder, Ellen T. and McMillan, Scott. 1998. Current Distribution and Historical Extent of Vernal Pools in Southern California and Northern Baja California, Mexico. Ecology, Conservation and Management of Vernal Pool Ecosystems-Proceedings from a 1996 Conference. California Native Plant Society (CNPS), Sacramento, CA.
- Bowman, R. 1973. Soil Survey of the San Diego Area. U.S. Department of Agriculture in cooperation with the USDI, UC Agricultural Experiment Station, Bureau of Indian Affairs, Department of the Navy, and the U.S. Marine Corps.
- California Invasive Plant Council (Cal-IPC). 2006. California Invasive Plant Inventory. February.
- California Native Plant Society (CNPS). 2010. Inventory of Rare and Endangered Plants. <http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi>
- Collins, J.N., E.D. Stein, M. Sutula, R. Clark, A.E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind. 2008. California Rapid Assessment Method (CRAM) for Wetlands. Version 5.0.2. 151 pp.
- Hanes, T. and H. Stromberg. 1998. Hydrology of Vernal Pools on Non-Volcanic Soils in the Sacramento Valley. Ecology, Conservation and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference. CNPS, Sacramento, CA.
- HELIX Environmental Planning, Inc. (HELIX). 2004. Sweetwater Union High School District Vernal Pool Preserve Year 4 Annual Monitoring Report, December 29.
- RECON. 1997. Dennery Canyon Vernal Pool, Coastal Sage Scrub, and Mule Fat Scrub Restoration and Preservation Plan.
- Sarver, Matthew J., ed. 2007. Farm Management for Native Bees: a Guide for Delaware. Dover, DE: USDA NRCS and Delaware Department of Agriculture.
- Scheidlinger, C., C. Patterson, and P. Zedler. 1985. Recovery of Vernal Pools and their Associated Plant Communities Following Disturbance: Miramar, San Diego County, CA.
- Soil Ecology Restoration Group (SERG). Restoration Bulletin #6. Irrigation for Remote Sites. URL: <http://www.sci.sdsu.edu/SERG/techniques/Irrigation.pdf>.
- The Planning Center. 2009 Final Subsequent Environmental Impact Report for Vista Del Mar. July.

U.S. Army Corps of Engineers (Corps). 1997. Vernal Pool Plant Indicator Species List. November.

Zedler, Paul. 1990. Life Histories of Vernal Pool Vascular Plants. Vernal Pool Plants: Their Habitat and Biology. CSU Chico. June.

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Appendix B

Selected Permits and Biological Opinion

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DEPARTMENT OF THE ARMY

Los Angeles District, Corps of Engineers
Regulatory Division, South Coast Branch
6010 Hidden Valley Road, Suite 105
Carlsbad, CA 92011

June 13, 2011

REPLY TO ATTENTION OF:

Office of the Chief
Regulatory Division

San Ysidro School District
Attn: Dena Whittington
4350 Otay Mesa Road
San Ysidro, California 91723

Dear Ms. Whittington:

We have received your request to amend specific Special Conditions within Permit No. SPL-2009-00028-LLC, executed on April 29, 2011, which authorized you to discharge fill into waters of the U.S., in association with the San Ysidro School Vista Del Mar Elementary School (VDMES) Project. The executed permit authorized the fill of 0.02 acre of vernal pool wetlands in the southwest portion of the California Terraces Precise Plan (CTTP) area, in the City and County of San Diego, California. Two Special Conditions (SP #4 and 16), of the executed permit, are revised as follows:

Special Condition 4: The Permittee shall preserve, protect, and maintain in perpetuity the **5.03-acre on-site preservation area** (as shown in attached Figure 3). The Permittee shall record a Conservation Easement (CE), in a form approved by the Corps Regulatory Division, over the 5.03-acre on-site preservation area. Further, the Permittee shall receive written approval of the CE from the Corps' Regulatory Division prior to it being executed and recorded. The CE shall be held by a qualified third-party pursuant to California Civil Code section 815.3 and Government Code section 65965. The Permittee must provide monies in the form of an endowment (endowment amount to be determined by Property Analysis Record or similar methodology) for the purposes of fulfilling the third-party easement holder's responsibilities under the CE. The endowment holder must be approved by the Corps. The CE shall preclude establishment of fuel modification zones, paved public trails, drainage facilities, walls, maintenance access roads and/or future easements. Further, to the extent practicable, any such facilities outside the CE shall be sited to minimize indirect impacts on the preservation area.

Special Condition 16: Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 11 will not be considered fulfilled until you have demonstrated compensatory mitigation project success (listed below), **have complied with all Special Conditions of this permit**, and have received written verification of that success from

the Corps Regulatory Division. Detailed mitigation objectives, performance standards, and monitoring requirements are described in the approved HMMP with key Year 5 success criteria and **Special Conditions that are required to be met prior to mitigation sign off** are outlined below.

- a. A minimum of 5-years of maintenance and monitoring for the mitigation site has been completed;
- b. All water supplies shall be shut off for a minimum of 2 years prior to sign off;
- c. A minimum of 16 restored pools, totaling a minimum of 0.10 acre AND a minimum of 4455 square feet, of the 18 restored pools proposed within the mitigation site shall support San Diego fairy shrimp;
- d. At the end of the 5-year monitoring period, the monitored pools shall demonstrate hydrologic patterns similar to those of the control pools. The monitoring period will be extended if a drought period prevents the pools from demonstrating the desired hydrologic patterns. The vernal pools within the mitigation site must pond for sufficient time (estimated to be 30 days) to support SDFS during 2 winters in a 5-year monitoring period or 3 winters in a 10-year monitoring period in order to be deemed successful;
- e. The mitigation site must meet all the vernal pool and Diegan coastal sage scrub (upland buffer) success criteria outlined in Table 1 and 2 in order to be deemed successful; AND
- f. **The Permittee must also comply with and satisfy Special Conditions 4, 5, 11, and 13, of the April 29, 2011 executed permit or as modified herein, in order for the site to be eligible for sign-off.**

Table 1
VERNAL POOL SUCCESS CRITERIA

Year	Number of Indicator Species Relative to Control Pools (Species richness; percent)	Minimum # of Indicator Species Present in each pool (Species Richness)	Cover of Indicator Species Relative to Control Pools (percent)	Cover limits for Non-native species in vernal pools	CRAM scores Minimum score for each pool/Average across pools
1	35	1	25	--	--
2	50	1	35	--	--
3	65	2	50	<10% total	56/58
4	80	3	70	<5% Cal-IPC, <10% total	--
5	100	3	90	<1% Cal-IPC, <5% total	62/64

Table 2
DIEGAN COASTAL SAGE SCRUB
RESTORATION SUCCESS CRITERIA

YEAR*	SPECIES RICHNESS**	NATIVE COVER**	NON- NATIVE COVER†	TARGET WEEDS†
3	≥ 30	≥40	<5	<1
4	≥50	≥50	<5	<1
5	≥75	≥70	<5	<1

*No success criteria for Years 1 and 2

** Percent of richness relative to control transects.

Greater than or equal to amount shown.


† total cover - not relative to reference

All other terms and conditions of Permit No. SPL-2009-00028-LLC, executed on April 29, 2011, except as changed herein, remain in full force and effect.

Thank you for participating in our regulatory program. If you have any questions, please contact Lanika Cervantes at 760.602.4838 or via e-mail at Lanika.L.Cervantes@usace.army.mil.

Please be advised that you can now comment on your experience with Regulatory Division by accessing the Corps web-based customer survey form at:
<http://per2.nwp.usace.army.mil/survey.html>.

Sincerely,



Therese O. Bradford
Chief, South Coast Branch
Regulatory Division



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011



In Reply Refer To:
FWS-SDG-09B0258- 11F0076

FEB 04 2011

Colonel R. Mark Toy
District Commander
U.S. Army Corps of Engineers, Los Angeles District
Regulatory Branch – San Diego Field Office
6010 Hidden Valley Road, Suite 105
Carlsbad, California 92011

Attention: Lanika Cervantes, San Diego Field Office

Subject: Formal Section 7 Consultation on the San Ysidro School District's Vista Del Mar Elementary School Project (Corps File No. SPL-2009-0028-LLC), San Diego County, California

Dear Colonel Toy:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the effects of the San Ysidro School District's (District) Vista Del Mar Elementary School Project located in San Diego County, California, on the federally endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*), in accordance with section 7(a)(2) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your April 20, 2010, request for formal consultation was received on the same date and included a "may affect" determination by your agency for the federally threatened coastal California gnatcatcher (*Polioptila californica californica*, "gnatcatcher").

The Multiple Species Conservation Program (MSCP) establishes a multiple species conservation program to minimize and mitigate habitat loss and the incidental take of covered species in association with specific activities covered by the program. The MSCP encompasses a 900-square mile (mi) [2,331-square kilometer (km)] area in southwestern San Diego County and includes the City of San Diego (City), 10 additional city jurisdictions, and unincorporated portions of the County of San Diego. On July 18, 1997, the Service issued a section 10(a)(1)(B) permit ("incidental take permit") to the City for their Subarea Plan under the broader MSCP. The proposed project is located within the City's Subarea Plan boundary.

The gnatcatcher is a covered species under the City's Subarea Plan, and the City's incidental take permit authorizes take of gnatcatcher for projects consistent with their Subarea Plan. The Service concurs with your agency's determination that the proposed project may affect gnatcatcher. We have also determined that the project, including the proposed conservation measures (enclosed), is consistent for impacts to gnatcatcher with the City's Subarea Plan and its



associated implementation agreement and permit. Therefore, upon receipt by the District of development approval from the City for the project, take of gnatcatcher by the Vista Del Mar Elementary School project will be authorized through the City's incidental take permit.

The status of the gnatcatcher and the effects of implementing the City's Subarea Plan under the MSCP were previously addressed in our biological opinion for the City's Subarea Plan dated June 6, 1997. In this biological opinion, we concluded that the level of anticipated take in the City's Subarea Plan area boundary was not likely to result in jeopardy to the gnatcatcher. Given that the proposed project is consistent with the City's Subarea Plan, we do not anticipate any adverse effects to the gnatcatcher that were not previously evaluated in our biological opinion for the Subarea Plan. No incidental take of gnatcatcher beyond that anticipated in the biological opinion for the City's Subarea Plan will occur. Therefore, it is our conclusion that implementation of the proposed project will not result in jeopardy to the gnatcatcher.

By this consultation, we are extending to the U.S. Army Corps of Engineers (Corps) the take coverage for gnatcatcher (incorporated herein by reference) already provided to the City through their incidental take permit for their Subarea Plan. Extension of take coverage to the Corps under the City's Subarea Plan is limited to the proposed project as described in this biological opinion and as provided in the incidental take statement of our biological opinion for the City's Subarea Plan dated June 6, 1997. Thus, the Corps' consultation obligations under the Act for gnatcatcher have been met.

This biological opinion is based on information provided in the: *Wetland Delineation for the 18.6-acre San Ysidro School Site* (Glenn Lukos Associates 2008); *U.S. Fish and Wildlife Service Dry Season Protocol Level Survey Report for San Diego and Riverside Fairy Shrimp (Branchinecta sandiegonensis and Streptocephalus woottoni)*, *San Ysidro Elementary School 8* (Helix 2008); *Results of Wet Season Fairy Shrimp Surveys on the San Ysidro Elementary School 8 Site for 2007–2008* (Mariposa Biology 2008); *Final Vista Del Mar Elementary School Subsequent Environmental Impact Report* [The Planning Center (TPC) 2009a]; *Vista Del Mar Elementary School Vernal Pool Preserve Restoration Plan* (Helix 2010); field site visits; and other sources of information available in our files. The complete project file for this consultation is maintained at the Carlsbad Fish and Wildlife Office (CFWO).

CONSULTATION HISTORY

Our knowledge of this project began in April 2009 when we received a Draft Subsequent Environmental Impact Report (DSEIR) submitted under the requirements of the California Environmental Quality Act. We provided comments on the DSEIR in May 2009. On February 16, 2010, we met with the Corps and District to discuss the project and proposed locations to offset vernal pool impacts.

On April 20, 2010, we received a request for formal consultation from your agency. After initiation of consultation, the Corps worked with the District regarding alternatives to minimize impacts to waters of the U.S.

On July 22, 2010, we met on the project site to discuss alternatives to minimize vernal pool impacts and measures to offset unavoidable impacts. At the meeting, we recommended the District pursue vernal pool restoration, enhancement and management on the West Otay Mesa B parcel to offset project impacts. On October 5, 2010, we received the *Vista Del Mar Elementary School Vernal Pool Restoration Plan* (Helix 2010) for the West Otay Mesa B parcel.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the issuance of a permit by the Corps to the District under section 404 of the Clean Water Act (CWA) to impact 0.02 acre (ac) [0.008 hectare (ha)] of waters of the U.S. to facilitate development of the proposed Vista Del Mar Elementary School. The project site covers 20.11 ac (8.1 ha) of vacant land and includes 19.2 ac (7.77 ha) of District-owned property and approximately 0.91 ac (0.37 ha) of private property. The project is located on Otay Mesa in the city of San Diego, approximately 1 mi (1.61 km) east of Interstate 805 (I-805) and immediately north of State Route 905 (SR-905) (Figure 1). Approximately 7.35 ac (2.97 ha) of the northwestern portion of the project site occurs within the Multi-Habitat Planning Area (MHPA), which is the City's preserve established under the MSCP. Access to the site will be via Del Sol Boulevard, which currently ends at the northeast border of the proposed project site.

The project consists of two components; 1) construction and operation of the Vista Del Mar Elementary School, and 2) extension of Del Sol Boulevard (Figure 2). The school will be constructed on 10.08 ac (4.08 ha) of the project site. The extension will begin at the existing terminus of Del Sol Boulevard and extend to the western boundary of the District-owned property and will encompass 5.47 ac (2.21 ha). Although the District will construct the extension of Del Sol Boulevard, the road extension will be funded by the City through reimbursement of fees to the District and/or through a mutual agreement between the City and District. Approximately 4.74 ac (1.92 ha) of the project site that is not directly impacted by the project will be conserved as part of the MHPA (Figure 2).

The project site includes 10 vernal pools that have a combined area of 0.02 ac (0.008 ha) (Table 1) (Figure 2), contain the vernal pool indicator plant species plantago (*Plantago elongata*), adobe popcornflower (*Plagiobothrys acanthocarpus*), and woolly marbles (*Psilocarphus brevissimus*), and support San Diego fairy shrimp. All of the vernal pools occur in disturbed coastal sage scrub on the mesa in the center of the project site.



Figure 1: Project Location Map

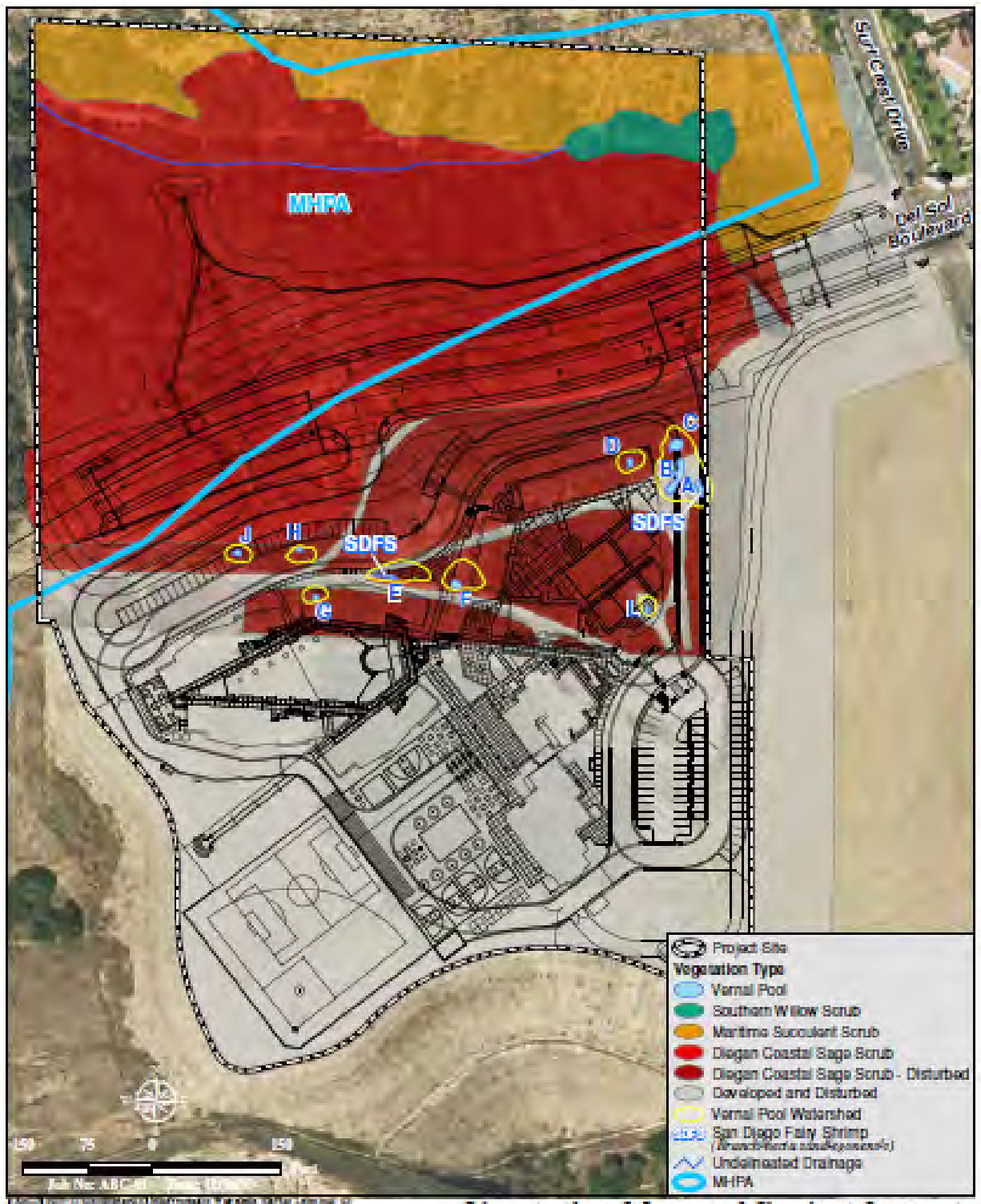


Figure 2: Vegetation, San Diego Fairy Shrimp and Project Impacts Map

Table 1. San Ysidro School District Vernal Pool and Watershed Area (square feet/ac)		
Basin	Pool Area	Watershed Area
A	121 (0.003 ac)	4,027* (0.09 ac)
B	303 (0.007 ac)	
C	157 (0.004 ac)	
D	45 (0.001 ac)	623 (0.01 ac)
E	47 (0.001 ac)	1,324 (0.03 ac)
F	74 (0.002 ac)	1,244 (0.03 ac)
G	43 (0.001 ac)	435 (0.01 ac)
H	26 (0.001 ac)	498 (0.01 ac)
J	45 (0.001 ac)	493 (0.01 ac)
L	29 (0.001 ac)	339 (0.01 ac)
Total	891 (0.02 ac)	8,983 (0.20 ac)

*pools A, B, and C share a single watershed area

The project will impact all 10 vernal pools on site. To offset these impacts, the project proposes to restore and enhance a total of 32 vernal pools with a basin area of 0.218 ac (0.09 ha) on the 1.05-ac (0.42-ha) West Otay Mesa B parcel, which is owned by the City and is in the City's MHPA (Figure 3). All restored pools and enhanced pools, as appropriate, will be planted with vernal pool indicator plant species and inoculated with San Diego fairy shrimp. However, based on the impacts to pools areas, to meet success criteria only 0.10 ac (0.04 ha) of the restored pools will be required to support reproducing San Diego fairy shrimp populations. In addition, the pool watersheds and surrounding uplands will be restored with maritime succulent scrub on the entire parcel. The District will also provide for long-term management of the West Otay Mesa B parcel.

