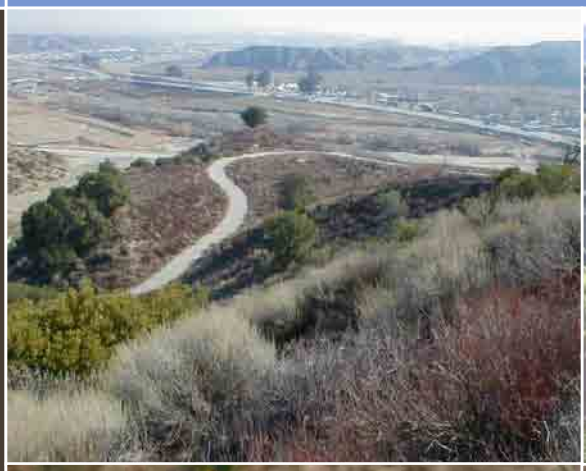
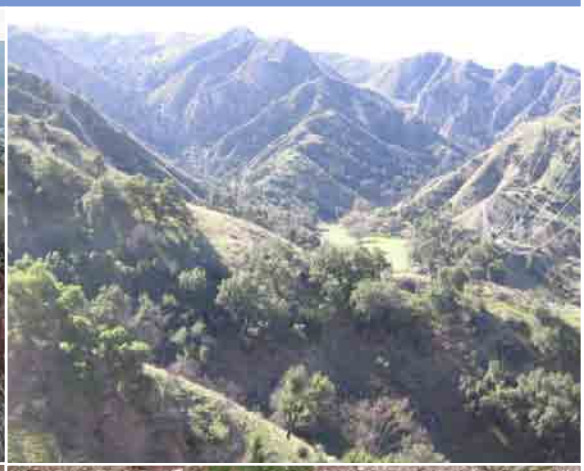
Dudek, "Draft RMDP Slender Mariposa Lily Mitigation and Monitoring Plan" (August 2007; 2007I)

DRAFT

Slender Mariposa Lily Mitigation and Monitoring Plan for

Newhall Ranch Resource Management and Development Plan

AUGUST 2007

PREPARED FOR:

The Newhall Land and Farming Company
23823 Valencia Blvd.
Valencia, CA 91355

PREPARED BY:

Dudek
25152 Springfield Ct., Suite 180
Valencia, CA 91355

REVISED DRAFT

SLENDER MARIPOSA LILY MITIGATION AND MONITORING PLAN

for the

NEWHALL RANCH RESOURCE MANAGEMENT AND DEVELOPMENT PLAN AND SPINEFLOWER CONSERVATION PLAN STUDY AREA

Prepared for:

THE NEWHALL LAND AND FARMING COMPANY
23823 Valencia Boulevard
Valencia, California 91355
Contact: Matt Carpenter

Prepared by:

DUDEK
25152 Springfield Court, Suite 180
Valencia, California 91355
Contact: Sherri Miller
661.705.4561

AUGUST 2007

Printed on 30% post-consumer recycled material.

Revised Draft Slender Mariposa Lily Mitigation and Monitoring Plan for the Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan Study Area

TABLE OF CONTENTS

Section **Page No.**

1.0 INTRODUCTION AND PROJECT DESCRIPTION 1

2.0 DESCRIPTION OF THE MITIGATION PROGRAM 8

2.1 Mitigation Program Goals 8

2.2 Preliminary Schedule for Implementation 11

2.3 Time Frame for Success 12

2.4 Rationale for Expecting Success 12

2.5 Backup Contingency Measures 13

3.0 SALVAGE AREA AND RECEPTOR SITE DESCRIPTIONS 14

3.1 Slender Mariposa Lily Salvage Areas 14

3.2 Slender Mariposa Lily Receptor Sites 14

4.0 IMPLEMENTATION PLAN 15

4.1 Phase 1 – Habitat Enhancement/Restoration 15

4.1.1 Site Preparation – Phase 1 15

4.1.2 Habitat Restoration/Enhancement 16

4.2 Phase 2 – Slender Mariposa Lily Introduction 16

4.2.1 Site Preparation – Phase 2 16

4.2.2 Salvaging and Planting Slender Mariposa Lily 17

4.3 As-Built Conditions 20

5.0 MAINTENANCE PLAN DURING 5-YEAR MONITORING PERIOD 20

6.0 MONITORING PLAN DURING 5-YEAR PERIOD 22

6.1 Receptor Site Monitoring Methods and Schedule 23

6.2 Annual Reports 25

7.0 COMPLETION OF MITIGATION AND PERFORMANCE CRITERIA 25

8.0 LITERATURE CITED 27

TABLE OF CONTENTS (CONTINUED)

Page No.

