OTAY BUSINESS PARK

VERNAL POOL PRESERVE RESTORATION PLAN
TM 5505

September 17, 2010

Prepared for the County of San Diego

Project Proponent :

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Otay Business Park
Vernal Pool Preserve Restoration Plan

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BMO	Biological Mitigation Ordinance
Cal-IPC	California Invasive Plant Council
CDFG	California Department of Fish and Game
cm	centimeter
City	City of San Diego
Corps	U.S. Army Corps of Engineers
County	County of San Diego
DEM	digital elevation model
EOMSP	East Otay Mesa Specific Plan
GIS	Geographic Information System
GPS	Global Positioning System
HELIX	HELIX Environmental Planning, Inc.
Lonestar Parcels	Lonestar Ranch Property
m	meter
MHPA	Multi-Habitat Planning Area
MSCP	Multiple Species Conservation Program
QCB	Quino checkerspot butterfly
RWQCB	Regional Water Quality Control Board
SR	State Route
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This restoration plan fully mitigates for direct impacts to vernal pools and road pools with fairy shrimp resulting from implementation of the Otay Business Park (proposed project). Additionally, this plan includes mitigation measures for impacts to burrowing owl (*Athene cunicularia*), rare plants, and Quino checkerspot butterfly (*Euphydryas editha quino*; QCB). The mitigation measures identified herein are based on those contained in the Otay Business Park Biological Technical Report (HELIX Environmental Planning, Inc. [HELIX] 2010b). The proposed mitigation is intended to meet the requirements of the Otay Business Park project's U.S. Fish and Wildlife Service (USFWS) Biological Opinion, U.S. Army Corps of Engineers (Corps) Section 404 Individual Permit, California Department of Fish and Game (CDFG) Section 1602 Streambed Alteration Agreement, Regional Water Quality Control Board (RWQCB) Section 401 Water Quality Certification, and County of San Diego (County) Biological Mitigation Ordinance (BMO). All restoration associated with this plan will occur at the Lonestar Ranch Property (Lonestar Parcels).

2.0 PROJECT DESCRIPTION

2.1 DEVELOPMENT PROJECT LOCATION

The project site (Assessor's Parcel Number 648-070-21) and adjacent off-site improvements are located in southeastern Otay Mesa within San Diego County (Figure 1). The property lies immediately north of the U.S./Mexico border approximately 0.5 mile east of Enrico Fermi Drive. It occupies the southeastern quadrant of Section 31 within Township 18 South, Range 1 East of the U.S. Geological Survey 7.5-minute Otay Mesa quadrangle (Figure 2). The site is within the East Otay Mesa Specific Plan (EOMSP) area and is within areas designated in the County's Multiple Species Conservation Program (MSCP; County 1997) as Minor Amendment Areas and Minor Amendment Areas Subject to Special Consideration.

2.2 DEVELOPMENT PROJECT SUMMARY

The proposed Otay Business Park project is an industrial business park development located on 161.6 acres in Subarea 2 of the EOMSP. Proposed project development would impact 175.31 acres.

2.3 HABITAT/SENSITIVE SPECIES IMPACTS

HELIX prepared a Biological Technical Report that details all of the impacts and required mitigation for the Otay Business Park project (HELIX 2010b).

2.3.1 Vernal Pools

Implementation of the Otay Business Park project would impact a total of 10 vernal pools with a combined surface area of 0.14 acre (Table 1). Each of the vernal pools had at least one indicator

species; however, the indicator species cover did not approach 1 percent in any pool. The pools are highly disturbed and exhibit very low species cover and richness. The site has experienced years of agriculture, off-road vehicle use, and Border Patrol activity and most of the pools are almost completely unvegetated throughout the year, including during the rainy season. Vernal pool indicator species that were observed in one or more pools include San Diego button-celery (*Eryngium aristulatum* var. *parishii*), toothed downingia (*Downingia cuspidata*), flowering quillwort (*Lilaea scillioides*), and water pygmyweed (*Crassula aquatica*). Nine of the vernal pools occur on the hill in the south-central portion of the property, and most lie largely within disturbed roads. The largest pool on site occurs in a gentle depression on the eastern portion of the site, supports San Diego fairy shrimp (*Branchinecta sandiegonesis*), and is the only pool to contain San Diego button-celery and spreading navarretia (*Navarretia fossalis*). The large pool on the southern boundary supports Riverside fairy shrimp (*Streptocephalus woottoni*).

Table 1
OTAY BUSINESS PARK
POOL IMPACTS (acre)

Habitat	Corps Impacts
Vernal pool	0.14
Road pool	0.10
TOTAL	**0.24**

2.3.2 Road Pools with Fairy Shrimp

Road pools are ephemeral water-holding basins formed on heavily compacted dirt in dirt trails and roads that lack vernal pool indicator plant species (Corps 1997), but support sensitive animal species such as San Diego and Riverside fairy shrimp.

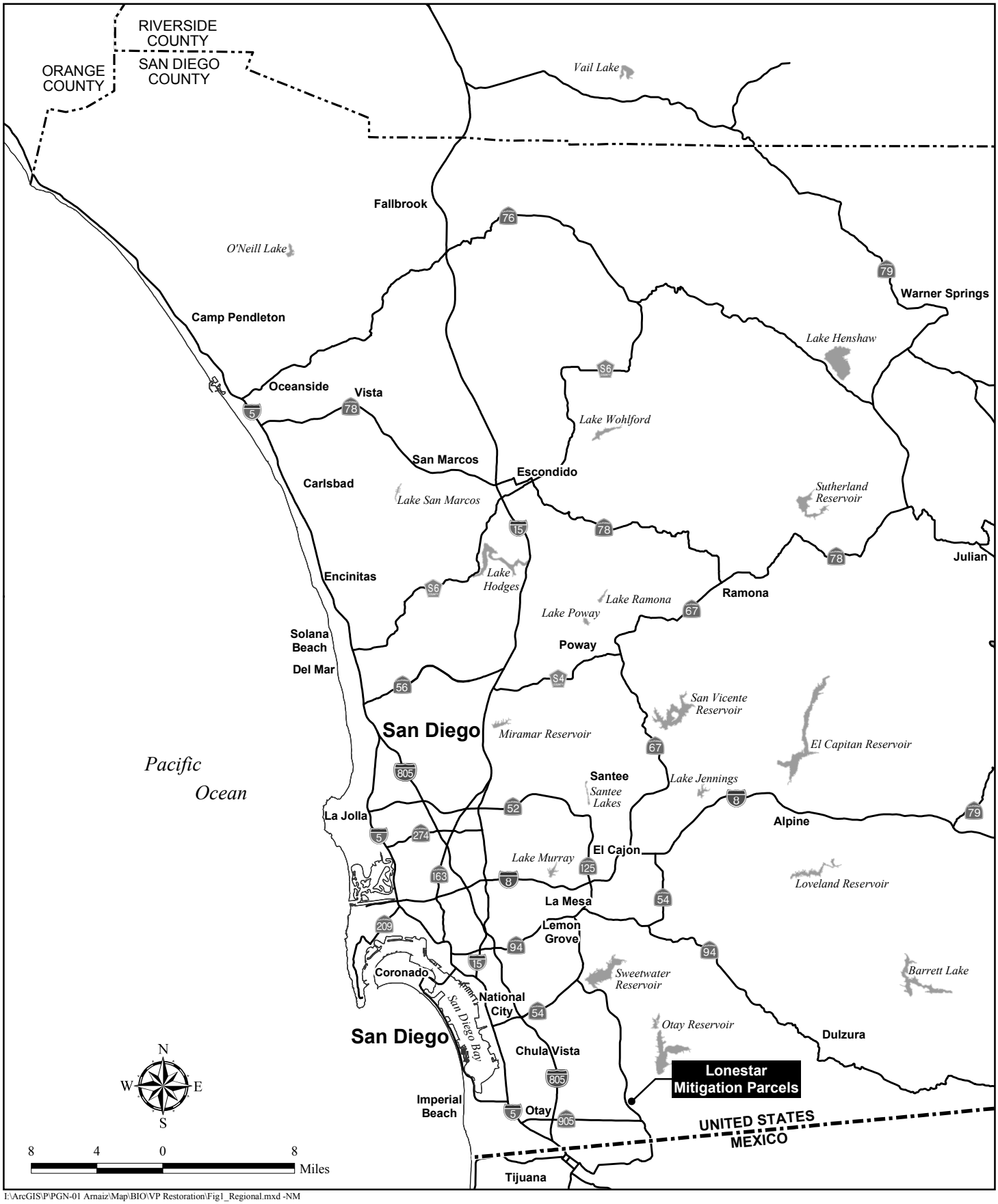
A total of 14 road pools with a combined surface area of 0.10 acre would be impacted by the Otay Business Park project (Table 1).

2.3.3 Burrowing Owl

The proposed project would impact 7 occupied burrowing owl burrows and approximately 163.60 acres of occupied habitat.