According to 50 CFR § 402.02 pursuant to section 7 of the Act, the "action area" includes all areas to be affected directly or indirectly by the Federal action. Areas directly impacted include all areas within the project footprint, including construction vehicle access routes, staging areas, and grading areas. Habitat immediately adjacent to the project footprint may be indirectly impacted or degraded by construction activities or later in time due to the developed nature of the road. Thus, we have defined the action area for the proposed project to be the 20.11 ac (8.1-ha) project site and the 1.05 ac (0.42 ha) West Otay Mesa B parcel. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area.

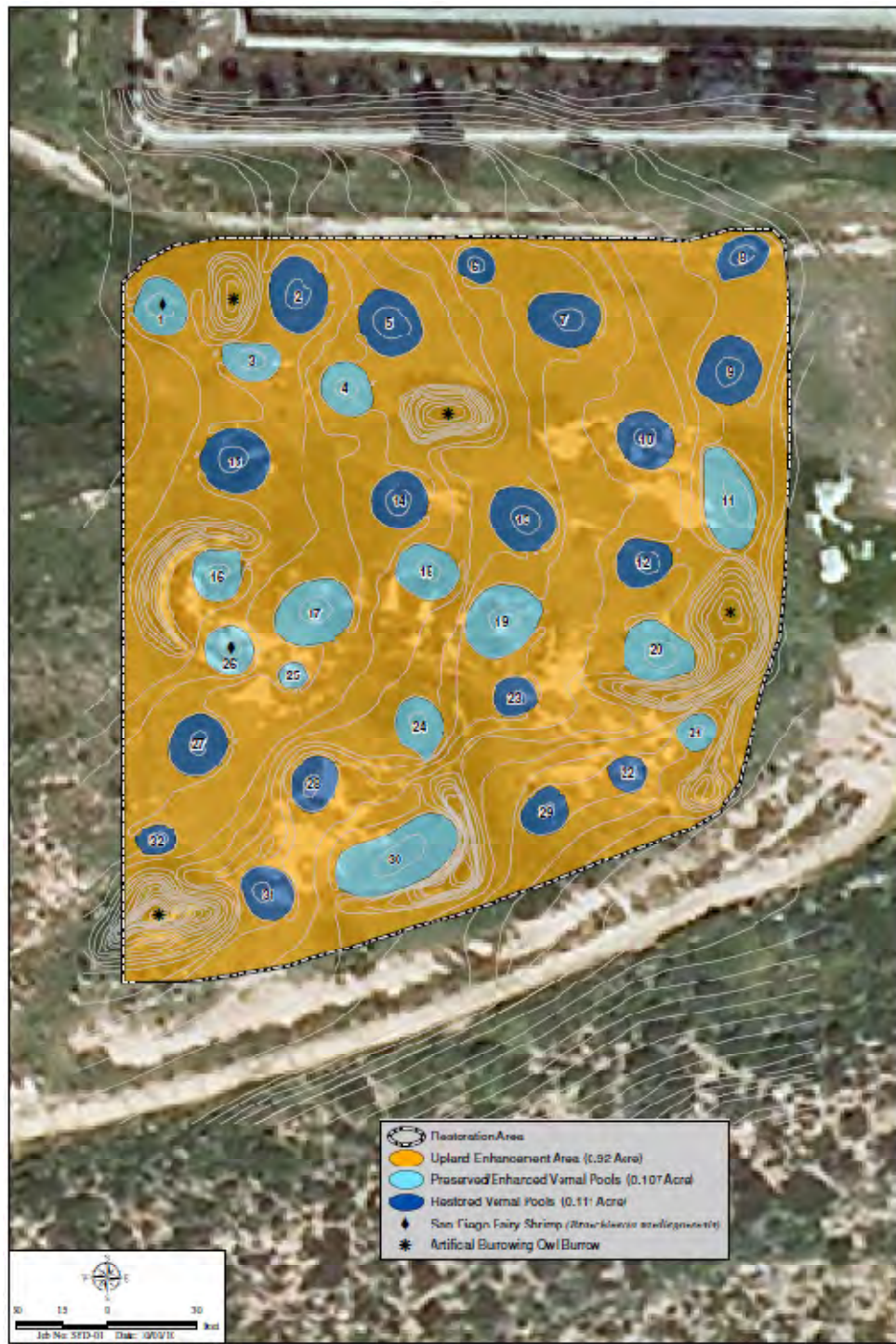


Figure 3: West Otay Mesa B Parcel Vernal Pool Restoration/Enhancement.

Conservation Measures

The following conservation measures will be implemented as part of the project to avoid, minimize, and offset adverse effects to San Diego fairy shrimp:

1. Impacts to 10 vernal pools [0.02 ac (0.008 ha)] will be offset through restoration of 15 vernal pools [0.10 ac (0.04 ha)] at the West Otay Mesa B parcel. In addition to this restoration, the existing 14 vernal pools on the site will be enhanced/expanded and 3 additional pools (i.e., pool 23, 31, and 32) will be restored for a combined total of 0.118 ac (0.047 ha) of surplus restored/enhanced vernal pool surface area. The surplus surface area is intended to provide a contingency surplus in the event that some of the restored pools are not successful. Upon completion, the site will support a total 0.218 ac (0.09 ha) of vernal pool habitat of which 0.10 ac (0.04ha) will offset project impacts. The remainder will be available to the City to offset future project impacts.
2. The District will submit a final vernal pool restoration/enhancement plan to the Corps and Service (Agencies) for approval at least 60 days prior to initiating project impacts. Project impacts will not occur until the Agencies have approved the final plan. The final plan will be based on the *Vista Del Mar Elementary School Vernal Pool Preserve Restoration Plan* (Helix 2010). In addition to the measures proposed in the draft plan, the final plan will include the following information:
 - a) Implementation of the final plan will be conducted under the direction of a qualified biologist (vernal pool restoration specialist) with at least 3 years of vernal pool restoration experience; the biologist will be approved by the Agencies;
 - b) The restoration area contains extant vernal pools. 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) All restoration/enhancement activities will commence the first summer-fall season prior to or concurrently with the start of construction of the project;
 - d) All final specifications and topographic-based grading, planting and watering plans will have 0.5-foot (ft) [0.15-meter (m)] 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 San Diego fairy shrimp that require soil manipulation (e.g., removal/recontouring of tire ruts or road fills, recontouring of pool slopes) will be done by hand 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 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;
- i) As a last resort and after approval by the Agencies, additional inoculum from donor vernal pools in the Otay Mesa area may be used to supplement the inoculum collected at the project impact site and West Otay Mesa B parcel. The final plan will identify any proposed donor pools and include documentation that they are free of versatile fairy shrimp (*Branchinecta lindahli*). No more than 10 percent of the basin area of any donor pool will be used for collection of inoculum. Collection of inoculum from Agency-approved donor pools will be consistent with Conservation Measure 4;
- j) Inoculum and planting will not be installed until the Agencies approve the habitat restoration site grading. 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 fairy shrimp [i.e., at least 30 days (Hathaway and Simovich 1996, Ripley et al. 2004)] and have been surveyed for versatile fairy shrimp to the satisfaction of the Agencies. If versatile fairy shrimp are detected in the restored or enhanced pools, inoculum will not be introduced until measures approved by the Agencies are implemented in attempt to remove the versatile fairy shrimp from the pools. Inoculum will be placed in a manner that preserves, to the maximum extent possible, the orientation of the San Diego 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);

- 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 species (no cultivars) cannot be obtained within Otay Mesa, an alternate site will be used only upon approval by the Agencies. The source and proof of local origin of all plant material and seed will be provided to the Agencies;
- 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 Agencies. 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;
- 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 Agencies (e.g., using the "glove" method). 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 Agencies, 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. The final success criteria 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) In addition to the extant occupied vernal pools, 0.10 ac (0.04 ha) of the restored vernal pools will support San Diego fairy shrimp. Restoration success, as determined by the final success criteria, for San Diego fairy shrimp will be determined by measuring the ponding of water and density of viable cysts, hatched San Diego 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 in the restored pools to determine the density of viable cysts in the soils. Wet samples will also be taken in the restored pools to determine the density of hatched San Diego 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 fairy shrimp. The average viable cyst, hatched fairy shrimp, and gravid female density of the restored pools must not differ significantly ($p < 0.05$) 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 2(h). Alternate methods of determining success will only be used if approved by the Agencies;
- r) Monitoring and success criteria for vernal pool and upland restoration/enhancement areas 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, and relative cover of all other weed species is no more than 5 percent coverage for other nonnative invasive weed species for all 5 years of the 5-year monitoring period. Container plant survival will be 80 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 District 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 Agencies. 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 Agencies, 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 District's maintenance and monitoring obligations will continue until the Agencies deem the restoration/

enhancement successful, or contingency measures are implemented. Restoration/enhancement will not be deemed successful until at least 2 years after any contingency measures are implemented, as determined by the Agencies; and

- t) Annual reports will be submitted to the Agencies 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 Vista Del Mar Project, terms and conditions included in the biological opinion, and Corps permit conditions.
3. Prior to project construction, topsoil will be salvaged from the vernal pools to be impacted on site. Vernal pool soil (inoculum) will be collected when dry to avoid damaging or destroying San Diego fairy shrimp cysts. Hand tools (i.e., shovels and trowels) will be used to remove the top 2 inches (in) [5.1 centimeters (cm)] 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 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 and stored off site at an appropriate facility for vernal pool inoculum. Inoculum from different source pools will not be mixed for translocation to any restored/enhanced pools. The collected soils will be spread out and raked into the bottoms of the restored/enhanced pools. Topsoil and plant materials salvaged from the upland habitat areas to be impacted will be transplanted to, and/or used as a seed/cutting source for, the upland habitat restoration/enhancement areas to the maximum extent practicable as approved by the Agencies.
4. Restoration grading activities at the West Otay Mesa B parcel 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, grading will comply with the following:
- a) Grading will occur only when the soil is dry to the touch at the surface and 1 in (2.5 cm) below. A visual check for color differences (i.e., darker soil indicating moisture) in the soil between the surface and 1 in (2.5 cm) below indicates the soil is dry;
 - b) After a rain of greater than 0.2 in (0.5 cm), 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. The District 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 District will submit a draft financial assurance instrument with an itemized cost list to the Agencies for approval at least 60 days prior to initiating project impacts. The District will submit the final bond or letter of credit for the amount approved by the Agencies within 30 days of receiving Agency approval of the draft financial insurance instrument.
6. The District will prepare and fund a perpetual long-term management, maintenance and monitoring plan (e.g., HMP) for the restored vernal pools used to offset impacts to San Diego fairy shrimp on the West Otay Mesa B parcel. The HMP should include, but not be limited to, the following: monitoring schedule, measures to prevent human and alien species encroachment, funding mechanism, and contingency measures should problems occur. The District will also establish a non-wasting endowment in an amount approved by the Agencies 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 Agencies. The District will submit a draft HMP 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 Agencies for approval at least 90 days prior to initiating project impacts. The District will submit the final HMP to the Agencies 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. The District will not initiate project impacts until the HMP is approved and a funding mechanism acceptable to the Agencies is in place.

STATUS OF THE SPECIES

The status of the San Diego fairy shrimp is described in detail in the *San Diego fairy shrimp (Branchinecta sandiegonensis) 5-year review: Summary and Evaluation* (“5-year review for San Diego fairy shrimp”) (Service 2008a). Additional information for this species can be found in the *Recovery Plan for Vernal Pools of Southern California* (“vernal pool recovery plan”) (Service 1998). Please refer to these documents for detailed information on the San Diego fairy shrimp’s listing status, life history requirements of this species, threats to the species, and conservation needs of the species.

Summary of Species' Distribution and Numbers Rangewide

The vernal pool recovery plan reported 155 complexes (series of vernal pool groups that are hydrologically connected with similar species compositions) occupied by San Diego fairy shrimp within the species range from southern Orange County to northern Baja California, Mexico (Service 1998). Based on information gained about San Diego fairy shrimp occurrences since listing and issuance of the vernal pool recovery plan, we revised this estimate in the 5-year review for San Diego fairy shrimp to approximately 137 vernal pool complexes (Service 2008a). The 5-year review estimated that approximately 24 of these vernal pool complexes occur specifically on Otay Mesa, but considered one complex (i.e., J1) as extirpated (Service 2008a). The vernal pools on the project site are either a previously unknown remnant of the J1 complex or a complex not identified in the recovery plan or 5-year review. The vernal pools on the West Otay Mesa B parcel were also not identified in the recovery plan or 5-year review.

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.

San Diego fairy shrimp 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 1998). Many of these vernal pool complexes have been developed, converted to agriculture, and/or degraded by off-highway vehicle (OHV) use.

The project site supports six plant communities: developed/disturbed, coastal sage scrub (CSS), disturbed CSS, maritime succulent scrub, southern willow scrub, and vernal pools¹ (Table 2). Much of the project site was previously graded and is devoid of any vegetation, and the vernal pools occur on the only native mesa top remaining on the project site. Soils on the mesa top consist of Olivenhain cobbly loam (Glen Lukos Associates 2008), which typically support vernal pools when they occur in flat areas like Otay Mesa. The mesa top has debris from human use and many OHV roads and lacks distinct mima mound features typically associated with vernal pool habitat on Otay Mesa. Ten vernal pools occur on the mesa top with a combined area of 0.02 ac (0.008 ha). All 10 of the vernal pools occur in or near the OHV roads and are relatively disturbed.

¹ "Vernal pools" technically do not constitute a plant community, but rather are a complex ecological system of unique plants, insects, and crustaceans associated with a seasonally wet habitat (Sawyer et al. 2009). Historically vernal pools were differentiated by edaphic (e.g., basalt flow, hardpan) or geographic/topographic (e.g., San Diego mesa, San Jacinto Valley) characteristics. Beginning in the 1990s and still ongoing (especially in southern California), a new classification based on ecological and floristic relationships between individual stands of plants (not individual pools or pool complexes) eventually will form the nomenclatural foundation for understanding vernal pool vegetation (Sawyer et al. 2009). Until this effort is completed, we will use the term "vernal pools" in the sense of a plant community.

Table 2
Plant Communities on Project Site
(ac)

<i>Plant Community</i>	<i>Inside MHPA</i>		<i>Outside MHPA</i>		<i>Total Project Area</i>
	<i>On Site</i>	<i>Off Site</i>	<i>On Site</i>	<i>Off Site</i>	
Developed/disturbed	0.02	0.00	7.54	0.53	8.09
Coastal sage scrub	5.74	0.04	1.56	0.11	7.45
Disturbed coastal sage scrub	0.06	0.00	2.60	0.10	2.76
Maritime succulent scrub	1.36	0.01	0.14	0.12	1.63
Southern willow scrub	0.16	0.00	0.00	0.00	0.16
Vernal pools	0.00	0.00	0.02	0.00	0.02
Total	7.35	0.04	11.86	0.86	20.11

Service protocol wet-season surveys for fairy shrimp were conducted on the project site from December through March 2008 (Mariposa Biology 2008). No fairy shrimp were detected in the 10 pools during the wet season surveys. However, these results may be due to the lack of sufficient ponding for fairy shrimp to hatch (Mariposa Biology 2008).

Dry season protocol surveys for fairy shrimp were performed on the project site in April 2008 (Helix 2008). Fairy shrimp cysts, identified as San Diego fairy shrimp after hydration, were found in pools A and E (Figure 2). No other fairy shrimp species cysts were found in any of the depressions (Helix 2008). However, based on habitat conditions, San Diego fairy shrimp have the potential to occur in all 10 pools. Rather than conduct additional, updated surveys to determine presence or absence of San Diego fairy shrimp within each pool, the District agreed with our determination that for the purposes of assessing project impacts to consider all 10 pools as occupied.

San Diego fairy shrimp were detected in two pools on the West Otay Mesa B parcel in 1997 (KEA Environmental 1998) (Figure 3). San Diego fairy shrimp also have the potential to occur in all 14 pools on this site. Rather than conduct additional, updated surveys to determine presence or absence of San Diego fairy shrimp within each pool, all 14 pools are also considered occupied on the West Otay Mesa B parcel.

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.

Direct Effects

Implementation of the Vista Del Mar Elementary School Project will directly impact (i.e., grade and fill) all 10 pools on the project site occupied by the San Diego fairy shrimp with a combined surface area of 0.02 ac (0.01 ha). These impacts will be offset through restoration, preservation and management of 15 new vernal pools [0.10 ac (0.04 ha)] occupied by the San Diego fairy shrimp at the West Otay Mesa B parcel. In addition to this restoration, 3 additional pools will be restored and the 14 extant vernal pools will be enhanced for a combined total of 0.118 ac (0.047 ha) of surplus restored/enhanced vernal pool basin area at the West Otay Mesa B parcel. Vernal pool restoration will occur around the extant pools on the West Otay Mesa B parcel, but will not impact the watersheds of extant pools. Enhancement will include pool re-contouring, expansion, and removing invasive species, trash and debris, as appropriate. While not required, surplus restored and enhanced pools may support San Diego fairy shrimp as well. Vernal pool restoration and enhancement will also include planting of vernal pool indicator plant species within the pools and maritime succulent scrub in the pool watersheds and surrounding uplands.

The long-term goal of the restoration and enhancement is to develop and preserve native habitats greater in area and superior in function to that presently on impact site, and to improve the potential for sustaining San Diego fairy shrimp in the vernal pool complex on the West Otay Mesa B parcel over the long-term. Upon project completion, the restored and enhanced pools will be within a 1.05 ac (0.42-ha) preserve that is connected to the MHPA in a configuration that maintains habitat functions and species viability.

Prior to initiation of impacts, soil containing San Diego 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 on the West Otay Mesa B parcel. Additional inoculum with San Diego fairy shrimp cysts may be collected from donor vernal pools on the West Otay Mesa B parcel, or elsewhere on Otay Mesa, to supplement the inoculum collected at the project site. Inoculum will be collected when dry to avoid damaging or destroying San Diego fairy shrimp cysts, and no more than 10 percent of the basin area of any donor pool will be used for collection of inoculum. Hand tools (i.e., shovels and trowels) will be used to remove the first 2 in (5.1 cm) 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 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, and stored off site at an appropriate facility for vernal pool inoculum.

The restored pools, and enhanced pools as appropriate, will be inoculated with cysts salvaged from the impacted pools and other pools on Otay Mesa approved by the Service. 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)] and have been surveyed for versatile fairy shrimp to the satisfaction of the Agencies. If versatile fairy shrimp are detected in the restored/enhanced pools, inoculum will not be introduced until measures approved by the

Agencies are implemented in attempt to remove the versatile fairy shrimp from the pools. Inoculum will be placed in a manner that preserves, to the maximum extent possible, the orientation of the San Diego 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).

With the above measures, we expect that the majority of the cysts will be salvaged out of the pools to be graded and filled, and that while some may be crushed or otherwise destroyed, most will survive the salvage/inoculum collection and transplant process. Any cysts remaining in the pools after the salvage/inoculum collection efforts are completed will then be destroyed by grading and filling of the pools.