LIST OF FIGURES

1 Regional Map 3
2 Vicinity Map 5
3 Proposed Impacts 9

LIST OF TABLES

1 Receptor Site Monitoring Schedule 23
2 Performance Criteria – Slender Mariposa Lily Mitigation Program 26

Revised Draft Slender Mariposa Lily Mitigation and Monitoring Plan for the Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan Study Area

1.0 INTRODUCTION AND PROJECT DESCRIPTION

This report provides Dudek's recommendations for slender mariposa lily (*Calochortus clavatus* var. *gracilis*) mitigation for the Newhall Ranch Resource Management and Development Plan (RMDP) and Spineflower Conservation Plan (SCP) area. The RMDP area contains the Newhall Ranch Specific Plan (Specific Plan) area, the Salt Creek area and offsite road improvements. The SCP area includes the RMDP and portions of two adjacent projects to the east, Entrada and Valencia Commerce Center (VCC). The RMDP area and SCP area are west of the City of Santa Clarita in an unincorporated portion of the County of Los Angeles. The area is generally located south of State Route 126 (SR-126) and is west of Interstate 5 (I-5) (Figures 1 and 2).

The development component of the RMDP consists of infrastructure improvements in or adjacent to the Santa Clara River and side drainages located on the Specific Plan site, which are needed to implement the approved Specific Plan. The RMDP infrastructure improvements comprise various flood-control features, stream bank protection, drainage facilities, roads, building pads, pipeline and utility river crossings, nature trails, new and widened bridges, the discharge outfall for the previously approved Newhall Ranch Water Reclamation Plant (WRP), and drainage facility maintenance activities of the Los Angeles County Department of Public Works (LACDPW). Implementation of the RMDP and SCP will accommodate build-out of the Specific Plan, VCC, and Entrada developments and will result in impacts to a maximum of 72 acres of cumulative occupied habitat (or an estimated 30,145 slender mariposa lily individuals) located within the RMDP and SCP areas. The *Newhall Ranch Resource Management and Development Plan* (Dudek 2008) and the EIS/EIR (Mitigation Measure BIO-40) presently require that:

> The Draft RMDP Slender Mariposa Lily Mitigation and Monitoring Plan (Dudek 2007I) shall be revised and submitted to California Department of Fish and Game (CDFG) for review and approval prior to ground disturbance to occupied habitat. Upon approval, the plan will be implemented by the applicant or its designee. The revised plan will demonstrate the feasibility of enhancing or restoring slender mariposa lily habitat in selected areas to be managed as natural open space (i.e., the Salt Creek or High Country areas, spineflower preserves, or River Corridor) without conflicting with other resource management objectives. Habitat replacement/enhancement will be at a 1:1 ratio (acres restored/enhanced to acres impacted).
>
> The revised plan will describe habitat improvement/restoration measures to be completed prior to introducing slender mariposa lily. Habitat

improvement/restoration will be based on native occupied slender mariposa lily habitat. The revised plan will specify: (1) the location of mitigation sites (may be selected from among 559 acres of suitable mitigation land in the High Country SMA and Salt Creek areas identified in the Draft Newhall Ranch Mitigation Feasibility Study (Dudek 2007A); (2) a description of "target" vegetation (native shrubland or grassland) to include estimated cover and abundance of native shrubs and grasses in occupied slender mariposa lily habitat on Newhall Ranch land (either at sites to be destroyed by construction or at sites to be preserved); (3) site preparation measures to include topsoil treatment, soil decompaction, erosion control, temporary irrigation systems, or other measures as appropriate; (4) methods for the removal of non-native plants (e.g., mowing, weeding, raking, herbicide application, or burning); (5) the source of all plant propagules (seed, potted nursery stock, etc.), the quantity and species of seed or potted stock of all plants to be introduced or planted into the restoration/enhancement areas; (6) a schedule and action plan to maintain and monitor the enhancement/restoration areas, to include at minimum, qualitative annual monitoring for revegetation success and site degradation due to erosion, trespass, or animal damage for a period no less than 2 years; (7) as needed where sites are near trails or other access points, measures such as fencing, signage, or security patrols to exclude unauthorized entry into the restoration/enhancement areas; and (8) contingency measures such as replanting, weed control, or erosion control to be implemented if habitat improvement/restoration efforts are not successful.