2.3.4 Rare Plants

All of the sensitive plants recorded on the project site would be impacted by the proposed development, including small-flowered morning-glory (*Convolvulus simulans*; 5 individuals), variegated dudleya (*Dudleya variegata*; approximately 3,465 individuals), San Diego button-celery (3 individuals), San Diego barrel cactus (*Ferocactus viridescens*; 31 individuals),



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Regional Location Map

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

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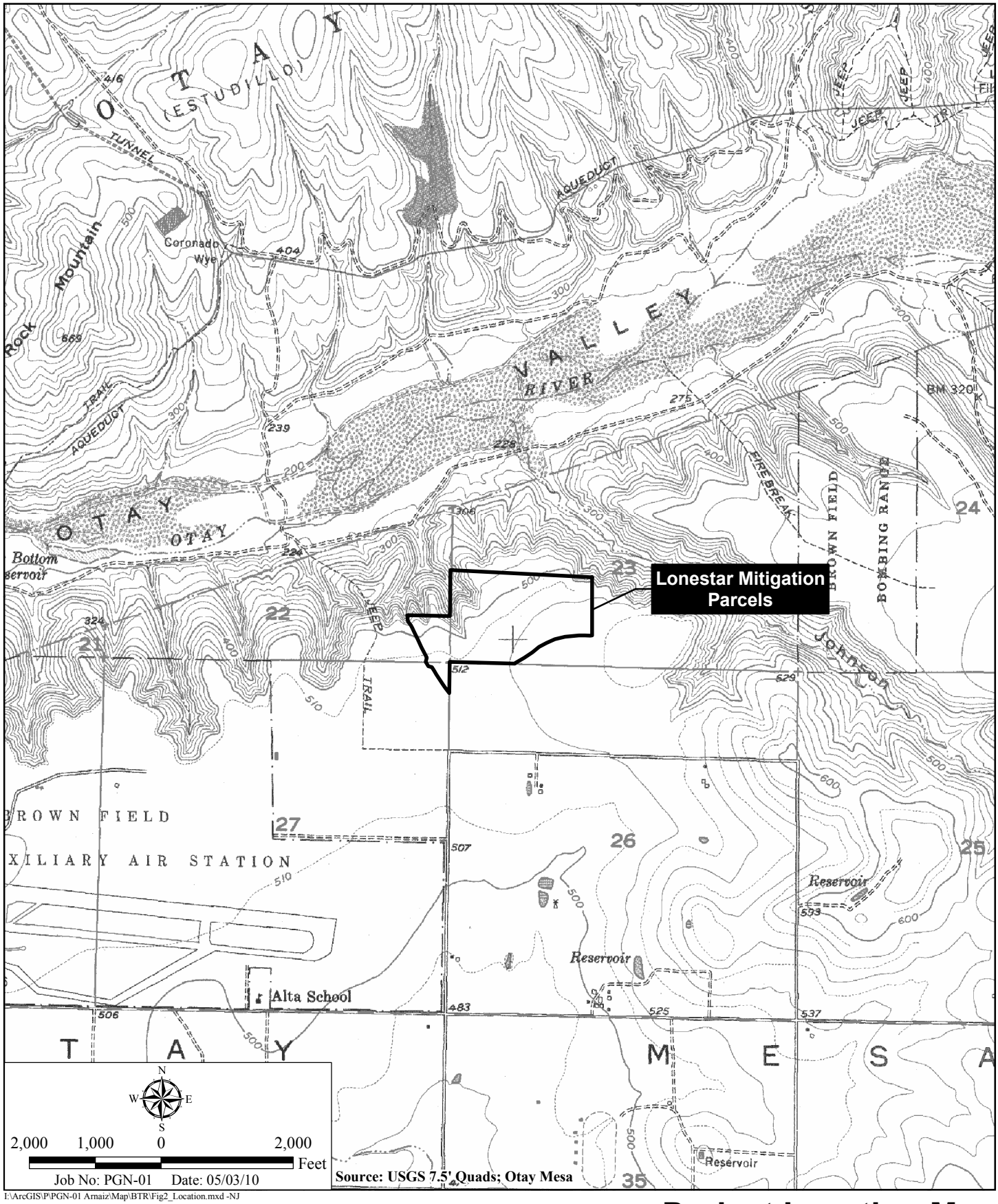
Figure 1



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Project Location Map

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

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Figure 2

chocolate lily (*Fritillaria biflora*; 4 individuals), San Diego marsh-elder (11 individuals), and spreading navarretia (3 individuals).

2.3.5 Quino Checkerspot Butterfly Habitat

The QCB observation location on the hill in the southern portion of the project site would be impacted by the proposed project. Dot-seed plantain (*Plantago erecta*) and potential nectar sources are abundant on the upper slopes of this hill. Non-native grasslands throughout the site have some limited potential to provide nectaring resources. While QCB have not been observed on site since 2005, the entire 161.6-acre property supports habitat at least marginally suitable to support the Quino checkerspot butterfly.

3.0 MITIGATION REQUIREMENTS

3.1 TYPE(S) OF HABITAT TO BE RESTORED

The total compensatory mitigation for impacts resulting from implementation of the Otay Business Park project is comprised of: on-site restoration and preservation; preservation, restoration, and enhancement of habitat on the 68.7-acre Lonestar parcels (Figures 3 and 4); and preservation of additional habitat at another location off site. This restoration plan deals only with the restoration and enhancement of the Lonestar Parcels.

3.2 VERNAL POOLS

3.2.1 Vernal Pool Restoration and Watershed Enhancement

Mitigation for impacts to vernal pools and road pools with fairy shrimp would occur through vernal pool preservation, enhancement, and restoration on the Lonestar Parcels. Watershed restoration also would occur at the Lonestar Parcels, which support 0.66 acre of vernal and road pools (Table 2). The mitigation effort would restore 0.41 acre of vernal pools within the Lonestar Parcels. The restored vernal pools would support vernal pool plant indicator species (Corps 1997) and function as viable, self-sustaining vernal pool basins. The total mitigation (1.07 acres) would be 0.35 acre more than that required to meet a 3:1 mitigation ratio. The mitigation program includes restoration of approximately 4.50 acres of vernal pool watersheds, including 0.38 acre of native grassland restoration

Table 2
MITIGATION FOR IMPACTS TO VEGETATION COMMUNITIES (Acres)

VEGETATION COMMUNITY	TOTAL IMPACTS	MITIGATION				
		Target		Proposed		
		Ratio	Area	Preservation	Restoration	Total
Vernal/Road pool	0.24	3:1	0.72	0.66	0.41	1.07

3.2.2 San Diego and Riverside Fairy Shrimp Mitigation

The project applicant proposes to mitigate impacts to San Diego and Riverside fairy shrimp at a 3:1 ratio in conjunction with the vernal and road pool mitigation identified above. This mitigation would include salvage of soil containing fairy shrimp cysts in the impacted pools and use it to inoculate a minimum of 1.07 acres of enhanced/restored pools with San Diego and Riverside fairy shrimp.

3.3 BURROWING OWL ARTIFICAL BURROW INSTALLATION

According to the BMO: [m]itigation for impacts to the occupied habitat must be through the conservation of occupied burrowing owl habitat or lands appropriate for restoration, management and enhancement of burrowing owl nesting and foraging requirements at a ratio of no less than 1:1 for the territory of the burrowing owl.

The project applicant proposes to partially mitigate impacts to occupied burrowing owl habitat with habitat acquisition and enhancement at the Lonestar Parcels. Suitable habitat occurs throughout the Lonestar Parcels, and burrowing owls have been reported in a number of locations in the vicinity. To ensure suitable burrow opportunities are present within the mitigation area, the installation of 24 artificial burrows is included in the restoration effort.

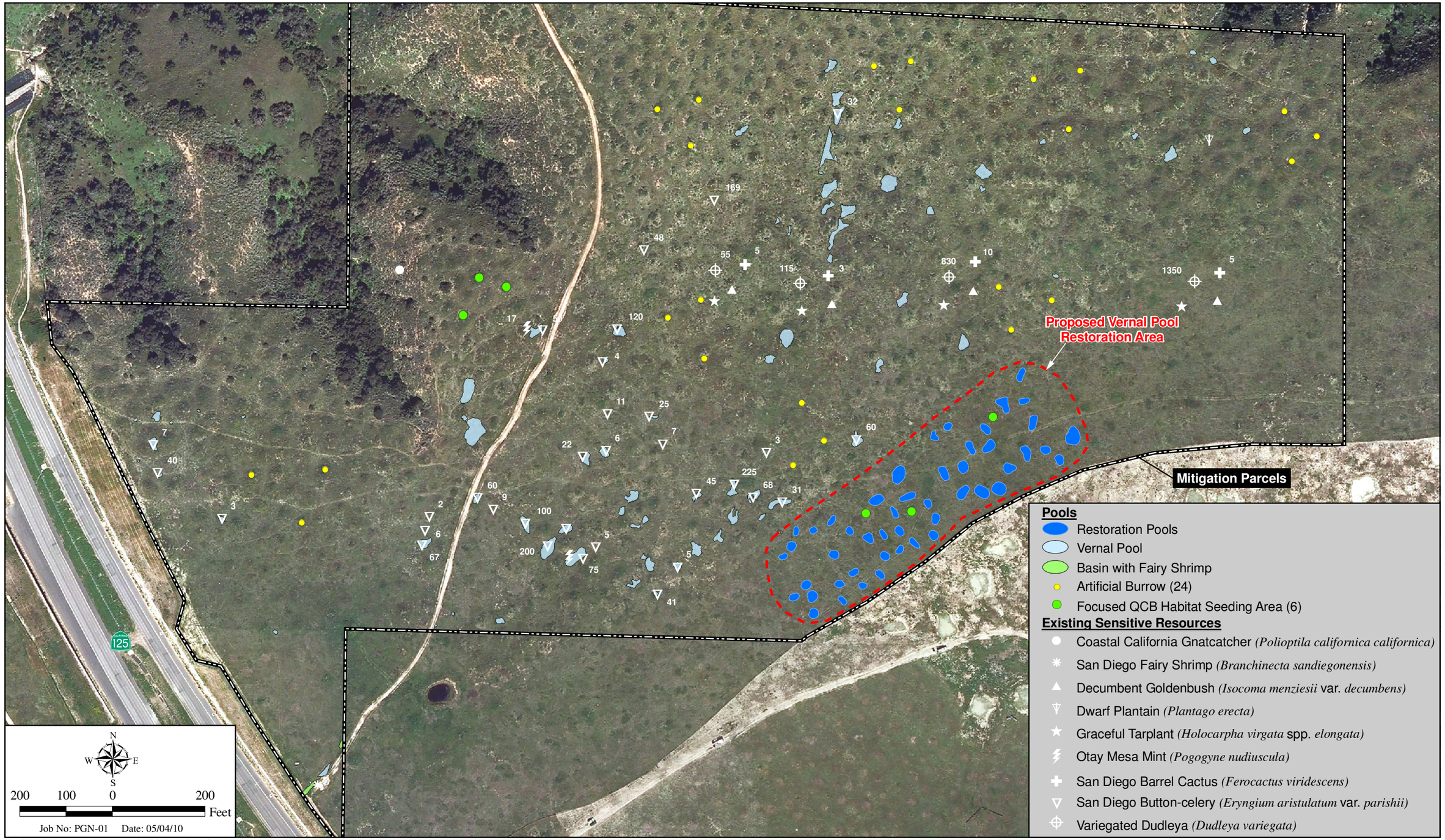
Burrowing owl mitigation includes the installation of 24 artificial burrows, and ensuring long-term protection of habitat for the owls as well as other natural resources.