Restoration and enhancement activities, such as re-contouring of ponds, soil replacement, removal of nonnative invasive plant species, and monitoring activities, are expected to kill or destroy a small number of San Diego fairy shrimp cysts in each of the affected pools. Cysts are expected to be killed or destroyed as a result of being crushed by personnel conducting restoration and enhancement activities; being covered by soil as the pools are re-contoured; and by changes in micro-climate associated with re-contouring the soil. However, because the majority of cysts will be salvaged prior to the re-contouring efforts and reintroduced to suitable habitat within the enhanced basins, we expect the great majority of cysts to remain viable. Overall, the benefits to San Diego fairy shrimp associated with the restoration and enhancement are anticipated to be substantially greater than the destruction of some cysts during restoration, enhancement, and monitoring activities. The primary benefit of the enhancement activities will be to ensure that the hydrology of the vernal pool is enhanced by removing obstacles to water flow within the pool and replacing soil displaced from the tire tracks. In addition, the San Diego fairy shrimp will benefit from the removal of nonnative invasive plant species during vernal pool restoration and enhancement.

We anticipate that the restoration and enhancement protocols and associated adaptive management procedures will ensure that negative impacts to San Diego fairy shrimp are minimal. For example, disturbance will be limited to the area that is being enhanced; soil within areas that are being re-contoured will be salvaged and reintroduced to the pool where they were collected following re-contouring; cobbles will be oriented within the enhanced or restored vernal pools to serve as stepping stones; and restoration and enhancement activities will be overseen by a biological monitor familiar with vernal pool species and their habitats.

The District will also implement several other conservation measures to minimize impacts to San Diego fairy shrimp and to help ensure the success of vernal pool restoration, enhancement, and preservation efforts. Those efforts include: commencing restoration/enhancement activities the first summer-fall season prior to or concurrently with the start of construction of the project; posting a financial assurance approved by the Agencies to ensure successful implementation of vernal pool restoration and enhancement, upland restoration and maintenance, and overall monitoring; and funding a perpetual management, maintenance and monitoring plan. Implementation of these and the other proposed conservation measures discussed above will

minimize and offset the direct effects of the project on individual San Diego fairy shrimp and their habitats and are expected to ensure the long-term viability of San Diego fairy shrimp populations in the project area.

The vernal pools on the project site are highly degraded and subject to ongoing threats due to lack of management. While the vernal pools within the project footprint will be permanently impacted, the identified vernal pool restoration, enhancement and management is expected to result in a net increase in the acreage and quality of the vernal pools occupied by the San Diego fairy shrimp on Otay Mesa and range-wide. Therefore, the proposed project is not expected to result in an appreciable reduction in the numbers, reproduction, or distribution of the San Diego fairy shrimp.

Impact on Recovery

As stated above, the Service's 5-year review for San Diego fairy shrimp estimated that there are approximately 137 complexes occupied by San Diego fairy shrimp throughout the species range (Service 2008a). We also recommended in the 5-year review that the vernal pool recovery plan be updated to determine which of the known occurrences of San Diego fairy shrimp are needed for recovery of this species (Service 2008a). This evaluation has not been accomplished for the San Diego fairy shrimp.

Therefore, we are evaluating potential impacts to vernal pool complexes occupied by San Diego fairy shrimp 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 complex at the Vista Del Mar Elementary School project site, we have supported a conservation strategy² that allows impacts to disturbed, unmanaged vernal pools in exchange for preservation, restoration, and management of vernal 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 Vista Del Mar Elementary School project site is highly disturbed with no management actions in existence or planned, we determined that following this same conservation approach would not preclude recovery of the San Diego fairy shrimp.

The proposed restoration and enhancement will be consistent with 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 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 the San Diego fairy shrimp on Otay Mesa. Thus, the

² For other projects using this approach, please refer to the Robinhood Ridge biological opinion 1-6-97-F-57 (Service 1997); Caltreras biological opinion 1-6-95-F-35 (Service 1995), Sweetwater High School District biological opinion 1-6-99-F-77 (Service 1999), and Candlelight Villas biological opinion FWS-SDG-08B0715-08F0817 (Service 2008b).

breeding, feeding, and sheltering functions of the onsite habitat to San Diego fairy shrimp lost to project construction will be replaced and improved, and the overall project will be consistent with the habitat reestablishment and management goals outlined in the vernal pool recovery plan for the San Diego fairy shrimp.

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 have not identified any State, Tribal, local, or private actions within the action area that should be considered in this biological opinion.

CONCLUSION

After reviewing the current status of the San Diego fairy shrimp, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that development of the Vista Del Mar Elementary School, as proposed, is not likely to jeopardize the continued existence of the San Diego fairy shrimp.

The Service reached this conclusion for the following reasons:

1. Impacts from the Vista Del Mar Elementary School project will affect only 1 of the approximately 137 (less than 1 percent) vernal pool complexes known to support San Diego fairy shrimp within its U.S. range.
2. All of the individual pools to be impacted are highly degraded and subject to ongoing threats due to lack of management.
3. The loss of 0.02 ac (0.01 ha) (10 pools) supporting San Diego fairy shrimp will be offset through restoration and perpetual management of a minimum of 15 [0.10 ac (0.04 ha)] vernal pools at the West Otay Mesa B parcel that will support San Diego fairy shrimp. This action is expected to result in at least five times the amount of San Diego fairy shrimp vernal pool habitat that will be lost on site.
4. The restoration actions proposed likely will be successful because the restoration 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 effort have been successful on other Otay Mesa sites.
5. The project supports recovery of the San Diego fairy shrimp because it is consistent with the overall habitat reestablishment and management goals outlined for the species in the vernal pool recovery plan (Service 1998); specifically, the project is expected to result in a

net increase in the acreage and quality of the vernal pools occupied by the San Diego fairy shrimp on Otay Mesa through the restoration and management of at least 15 [0.10 ac (0.04 ha)] vernal pools on the West Otay Mesa B parcel in a configuration that maintains habitat function and species viability.

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

The measures described below are non-discretionary and must be implemented by the Corps and/or the Applicant (i.e., project proponent) in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Corps and/or Applicant (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) fails 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 and/or the Applicant 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

The Service anticipates that it will be difficult to quantify the exact number of San Diego fairy shrimp cysts that could be affected by the proposed action because 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.

Because the precise number of individual San Diego fairy shrimp cysts that will be taken cannot be determined, we have established take thresholds based on the number and area of pools impacted. If any take threshold is exceeded, it will trigger reinitiation of consultation.

Take of San Diego fairy shrimp cysts is authorized as follows:

- Collection of San Diego fairy shrimp cysts from pool basins within the project footprint of the proposed Vista Del Mar Elementary School for subsequent translocation into restored and/or enhanced pools on the West Otay Mesa B parcel; and death and injury of San Diego fairy shrimp cysts as a result of these collection and translocation efforts. The take threshold will be met if San Diego fairy shrimp cysts are identified and collected from more than 10 pools or 0.02 ac (0.01 ha) of vernal pool habitat within the project site's development footprint.
- Following collection and salvage actions, death and injury of, or harm to, San Diego fairy shrimp cysts remaining within the 10 pools identified for grading and filling within the project site's development footprint. The take threshold will be met if more than 10 pools or 0.02 ac (0.01 ha) of vernal pool habitat within the project site, development footprint are identified and impacted.
- Collection of San Diego fairy shrimp cysts from the West Otay Mesa B parcel and/or other offsite donor vernal pools identified and approved by the Agencies on Otay Mesa for subsequent translocation into restored and/or enhanced pools on the West Otay Mesa B parcel; and death and injury of San Diego fairy shrimp cysts as a result of these collection and translocation efforts. The take threshold will be met if more than 10 percent of the basin area of any donor pool is impacted.
- Death and injury of, or harm to, San Diego fairy shrimp cysts within the 32 pools identified for restoration and/or enhancement at the West Otay Mesa B parcel by crushing, burying with sediment, or changes to habitat characteristics associated with the proposed restoration/enhancement. The take threshold will be met if more than 32 pools are identified for restoration and are subsequently impacted without notifying the CFWO.

EFFECT OF THE TAKE

In the accompanying biological opinion, we determined that this level of take is not likely to result in jeopardy to San Diego.

REASONABLE AND PRUDENT MEASURE

The project proponent is implementing significant conservation measures to offset the incidental take of San Diego fairy shrimp during construction and implementation of the Vista Del Mar Elementary School project. We have not identified any other measures that would further minimize this incidental take of these species. We believe the following reasonable and prudent

measure is necessary and appropriate to monitor the incidental take of San Diego fairy shrimp and to provide a trigger for reinitiation of consultation, if necessary.

1. The Corps and/or project Applicant will monitor and report on compliance with the established take thresholds for San Diego fairy shrimp prior to and following construction impacting occupied pools at the Vista Del Mar Elementary School project site.

TERMS AND CONDITION

To be exempt from the prohibitions of section 9 of the Act, the Corps and/or Applicant must comply with the following term and condition, which implements the reasonable and prudent measure described above. This term and condition is non-discretionary.

- 1.1 The Corps and/or Applicant will notify the CFWO in writing within 30 days of collecting the San Diego fairy shrimp cysts from the 10 vernal pools at the Vista Del Mar Elementary School project site;
- 1.2 The Corps and/or Applicant will provide a report to the CFWO within 60 days of completing project construction documenting that no more than 10 pools or 0.02 ac (0.01 ha) of vernal pool habitat were impacted at the Vista Del Mar Elementary School project site;
- 1.3 The Corps and/or Applicant will notify the CFWO if more than 32 pools occupied by San Diego fairy shrimp are identified for restoration or enhancement at the West Otay Mesa B parcel
- 1.4 Consistent with the vernal pool restoration/enhancement plan, the Corps and/or Applicant will provide annual reports for each of the years in which restoration and enhancement activities take place (minimum of 5 years) at the West Otay Mesa B parcel. The annual reports will include a summary of actions at each of the 32 restoration or enhancement pools that may have resulted in impacts to San Diego fairy shrimp; and identify all San Diego fairy shrimp cyst donor pools and confirm that no more than 10 percent of the basin area of any donor pool was impacted by cyst collection.

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.

1. Wherever possible, for all projects involving vernal pools, the Corps should work with project applicants to establish a minimum 100-ft (30.5-m) wide habitat buffer to be preserved around vernal pools and their watersheds to limit the more immediate indirect edge effects caused by surrounding development and to ensure natural hydrological regimes are maintained.

REINITIATION NOTICE

This concludes formal consultation on the development of the Vista Del Mar Elementary School Project, as outlined in the request for initiation. 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, any operations causing such take must cease pending reinitiation.

If you have any questions or concerns about this biological opinion, please contact Patrick Gower of my staff at (760) 431-9440.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jim A. Bartel', with a stylized, cursive script.

Jim A. Bartel
Field Supervisor

LITERATURE CITED

- City of San Diego. 1997. Multiple Species Conservation Program: City of San Diego MSCP Subarea Plan. 109+ pp.
- City of San Diego. 2004. City of San Diego vernal pool inventory. 125+ pp.
- Glenn Lukos Associates. 2008. Wetland delineation for the 18.6-acre San Ysidro School site, San Diego, San Diego County, California. 18+ pp.
- 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.
- HELIX Environmental Planning, Inc. 2008. Dry season protocol survey report for the San Diego fairy and Riverside fairy shrimp. 6 pp.
- HELIX Environmental Planning, Inc. 2010. Vista Del Mar Elementary School vernal pool preserve restoration plan. 30+ pp.
- KEA Environmental. 1998. Summary of restoration potential on The Environmental Trust vernal pool preserve, West Otay Mesa. 9+ pp.
- Mariposa Biology. 2008. Results of wet season fairy shrimp surveys on the San Ysidro Elementary School 8 Site for 2007-2008. 9 pp.
- The Planning Center [TPC]. 2009a. Final Vista Del Mar Elementary School subsequent environmental impact report. SCH NO. 2004111054. 100+ pp.
- 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.
- Sawyer, J. O., T. Keeley-Wolf, and J. M. Evans. 2009. A manual of California vegetation. California Native Plant Society Press, Sacramento, California. 1300 pp.
- U.S. Fish and Wildlife Service (Service). 1995. Biological opinion for Calterracas, San Diego County, California (FWS-SDG-1-6-95-F-35). 30 pp.
- U.S. Fish and Wildlife Service (Service). 1998. Biological opinion for Robinhood Ridge, San Diego County, California (FWS-SDG-1-6-97-F-57). 18 pp.

U.S. Fish and Wildlife Service (Service). 1998. Recovery plan for vernal pools of southern California. U.S. Fish and Wildlife Service, Portland, Oregon. U.S. Fish and Wildlife Service, Portland, Oregon. 113+ pp.

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 (Service). 2008b. Biological opinion for Candlelight Villas Project, San Diego County, California (FWS-SDG-08B0715-08F0817). 65 pp.

ENCLOSURE

Measures to avoid and minimize potential adverse effects to the coastal California gnatcatcher (*Polioptila californica californica*) from the Vista Del Mar Elementary School Project

The Vista Del Mar Elementary School project includes the following conservation measures that the San Ysidro School District has committed to implement to avoid and minimize potential adverse effects to the gnatcatcher and to support a determination by the U.S. Fish and Wildlife Service (Service) that the project is consistent with the City of San Diego's Subarea Plan and its associated implementation agreement and Endangered Species Act (Act) section 10(a)(1)(B) permit.

1. Project activities will occur between August 15 and March 1 to avoid the gnatcatcher nesting season;
2. To offset the loss of 0.13 ac (0.052 ha) of maritime succulent scrub and 6.83 ac (2.76 ha) of Diegan coastal sage scrub, the remaining 4.74 ac (1.92 ha) of habitat on site will be preserved. This preserved land will be deeded over to the City of San Diego (City) for conservation in perpetuity as a component of the City's Multi-Habitat Planning Area (MHPA). The City will accept long-term management responsibility for the onsite preserved land. An additional 2.10 ac (0.85 ha) of coastal sage scrub credit will be purchased in the City of San Diego's Marron Valley Cornerstone Mitigation Bank. The District will provide proof of credit purchase to the Agencies prior to initiating project impacts;
3. Prior to project construction, the District will temporarily fence (with silt barriers) the limits of project impacts (including construction staging areas and access routes) to prevent additional habitat impacts and prevent the spread of silt from the construction zone into avoided adjacent areas. The entire impact limits will be fenced with silt fencing and/or orange construction fencing that will be maintained throughout the construction period to preclude human entry into the MHPA. Fencing will be installed in a manner that does not impact avoided habitats. No construction activities, materials, or equipment will be permitted outside the fenced project footprint. The District will submit to the Service and U.S. Army Corps of Engineers (Corps) (hereafter referred to collectively as the Agencies) for approval, at least 7 days prior to initiating project construction for each phase, final construction plans that include photographs of the fenced limits of impact and all areas to be impacted or avoided. If work occurs beyond the fenced limits of impact, all work will cease until the problem has been remedied to the satisfaction of the Agencies. Any impacts to riparian/wetland, upland habitat, and habitat for gnatcatcher or other federally listed species that occur beyond the approved fenced area will be offset as approved by the Agencies. Temporary construction fencing will be removed upon project completion;
4. Drainage from the construction area, new and proposed parking lots and developed areas in and adjacent to the preserve will not drain directly into the MHPA. The use of structural

and non-structural Best Management Practices, Best Available Technology, the restriction of grading and paving activity during a significant rain event, and the use of sediment catchment devices downstream of construction and paving activities will reduce potential impacts associated with construction. The project design will comply with the Standard Urban Stormwater Management Plan and Municipal Stormwater Permit criteria of the State Water Resources Control Board and the Clean Water Act section 401 Water Quality Certification issued by the Regional Water Quality Control Board for the Project.;

5. All lighting, including night lighting for project construction, installed in the vicinity of the MHPA, native vegetation communities, and other open space will be directed away or shielded to prevent light overspill. Streetlights will be low-intensity and shielded to minimize illumination of the adjacent MHPA. Night lighting of construction areas will be of the lowest illumination necessary for human safety, selectively placed, shielded and directed away from natural habitats;
6. Uses in or adjacent to the MHPA should be designed to minimize noise impacts. Berms or walls should be constructed adjacent to commercial areas, recreational areas, and any other use that may introduce noises that could impact or interfere with wildlife use of the MHPA. Excessively noisy uses or activities adjacent to breeding areas must incorporate noise reduction measures and be curtailed during the breeding season of sensitive species. Adequate noise reduction measures should also be incorporated for the remainder of the year;
7. If project construction (other than clearing and grubbing of sensitive habitats) is necessary adjacent to preserved on and offsite habitat during the gnatcatcher breeding season (March 1 to August 15, or sooner if a qualified biologist demonstrates to the satisfaction of the Agencies that all nesting is complete), a qualified biologist will conduct pre-construction surveys in the adjacent habitat to determine the location of any active gnatcatcher nests in the area. The biologist must be knowledgeable of gnatcatcher biology and ecology and have a minimum 3 years of experience. The survey should begin not more than 3 days prior to the beginning of construction activities. The Agencies will be notified if any nesting gnatcatchers are found. During construction, no activity will occur within 500 feet of active gnatcatcher nest, unless measures are implemented to minimize the noise and disturbance to those adjacent birds. Exceptions to this measure includes cases where surveys confirm that adjacent habitat is not occupied or where noise studies confirm that construction noise levels are below 60 dBA hourly L_{eq} along the edge of adjacent habitat. If construction activities are not completed prior to the breeding season and noise levels exceed this threshold, noise barriers will be erected to reduce noise impacts to occupied habitat to below 60 dBA hourly L_{eq} and/or the culpable activities will be suspended;
8. Storage and staging areas will be placed as far from sensitive areas as possible and kept free from trash and other waste. Staging areas for construction work will be located within previously disturbed sites and not adjacent to or within sensitive habitat. All construction-related debris will be removed off site to an approved upland disposal facility (not waters of the U.S., including Corps jurisdictional wetlands);

9. The changing of oil, refueling, and other actions that could result in a release of a hazardous substance will be restricted to designated areas that are a minimum of 100 ft (30.5 m) from any drainages. Such designated areas will be surrounded with berms, sandbags, or other barriers to further prevent the accidental spill of fuel, oil, or chemicals. Any accidental spills will be immediately contained, cleaned up, and properly disposed;
10. Impacts from fugitive dust will be avoided and minimized through watering and other appropriate measures;
11. The District will install permanent protective fencing along any interface with developed area, and/or use other measures approved by the Agencies, to deter human 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) and be designed to prevent intrusion by pets, especially cats. 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 Agencies for approval at least 60 days prior to initiating project impacts. Fencing, as approved by the Agencies, will be installed within 60 days of execution of the conservation easement;
12. The District will ensure that development landscaping adjacent to the biological conservation easement area(s) does not include nonnative plant species that may be invasive to native habitats. Nonnative 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 tree, 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 and water runoff from landscaped areas should be directed away from the biological conservation easement areas and contained and/or treated within the development footprint. The District will submit a draft list of species to be included in the landscaping to the Agencies for approval at least 30 days prior to initiating project impacts. The District will submit to the Service the final list of species to be included in the landscaping within 30 days of receiving approval of the draft list of species. The District will not initiate project impacts until the list of species to be included in the landscaping is approved by the Agencies;
13. 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 ft (91.4 m) of natural habitats unless documentation is provided to the Agencies 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 District 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;