Habitat restoration/enhancement will be judged successful when (1) percent cover and species richness of native species reach 50% their cover and species richness at undisturbed occupied slender mariposa lily habitat at reference sites; and (2) the replacement vegetation has persisted at least one summer without irrigation. At that point slender mariposa lily propagules (seed or bulbs) will be introduced onto the site.

IMAGE SOURCE: USGS 24K Quad

FIGURE 1

DUDEK

Resource Management Development Plan
Slender Mariposa Lily Mitigation and Monitoring Plan

Regional Map

Z:\Projects\j373801\RMDP\arcmap\Slender Mariposa Lily Mitigation and Monitoring Plan\Figure 1 - RMDP Slender Mariposa Lily Regional Proposal.mxd

INTENTIONALLY LEFT BLANK

Legend

- RMDP Boundary
- SCP Boundary
- County Boundary
- Slender Mariposa Lily
- RMDP Receptor Site

0 0.25 0.5 1 Miles

n

APPROXIMATE SCALE IN MILES

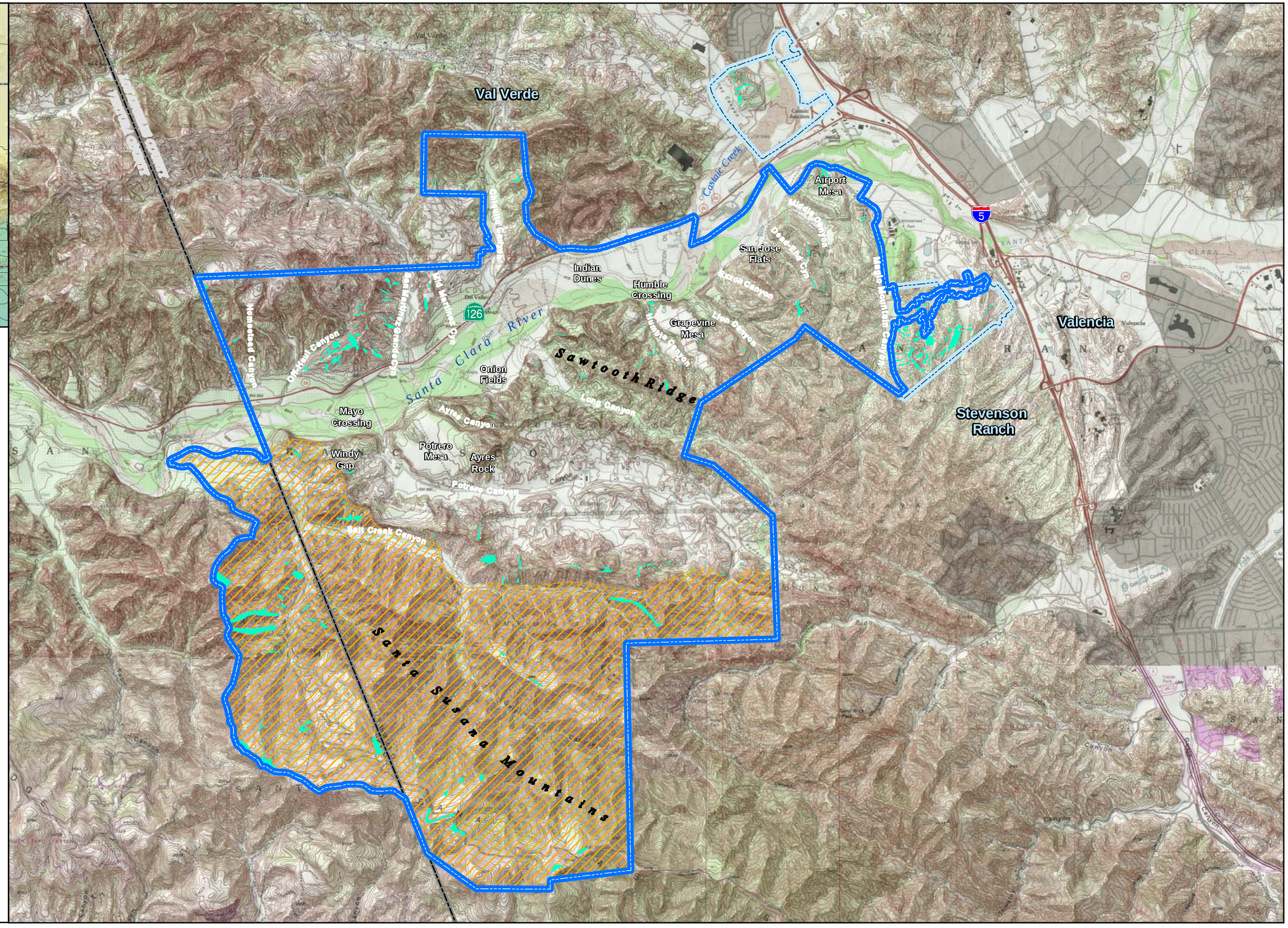


IMAGE SOURCE: USGS 24K Quad

FIGURE 2

Resource Management Development Plan Slender Mariposa Lily Mitigation and Monitoring Plan