3.4 RARE PLANT SALVAGE AND TRANSLOCATION

The project applicant proposes to mitigate impacts to variegated dudleya, San Diego button-celery, San Diego barrel cactus, and spreading navarretia through the salvage and translocation of the on-site populations to the Lonestar Parcels, and preservation of translocated and existing populations on the Lonestar parcels. Salvaged variegated dudleya, San Diego button-celery, and San Diego barrel cactus would be translocated to the Lonestar Parcels and are incorporated into this vernal pool restoration area. San Diego barrel cactus also will be included in the Diegan coastal sage scrub planting palette (Section 6.6.2).

Soil containing San Diego button-celery and spreading navarretia will be salvaged and used to inoculate restored pools in the Lonestar Parcels.

Impacts to chocolate lily would be mitigated with the preservation of 68.72 acres of habitat at the Lonestar Parcels, including the approximately 50 chocolate lily individuals mapped in the northwestern corner. Chocolate lily seeds would be collected from the Otay Business Park site and applied to the vernal pool watershed restoration area.



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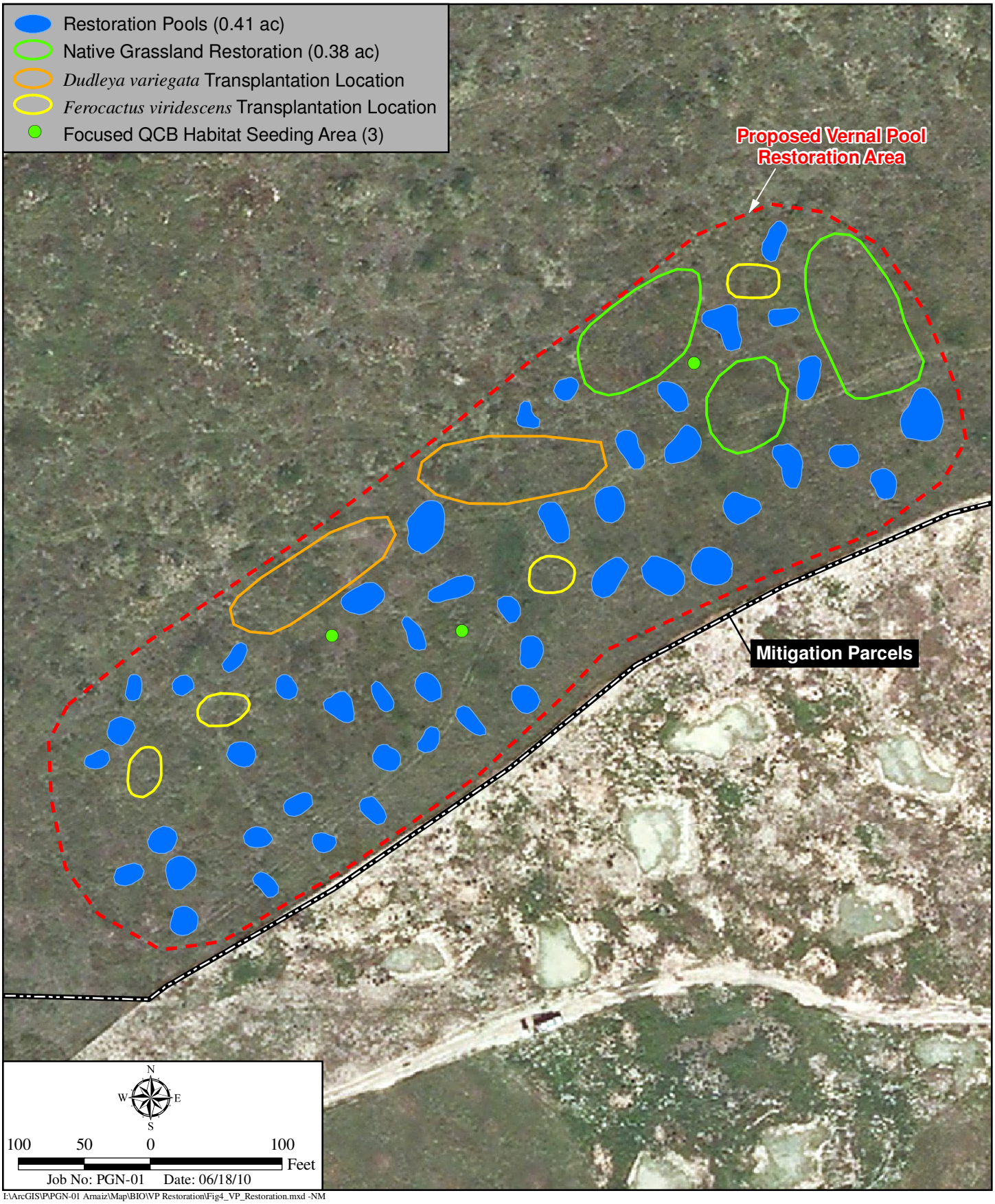
Existing Conditions and Planned Restoration at Lonestar Mitigation Parcels

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

Figure 3



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Vernal Pool Restoration Area

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Figure 4

Methods for translocation of sensitive plant species are included in this restoration plan.

3.5 QUINO CHECKERSPOT BUTTERFLY

Because of the low quality habitat on site and small population (one individual observed in 6 years of focused surveys of QCB), the focus of the mitigation effort is on preservation/restoration of appropriate QCB habitat off site, as opposed to any direct attempt at establishing a new population. The project applicant proposes to mitigate for the loss of the QCB through preservation of historically occupied habitat on the Lonestar Parcels, both of which have been designated as QCB Critical Habitat. Additionally, host plant species and adequate nectar plants will be included in the vernal pool watershed restoration effort, and 6 QCB habitat focused planting areas will be created within the Lonestar parcels. Such measures would improve the habitat value of these historically occupied parcels for the QCB.

3.6 NATIVE GRASSLAND

The project applicant proposes to mitigate impacts to native grassland with the restoration of 0.38 acre of native grassland in the watershed restoration around the restored vernal pools on the Lonestar Parcels.

4.0 MITIGATION SITE

4.1 LOCATION AND SIZE OF MITIGATION AREA

The project would cause direct and indirect impacts to sensitive vegetation communities, jurisdictional areas, and sensitive plant and animal species. The project applicant proposes to conduct mitigation for the loss of these sensitive resources with on-site preservation and restoration, purchase of mitigation parcels, and restoration within those parcels. The Lonestar Parcels were acquired to serve as partial off-site compensatory mitigation. The Lonestar Parcels are two parcels adjacent to each other totaling 68.72 acres located within the City of San Diego (City), east of State Route (SR)-125 and north of Lonestar Road. These parcels occupy portions of Sections 22, 23, and 27 in Township 18 South, Range 1 West of the U.S. Geological Survey 7.5-minute Otay Mesa quadrangle (Figure 2). These parcels are approximately 3 miles northwest of the project site within the same Otay Mesa burrowing owl sub-population as the project site. All of the habitat on the Lonestar Parcels supports or has potential to support: burrowing owls, non-native grassland, vernal pools, road pools with San Diego fairy shrimp, and Diegan coastal sage scrub. Vernal pools and mima mound topography are present throughout much of the Lonestar Parcels. QCB were historically found in these parcels and the Lonestar Parcels support QCB larval host plants and potential nectar resources. Other County of San Diego sensitive species that occur on the Lonestar Parcels include:

- Otay mesa mint (*Pogogyne nudiscula*; a federal and state listed Endangered species and a County List A species)
- San Diego button-celery (a federal and state listed Endangered species and a County List A species)
- variegated dudleya (a County List A species)
- decumbent goldenbush (*Isocoma menziesii* var. *decumbens*; a County List A species)
- San Diego barrel cactus (a County List B Species)
- graceful tarplant (*Holocarpha virgata* ssp. *elongata*; a County List D species)
- chocolate lily (a County List D species)
- San Diego sunflower (*Viguirea laciniata*; a County List D species)
- Coastal California gnatcatcher (*Polioptila californica californica*; a County Group 1 species).

The Lonestar Parcels are within the City of San Diego's Multi-Habitat Planning Area (MHPA), with County open space to the north, SR-125 to the west, and the SR-125 vernal pool and burrowing owl mitigation area to the south. The site can be reached by an unnamed dirt road from Lone Star Road.

4.2 LOCATION OF VERNAL POOL RESTORATION

Vernal pool restoration would occur in an approximately 4.50-acre area on the Lonestar Parcels (Figure 4). This area has mima mound topography and vernal pools exist in non-native grasslands. Rare plant translocation would be co-located in the vernal pool restoration area.

4.3 LOCATION OF ENHANCEMENT AREAS

Vernal pool watershed enhancement will occur throughout the entirety of the non-native grasslands within the Lonestar Parcels, and would consist of a one-time mowing of the site and removal of the thatch of dead grasses.

4.4 LOCATION OF ARTIFICIAL OWL BURROWS

The creation of 24 artificial owl burrows will occur throughout the Lonestar Parcels (Figure 3). Artificial burrows would be placed in existing mima mounds. The siting of these burrows takes into consideration factors that may affect burrow site suitability (e.g., vegetative cover, relative elevation to surrounding landscape, distance from present/future development, and nearby human activity), spacing between burrows, availability of nearby foraging habitat, and threat of very localized events such as pets, fire, or vandalism.