14. The District will provide a qualified project biologist for each phase of project construction who will be responsible for overseeing compliance with protective measures for the gnatcatcher and will be approved by the Agencies. The project biologist must be knowledgeable of gnatcatcher biology and ecology and have a minimum 3 years of experience. The District will submit the project biologist's name, address, telephone number, and work schedule on the project to the Agencies at least 30 days prior to initiating project impacts. The project biologist will perform the following duties:
 - a. Be on site during work and/or grading adjacent to areas to be preserved to ensure compliance with all conservation measures;
 - b. Oversee installation of and inspect the fencing and erosion control measures within the 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;
 - c. Periodically monitor the work area to ensure that work activities do not generate excessive amounts of dust;
 - d. 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 gnatcatcher and its/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 the gnatcatcher, 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) the protocol to resolve conflicts that may arise at any time during the construction process; 5) the general provisions of the Act, the need to adhere to the provisions of the Act, and the penalties associated with violating the Act;
 - e. 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 and conditions of the Corps permit. The biologist will report any non-compliance issues to the Agencies within 24 hours of its occurrence and confer with the Agencies to ensure the proper implementation of species and habitat protection measures; and

- f. Submit a final report to the Agencies within 60 days of project completion that includes: as-built construction drawings with an overlay of habitats that were impacted or preserved, photographs of the minimization and avoidance measures, 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.
- 15. The Construction Manager will keep the project biologist up-to-date with current plans for each phase. A pre-construction meeting will be conducted with the project biologist, the vernal pool restoration biologist, and construction supervisors prior to all earthwork. The Agencies 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 project 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 the gnatcatcher and its habitats;
 - c) The conditions of the Corps permit and the conservation measures described in the Service’s biological opinion and the that should be implemented during project construction to conserve sensitive habitats, 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) Employees will strictly limit their activities, vehicles, equipment, and construction materials to the fenced project footprint;
 - f) To avoid attracting avian predators, the project site will be kept as clean of debris as possible. All food related trash items will be enclosed in sealed containers and regularly removed from the site;
 - g) Pets of project personnel will not be allowed on the project site;
 - h) Disposal or temporary placement of excess fill, brush or other debris will not be allowed in avoided waters of the U.S., as identified by flagging and/or fencing;
 - i) The protocol to resolve conflicts that may arise at any time during the construction process;

- j) 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
 - k) 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 District and the biologist(s) will be responsible for ensuring that employees are aware of the listed species.
16. The District will execute and record a perpetual biological conservation easement over the onsite preserve. This easement will be in favor of an entity approved by the Agencies. The Service will be named as third party beneficiary in the conservation easement and the terms of the easement will be approved by the Agencies 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 would result in soil disturbance and/or vegetation removal will be allowed within the biological conservation easement area. The District will submit a draft conservation easement agreement to the Agencies 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 Agencies. The District will submit the final easement and evidence of its recordation to the Agencies within 90 days of recordation of the final map;
17. The District will implement a perpetual long-term management, maintenance and monitoring plan (e.g., HMP) for the biological conservation easement areas. The HMP 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 alien species encroachment; funding mechanism; and contingency measures should problems occur. The easement holder will designate a qualified organization or individual with suitable natural resource management experience and approved by the Agencies to manage the site. The District will also establish a non-wasting endowment in an amount approved by the Agencies 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 Agencies. The District will submit a draft HMP 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 Agencies for approval at least 90 days prior to initiating project impacts. The District will submit the final HMP to the Agencies 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. The District will not initiate project impacts until the HMP is approved and a funding mechanism acceptable to the Agencies is in place.

Appendix C

J26 Vernal Pool Complex Programmatic Reference Pool Monitoring Protocol

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J26 VERNAL POOL COMPLEX PROGRAMMATIC REFERENCE POOL MONITORING PROTOCOL

Introduction

This memo addresses post-restoration monitoring methods for the programmatic reference vernal pools in the J26 vernal pool complex as they relate to 5-year monitoring requirements for a vernal pool restoration project that is part of a comprehensive mitigation program associated with construction of the San Ysidro School District's (SYSD) Vista Del Mar Elementary School. The vernal pool restoration project is being implemented in compliance with the following regulatory agency authorizations: Department of the Army Permit No. SPL-2009-00028-LLC, the Biological Opinion (FWS-SDG-09BO258-11F0076), and the Water Quality Certification No. 09C-017 (WDID 9-000001990). In addition to the above-referenced regulatory agency authorizations, the 5-year monitoring requirements for the SYSD vernal pool restoration site are guided by a vernal pool restoration plan that was approved by the agencies in 2011. That restoration plan addresses the enhanced and created vernal pools (also collectively referred to herein as "restored pools"), as well as the upland vegetation within the surrounding vernal pool watersheds onsite. This memo only pertains to the vernal pool monitoring requirements; implementation of the upland vegetation monitoring will follow the methods prescribed by the restoration plan.

In accordance with these authorizations, an approximate one-acre vernal pool restoration site has been installed within the City of San Diego West Otay Mesa Parcel B Vernal Pool Preserve. Installation was completed on March 23, 2012. Data collection began in 2011 for the Vista del Mar Elementary School vernal pool restoration project using methods identified below. The data collected from 2012 onward will also benefit the following projects: State Route 11, Otay Mesa East Port of Entry, Otay Crossing Commerce Park and Otay Business Park.

The following vegetation monitoring methods are part of a post-restoration monitoring protocol specifically designed to programmatically monitor the success of vernal pool restoration projects on the Otay Mesa. The use of a programmatic reference site for vernal pool restoration projects will reduce monitoring-associated impacts on the remaining natural Otay Mesa vernal pools by collecting one set of monitoring data for all Otay Mesa vernal pool restoration projects.

The stipulation for this memorandum is the recommendation by U.S. Fish and Wildlife Service (USFWS) to use the vernal pool complex J26 as a suitable reference site for this programmatic monitoring approach (pers. com. S. Wynn, June 26, 2012). J26 has been used as a reference site for multiple restoration projects, including the restoration of vernal pools above Johnson Canyon as mitigation for the SR-125 construction project (EDAW 2005 – 2008), and data from these previous monitoring efforts are available. Monitoring data will be housed with the San Diego Management and Monitoring Program's (SDMMP) South Coast Multi Taxa database (<http://www.sdmmp.com/SCMTX.aspx>). The development of this database is in progress and data entry will be coordinated directly with SDMMP.

Proposed Vegetation Monitoring Methods

The following vegetation monitoring methods are part of a post-restoration monitoring protocol specifically designed to monitor the success of vernal pool restoration projects on the Otay Mesa on a programmatic level. The use of a programmatic reference site for vernal pool restoration projects will reduce monitoring-associated impacts to the remaining natural vernal pools on the mesa.

Qualitative (Horticultural) Monitoring

During the wet season (typically October through March, but varies annually), the restoration and reference sites will undergo qualitative monitoring monthly in the first year and quarterly for the remainder of the monitoring years. Qualitative surveys will give an overview of the general progress of the site, including the observation of invasive species, debris, trash, access issues, erosion, and other potential problems. Qualitative monitoring will consist of a general site walk-through and characterization of the restoration planting. General observations, such as health of planted and seeded species, signs of over/under watering, and drought stress will be noted. Restoration plantings will be examined to visually estimate species mortality, species composition, seedling recruitment, and soil, weed, and pest problems.

Quantitative (Botanical) Monitoring

The following quantitative methods will be employed for monitoring of selected pools in the treatment (restored) and control (reference) sites; the same protocols must be used for the treatment and control pools to yield meaningful results. The purpose of quantitative sampling is to compare the restored and control pools to quantify the restoration success and determine, over time, the overall function of the restored vernal pool system at the project mitigation site compared to a naturally occurring system.

Quantitative monitoring of vernal pool flora will be performed using the point intercept line transect sampling methods described in the California Native Plant Society's Field Sampling Protocol (Sawyer and Keeler-Wolf 1995), and at established photo points.

These methods are suitable to determine the overall richness, density, and species distribution in vernal pools.

For the Vista del Mar restoration project, at least two “sentinel” pools (i.e., pools that will be subject to permanent sampling over the duration of the monitoring period) will be selected in each monitoring site (i.e., one restoration pool and one reference pool). In addition, two random pools will be selected for sampling each year. Within each of the four pools, the vernal pool basin and periphery will be identified. Per the Vernal Pool Hydrogeomorphic Method (HGM) Guidebook (Bauder et al. 2009), the periphery is a 20-foot wide band of transitional and upland habitat around the edge of the vernal pool basin. The edges of the vernal pool basins are defined by the elevation of standing water at full capacity. The distinct basin edge may be characterized by an abrupt change in the presence or absence of algae and/or debris, vegetation, cobble density, or soil color over a very small distance (~10 cm in small pools to 1 m in large pools) around the majority of the pool perimeter; an indistinct edge does not show a contrast in these features over a small area (Bauder 2009). In addition, the deepest point of each monitoring pool will be permanently marked (in accordance with hydrological monitoring methods).

One transect will be placed across the longest part of each pool basin. The transect tape will be extended across the deepest point of each vernal pool between the outer edges of the pool perimeter on either side of the pool. Each transect end point would be recorded with a sub-meter accuracy Global Positioning System (GPS) unit.

Point intercept data will be collected at each 1-meter interval using a thin metal rod; standing vegetation that is incident at the point where the rod is vertically placed will be recorded in a datasheet as the species epithet (flora and bare ground in separate columns). Species occurrence will be measured by placing 0.25-meter quadrats at each 2.5-meter intercept and recording all species within the quadrat.

To calculate total vegetation **percent cover**, the number of points that intercept live plant material is summed and divided by the total number of intercepts possible along that transect. Multiple hits of plants at a single point resulting from overlap of 2 or more species are counted as a single hit for this calculation. To calculate the percent cover contributed by each species, the number of intercepts by each species is divided by the number of possible intercepts for the given transect.

All plant species observed within the 0.25-meter quadrat will be recorded, resulting in **species richness** (the number of species in a given area). All plants observed are categorized by origin (native/non-native) and stratum (herb, shrub), and by plant distribution categories (Bauder 2009). **Frequency** will be calculated by the number of quadrats in which a species occurred.

Permanent photo points will be marked using sub-meter accuracy GPS units. Photographs will be taken at the same time each year from the same locations and vantage point (i.e., by using photo-equipped GPS units) to monitor change over time.

Direction, height and angle of photographs will be recorded to assure that the same vantage point will be used repeatedly over the monitoring period.

Other Elements of Post-Restoration Monitoring

A variety of monitoring methods have been developed to assess functions and values of vernal pools, including the regional Vernal Pool HGM (Bauer et al. 2009), USFWS Multiple Species Conservation Program (MSCP) Animal Monitoring Protocols (USFWS 2008), the City of San Diego Vernal Pool Habitat Conservation Plan (HCP – in progress), and the recent California Rapid Assessment Method (CRAM) Vernal Pool Module (California Wetlands Monitoring Workgroup 2012). The U.S Army Corps of Engineers (Corps) and Regional Water Quality Control Board (RWQCB) will likely require CRAM analysis for all vernal pool restoration projects following the established CRAM protocol; therefore, the implementation of a CRAM is not addressed in this monitoring protocol.

The regional Vernal Pool HGM (Bauder et al. 2009) will be used as a basic guidance to determine the compatibility of the programmatic reference vernal pools in the J26 vernal pool complex with the restored pools in the Vista del Mar vernal pool restoration site. The following assessments¹ of both sets of pools will be conducted to establish a baseline for the monitoring effort, including determining

- Position of vernal pool complex/restoration project in the landscape
- Watershed
- Connectivity to other vernal pool complexes or open space
- Disturbance factors (within and adjacent to the restoration/reference sites)
- Surface features (vernal pool basin, vernal pool periphery)
- Soils
- Stratified Sampling Design

These assessments will be conducted at the onset of the monitoring efforts and will only be needed once during the post-restoration monitoring phase.

Hydrological and biological assessments will be performed throughout the monitoring period using repeatable, replicable and quantifiable methods. Except for the vegetation monitoring methods described in this document, a detailed description of methods will be forthcoming in future annual monitoring reports upon agency coordination and approval. The following lists the basic parameters of hydrological monitoring and branchiopod surveys.

Hydrological Monitoring

Without proper hydrological function, the success of vernal pool restoration is significantly compromised. Therefore, hydrological monitoring is extremely important. Vernal pools periodically fill with water during the wet season and, in most cases, slowly

¹ Protocol will be determined as part of this monitoring effort and are forthcoming.

evaporate over a period of about six months. During the wet season, multiple wetting and drying cycles may occur. Because vernal pools in Southern California are small and shallow, and due to the variability of inundation periods, hydrological monitoring requires methods specifically designed to work in vernal pools. A variety of methods have been tested and successfully implemented, including:

- Frequent (daily) visits to record water levels off rulers installed in the deepest portion of the pool;
- Frequent visits to record water levels from Visitubes (clear PVC tubes with a ‘floater’ (cork) that marks water levels);
- Data recording from stack-mounted i-Buttons (electronic, button-sized temperature/humidity data loggers); and
- Pressure transducers (non-vented water level recorders).

The first two methods are easy, but very labor intensive and data are not always reliable. The latter two methods require technological instrumentation, but less frequent site visits. For example, information from data loggers installed in the vernal pools are downloaded and analyzed. While i-Buttons are less expensive, they are less accurate in recording vernal pool hydrology than pressure transducers, which are relatively costly.

Faunal/Branchiopod Sampling

The vernal pool faunal community should also be monitored to gauge the long-term success of vernal pool restoration and determine the health and vigor of vernal pool species. Because vernal pool restoration projects are typically the means of compensatory mitigation for regulatory purposes, emphasis is often placed on the recovery of federally or State listed species, such as listed branchiopods. However, the entire faunal community should be monitored, at least qualitatively, to document the overall success of the vernal pool ecosystem.

While population density and trend monitoring would require the application of dry-season sampling protocols, these methods disturb the vernal pool basin and potentially impact the function of the vernal pool when applied frequently. The application of dry season sampling will be assessed by USFWS on a case-by-case basis and is usually stipulated in the Biological Opinion or other permits issued for projects. While this type of sampling is important to monitor long-term functions of branchiopod populations, it is not required for the monitoring of the Vista del Mar vernal pool restoration success, which will be accomplished by using wet-season presence/absence protocols. Therefore, USFWS-protocol level wet season fairy shrimp sampling will be conducted in 20% of the pools by certified biologists immediately after vernal pool grading, and during monitoring years 1, 3, and 5.

References

- EDAW. 2005 – 2008. Monitoring Report for the State Route 125 South Vernal Pool and Quino Checkerspot Habitat Restoration Site. Annual monitoring reports to U.S. Fish and Wildlife Services, U.S. Army Corps of Engineers, Regional Water Quality Control Board and California Department of Fish and Game. California Department of Transportation and South Bay Expressway (formerly California Transportation Ventures, Inc.).
- Bauder, Ellen T., Andrew J. Bohonak, Barry Hecht, Marie A. Simovich, David Shaw, David G. Jenkins, and Mark Rains. 2009. A Draft Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Vernal Pool Depressional Wetlands in Southern California. Updated November 8, 2011. San Diego State University, San Diego, CA
- California Wetlands Monitoring Workgroup (CWMW). 2009. Using CRAM (California Rapid Assessment Method) to Assess Wetland Projects as an Element of Regulatory and Management Programs.
- Deutschman, D., and Strahm, S. 2009. Improving Statistical Sampling and Vegetation Monitoring for the San Diego MSCP, 2008 Final Report, Contract 5001033. Prepared for The San Diego Association of Governments. San Diego, California.
- U.S. Fish and Wildlife Service (USFWS). 2011. Formal Section 7 Consultation on the San Ysidro School District's Vista Del Mar Elementary School Project (Biological Opinion).
- U.S. Fish and Wildlife Service (USFWS). 2008. Draft San Diego Multiple Species Conservation Program Animal Monitoring Protocols. Prepared for the City of San Diego. February 2008.

Appendix D

2015 Fairy Shrimp Survey Report

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June 19, 2015

Ms. Stacey Love
U.S. Fish and Wildlife Service
Carlsbad Field Office
2177 Salk Ave, Suite 250
Carlsbad, CA 92008

Subject: Fairy Shrimp Survey Report for the Vista Del Mar Elementary School Project San Diego County, CA.

Dear Ms. Love:

As required by the U.S. Fish and Wildlife Service (USFWS), this letter provides documentation of the results of 2014/2015 wet season surveys for federally-listed vernal pool branchiopod (fairy shrimp) species. The surveys were conducted on behalf of the San Ysidro School District within the vernal pool restoration area associated with the Vista Del Mar Elementary School Project (Project), located in the community of San Ysidro, San Diego County, California.

Overview

To mitigate impacts to vernal pools from Project construction, a total of 32 vernal pools within the restoration area were created, restored, or enhanced through implementation of the agency-approved *Vista Del Mar Elementary School Vernal Pool Restoration Plan for the Off-Site Preserve* (Helix, 2011; as amended by TAIC, 2012). Pursuant to Project permit requirements, protocol-level fairy shrimp surveys will be conducted annually during the restoration period (generally five years) to ensure successful restoration. This report discusses the results of the fairy shrimp surveys conducted during the 2014/2015 wet season (Year 4), which were performed within the restoration area, as summarized below:

Name of project: Vista Del Mar Elementary School

Permittee: San Ysidro School District

Property Owner: City of San Diego

Location: The 1-acre survey area comprises 18 newly created and 14 restored or enhanced vernal pools within the vernal pool restoration area. The restoration area is located within the Imperial Beach 7.5 minute U.S. Geologic Survey (USGS) Quadrangle, on the Otay Mesa in the community of San Ysidro within the City of San Diego, San Diego County, California (Figure 1).

Reference Site: Two reference sites have been selected for monitoring. One reference site is located adjacent to the references area on the west side. This area was restored as mitigation for impacts associated with construction of the San Ysidro High School. The second site, known as the J26 Complex, is formally recognized by the U.S. Fish and Wildlife Service as a vernal pool reference site. This site is located approximately 10 km northeast of the restoration area (Figure 2).

Fairy Shrimp & Vernal Pool Biology

Fairy shrimp habitat includes all vernal pools and swales (including road ruts) that occur within the species' range, which can hold water for an extended period of time. According to the USFWS, vernal pools and swales can be defined as ephemeral wetlands that form in areas of California with Mediterranean climates that have shallow depressions underlain by a substrate of hardpan, clay, or basalt near the surface that restricts the percolation of water. They may be characterized by a barrier to overland flow that causes water to collect and pond. Vernal pools/swales may occur singly, but more typically occur in vernal pool/swale complexes, due to the local hydrology, geology, and topography. Initially, the dry soil in vernal pools/swales becomes wet and starts to saturate during the fall and early winter rains. The second stage in a typical vernal pool cycle is characterized by peak rainfall and inundation of the vernal pools/swales. Vernal pools may remain inundated until spring or early summer, sometimes filling and drying numerous times during the wet season. The vernal pools gradually dry down during the spring, quite often forming the unique "bathtub ring" of flowers from endemic vernal pool plants blooming profusely at the pool margins. This drying down stage is typified by the production of seeds in the endemic plants and the dispersal of animals from the vernal pools. These pools eventually dry down totally, with the onset of drought conditions. During this final stage, early season and shallow-rooted plants turn brown, and the soil dries and may crack. With average rainfall patterns, vernal pools are typically characterized by a predominantly annual plant community dominated by wetland species (USFWS, 1996).