4.5 OWNERSHIP STATUS

The mitigation site (Lonestar Parcels) has been purchased by Otay Business Park, LLC. Contact information is as follows:

Ricardo Jinich
Otay Business Park, LLC
4225 Executive Square, Suite 920
La Jolla, CA 92037
(858) 535-9000 x 222

4.6 EXISTING FUNCTION AND SERVICE OF MITIGATION AREA

The Lonestar Parcels are undeveloped with habitat consisting primarily of non-native grasslands over the mesa top, and high-quality Diegan coastal sage scrub in the canyons. Mima mound topography, one of the main characteristics of San Diego hardpan vernal pools, exists over the majority of the site. At least 7 sensitive plant species (Otay mesa mint, variegated dudleya, San Diego button-celery, decumbent goldenbush, graceful tarplant, chocolate lily, and San Diego barrel cactus) and 2 federally endangered animal species (coastal California gnatcatcher and San Diego fairy shrimp inhabit the Lonestar Parcels (Figure 3; HELIX 2009).

The site has historically been disturbed by grazing, and by pedestrian and off-highway vehicle usage. The site serves as foraging habitat for migratory birds including sensitive raptor species. The adjacent SR-125 vernal pool restoration site was in the same condition prior to restoration and now, 3 years after installation, it supports successfully restored vernal pool habitat and occupied burrowing owl burrows.

Vernal pools on site support 2 federally endangered plant species (Otay mesa mint and San Diego button-celery). The existing pools hold water for limited amounts of time given average rainfall, making it difficult for these pools to support fairy shrimp.

5.0 IMPLEMENTATION PLAN

The restoration at the Lonestar Parcels will consist of several components, including:

- Initial dethatching of the entirety of non-native grassland on the Lonestar Parcels, including mowing of the site and removal of thatch.
- The restoration of 0.41 acre of vernal pools in an approximately 4.50-acre vernal pool restoration area
- The establishment of 0.38 acre of native grassland in the vernal pool restoration area
- The addition of Diegan coastal sage scrub plantings and seeding in the vernal pool restoration area
- Creation of 6 QCB habitat focused seeding areas
- Installation of artificial burrowing owl burrows in mima mounds
- Translocation of rare plants to the vernal pool restoration area
- Enhancement of wildlife habitat

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

The initial cost estimate for site preparation, installation, and 5-year maintenance and monitoring of the mitigation site is approximately $500,000.

5.1 RATIONALE FOR EXPECTING IMPLEMENTATION SUCCESS

The mitigation site currently supports non-native grassland habitat with sensitive plant species, vernal pools (some with sensitive species), and potential QCB and burrowing owl habitat. This plan would enhance the watersheds of existing pools, restore vernal pools, install 24 artificial owl burrows, restore native grassland habitat, salvage and translocate rare plants and seed, improve areas of QCB habitat, and implement habitat enhancements for other wildlife species.

Variegated dudleya, San Diego button-celery, and San Diego barrel cactus have all been observed in grassland habitat on the Lonestar Parcels, so the habitat in these areas would be appropriate to support the translocated plants. Spreading navarretia occurs in vernal pools throughout Otay Mesa, so the vernal pool habitat on the Lonestar Parcels will be appropriate for this 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 includes 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 5) 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

Post-construction Hydrologic Analysis

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

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Figure 5

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 one 1 foot by 1 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. Because of the small size and general flat character of the site, channelization is not anticipated to occur on site.

The overall watershed to pool ratio of 8.4:1 is larger than 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.

5.2 RESPONSIBLE PARTIES

5.2.1 Project Proponent

Otay Business Park, LLC would be responsible for financing the installation, maintenance, and monitoring of the mitigation measures.

5.2.2 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, artificial owl burrows, focused QCB plantings, and rare plant translocation. 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.

5.2.3 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, and creation and installation of the artificial burrows. The restoration specialist would educate the contractor(s) on the installation and maintenance of vernal pools, native plant species, QCB focused planting areas, and artificial burrows.

After the installation contract is completed, the project proponent(s) would hire a maintenance contractor for the duration of the 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. 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.

5.3 RESTORATION IMPLEMENTATION SCHEDULE

5.3.1 Vernal Pool Restoration and Enhancement Implementation Schedule

The schedule for implementation of the mitigation program has not yet been set. Any 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, CDFG, and County. 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 1 inch below, and a visual check for color differences (i.e., darker soil indicating moisture) in the soil between the surface and 1 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 delineating all restoration areas, thatch removal from the entire site, 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 dethatched. 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. Site dethatching could also only be carried out when soils are dry and capable of supporting machinery (usually June – November). Monitoring of the restoration effort would begin immediately following installation. The monitoring program would continue for a 5-year

period. 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 September 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. At the end of the 5-year period, a final report would be produced.

5.3.2 Artificial Burrow Implementation Schedule

Implementation of the burrowing owl mitigation program will occur before any site grading is conducted provided that weather and soil conditions are dry enough to conduct the artificial burrow installation without causing irreparable damage to the mima mounds.

5.3.3 QCB Focused Planting Implementation schedule

Compaction of the QCB focused planting areas will occur concurrent to the vernal pool grading. Seeding of the QCB focused planting areas will occur in the late fall/ early winter concurrent with the seeding of the vernal pool restoration area.

5.3.4 Rare Plant Translocation Schedule

Variegated dudleya and San Diego barrel cactus would be salvaged before any project site grading occurs. Variegated dudleya and San Diego button-celery salvage will occur in the fall, after the plants have gone dormant. Chocolate lily and San Diego button-celery seed would ideally be collected in May and July respectively, as these are the most likely times of year for seed to still be on the plant. Efforts would be made to reduce the time between salvage and installation.

5.4 RESTORATION SITE PREPARATION

Site preparation would be accomplished by: dethatching the non-native grasslands in the Lonestar Parcels; salvaging topsoil from vernal pools and road pools in the proposed project site; salvaging rare plants and seed in the proposed project site and seed on the mitigation site; grading restored vernal pools; compacting and preparing QCB focused planting areas, and protecting the restoration area from intrusion.

5.4.1 Initial Dethatching

Accumulation of years of dead grass stems (primarily wild oats [*Avena fatua*]) prevents the establishment and growth of native species throughout the site, including the pools and uplands. All non-native grassland areas within the entirety of the Lonestar Parcels would be mowed before any other restoration activities occur, and the cuttings and thatch would be raked up by hand and disposed of in a legal manner.

5.4.2 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). While only a small amount of vernal pool vegetation was observed in the existing pools on site, it is likely that vernal pool plant seed, spores, bulbs, cysts, and other propagules are present in the soil.

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 1 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" x 15" x 10" (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.

It is expected that topsoil salvage from the large pool on the east side of the site will include seeds of San Diego button-celery and spreading navarretia.

Off-site inoculum would be required to supplement the salvaged soils, to achieve reasonable vernal pool cover, because of the low quality of 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, Sweetwater Unified High School District Restoration Site, 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 agencies (Corps, USFWS, and CDFG) for approval.

The large basin on the east side of the proposed project site contains several sensitive species, but also contains a high cover of invasive weeds. Any restoration basin that receives topsoil from this basin would be closely observed for the emergence of Italian ryegrass (*Lolium multiflorum*).

5.4.3 Rare Plant and Seed Salvage

Variegated dudleya

The large patches of variegated dudleya exist on the eastern side of the hill on the south edge of

the site. Seed and corms of these plants would be collected. 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.

Variegated dudleya would be salvaged and transplanted to receptor sites within the vernal pool restoration area (Figure 4) in the summer/fall when the plants are dormant. At this time of year the above ground portion of the plant has died off, leaving an underground corm to resprout in the following winter/spring season. Salvage of the corms will be accomplished by collecting large chunks of soil several inches deep and approximately 1 foot in diameter from the impacted population areas. The corm containing soil chunks will be carefully removed with hand tools so that the corms and topsoil remain undamaged. By collecting and transplanting chunks of soil, instead of digging up individual corms, the corms will remain at their original depth and position in the soil. In addition, the chunks contain corms, bulbs, seed, and propagules of other desirable native species. Following collection, the soil clumps will be placed in nursery flats and carefully transported to the receptor site for transplantation.

San Diego barrel Cactus

When salvaging the San Diego barrel cactus, the contractor will mark the south side of the cactus with a small amount of paint. The main taproot should be trimmed to approximately 6 inches, laid in shade, and kept dry for a week, to allow the root to callus over. Roots may also be dusted with sulfur at time of removal to prevent rot. Plants should be kept in a holding bed or pot, of native soil mixed with sand. When the cactus is installed at the planting site, the cactus should be oriented with the marked side facing south, to prevent sun damage to the plant. Cactus should ideally not be held for more than 6 months, to prevent the cactus from rooting at the holding site.

5.4.4 Vernal Pool Grading

The restored pools (Figures 3 and 4) would be formed to replicate hydrologic conditions of existing vernal pool habitat in Otay Mesa. A post-construction hydrologic analysis depicts the vernal pool restoration area and its watershed following project implementation and vernal pool restoration (Figure 5). Material removed during pool excavation would be used to enhance and restore existing disturbed 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.

5.4.5 QCB Habitat Focused Planting Area Compaction

Six focused QCB habitat focused planting areas would be constructed in the vernal pool restoration area (Figure 7). Each QCB habitat area would be 30 feet in diameter and would be centered on a mima mound. Construction would involve removing all weed material, ripping the soil surface, importing decomposed granite, spreading the gravel over the planting area, and compacting it into the soil surface. Soil would be ripped to a depth of 4-inches with ripping tines mounted to a tractor. Approximately 1 cubic yard of decomposed granite would be imported per area (6 yd^3 total). The granite gravel would be spread over each QCB area, and compacted into the soil by driving a wheeled or tracked tractor over it.
HELIX constructed 6 of these focused planting areas for the Redhawk mitigation site in Murrieta, California. At the end of the fourth year of monitoring program, the focused planting areas remained low in weed cover and had high cover of QCB host plants (HELIX 2006). It is expected that HELIX will have similar success with this procedure at this location.

5.4.6 Fencing and Signage

A temporary, 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.

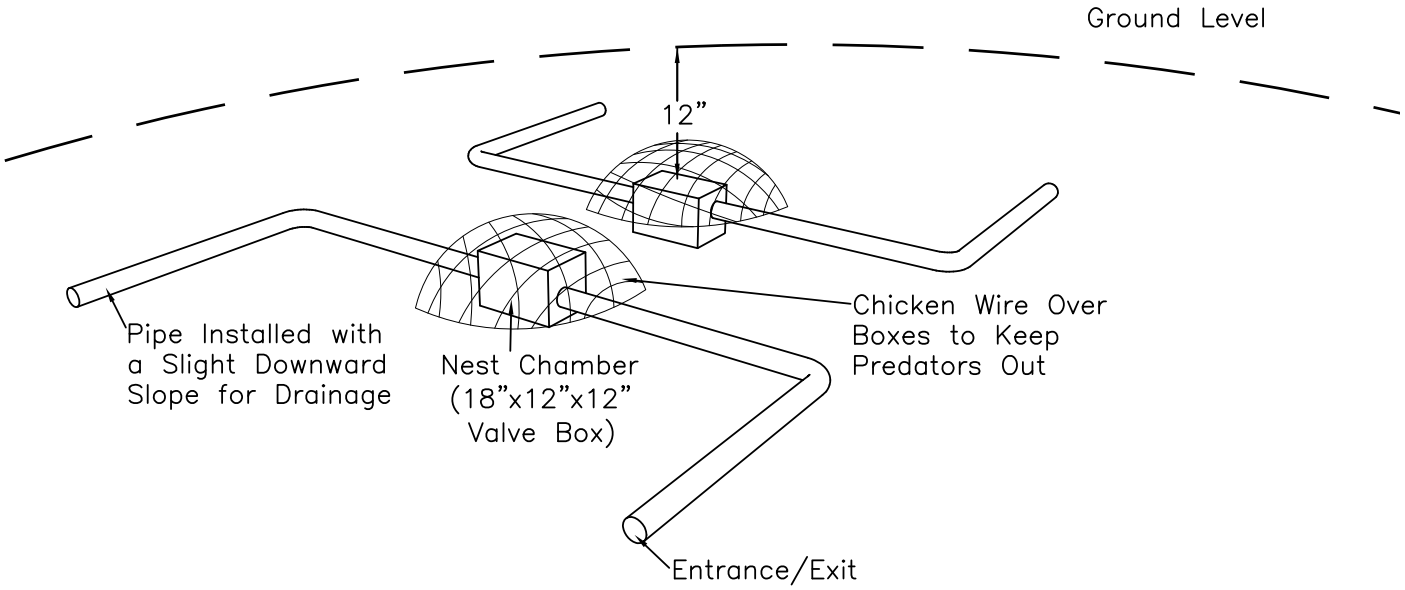
Aluminum signs would be posted adjacent to the dirt road on the north and south boundary of the site, providing notice in both English and Spanish that the area is an ecological preserve and that trespassing is prohibited.

5.5 ARTIFICIAL BURROW INSTALLATION

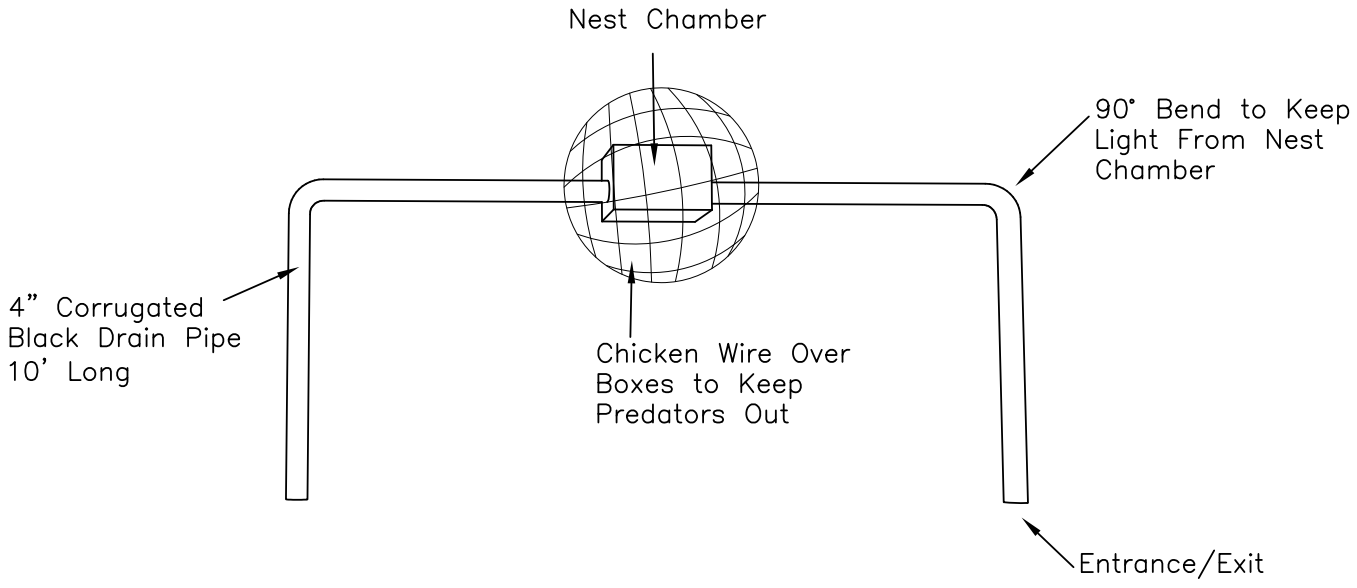
Twenty-four artificial burrows would be constructed of man-made materials and installed on the Lonestar Parcels. The burrow locations would be situated on mima mounds to ensure a slightly higher vantage point on the surrounding area. The area immediately adjacent to the artificial burrows would be cleared of vegetation, compacted, and covered with several mid-size rocks to discourage the establishment of tall vegetation.

The artificial owl burrow design (Figure 6) is based on plans described in the CDFG staff recommendations (CDFG 1995) and in Barclay (2008). Each artificial owl burrow would consist of a nest chamber and 2 entrance/exits. An irrigation valve box is used as the nest chamber and would be placed at least a foot underground. The valve box would be covered by chicken wire mesh fencing to discourage predation. Bricks would be placed below box, with 3 to 4 inches of soil on top of the bricks, to create a dirt floor within the chamber. The 2 entrance/exits would be created using 4-inch corrugated black drain pipe and each pipe would have a 90 degree bend to keep light out of the nesting chamber. The pipes will be installed at a downward angle to prohibit water flow into the nesting chamber. To prevent animals from digging into the burrows, chicken wire would be placed on top of the chamber and the pipes and then would be buried with

Artificial Burrowing Owl Burrows
Side View



Artificial Burrowing Owl Burrows
Top View



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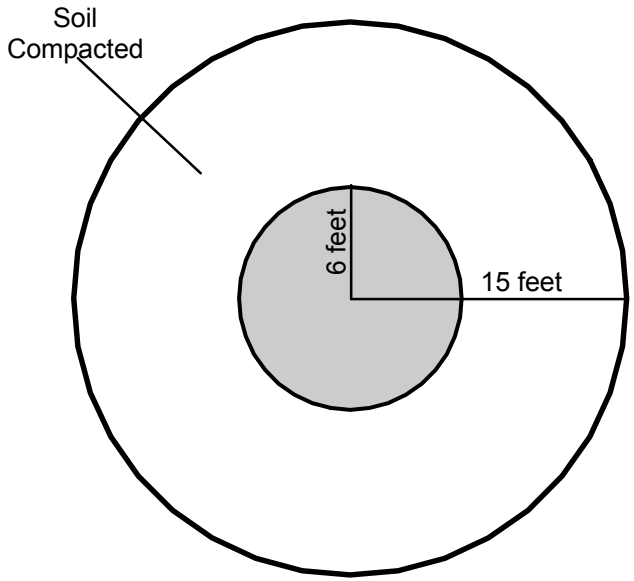
Artificial Burrowing Owl Burrows

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

HELIX

Figure 6

Planting Diagram for Each Focused Quino Checkerspot Butterfly Seeding Area (6 Total)



Center Circle

2 Lbs	Dot-seed plantain *(Plantago erecta)*	- Quino host plant

Outer Circle

0.2 Lb	Coulter's snapdragon *(Antirrhinum coulterianum)*	- Quino host plant
0.4 Lb	Rancher's fiddleneck *(Amsinckia menziesii var. intermedia)*	- Quino nectar resource
0.2 Lb	Purple owl's clover *(Castillejia exserta ssp. exserta)*	- Quino host plant
0.2 Lb	Chinese houses *(Collinsia heterophylla)*	- Quino host plant
0.2 Lb	Nievitas cryptantha *(Cyptantha intermedia)*	- Quino nectar resource
0.4 Lb	Common goldfields *(Lasthenia gracilis(L. californica))*	- Quino nectar resource
0.2 Lb	Ground Pink *(Linanthus dianthiflorus)*	- Quino nectar resource
3 Lbs	Dot-seed plantain *(Plantago erecta)*	- Quino host plant

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Focused Quino Checkerspot Butterfly Habitat Seeding Area Diagram

VERNAL POOL PRESERVE RESTORATION PLAN FOR OTAY BUSINESS PARK

HELIX

Figure 7

soil. The ends of the pipes would pass through square cinder blocks to help prevent the pipes being dug up or crushed. A stake/post would be provided adjacent to each artificial burrow to provide a perch. Any rocks unearthed during burrow construction would be piled on the soil surface above the nest box. A native seed mix would be applied to any soil disturbed during the creation of the artificial owl burrows (Table 3).