Fairy shrimp mature and lay cysts in the soils lining the bottom of the pools while the pools are filled with water. Fairy shrimp hatch from cysts once the pools fill with water during winter months. As the pools dry in the spring and summer, the cysts are able to remain dormant in the soil for extended periods of time until the pool becomes inundated again. Fairy shrimp cysts can persist unharmed in the soil for years despite extreme weather conditions. Fairy shrimp cysts do not all hatch at once, and each time a pool fills in a single season new cysts may hatch (Eriksen and Belk, 1999).

Existing Conditions and Restoration Background

The 1-acre restoration area is located on a plateau within coastal sage scrub vegetation on the Otay Mesa and is known to have historically contained vernal pools (Figure 1). Prior to restoration, the restoration area had been disturbed by off-road vehicles and was previously owned by The Environmental Trust (TET). After TET declared bankruptcy, the restoration area and conservation easement was transferred to the City of San Diego. As part of the mitigation requirements for the Vista Del Mar Elementary School construction, the restoration area was seeded and planted with native vernal pool and upland coastal sage scrub species.

A total of 32 vernal pools within the Restoration Area were either created, restored, or enhanced through implementation of the agency-approved *Vista Del Mar Elementary School Vernal Pool Restoration Plan for the Off-Site Preserve* (Helix, 2011; as amended by TAIC, 2012). Eighteen of the pools (i.e., pool numbers 2, 5-10, 12-15, 22, 23, 27-29, 31, and 32) were newly created within the restoration area and were inoculated with vernal pool soils containing the federally-listed San Diego fairy shrimp (*Branchinecta sandiegonensis*) cysts salvaged from the Vista Del Mar Elementary School impact site and/or a vernal pool donor site located just west of the restoration area. The remaining fourteen pools (i.e., pool numbers 1, 3, 4, 11, 16-21, 24-26, and 30) were existing pools that were restored or enhanced within the restoration area and inoculated with San Diego fairy shrimp cysts from the road rut pool adjacent to the restoration area. All pools were constructed or recontoured in January and February 2012.

Fairy Shrimp Survey Methods

Branchiopod surveys were conducted within pools that were inundated for a sufficient amount of time and depth to support fairy shrimp, based on the results of hydrological monitoring that was being conducted within the restoration area and reference pools. During the 2014/2015 rainy season, the restoration area pools (Figure 3) were sampled twice during the season and the adjacent pools at San Ysidro High School reference site were sampled once; the J-26 reference pools were not sampled as they were not inundated sufficiently to support fairy shrimp. Sampling was conducted by Rocks Biological Consulting biologists Melanie Rocks (TE-082908-1) and Lee Ripma (TE-221290-3), who were assisted by Rocks Biological Consulting biologist Shannon Walsh, on December 16 and December 31, 2014 according to the Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods (USFWS, 1996).

The protocol requires that depressions be examined 24 hours after a storm event to determine if the depression is inundated (defined as holding more than three centimeters of water). If after two weeks the depressions are still inundated, protocol fairy shrimp surveys must be conducted. All pools inundated to levels sufficient to support fairy shrimp were sampled using a hand-held net, which was

swept through the water and the net contents were examined for invertebrates. San Diego fairy shrimp were collected and identified with the aid of a dissecting microscope after the surveys were completed. The collected voucher specimens will be accessioned to the Los Angeles Natural History Museum, Crustacea Section, Invertebrate Zoology, 900 Exposition Boulevard, Los Angeles, California 90007.

Survey Results

During the 2014/2015 rainy season, San Diego County experienced its fourth straight year of drought conditions (San Diego County Water Authority, 2015). Between October 2014 and May 2015, a total of only 8.91 inches fell, as compared to 14.26 inches based on average monthly precipitation rates (Table 1).

Table 1. Actual vs. Average Precipitation October 2014-May 2015

Month	Normal (in.)	Actual (in.)
October 2013	0.82	0.00
November 2013	1.13	0.37
December 2013	2.27	4.50
January 2014	2.98	0.42
February 2014	3.23	0.28
March 2014	2.69	0.93
April 2014	0.96	0.02
May 2014	0.18	2.39
TOTALS	14.26	8.91

Source: local climate data from the National Oceanic and Atmospheric Administration (NOAA), Lindbergh Field.

During the current reporting period, two surveys were conducted; the first survey took place on December 16 within the restoration area and the second survey was performed on December 31, 2014 within both the restoration area and San Ysidro High School reference site. At the time of the first survey, all 32 pools held water for a sufficient depth and duration to support fairy shrimp. However, only half of these pools were found to hold fairy shrimp, therefore a second survey was performed on the remaining 16 pools to retest for fairy shrimp presence (Table 3). Only four pools within the adjacent San Ysidro High School reference site and no pools within the J26 Complex reference sites were inundated for a sufficient depth and duration to support fairy shrimp; the pools that were not inundated were not sampled. The four sampled pools are represented in Table 4.

Table 2. Fairy Shrimp Data from December 16, 2014 Survey

Pool Number	Description	Water Temp. (°C)	Maximum Depth (cm)	Size (m ²)	Presence of Fairy Shrimp	No. Male	No. Female	Population Estimate
1	Enhanced	17.9	3.0	10.0	none	0	0	0
2	Created	18.1	6.0	35.0	none	0	0	0
3	Enhanced	18.1	3.0	12.0	none	0	0	0
4	Enhanced	16.9	6.0	25.0	none	0	0	0
5	Created	17.1	7.0	30.0	none	0	0	0
6	Created	17.1	3.0	6.0	none	0	0	0
7	Created	16.5	10.0	28.0	<i>B. sandiegonensis</i>	6	2	1000s
8	Created	15.8	7.0	12.0	none	0	0	0
9	Created	15.8	9.0	30.0	<i>B. sandiegonensis</i>	5	2	1000s
10	Created	16.2	9.0	35.0	<i>B. sandiegonensis</i>	6	2	1000s
11	Enhanced	16.0	6.0	21.0	none	0	0	0
12	Created	16.1	6.0	16.0	<i>B. sandiegonensis</i>	6	3	1000s
13	Created	17.3	10.0	42.0	<i>B. sandiegonensis</i>	5	2	1000s
14	Created	16.6	8.0	60.0	<i>B. sandiegonensis</i>	5	2	1000s
15	Created	18.1	3.0	15.0	none	0	0	0
16	Enhanced	18.5	3.5	16.0	none	0	0	0
17	Enhanced	17.9	9.0	30.0	<i>B. sandiegonensis</i>	5	2	1000s
18	Enhanced	17.6	5.0	16.0	none	0	0	0
19	Enhanced	17.1	8.0	25.0	<i>B. sandiegonensis</i>	5	2	1000s
20	Enhanced	16.2	4.0	16.0	none	0	0	0
21	Enhanced	15.8	12.0	25.0	<i>B. sandiegonensis</i>	5	2	1000s
22	Created	15.5	13.0	25.0	<i>B. sandiegonensis</i>	5	2	1000s
23	Created	16.1	0.5	2.0	none	0	0	0
24	Enhanced	16.8	9.0	24.0	<i>B. sandiegonensis</i>	6	3	1000s
25	Enhanced	17.8	6.0	12.0	none	0	0	0
26	Enhanced	17.4	10.0	20.0	<i>B. sandiegonensis</i>	4	2	100s
27	Created	18.0	10.0	24.0	<i>B. sandiegonensis</i>	5	3	1000s
28	Created	17.6	5.0	12.0	<i>B. sandiegonensis</i>	2	2	10s
29	Created	15.3	16.5	40.0	<i>B. sandiegonensis</i>	5	4	1000s
30	Enhanced	17.6	6.5	36.0	<i>B. sandiegonensis</i>	3	2	100s
31	Created	18.3	4.5	8.0	<i>B. sandiegonensis</i>	1	1	10s
32	Created	17.7	8.0	12.0	<i>B. sandiegonensis</i>	5	2	1000s

Table 3. Fairy Shrimp Data from December 31, 2014 Survey

Pool Number	Description	Water Temp. (°C)	Maximum Depth (cm)	Size (m ²)	Presence of Fairy Shrimp	No. Male	No. Female	Population Estimate
1	Enhanced	11.9	2.0	8.0	<i>B. sandiegonensis</i>	3	3	100s
2	Created	11.8	5.0	25.0	<i>B. sandiegonensis</i>	5	4	100s
3	Enhanced	11.8	3.0	20.0	<i>B. sandiegonensis</i>	4	2	100s
4	Enhanced	11.8	5.0	20.0	<i>B. sandiegonensis</i>	5	2	1000s
5	Created	11.8	5.0	18.0	<i>B. sandiegonensis</i>	5	2	100s
6	Created	12.1	4.5	6.0	<i>B. sandiegonensis</i>	4	2	100s
8	Created	11.2	8.0	12.0	<i>B. sandiegonensis</i>	4	2	1000s
11	Enhanced	11.7	4.0	16.0	<i>B. sandiegonensis</i>	3	3	100s
15	Created	11.6	3.0	15.0	<i>B. sandiegonensis</i>	4	2	1000s
16	Enhanced	11.9	3.0	16.0	<i>B. sandiegonensis</i>	5	1	100s
18	Enhanced	12.1	4.0	6.0	none	0	0	0
20	Enhanced	12.1	4.0	16.0	<i>B. sandiegonensis</i>	5	2	1000s
23	Created	12.2	1.0	1.0	none	0	0	0
25	Enhanced	11.9	6.0	6.0	<i>B. sandiegonensis</i>	5	1	100s
30	Enhanced	12.1	5.0	36.0	<i>B. sandiegonensis</i>	3	2	100s
31	Created	12.4	5.0	8.0	<i>B. sandiegonensis</i>	3	3	100s

Table 4. Fairy Shrimp Reference Pool Data from December 31, 2014 Survey

Pool Number	Description	Water Temp. (°C)	Maximum Depth (cm)	Size (m ²)	Presence of Fairy Shrimp	No. Male	No. Female	Population Estimate
A-9	Reference	13.2	4.5	15.0	none	0	0	0
A-12	Reference	12.7	5.0	1.0	none	0	0	0
A-13	Reference	12.9	2.0	2.0	none	0	0	0
A-14	Reference	12.4	3.0	8.0	none	0	0	0

On December 16, the sampled pools within the restoration site varied in size from 2.0 to 60.0 square meters, with maximum depths ranging from 0.5 to 16.5 centimeters (Table 2). Water temperatures ranged from 15.3 to 18.5 degrees Celsius. Sixteen of the 32 pools sampled were found to support San Diego fairy shrimp. On December 31, the sampled pools within the restoration site varied in size from 1.0 to 36.0 square meters, with maximum depths ranging from 1.0 to 8.0 centimeters (Table 3). Water

temperatures ranged from 11.2 to 12.4 degrees Celsius. Of the four vernal pools surveyed at the San Ysidro High School reference site, the pools ranged in size from 1.0 to 15.0 square meters, maximum depths ranged from 2.0 to 5.0 centimeters, and water temperatures ranged from 12.4 to 13.2 degrees Celsius (Table 4).

Across both sampling dates, 30 of the 32 sampled restoration pools were found to support San Diego fairy shrimp (Tables 2 and 3). Two pools did not support fairy shrimp, 1 pool supported a low density of fairy shrimp (i.e., tens), 12 pools supported a medium density of fairy shrimp (i.e., hundreds), and the remaining 17 pools supported high densities of fairy shrimp (i.e., thousands). The presence of fairy shrimp is much higher than the previous year in which fairy shrimp were found in only 14 pools. Additionally, densities are slightly higher than in the previous year, in which 1 pool supported a medium density of fairy shrimp and 13 pools supported a high density of fairy shrimp.

The USFWS Vernal Pool Data Sheets for Wet Season Surveys (USFWS, 1996) are attached to this report and summarized in Tables 2-4. Photographs of site conditions at the time of surveys, the 10-Day Survey Notification Letter, and the California Natural Diversity Database (CNDDB) California Native Species Field Survey Forms are also attached to this report.

If you have any questions about the surveys or the Project, please do not hesitate to contact Rosanne Humphrey.

Sincerely,

A handwritten signature in black ink, appearing to read "Melanie Rocks".

Melanie Rocks
Rocks Biological Consulting
5101 September Street
San Diego, CA 92110-1118
(619) 843-6560

A handwritten signature in black ink, appearing to read "Rosanne Humphrey".

Rosanne Humphrey
Senior Biologist
ESA | Biological Resources and Land Management
rhumphrey@esassoc.com

Attachments

Rocks Biological Consulting Survey Certification Letter

Figures

Figure 1: Regional Location

Figure 2: Site Map

Figure 3: Presence of Fairy Shrimp within Restoration Pools

10-Day Notification Letter

Representative Site Photographs

USFWS Vernal Pool Data Sheets for 2014 Wet Season Surveys

CNDDB Field Form

References

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

Environmental Science Associates, Inc. (ESA). 2012. *90-Day Report: Post-Survey Notification of Fairy Shrimp Surveys on the San Ysidro School District's Vista Del Mar Elementary Vernal Pool Restoration Area*.

Helix Environmental Planning (Helix). February 2, 2011; amended by TAIC August, 5, 2011. *Vista Del Mar Elementary School Vernal Pool Restoration Plan for the Off-Site Preserve*. Prepared for San Ysidro School District.

U.S. Fish and Wildlife Service (USFWS). 1996. *Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods*. April 19, 1996.

National Oceanic and Atmospheric Administration. 2015. *Monthly Precipitation Summary Water Year 2015*. Accessed June 8, 2015. http://www.cnrfc.noaa.gov/monthly_precip.php.

San Diego County Water Authority. 2015. Accessed June 8, 2015. <http://www.sdcwa.org/drought-conditions>



May 29, 2015

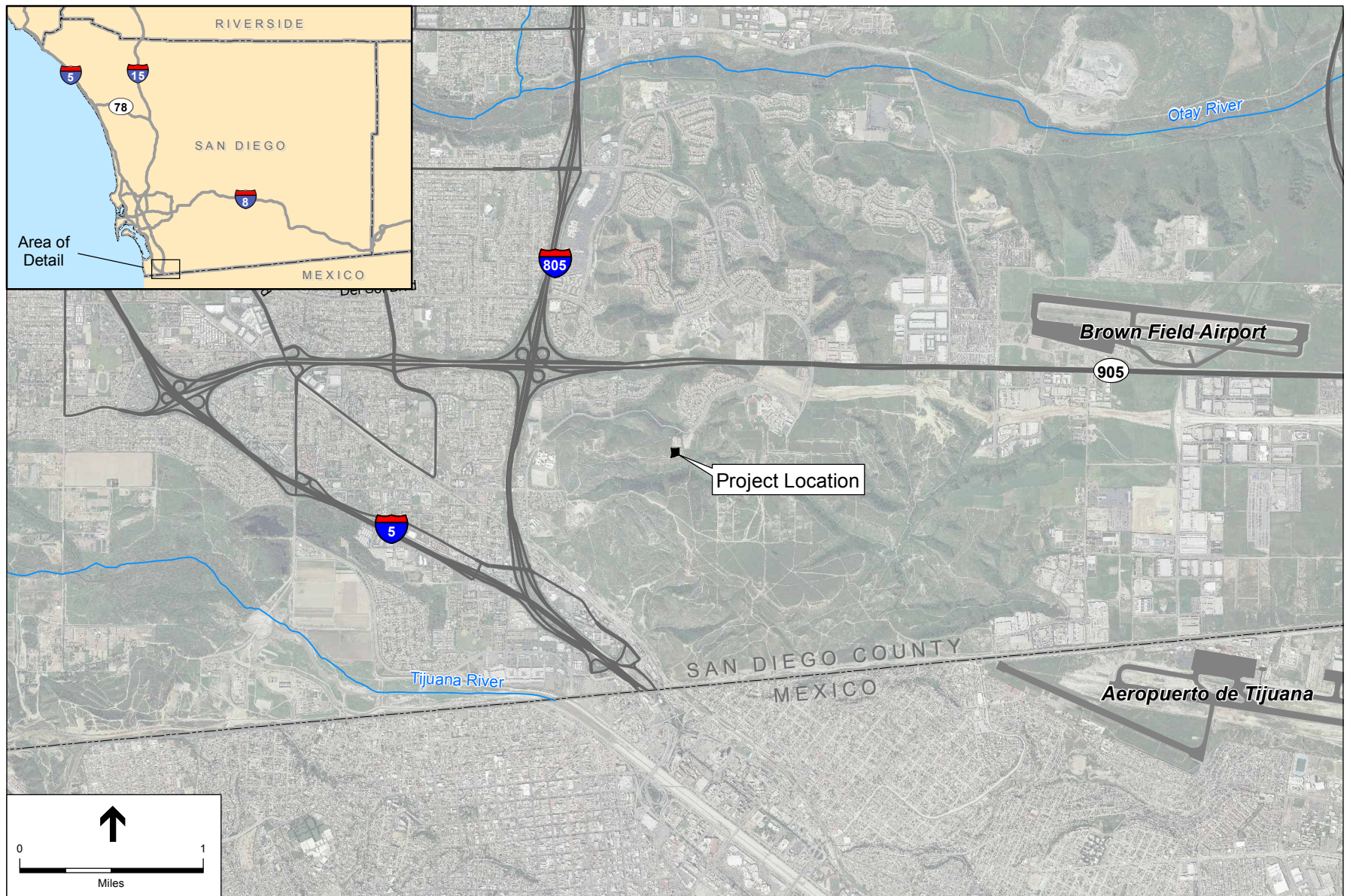
I certify that this survey report and attached exhibits fully and accurately represents my work.

A handwritten signature in black ink, appearing to read "Melanie Rocks", written over a light gray rectangular background.

Melanie Rocks
Owner/Principal
TE-082908-2

A handwritten signature in black ink, appearing to read "Lee Ripma", written over a light gray rectangular background.