Table 3
ARTIFICIAL OWL BURROW HABITAT SEED MIX

Scientific Name	Common Name	Pound/Acre	Amount to be Ordered*
Calochortus splendens	splendid mariposa lily	1	0.5
Castillejia exserta ssp. *exserta*	purple owl's clover	2	1
Cryptantha intermedia	nievitas cryptantha	1	0.5
Eschscholzia californica	California poppy	2	1
Lasthenia gracilis (L. californica)	common goldfields	3	1.5
Lepidium nitidum	shining peppergrass	2	1
Nassella pulchra	purple needlegrass	4	2
Plantago erecta	dot-seed plantain	2	1
Sisyrinchium bellum	blue-eyed grass	2	1
	TOTAL	**19**	**9.5**

*Based on 0.5 acre

5.6 VERNAL POOL RESTORATION AREA PLANTING PLAN/ INSTALLATION

5.6.1 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.

5.6.2 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. All vernal pool restoration will occur within a 4.50-acre portion of the site. Uplands in this restoration area will be restored to either native grassland or Diegan coastal sage scrub. Upland restoration will involve a number of techniques including installing: (1) salvaged rare plants from the Otay Business Park site, (2) container stock plantings, and (3) commercially obtained seed mix. No seeding or planting will occur within restored pools (besides salvaged inoculum).

Native grassland restoration will occur in 0.38 acre of the vernal pool uplands. The remainder of the upland restoration will consist of the addition of supplemental Diegan coastal sage scrub species. The planting palette for the native grassland is presented in Table 4. All grass plantings would be 2-inch "square-liner" plugs. The native grassland seed mix is presented in Table 5. The seed mix is dominated by native bunchgrasses, with additional forb and shrub species. All seed will be broadcast by hand. To take advantage of the rainy season and minimize seed predation, all seeding will occur between November 15 and January 15.

Table 4
NATIVE GRASSLAND PLANT PALETTE

Scientific Name	Common Name	Number per Acre	Number to be Ordered*
Distichlis spicata	saltgrass	1000	380
Nassella Pulchra	purple needlegrass	1000	380
	TOTAL	**2000**	**760**

*Based on 0.38 acre

Table 5
NATIVE GRASSLAND SEED MIX

Scientific Name	Common Name	Pounds per Acre	Amount to be Ordered*
Achillea millefolium	yarrow	1	0.38
Aristida purpurea	purple three-awn	1	0.38
Artemisia californica	coastal sagebrush	2	0.76
Eriophyllum confertiflorum	golden yarrow	2	0.76
Eriogonum fasciculatum	California buckwheat	3	1.14
Lupinus bicolor	bicolor lupine	1	0.38
Melica imperfect	oniongrass	1	0.38
Nassella lepida	valley needlegrass	2	0.76
Nassella pulchra	purple needlegrass	5	1.9
Sisyrinchium bellum	blue-eyed grass	1	0.38
Viguiera laciniata	San Diego sunflower	1	0.38
	TOTAL	**20**	**7.6**

*Based on 0.38 acre

The Diegan coastal sage scrub container stock plant palette is included in Table 6. The amount of

container stock for each species is dependent upon availability from local nurseries. All of the species in the planting and seeding palettes have been observed either on the Lonestar parcels, or on south facing slopes in the vicinity on Otay Mesa. All plantings would be 1-gallon pots. 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 1-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.

The seed mix for the upland restoration area is presented in Table 7. This palette includes a mix of shrub, forb, and native bunchgrass species. To take advantage of the rainy season and minimize seed predation, all seeding will occur between November 15 and January 15.

Table 6
DIEGAN COASTAL SAGE SCRUB CONTAINER STOCK PLANT PALETTE

Scientific Name	Common Name	Number per Acre	Number to be Ordered*
Adolphia californica	spineshrub	40	128
Ambrosia pumila	San Diego ambrosia	20	64
Artemisia californica	coastal sagebrush	150	480
Brickellia californica	California bricklebush	20	64
Cylindropuntia californica var. *californica*	snake cholla	20	64
Cylindropuntia prolifera	coast cholla	N/A	100†
Eriogonum fasciculatum	California buckwheat	200	640
Ferocactus viridescens	San Diego barrel cactus	20	64
Malacothamnus fasciculatus	bush mallow	20	64
Mirabilis laevis	wishbone bush	20	64
Opuntia littoralis	coast prickly-pear	N/A	100†
Viguiera laciniata	San Diego sunflower	200	640
	TOTAL	**700**	**2,440**

*Based on 3.2 acres

†For use in coastal cactus wren planting areas

Table 7
DIEGAN COASTAL SAGE SCRUB SEED MIX

Scientific Name	Common Name	Pound/Acre	Amount to be Ordered*
Achillea millefolium	yarrow	1	3.2
Artemisia californica	California sage brush	3	9.6
Bloomeria crocea	common golden star	1	3.2

Collinsia heterophylla‡	Chinese houses	1	3.2
Convolvulus simulans	small-flower morning glory	0.5	1.6
Corethrogyne filaginafolia var. *filaginafolia*	common sand-aster	1	3.2
Dichelostemma capitatum	blue dicks	1	3.2
Dodecatheon clevelandii‡	shooting stars	1	3.2
Eriogonum fasciculatum	California buckwheat	5	16.2
Eriophyllum confertiflorum	golden yarrow	2	6.4
Eschscholzia californica	California poppy	1	3.2
Lotus scoparius	deerweed	3	9.6
Nassella pulchra	purple needlegrass	4	12.8
Penstemon spectabilis	showy penstemon	0.5	1.6
Plantago erecta	dot-seed plantain	2	6.4
Sisyrinchium bellum	blue-eyed grass	2	6.4
Viguiera laciniata	San Diego sunflower	4	12.8
	TOTAL	**33**	**105.6**

*Based on 3.2 acres

‡These species will be kept separate from the rest of the seed order, and applied on the north facing sides of existing mima mounds

5.6.3 QCB Focused Planting Area Planting Plan

QCB habitat focused planting areas will be hand-seeded with a mix of larval host plants and potential nectaring resource flowers at the beginning of the rainy season (Table 8). The inner area, in a 6-foot radius from the center of the planting area, will be seeded with a high concentration of dot-seed plantain, a main QCB larval host plant. An outer ring, consisting of the area from 6 through 15 feet from the center of the circle, will be seeded with a mix of QCB larval and host plants (Figure 7).

Table 8
QCB HABITAT FOCUSED PLANTING AREA SEED MIX

Scientific Name	Common Name	Pound/ Area†	Pounds to be Ordered
Center Seeding Area			
Plantago erecta	dot-seed plantain	2.0	12.0*
Outer Seeding Area			
Antirrhinum coulterianum	Coulter's snapdragon	0.2	1.2
Amsinckia menziesii var. *intermedia*	rancher's fiddleneck	0.4	2.4
Castillejia exserta ssp. *exserta*	purple owl's clover	0.2	1.2
Collinsia heterophylla	Chinese houses	0.2	1.2
Cryptantha intermedia	nievitas cryptantha	0.2	1.2
Lasthenia gracilis (L. californica)	common goldfields	0.4	2.4

Linanthus dianthiflorus	ground pink	0.2	1.2
Plantago erecta	dot-seed plantain	3.0	18.0
	TOTAL	**6.8**	**40.8***

†Seeding rates are dependent on availability of seed material
*Center circle seed to be kept separate from rest of order

Flat-top buckwheat (*Eriogonum fasiculatum*) shrubs (Table 6) will be installed around the perimeter of each focused QCB habitat focused planting area, to provide needed shrub cover for any QCB utilizing the area. Some of the cobble expected to be uncovered during vernal pool grading and container stock planting would be placed in the QCB habitat focused planting areas to provide potential perches for QCB.

5.6.4 Rare Plant Translocation

The receptor sites for the variegated dudleya is located in mima mounds adjacent to vernal pools near areas supporting existing variegated dudleya populations. The mima mounds will be ripped to a depth of approximately four inches prior to planting with the collected soil clumps. The soil clumps will be hand "tiled" in the ripped area in much the same way kitchen tiles are fitted on to a counter top. Each clump will be carefully placed in the soil such that the surface of the clump is level with the surrounding ground level and there are no spaces between adjacent clumps. Careful placement and fitting will continue until all of the clumps have been planted. At this time the entire area will be watered to help the clumps settle into place. Native topsoil will be used to fill in any gaps that open up after watering. Collected variegated dudleya seed will be applied to the vicinity of the dudleya clumps, at the beginning of the rainy season. Once the clump fitting and site seeding is complete the entire area will be marked, staked, and flagged to preclude accidental entry and to identify the area in the future.

Salvaged San Diego barrel cactus will be planted in groups throughout the vernal pool restoration area. Groupings will consist of at least 5 plants. The cactus will be aligned with the previously applied mark pointing south. Metal plant tags will be installed in the soil near transplanted San Diego barrel cactus, so that the transplanted individuals can be differentiated from the container stock plantings after the paint markings fade.

5.7 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 2-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 ¼" diameter holes drilled every 3 to 4." A screen cap of 1/8" 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 in 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 sites. Each planting will be individually watered by hand, in a way such that run-off from the planting does not occur. 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, then filled again.

5.8 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.

5.8.1 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 20 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.

Additionally, the sparse shrubs on the hill on the southern side of the Otay Business Park will be collected and used for brush piles within the Otay Business Park Mitigation 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.

5.8.2 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, 20 bee blocks will be prepared and scattered throughout the Lonestar Parcels 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 hole 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 12 sand pits will be installed within the Lonestar parcel, with at least 4 of those within the vernal pool restoration area. Each pit will be approximately 2 feet 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.

5.8.3 Cactus Wren Habitat

Populations of coastal cactus wrens have dramatically decreased over recent years due to habitat loss resulting from wildfires and development. Coastal cactus wren is a California Species of Special Concern and is known to inhabit communities of coastal sage scrub that contain substantial clusters of cactus species. The species nests almost exclusively in cholla and prickly pear species. Coastal cactus wren were observed in nearby Johnson Canyon in 2010 by HELIX biologists. Prickly pear (*Opuntia littoralis*) and coast cholla (*Cylindropuntia prolifera*) container stock will be planted in thick patches within the restoration area to provide habitat suitable for cactus wren nesting (Table 6). Patches will contain at least 20 container stock.

5.8.4 San Diego Fairy Shrimp

The majority of the Lonestar mitigation site is within designated Critical Habitat for the San Diego fairy shrimp. The habitat restoration effort is intended to improve the quality of the habitat for this, and other vernal pool associated species, through vernal pool habitat restoration and enhancement of the primary constituent elements (PCEs) of San Diego fairy shrimp habitat. PCEs for this species include:

1. Vernal pools with shallow to moderate depths (2 in [5 cm] to 12 in [30 cm]) that hold water for sufficient lengths of time (7 to 60 days) necessary for incubation, maturation, and reproduction of the San Diego fairy shrimp, in all but the driest years;

2. Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools described in PCE 1, providing for dispersal and promoting hydro periods of adequate length in the pools (i.e., the vernal pool watershed); and

3. Flat to gently sloping topography, and any soil type with a clay component and/or an impermeable surface or subsurface layer known to support vernal pool habitat (including Carlsbad, Chesterton, Diablo, Huerhuero, Linne, Olivenhain, Placentia, Redding, and Stockpen soils).

All of these PCEs occur within the restoration site. The habitat restoration activities proposed in this plan will improve and increase the presence of PCEs 1 and 2 noted above. Specifically, the project will increase the amount of vernal pools supporting San Diego fairy shrimp on site from 2 pools (0.01 acre) to 50 pools (0.42 acre), a 2,400 percent increase in known occupied pools for the Lonestar CH subunit. Additionally, the mowing of grasses and thatch removal across the site (refer to Section 5.4.1), and within the preserved vernal pools, will improve the quality of the existing vernal pool and San Diego fairy shrimp habitat on site. Over the past several years, since the removal of cattle on the site, non-native grasses (primarily *Avena* sp. and *Lolium* sp.) have steadily taken hold within the pools, altering their hydrological characteristics and reducing their ability to pond water long enough and deep enough for San Diego fairy shrimp populations to persist. Mowing and thatch removal will result in increased capacity for a total of 80 existing pools to support fairy shrimp over time.

5.9 HABITAT AND ARTIFICIAL BURROW AS-BUILT CONDITIONS

The restoration specialist shall submit to the County, Corps, CDFG, and USFWS, within 6 weeks of completion of site preparation and planting, a map showing the as-built conditions of the vernal pool mitigation areas. Areas of grading and seeding shall be shown on the map. The restoration specialist shall submit to the County, USFWS, and CDFG within 6 weeks of completion of installation of artificial burrows and planting, a map showing the as-built conditions of the artificial burrows.

6.0 MAINTENANCE PLAN

6.1 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).

6.1.1 Trash Removal

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

6.1.2 Weed Control

Vernal Pool Restoration Area

Particular maintenance 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 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, but focused herbicide application could be used if needed and requested by the vernal pool restoration specialist. 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.

Care will be taken in the QCB habitat focused planting area, in an effort to reduce damage to small annual plants and to avoid walking on QCB larval host plants (e.g. dot-seed plantain and purple owl's clover [*Castilleja exserta*]).

Mechanical removal of weed species with a line trimmer or other such device in the upland areas also may 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 polluted with nitrogen deposition, no fertilizers will be used in the restoration site.

Vernal Pool Enhancement Area

The entire non-native grassland area of the Lonestar Parcels would be dethatched during initial site preparation. Additional weeding of the entire non-native grassland will occur in March of the first and second year. Weeding must be completed by the maintenance contractor in March, before annual grasses go to seed, to reduce the seedbank of these weeds. If weeding is not conducted before grasses go to seed, an additional year of weeding must occur (e.g. in Year 3).

6.1.3 Artificial Burrow Maintenance

Maintenance personnel shall be educated as to the sensitivity of burrowing owls and the goals of the artificial burrow maintenance program. Maintenance tasks shall be performed only at the direction of the specialist for a 5-year period following burrow construction. Sites have been selected and designed to ensure that the need for maintenance would decrease each of the 5 years. The specialist may direct maintenance personnel to avoid burrows by providing a minimum 50-meter (m), non-maintenance buffer should owls occupy burrows.

Maintenance tasks could include vegetation management around each burrow, repair of burrows damaged by vandalism, and installation of signs prohibiting trespassing in sensitive habitat areas

(i.e., where burrows are located).

Vegetation management could include mowing or weed-whipping a 50-foot radius around each burrow, although the burrow locations have been designed with gravel placement, soil compaction, and seeding with low-growing plant species to limit the need for this type of maintenance. Vegetation management could also include reseeding around the burrows with the low-growing plant species listed earlier in this document, or other species, if deemed necessary by the specialist. Damage to burrows could be caused accidentally (such as by maintenance equipment or humans trespassing) or by vandalism. Damage could include collapse or blockage of burrow entrances or vegetation alteration around burrows. Damaged burrows and vegetation surrounding the burrows should be repaired to their pre-damaged condition within 1 week of the damage being observed. In a worst-case scenario, damage repair could include reconstructing part of a burrow, recompacting soil, and reseeding. The burrows would be designed and installed to limit the potential risk of collapse by making use of heavy materials and extending the burrow entrances well beyond the soil horizon.

The restoration specialist will be periodically inspecting the artificial burrows for presence of burrowing owls (See section 8.1.3). If owls are observed, the restoration specialist will determine if maintenance adjacent to the burrows can be avoided. Maintenance adjacent to burrows will only be a priority in February to March, when exotic plants tend to exhibit the most growth. Maintenance will be avoided during the burrowing owl breeding season (April 15 through July 15). The restoration specialist will provide a labeled map to the maintenance personnel showing the location of any avoidance areas.

6.1.4 Container Stock Irrigation

Container stock, native grass plugs, and transplanted sensitive pants 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 are 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.

6.1.5 Fence Repair

The 3-strand barbless wire fence will be maintained in good order by the maintenance contractor. The maintenance of the existing chain-link fence bordering SR-125 is not the responsibility of the maintenance contractor.

6.2 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 5-year maintenance and monitoring period. Additional visits would be conducted as directed by the restoration specialist during the rainy season (generally December through May) each year to keep weeds under control.

7.0 SUCCESS CRITERIA

As discussed in Section 3.0, mitigation for impacts to 0.24 acre of vernal and road pools with and without fairy shrimp would be at a 3:1 ratio, and would consist of 1.07 acres of vernal pool restoration and watershed enhancement of preserved pools. Impacts to rare plant species would be met through translocation of impacted populations from the Otay Business park site, and preservation of existing rare plant populations at the Lonestar Parcels. Impacts to owl burrows and occupied burrowing owl habitat would be met with the installation of 24 artificial burrows and the preservation of habitat.

The following sections provide standards to determine the successful completion of the 5-year mitigation and monitoring program. Attainment of these standards indicates the mitigation areas are progressing toward the habitat functions and values specified for this plan. Methods used to measure these success criteria are described in the following text. The CDFG, Corps, USFWS, and County may terminate monitoring earlier than 5 years if success criteria are met and it is recommended by the restoration specialist in a year-end report. Likewise, if the restored areas fail to meet the Year 5 standards after the full monitoring term, a specific set of remedial measures (approved by the CDFG, Corps, USFWS, and County) 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).

7.1 RESTORED VERNAL POOLS

7.1.1 Control Pools

In order to measure the success of the restored vernal pools, 8 on site and 8 off-site preserved pools in Otay Mesa would serve as control pools. Eight of the control pools are located 2 miles east of the Lonestar Parcels on the Upham Parcel. This parcel was previously being managed as a habitat preserve by The Environmental Trust. The pools on this site are within the J-26 complex (Bauder 1986). While not being actively managed, the J-26 pools are protected from grazing and OHV impacts by a barbed wire fence, making it a reliable control site. HELIX collected data from the pools in this complex each year from 2000 through 2008, to serve as controls for other vernal pool restoration projects on Otay Mesa. The control pools are of similar depth and vegetative makeup as those proposed for the mitigation site.

A total of 11 vernal pool plant indicator species and 3 native vernal pool associated species have been observed in the control pools (Table 9). The mean vernal pool plant richness for 2005 was 3.6 species per pool. This richness is typical of what has been observed in the control pools over the last 5 years. In 2003, the average vernal pool plant cover in the control pools ranged from 1 to 95 percent with a combined average of approximately 20 percent. In 2004, vernal pool plant cover varied from 1 to 60 percent, with an average of 13.5 percent. In the exceptionally wet 2005 rainy season, the average vernal pool plant cover in the control pools ranged from 2 to 47 percent (20 percent average).

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.

Table 9
CONTROL VERNAL POOL PLANT SPECIES

SCIENTIFIC NAME	COMMON NAME
Vernal Pool Indicators*	
Callitriche marginata	long-stalk water-starwort
Centunculus minimus	chaffweed
Crassula aquatica	crassula
Deschampsia danthonoides	annual hairgrass
Epilobium pygmaeum	smooth boisduvalia
Eryngium aristulatum var. *parishii*	San Diego button-celery
Lilaea scilloides	flowering quillwort
Navarretia fossalis	spreading navarretia
Pogogyne nudiuscula	Otay mesa mint
Plantago elongata	plantago
Psilocarphus brevissimus	woolly marbles
Other Native Vernal Pool Associated Species	
Brodiaea terrestris ssp. *kernensis*	dwarf brodiaea
Eleocharis macrostachya	pale spike-sedge
Juncus bufonius	common toad-rush

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

7.1.2 Vernal Pool Indicator Species Richness

Only native vernal pool indicator species (Corps 1997) and selected native vernal pool associates (Table 9) 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 10. Acceptable species richness within each restored pool at the end of the five-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 10
VERNAL POOL SPECIES RICHNESS
SUCCESS CRITERIA

Year	Restored Vernal Pools*
1	35
2	50
3	65
4	80
5	100

*Percent of relative indicator richness in control pools. Greater than or equal to amount shown.