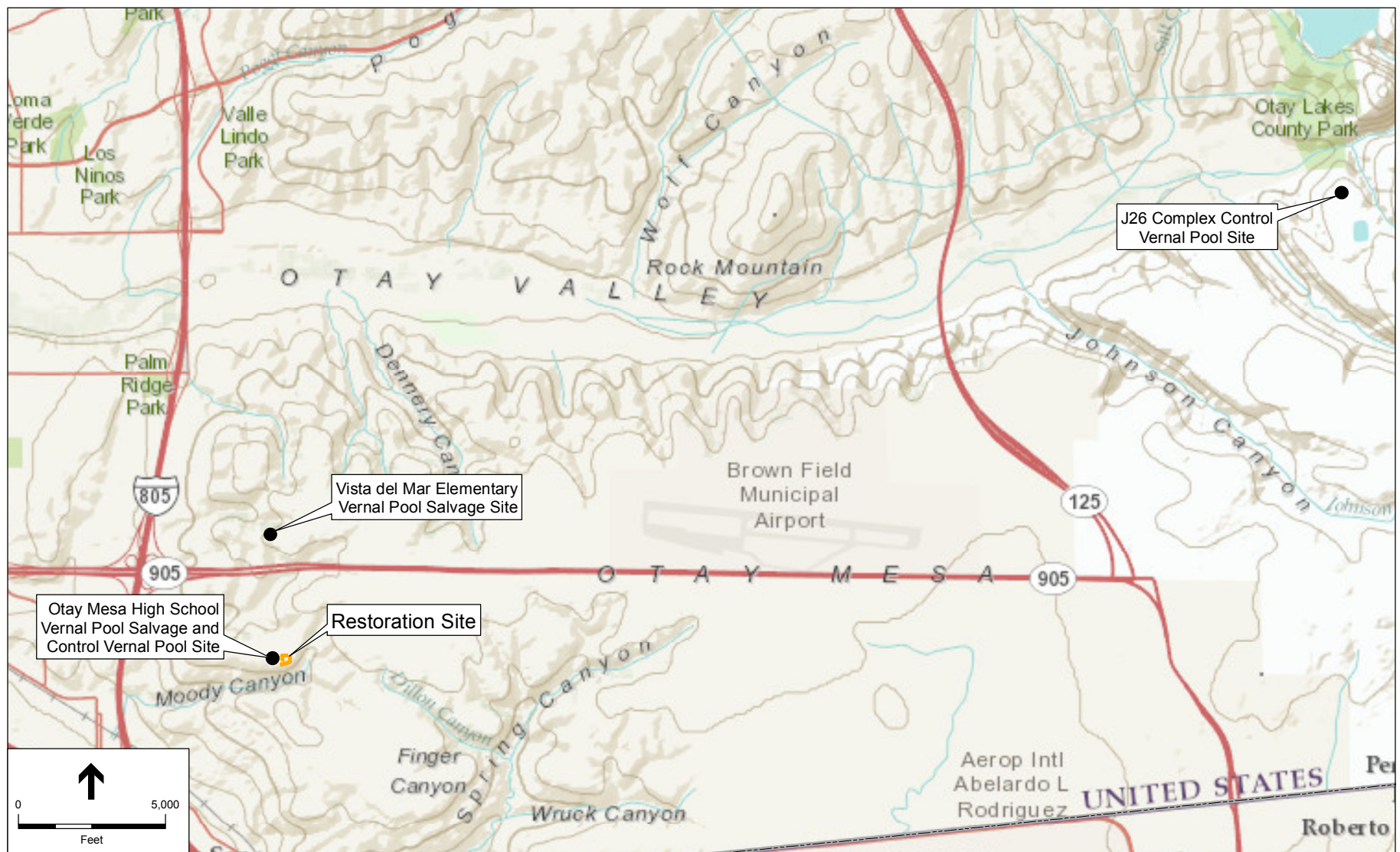
Lee Ripma
Senior Biologist
TE-221290-3.1



SOURCE: ESA, 2012.

Vista Del Mar Elementary School . 211685

Figure 1
Regional Location



SOURCE: USGS; RBF, 2012; ESA, 2012.

Vista Del Mar Elementary School . 211685

Figure 2
Site Map



SOURCE: Landiscor, 2010; RBF, 2012.

Vista Del Mar Elementary School . 211685

Figure 3
Presence of Fairy Shrimp within Restoration Pools



550 West C Street
Suite 750
San Diego, CA 92101
619.719.4200 phone
619.719.4201 fax

www.esassoc.com

December 17, 2014

Stacie Love
Recovery Permit Coordinator
Carlsbad Fish & Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

Subject: Notice of intent to conduct wet season survey for San Diego fairy shrimp (*Branchinecta sandiegonensis*) on the Vista Del Mar vernal pool restoration site and reference sites on Otay Mesa in San Diego, CA.

Dear Ms. Love:

This letter serves as notification from Environmental Science Associates (ESA) of intent to conduct wet season surveys during the 2014/2015 wet season for the endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*) as part of the on-going restoration monitoring on the Vista Del Mar vernal pool mitigation site on Otay Mesa in San Diego, California (Figure 1). The surveys will be conducted on behalf of the San Ysidro School District. The purpose of the sampling is to determine if fairy shrimp occupy vernal pools on the mitigation and reference sites, as a part of on-going restoration monitoring efforts (Figure 2). All mitigation site pools are known to contain fairy shrimp, either from previous wet season surveys or from restoration-related inoculations.

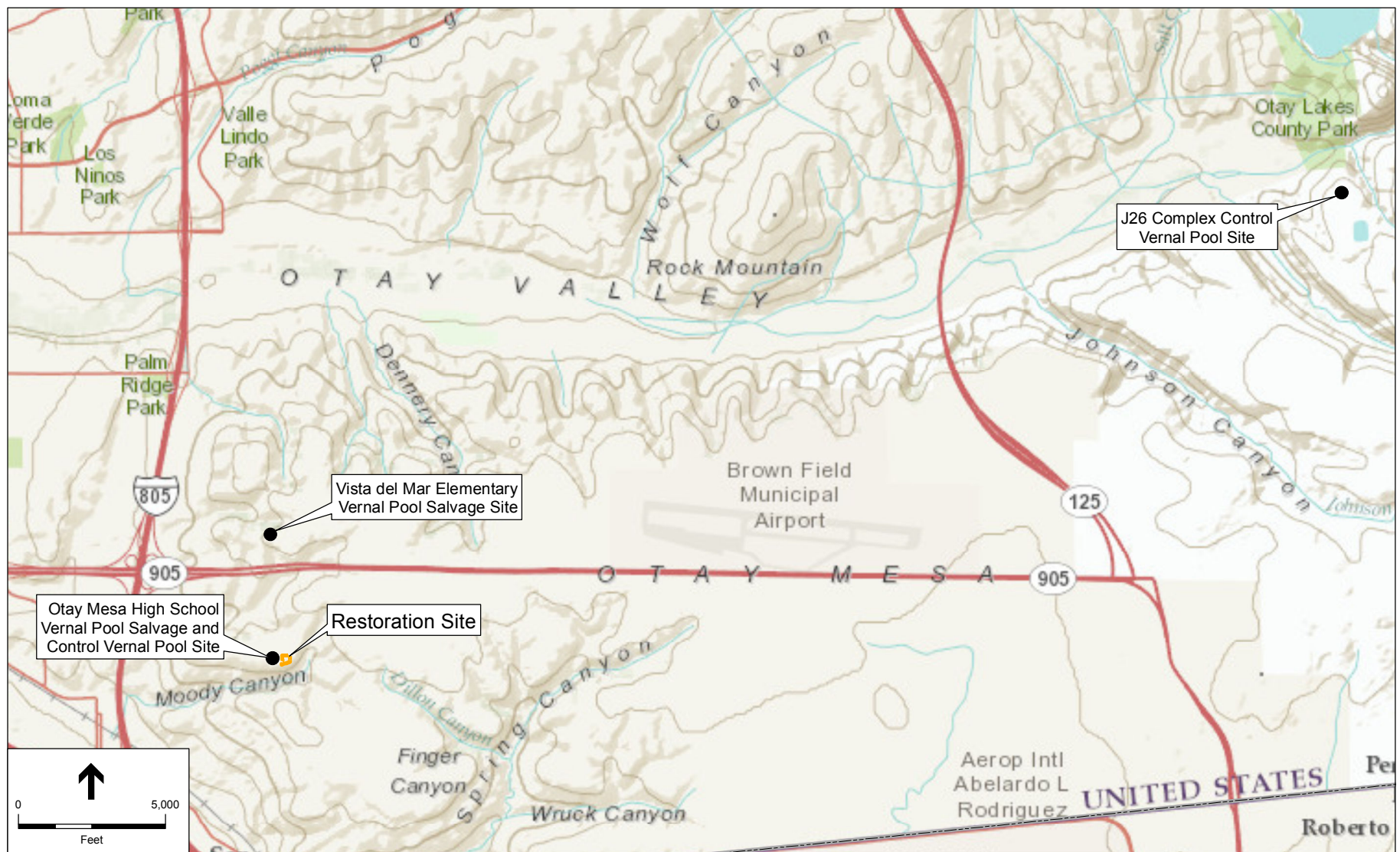
Surveys for the federally listed San Diego fairy shrimp will be conducted by Jim Rocks and/or Melanie Rocks under Recovery Permit Number TE-063230-4 and TE-082908-1, respectively. Surveys on the restoration site will occur within restored and enhanced vernal pools on the mitigation site (Figure 2). Surveys on the reference sites will include three pools at the San Ysidro High School restoration site adjacent to the Vista del Mar restoration site (Figure 3) and three pools at the J26 vernal pool complex (Figure 4). Surveys will be conducted pursuant to USFWS updated protocol for the survey of branchiopod species, and commence when the pools have held water long enough to allow for the identification of branchiopods to the species level. A single wet season survey will be conducted according to USFWS Interim Survey Guidelines (April 19, 1996). A voucher specimen will be collected from a single sampling location on the Vista Del Mar site as well as the two reference sites and submitted to the Los Angeles Natural History Museum. As required under the USFWS protocol for conducting San Diego fairy shrimp surveys, a written 10(a) report will be submitted to the USFWS Carlsbad Office within 45 days of completion of the final survey. Thank you for your consideration of this request. If you have any questions regarding this notice of intent, or if you would like additional information, please feel free to contact me at (619) 719-4200.

Sincerely,

A handwritten signature in black ink, appearing to read 'RHumphrey', is written over a light gray horizontal line.

Rosanne Humphrey

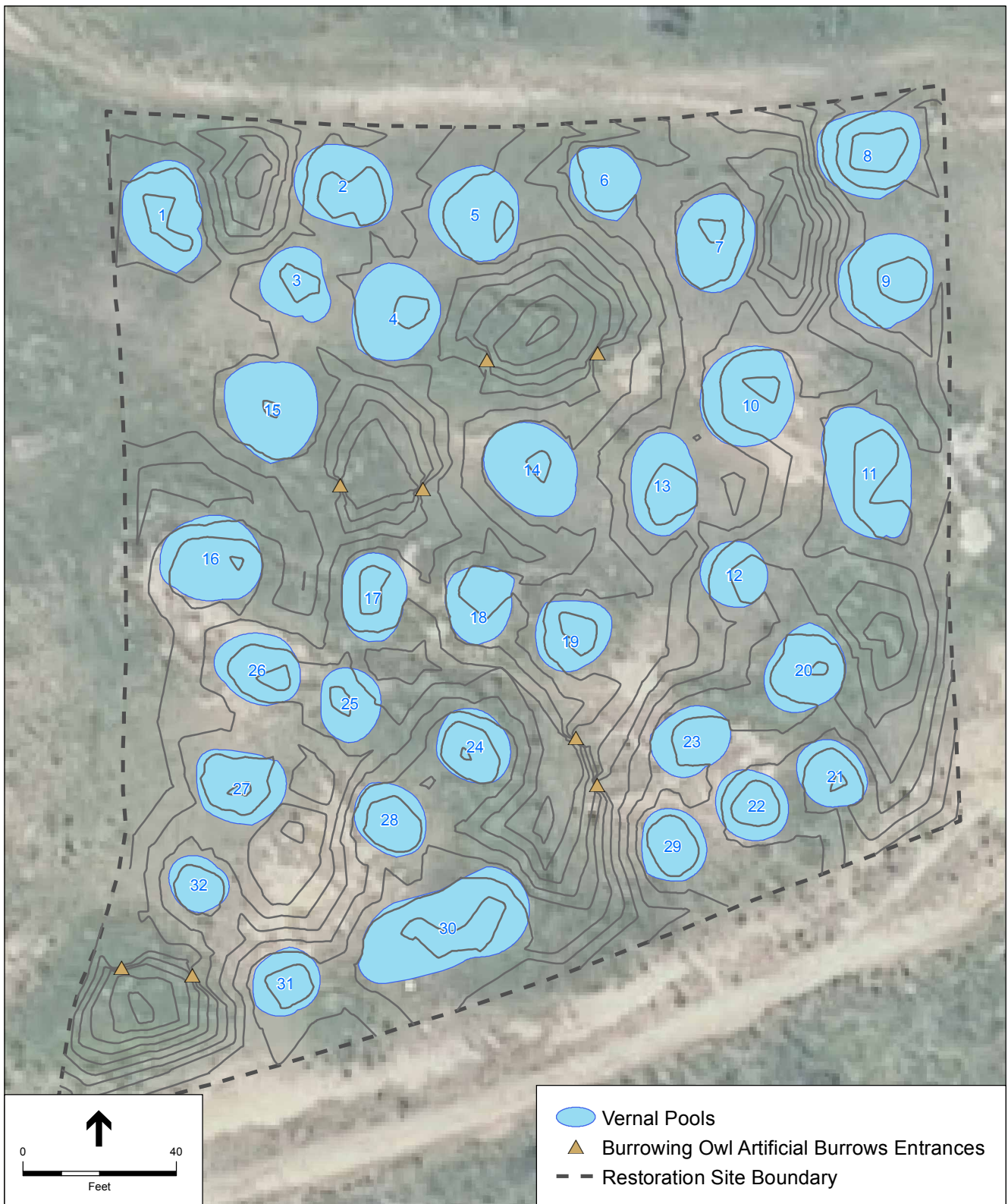
Senior Biologist
ESA | Biological Resources and Land Management



SOURCE: USGS; RBF, 2012; ESA, 2012.

Vista Del Mar Elementary School . 211685

Figure %
 Û Á Map



SOURCE: Landiscor, 2010; RBF, 2012.

Vista Del Mar Elementary School . 211685

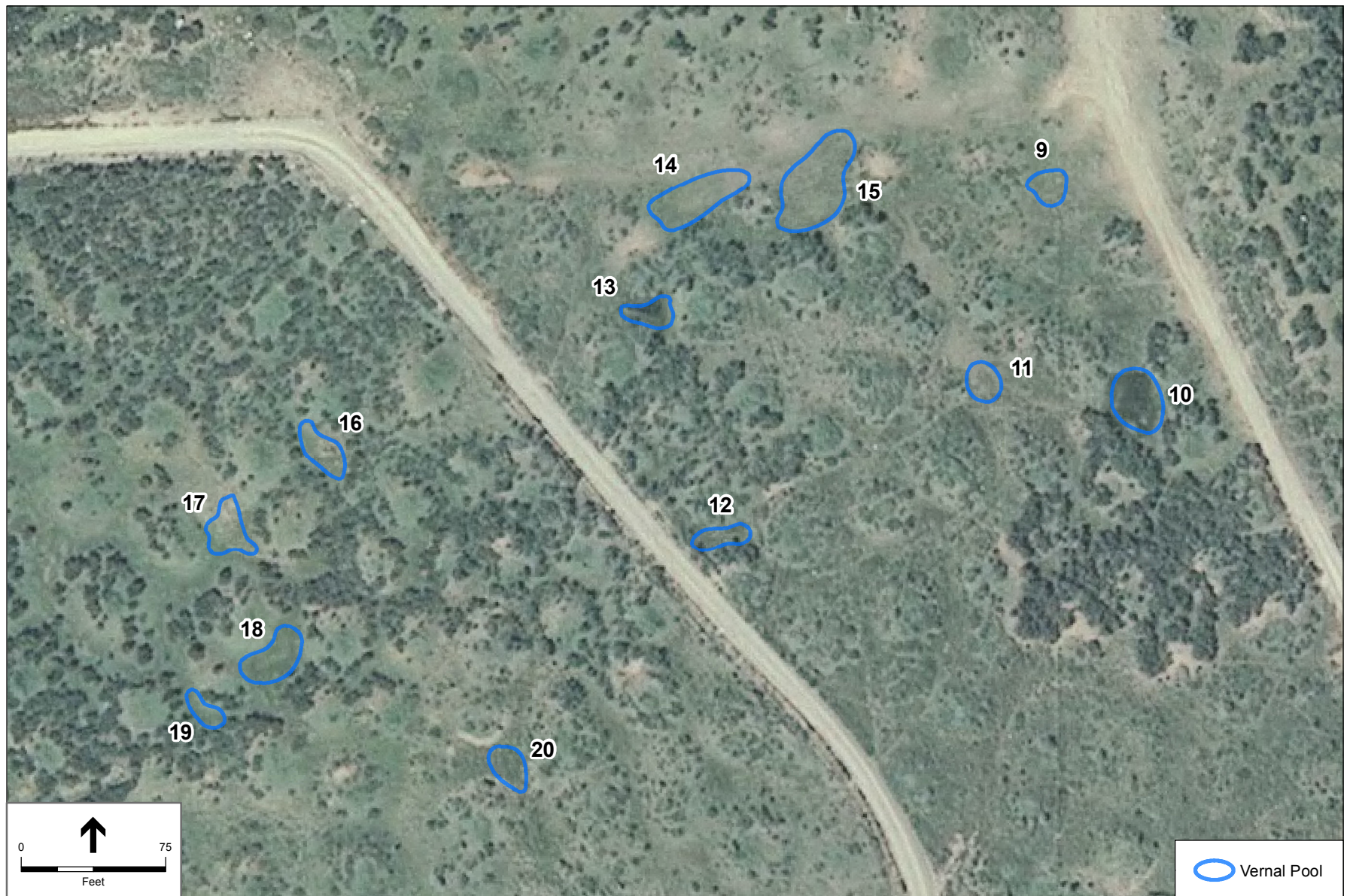
Figure 2
As Built Vernal Pool Restoration



SOURCE: Landiscor, 2010; RBF, 2012; ESA, 2012.

Vista Del Mar Elementary School . 211685

Figure 3
San Ysidro High School Vernal Pool



SOURCE: LandisCor, 2010; RBF, 2012; ESA, 2012.