7.1.3 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 11). 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 11
VERNAL POOL PLANT COVER
SUCCESS CRITERIA

Year	Restored Vernal Pools*
1	25
2	35
3	50
4	70
5	90

*Percent of relative indicator cover in control pools. Greater than or equal to amount shown.

7.1.4 Weed Cover in Restored Vernal Pools

Non-native weed species anticipated to encroach upon the vernal pools include Italian ryegrass (*Lolium multiflorum*), grass poly (*Lythrum hyssopifolia*), curly dock (*Rumex crispus*), rabbitsfoot grass (*Polypogon monspeliensis*), filaree (*Erodium* spp.) 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 five-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 five percent. If weed cover criteria are not being met, additional maintenance effort would be required. Table 12 includes Cal-IPC listed species likely to occur within the mitigation project area.

Table 12
CALIFORNIA INVASIVE PLANT COUNCIL
MODERATELY TO HIGHLY INVASIVE PLANT SPECIES*

SCIENTIFIC NAME	COMMON NAME
Avena spp.	wild oats
Brassica nigra	black mustard
Bromus diandrus	ripgut brome
Bromus madritensis ssp. *rubens*	red brome
Centaurea melitensis	tocalote
Foeniculum vulgare	fennel
Hirschfeldia incana	shortpod mustard
Lolium multiflorum	Italian ryegrass
Lythrum hyssopifolia	grass poly
Vulpia myuros	rattail fesuce

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

7.2 SITE DETHATCHING

There are no specific success criteria for the dethatching of the Lonestar Parcels. Implementation of the dethatching effort will be considered successful if the watershed dethatching is carried out correctly and in a timely manner.

7.3 FAIRY SHRIMP

All of the restored and enhanced vernal pools are intended to support San Diego fairy shrimp.

Some of the basins are designed to be deep enough to support a hydrological regime long enough to support Riverside fairy shrimp. 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.

7.4 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 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 may have to be extended if a drought period prevents the pools from demonstrating the desired hydrologic patterns.

7.5 RARE PLANT TRANSLOCATION

The goal of the variegated dudleya translocation effort is to obtain populations of similar size to the impacted population by the end of the 5-year restoration program. At the end of each year, if the population does not appear to be progressing toward this goal, variegated dudleya plantings or seed will be obtained from a native plant nursery and applied to the restoration area.

At the end of each year, survivorship of San Diego barrel cactus will be tabulated. If there is a survivorship of less than 90 percent, additional San Diego barrel cactus will be obtained from a native plant nursery and added to the restoration site, to replace lost individuals.

7.6 UPLAND RESTORATION IN VERNAL POOL RESTORATION AREA

During annual monitoring, species richness in the native grassland area 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. As suitable native grassland reference sites are not known on Otay Mesa, success will not be compared to a reference site. Instead, success will be measured relative to predetermined richness values. 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
NATIVE GRASSLAND RESTORATION
SPECIES RICHNESS SUCCESS CRITERIA

YEAR*	SPECIES RICHNESS
3	5
4	6
5	8

*No success criteria for Years 1 and 2

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 native grassland restoration area. No specific richness criteria are established for Years 1 or 2 in the native grassland restoration area. As within the restored vernal pools, control of weed species categorized as High or Moderate in the Cal-IPC (2006) Invasive Plant Inventory 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 other weed species does not exceed 5 percent. 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
NATIVE GRASSLAND RESTORATION
VEGETATIVE COVER SUCCESS CRITERIA
(percent cover)

YEAR*	NATIVE SPECIES	NON-NATIVE SPECIES	INVASIVE WEEDS‡
1	>25	<10	<5
4	>35	<5	<1
5	>45	<5	<1

*No success criteria for Years 1 and 2
‡Species listed as High or Moderate in the California Invasive Plant Council (Cal-IPC) 2006 Invasive Plant Inventory

As mima mound habitat suitable for the long-term preservation of vernal pools currently exists within the vernal pool restoration area, no success criteria are proposed for the Diegan coastal sage scrub habitat enhancement. Installation and maintenance of Diegan coastal sage scrub species would enhance the vernal pool watersheds and successful establishment would enhance the value of the mitigation site, but is not essential for continued pool function.

7.7 SUCCESS CRITERIA FOR ARTIFICIAL BURROWS

The degree to which burrowing owls utilize artificial burrows and foraging habitat will be documented through the monitoring program; however, there are no success criteria for this effort. If this burrowing owl mitigation plan is implemented correctly, and burrowing owls are not found to be utilizing the artificial burrows or preserved foraging habitat, there will be no consequences for the project proponent. Installation of artificial burrows and preservation of habitat is considered successful mitigation.

8.0 MONITORING PLAN

8.1 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. 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. If annual goals are not being met, corrective measures would be implemented. Corrective measures may include but are not limited to importing new soil inoculum from an off-site source, recontouring of non-functioning pools, and re-seeding with collected or commercially available seeds from the immediate area. Prior to conducting any remedial measures outside of this plan, the USFWS, Corps, CDFG, and County would be notified.

8.1.1 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 and Riverside fairy shrimp in the restored pools, in particular the estimated population size of hatched fairy shrimp, and estimates on the number of gravid female. 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.

8.1.2 Upland Habitat

Native Grassland

The status of the native grassland area 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 the native grassland upland area 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 transectswould 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 25m by 5m 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. Photopoints would be would be physically marked, and

have their locations recorded with a GPS unit.

Diegan Coastal Sage Scrub

Diegan coastal sage scrub habitat in the uplands around the restored vernal pools will be qualitatively monitored during each annual monitoring event, and photographs would be taken each year.

QCB Habitat

The QCB habitat focused planting areas would be qualitatively inspected during each annual monitoring event. Observations would be taken on native and non-native plant cover and species diversity.

Rare plant

During the annual monitoring visit the number and species cover within the variegated dudleya area will be visually estimated. The collected data will be used to determine the success of the planted area.

The survivorship of transplanted San Diego barrel cactus and of container stock cactus plantings will be recorded.

8.1.3 Artificial Burrows

Monitoring of the artificial burrows shall be carried out by a qualified biologist and shall include the following observations: presence of owls and other burrowing animals, burrow use, general available prey base, vegetation condition (in particular height) around burrows, other predatory animal species that could prey on burrowing owls and/or compete with them for food, and any maintenance concerns as described above.

Monitoring shall occur for 5 years according to the schedule below. The majority of visits occur during the breeding (April 15 through July 15) and wintering seasons (December 1 through January 31) of burrowing owls. This schedule is designed under the assumption that monitoring would begin following artificial burrow construction. The specialist shall have reasonable flexibility to alter the exact timing of monitoring events in response to on-site observations/conditions.
Monitoring would occur according to the following schedule:

- Year 1 (12 monitoring events; 1 monitoring event per month).

- Years 2 through 5 (8 monitoring events per year) as follows: December 1 through January 31 – 3 logically spaced events; February 1 through April 14 – 1 event; April 15 through July 15 – 3 logically spaced events; and July 16 through November 30 – 1 event.

Monitoring events should occur concurrently with other site monitoring visits (e.g. maintenance

monitoring, fairy shrimp surveys).

8.2 ANNUAL REPORTS/INVITATION

As part of the monitoring program, annual reports prepared by the restoration specialist would be submitted to the County, Corps, CDFG, and USFWS evaluating the success of the vernal pool mitigation effort to date, along with any recommendations for future work that may be deemed necessary. Annual reports prepared by HELIX would be submitted to the USFWS, CDFG, and County evaluating the success of the burrowing owl translocation effort to date. Each annual monitoring report would include data collected throughout the year in addition to the annual monitoring visit. 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.

The USFWS, Corps, CDFG, RWQCB, and County shall be annually invited to view the mitigation site.

8.3 REMEDIAL MEASURES

If the annual goals are not being met, corrective measures would be implemented. Corrective measures may include, but are not limited to, importing new inoculum from an off-site source, recontouring of non-functioning pools, and re-seeding with collected or commercially available seed. For example, if a pool does not pond water sufficiently, it would be deepened, recontoured, and recompacted during the dry season. Pools exhibiting appropriate hydrological characteristics but low species cover and richness would be re-seeded with vernal pool plant species. Prior to conducting any significant remedial measures, the USFWS, Corps, CDFG, and County would be notified.

8.4 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 USFWS, Corps, CDFG, and County by September 1 of each year to ensure that adequate time remains in the dry season to make any necessary alterations to the preserve areas.

9.0 COMPLETION OF MITIGATION

9.1 NOTIFICATION OF COMPLETION

The permittee shall notify the USFWS, Corps, CDFG, and County of completion of the mitigation effort through submittal of a final (Year 5) monitoring report. The final monitoring

report would include a jurisdictional delineation of the mitigation areas. This delineation must show that the goals of the mitigation program (as described in Section 3) have been met.

9.2 AGENCY CONFIRMATION

After receipt of the final monitoring report, the USFWS, Corps, CDFG, and County may 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.

9.3 LONG-TERM MANAGEMENT

Prior to initiation of project impacts, a Biological Open Space Easement or Conservation Easement dedication will be recorded over the vernal pool mitigation areas. These areas will be turned over in fee-title to a non-profit organization dedicated to the preservation of sensitive lands. Long-term management of the vernal pool mitigation areas would be the responsibility of the organization accepting the fee-title. As of the writing of this report, no entity has been chosen to accept long-term responsibility of the restoration areas. Long-term management would be conducted according to the Resource Management Plan for Otay Business Park Off-Site Biological Open Space at Lonestar Ridge (HELIX 2010a).

10.0 CONTINGENCY MEASURES

10.1 INITIATING PROCEDURES

If the Corps, CDFG, USFWS, and County determine upon receipt of any of the annual monitoring reports that the restoration effort is not meeting success standards for the project, the Corps, CDFG, USFWS, and County shall notify the project proponent in writing 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 USFWS, Corps, CDFG, and County.

10.2 FUNDING MECHANISM

The permittee (Section 4.5) shall be responsible for all costs associated with any remedial measures.

10.3 RESPONSIBLE PARTIES

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

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