Vista Del Mar Elementary School . 211685
Figure 4
J26 Complex Control Vernal Pools

Site Photographs

Vista del Mar Elementary School Project

Vernal Pool Restoration Area, December 2014





Fairy Shrimp Survey Form

Surveyor: Lee Ripma Add'l Person(s): Shannon Walsh

Project: Vista Del Mar Restoration Site Date: 16 December 2014 Survey 4 of 3

Start Time: 1050 Temp 57° Wind: 2-4 Cloud Cover: 100% End Time: 1345 Temp 58° Wind: 1-3 Cloud Cover: 100%

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-8	15.8	7cm	6	2	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-9	15.8	9cm	6	5	B. sandiegensis	5	2	1000's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-11	16	6cm	7	3	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-20	16.2	4cm	4	4	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-21	15.8	12cm	5	5	B. sandiegensis	5	2	1000's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Fairy Shrimp Survey Form—(continued)

Surveyor Lee RipmaDate 16 December 2014

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-22	15.5°	13cm	5	5	B. sandiegorensis	5	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-29	15.3°	16.5cm	8	5	B. sandiegorensis	5	4	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-23	16.1°	0.5cm	1	1	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-12	16.1°	6cm	4	4	B. sandiegorensis	4	3	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-10	16.2°	9cm	7	5	B. sandiegorensis	6	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-7	16.5°	10cm	7	4	B. sandiegorensis	6	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Additional Comments:

Fairy Shrimp Survey Form—(continued)

Surveyor Lee Ripma

Date 16 December 2014

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-6	17.1°	3cm	3	2	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-5	17.1°	7cm	6	5	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-4	16.9°	6cm	5	5	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-14	16.6°	8cm	10	6	B. sandiegensis	5	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-13	17.3°	10cm	7	6	B. sandiegensis	5	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-19	17.1°	8cm	5	5	B. sandiegensis	5	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Additional Comments: _____

Fairy Shrimp Survey Form—(continued)

Surveyor Lee Pipma

Date 16 December 2014

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-18	17.6°	5cm	4	4	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-24	16.8°	9cm	6	4	B. sandiegensis	6	3	1000's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-28	17.6°	5cm	4	3	B. sandiegensis	2	2	10's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-30	17.6°	6.5cm	12	3	B. sandiegensis	3	2	100's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments: possibly immature								
VP-31	18.3°	4.5cm	4	2	B. sandiegensis	1	1	10's
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments: shrimp are immature								
VP-32	17.7°	8cm	4	3	B. sandiegensis	5	2	1000's
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Additional Comments: _____

Fairy Shrimp Survey Form—(continued)

Surveyor Lee Ripma

Date 16 December 2014

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-27	18°	10cm	6	4	B. sandiegensis	5	3	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-26	17.4°	10cm	5	4	B. sandiegensis	4	2	100's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-25	17.8°	6cm	4	3	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-17	17.9°	9cm	6	5	B. sandiegensis	5	2	1000's
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-16	18.5°	3.5cm	4	4	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-15	18.1°	3cm	5	3	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Additional Comments: _____

Fairy Shrimp Survey Form—(continued)

Surveyor Lee Ripma

Date 16 December 2014

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-3	18.1°	3cm	4	3	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-2	18.1°	6cm	7	5	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-1	17.9°	3cm	5	2	none	—	—	—
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Additional Comments: _____

Fairy Shrimp Survey Form

 Surveyor: M. Rocks Add'l Person(s): 5. Walsh

 Project: Vista Del Mar Restoration Date: 12/31/2014 Survey _____ of _____

 Start Time: 10:15 Temp: 45 Wind: 0-2 Cloud Cover: 100% End Time: 1250 Temp: 48° Wind: 1-3 Cloud Cover: 80%

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-8	11.2°	8cm	6	2	B. sandiegonensis	4	2	1000s
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-11	11.7°	4cm	8	2	B. sandiegonensis	3	3	100s
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-20	12.1°	4cm	4	4	B. sandiegonensis	5	2	1000s
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-23	12.2°	1cm	1	1	none	-	-	-
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-18	12.1	4	3	2	none	-	-	-
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								



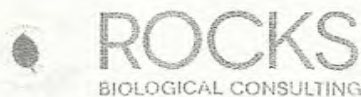
Fairy Shrimp Survey Form

Surveyor: M. Rocks Add'l Person(s): S. Walsh

Project: Vista Del Mar Restoration Date: 12/31/2014 Survey _____ of _____

Start Time: _____ Temp _____ Wind: _____ Cloud Cover: _____ End Time: _____ Temp _____ Wind: _____ Cloud Cover: _____

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-6	12.1	4.5cm	3	2	B. sandiegensis	4	2	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-5	11.8	5	6	3	B. sandiegensis	5	2	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-2	11.8	5	5	5	B. sandiegensis	5	4	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-4	11.8	5	5	4	B. sandiegensis	5	2	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-3	11.8	3	5	4	B. sandiegensis	4	2	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								



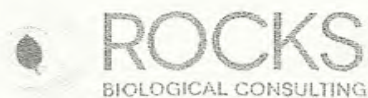
Fairy Shrimp Survey Form

Surveyor M. Rocks Add'l Person(s) S. Walsh

Project: Vista Del Mar Restoration Date: 12/31/2014 Survey _____ of _____

Start Time: _____ Temp _____ Wind: _____ Cloud Cover: _____ End Time: _____ Temp _____ Wind: _____ Cloud Cover: _____

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-1	11.9	2	4	2	B. sandiegonsensis	30	3	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-15	11.6	3	5	3	B. sandiegonsensis	4	2	1000s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-16	11.9	3	4	4	B. sandiegonsensis	50	10	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-25	11.9	6	3	2	B. sandiegonsensis	5	1	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
VP-31	12.4	5	4	2	B. sandiegonsensis	3	3	100s
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								



Fairy Shrimp Survey Form

Surveyor: M. Rocks Add'l Person(s): S. Walsh

Project: Vista Del Mar Restoration Date: 12/31/2014 Survey _____ of _____

Start Time: _____ Temp _____ Wind: _____ Cloud Cover: _____ End Time: _____ Temp _____ Wind: _____ Cloud Cover: _____

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
VP-30	12.1°	5	12	3	B. sandiegensis	3	2	1005
Pool condition (circle all): 1. <u>undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								



Fairy Shrimp Survey Form

Surveyor Melanie Rocks Add'l Person(s) Shannon Walsh

Project: Vista Del Mar Reference Pools Date: 12/31/2014 Survey _____ of _____

Start Time: 1250 Temp 48° Wind: 1-3 Cloud Cover: 80% End Time: 1310 Temp 48° Wind: 1-3 Cloud Cover: 80%

Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
REF-A-14	12.4	3	4	2	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
REF-A-13	12.9	2	2	1	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
REF-A-12	12.7	5	1	1	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
REF-A-9	13.2°	4.5	5	3	none	—	—	—
Pool condition (circle all): <u>1. undisturbed</u> 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								
Pool #	Water (°C)	Max. depth (cm)	Pool length (m)	Pool width (m)	Fairy Shrimp Present (Species)	# Male	# Female	Population Estimate
Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks garbage discing/plowing) 3. ungrazed 4. grazed (horses sheep) (light moderate heavy) Additional Comments:								

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1807 13th Street, Suite 202
Sacramento, CA 95811

Fax: (916) 324-0475 email: CNDDDB@wildlife.ca.gov

For Office Use Only

Source Code: _____ Quad Code: _____

Elm Code: _____ Occ No.: _____

EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): _____

California Native Species Field Survey Form

Scientific Name: _____

Common Name: _____

Species Found?

Yes No

If not found, why?

Total No. Individuals: _____ Subsequent Visit? Yes No

Is this an existing NDDDB occurrence? _____ No Unk.

Yes, Occ. #

Collection? If yes:

Number

Museum / Herbarium

Reporter: _____

Address: _____

E-mail Address: _____

Phone: _____

Plant Information

Phenology:

% vegetative

% flowering

% fruiting

Animal Information

adults

juveniles

larvae

egg masses

unknown

wintering

breeding

nesting

rookery

burrow site

lek

other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: _____ Landowner / Mgr: _____

Quad Name: _____ Elevation: _____

T _____ R _____ Sec _____, _____ 1/4 of _____ 1/4, Meridian: H M S Source of Coordinates (GPS, topo. map & type): _____

T _____ R _____ Sec _____, _____ 1/4 of _____ 1/4, Meridian: H M S GPS Make & Model: _____

DATUM: NAD27 NAD83 WGS84 Horizontal Accuracy: _____ meters/feet

Coordinate System: UTM Zone 10 UTM Zone 11 **OR** Geographic (Latitude & Longitude)

Coordinates: _____

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:

Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): Excellent Good Fair Poor

Immediate AND surrounding land use: _____

Visible disturbances: _____

Threats: _____

Comments: _____

Determination: (check one or more, and fill in blanks)

Keyed (cite reference): _____

Compared with specimen housed at: _____

Compared with photo / drawing in: _____

By another person (name): _____

Other: _____

Photographs: (check one or more)

Slide Print Digital

Plant / animal

Habitat

Diagnostic feature

May we obtain duplicates at our expense? yes no

Appendix E

Qualitative Site Photographs

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QUALITATIVE SITE PHOTOGRAPHS – YEAR 4



Photo 1. Restoration site. Supplemental watering prior to rainy season, September 2014.



Photo 2. Restoration Site Supplemental watering prior to rainy season, September 2014.



Photo 3. Restoration Site. Vernal pool inundation after the first rainfall (12/05/14).



Photo 4. Restoration site. San Diego night snake (*Hypsiglena ochrorhyncha klauberi*) under a cover board, December 2014.

QUALITATIVE SITE PHOTOGRAPHS – YEAR 4



Photo 5. Restoration site. Vernal pool basin (2/20/15)



Photo 6. Restoration site. Upland habitat (2/20/15)



Photo 7. Restoration Site. Vernal pool plant growth. March 2015



Photo 8. Restoration Site. Vernal pool plant growth. March 2015

QUALITATIVE SITE PHOTOGRAPHS – YEAR 4



Photo 9. Restoration site. Upland habitat, March 2015.



Photo 10. Restoration site. Upland habitat, March 2015.



Photo 11. Restoration site. Otay Mesa mint (*Pogogyne nudiuscula*), April 2015.



Photo 12. Restoration site. Vernal pools, April 2015).

QUALITATIVE SITE PHOTOGRAPHS – YEAR 4



Photo 13. Restoration Site. Vernal pool inundation after unseasonably late rainfall, May 2015



Photo 14. Restoration Site. Vernal pool inundation after unseasonably late rainfall, May 2015



Photo 15. Restoration site. Vernal pool basin, June 2015.



Photo 16. Restoration site. Vernal pool basins and surrounding upland, June 2015.

QUALITATIVE SITE PHOTOGRAPHS – YEAR 4



Photo 17. Restoration site. Inundation of vernal pools after unseasonably late rain, July 2015.



Photo 18. Restoration site. Inundation of vernal pools after unseasonably late rain, July 2015.



Photo 19. Restoration site. Pool inundation after unseasonably late rainfall, August 2015.



Photo 20. Restoration site. Upland habitat, August 2015.

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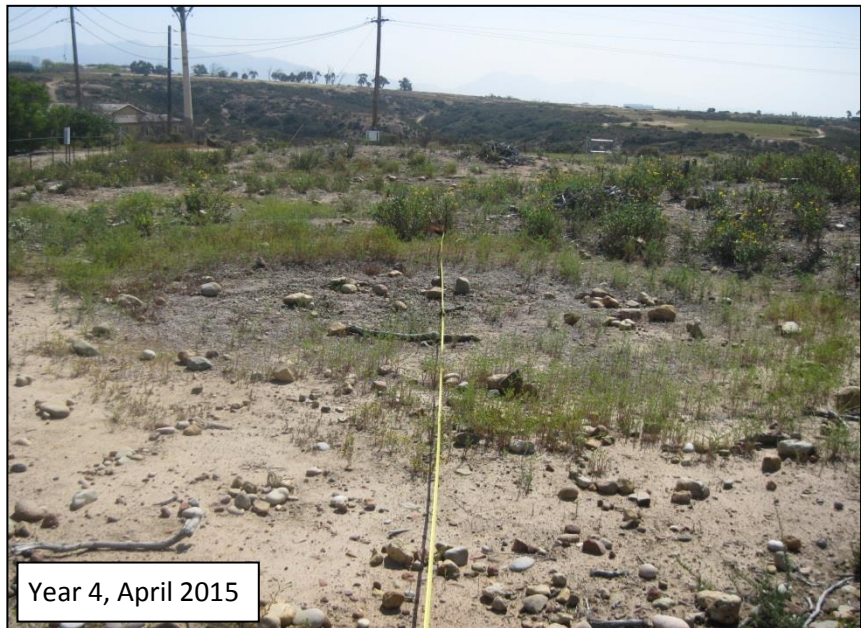
Appendix F

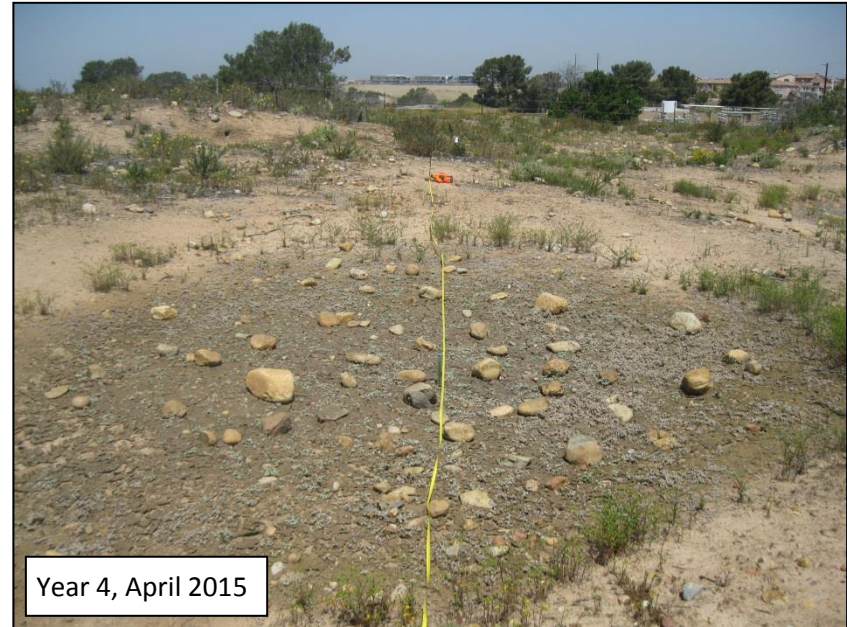
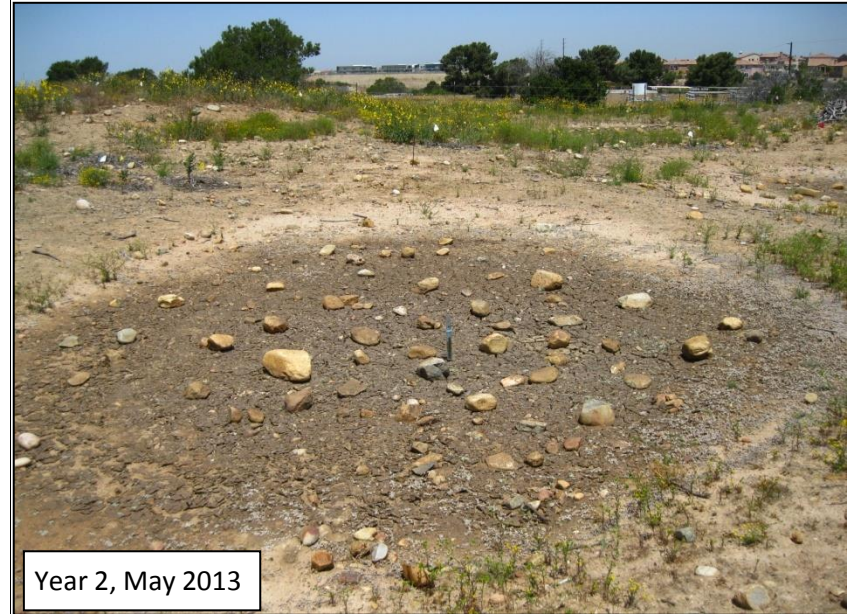
Photodocumentation at Quantitative Vegetation Transects

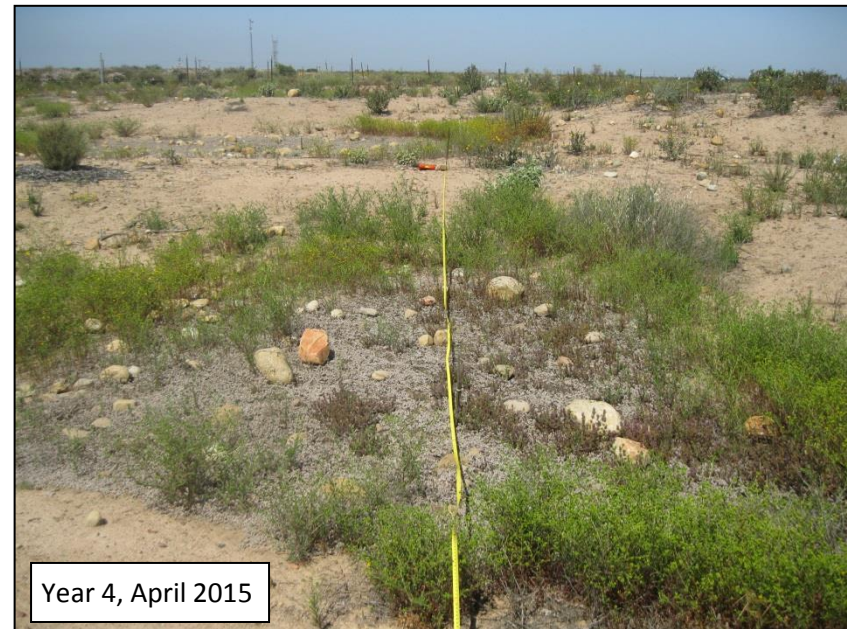
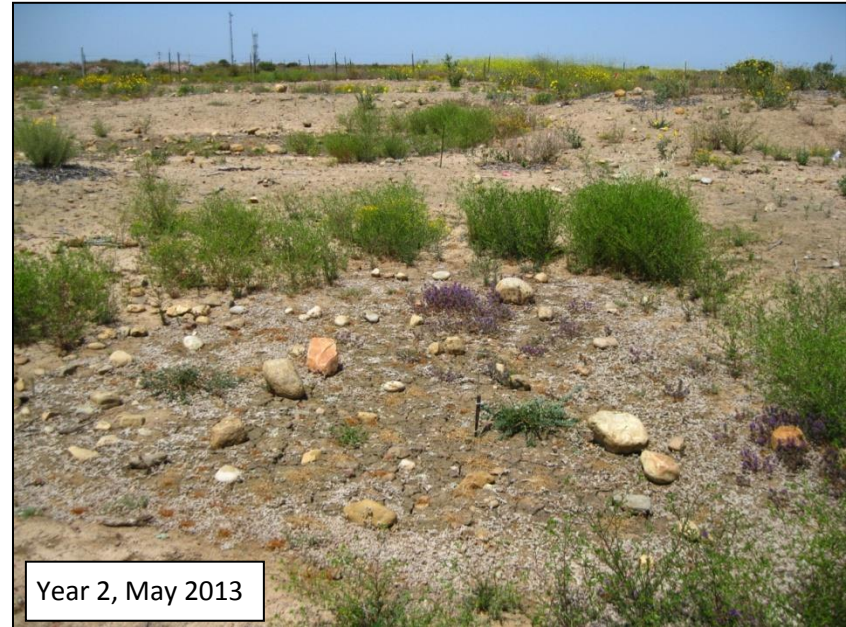
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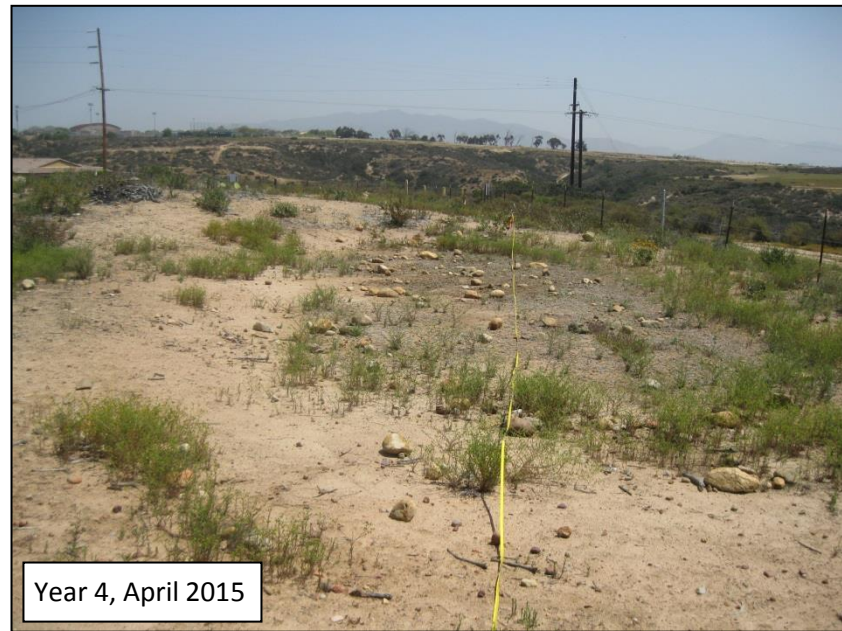
PHOTODOCUMENTATION – VERNAL POOLS

Restoration Site, sentinel pool 5 (VDM-Resto-S-5)











YEAR 1, Pool 10 (VDM-Resto-R-10), July 2012.



YEAR 1, Pool 27 (VDM-Resto-R-27), July 2012.



YEAR 2, Pool 7 (VDM-Resto-R-7), May 2013.



YEAR 2, Pool 14 (VDM-Resto-R-14), May 2013



YEAR 3, Pool 16 (VDM-Resto-R-16), April 2014.



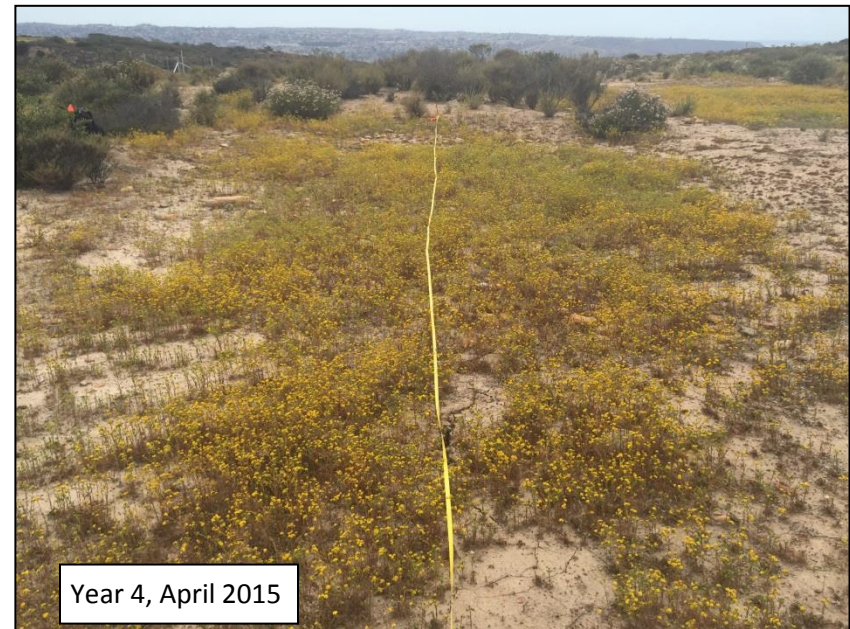
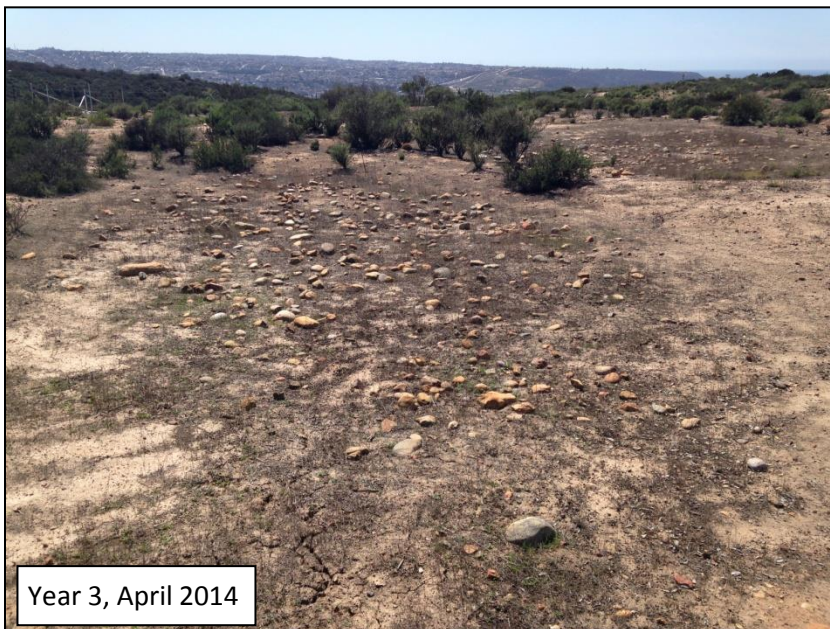
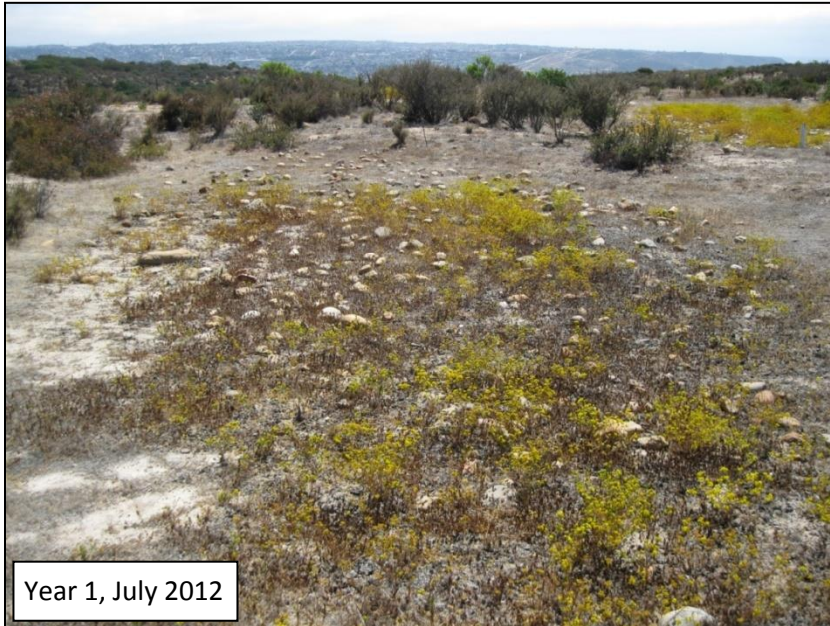
YEAR 3, Pool 22 (VDM-Resto-R-22), April 2014.

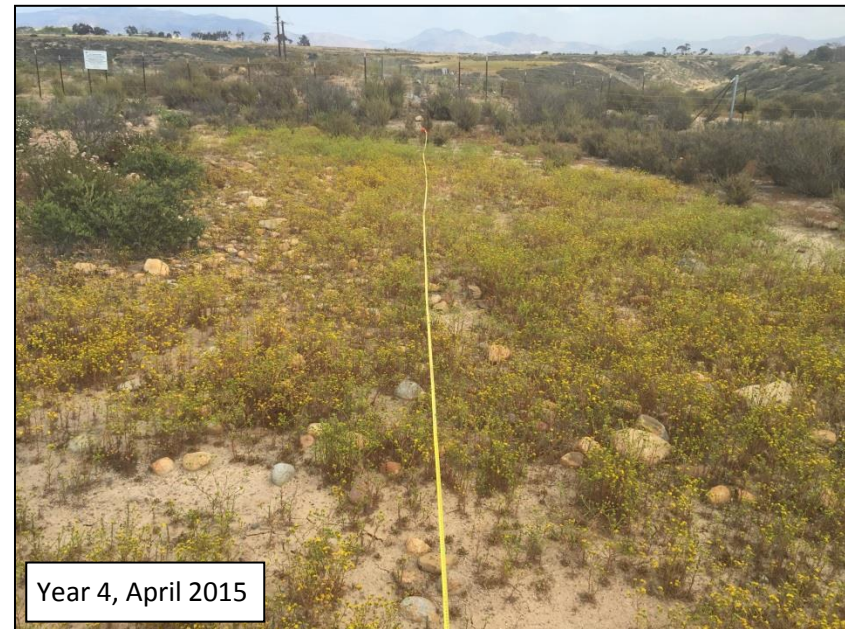


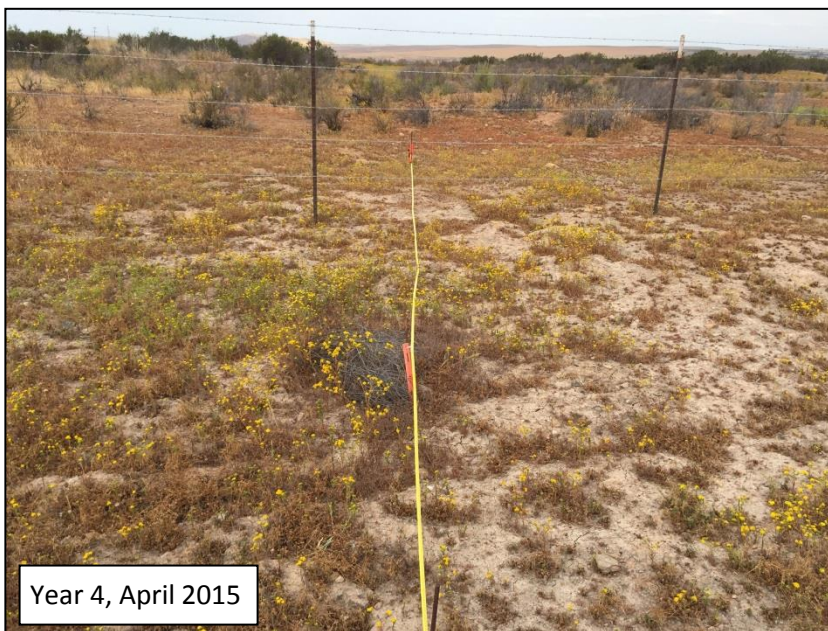
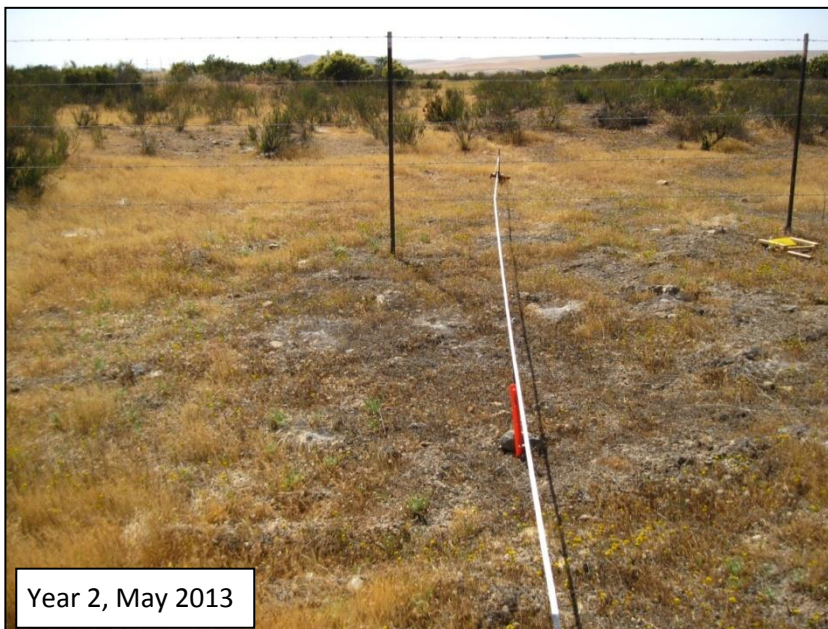
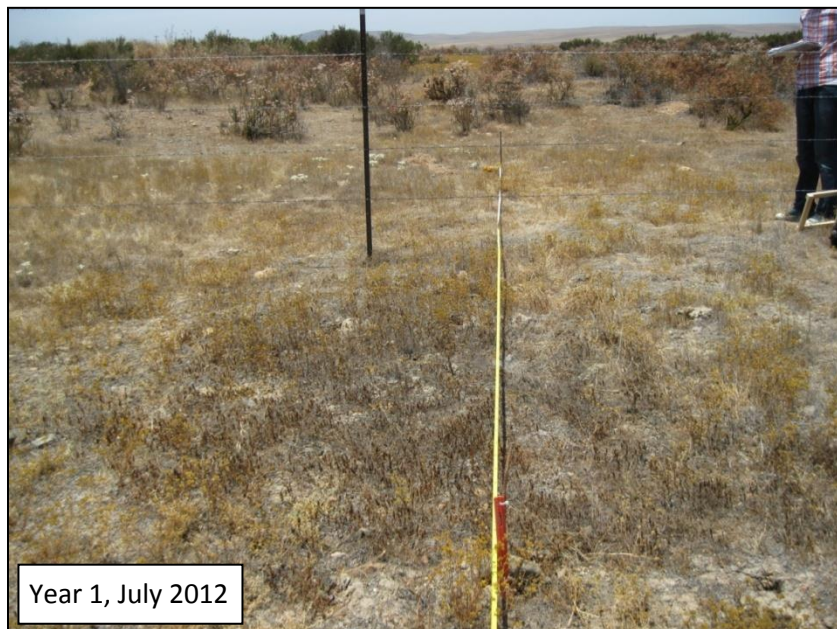
Year 4. Pool 1 (VDM-Resto-R-1), April 2015

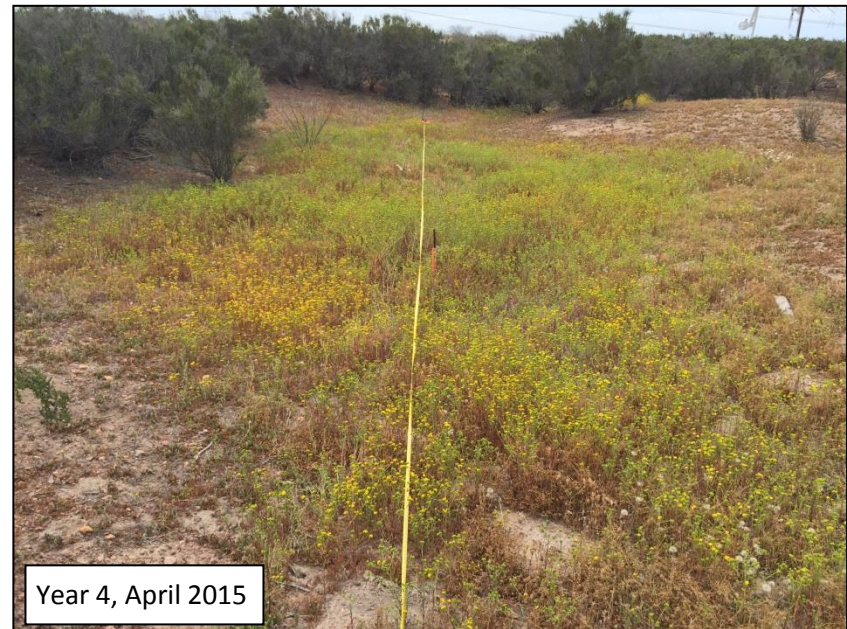


Year 4. Pool 19 (VDM-Resto-R-19), April 2015



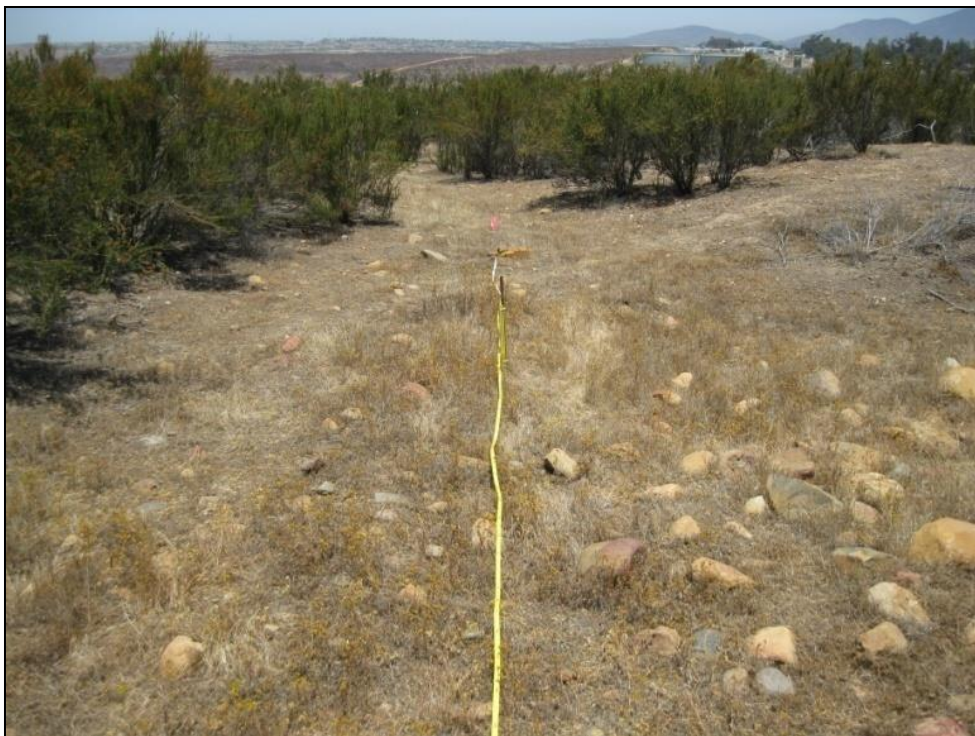








YEAR 1, Pool 15 (VDM-J26-R-15), July 2012.



YEAR 1, Pool 16 (VDM-J26-R-16), July 2012



YEAR 2, Pool 14 (VDM-J26-R-14), May 2013



YEAR 2, Pool 17 (VDM-J26-R-17), May 2013.



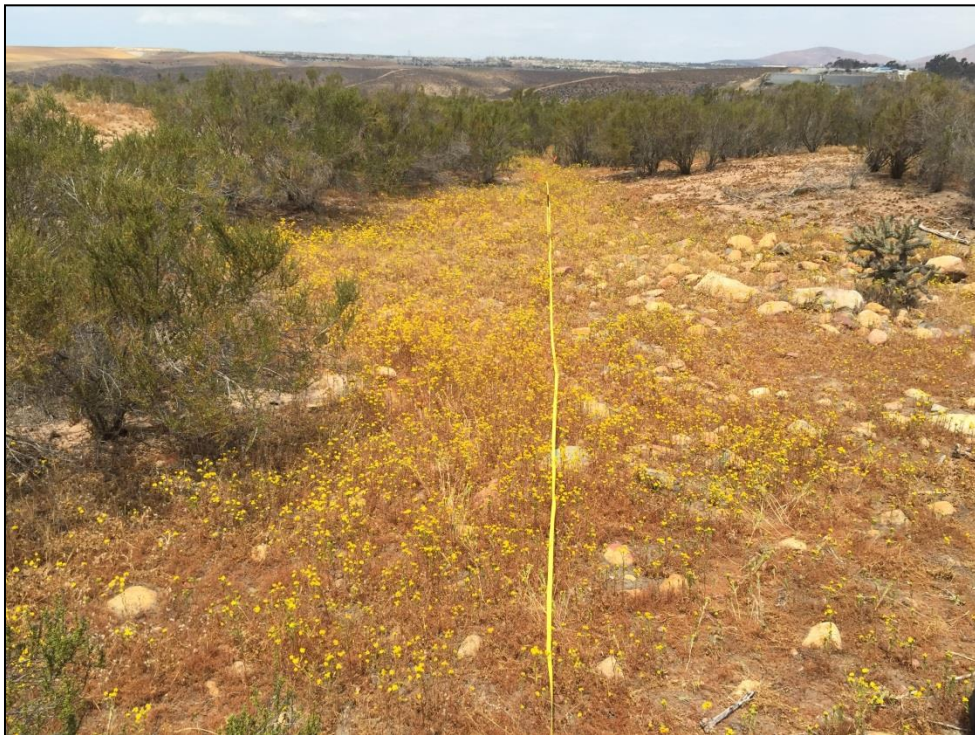
YEAR 3, Pool 10 (VDM-J26-R-10), April 2014



YEAR 3, Pool 19 (VDM-J26-R-19), April 2014



Year 4. Pool 12 (VDM-J26-R-12), April 2014



Year 4. Pool 16 (VDM-J26-R-16), April 2014