DUDEK

Vicinity Map

Z:\Projects\j373801\RMDP\arcmap\Slender Mariposa Lily Mitigation and Monitoring Plan\Figure 2 - RMDP Slender Mariposa Lily Vicinity Proposal.mxd

INTENTIONALLY LEFT BLANK

The revised plan will specify methods to collect propagules and introduce slender mariposa lily into these mitigation sites. Introductions will use source material (seeds or bulbs) from no more than 1.0 mile distant, similar slope exposures, and no more than 500 ft. elevational difference from the mitigation site, unless otherwise approved by CDFG. Bulbs may be salvaged and transplanted from slender mariposa lily occurrences to be lost; alternately, seed may be collected from protected occurrences, following CDFG-approved seed collection guidelines (i.e., MOU for rare plant seed collection). Newhall or its designee will monitor the reintroduction sites for no fewer than five additional years to estimate slender mariposa lily survivorship (for bulbs) or seedling establishment (for seeded sites).

Annual monitoring reports will be prepared and submitted to CDFG and will be made available to the public to guide future mitigation planning for slender mariposa lily. Monitoring reports will describe all restoration/enhancement measures taken in the preceding year; describe success and completion of those efforts and other pertinent site conditions (erosion, trespass, animal damage) in qualitative terms; and describe mariposa lily survival or establishment in quantitative terms.

A minimum of 133 acres of slender mariposa lily cumulative occupied area will be conserved in the RMDP and SCP Project boundaries. Approximately 103 acres of slender mariposa lily cumulative occupied area will be conserved and managed in the RMDP and SCP Project boundary in the High Country SMA and Salt Creek area. Additional cumulative occupied area will be conserved and managed in the San Martinez Grande Canyon area at a 1:1 ratio (acres conserved and managed to acres impacted) based on impacts to cumulative occupied area within the Entrada planning area, as a means to ensure regional biodiversity of the species. Up to an additional 28 acres of slender mariposa lily cumulative occupied area can be conserved and managed in the San Martinez Grande Canyon area for this purpose.

Proposed mitigation for direct impacts to slender mariposa lily may include collection and planting of slender mariposa lily seed and/or salvage and translocation of individuals identified within the disturbance area (Figure 3) to an appropriate receptor site within the High Country Special Management Area (SMA) or the Salt Creek area where they can be preserved in perpetuity (Figure 2). A habitat restoration/enhancement mitigation ratio of 1:1 is required by the CDFG and the County and will be met through sowing of salvaged seed and/or direct salvage and planting of mature bulbs.

This plan meets the general requirements of the above-proposed mitigation measures and provides the recommended guidelines for proposed slender mariposa lily mitigation. Details about specific site locations, planting palettes and quantities to be used in habitat restoration/enhancement, source of propagules, schedules, and other site-specific details will be included in the final plan to be completed prior to project initiation.

2.0 DESCRIPTION OF THE MITIGATION PROGRAM

2.1 Mitigation Program Goals

The Slender Mariposa Lily Mitigation Program (Mitigation Program) outlined herein is focused on compensating for impacts to the on-site populations of slender mariposa lily that occur within the development footprint of the proposed project. The goal of the Mitigation Program is to successfully restore/enhance slender mariposa lily habitat and re-establish or expand slender mariposa lily populations at appropriate/compatible off-site receptor sites, preferably adjacent to existing populations, where the plants can successfully exist and can be afforded protection in perpetuity.

Legend

- RMDP Boundary
- SCP Boundary
- County Boundary
- Slender Mariposa Lily

Impacts

- Direct Permanent
- Direct Temporary
- Indirect Permanent

Miles
0 0.25 0.5 1

APPROXIMATE SCALE IN MILES

AERIAL SOURCE: DigitalGlobe, 2007

FIGURE 3

Resource Management Development Plan Slender Mariposa Lily Mitigation and Monitoring Plan

Proposed Impacts

DUDEK

Z:\Projects\j373801\RMDP\arcmap\Slender Mariposa Lily Mitigation and Monitoring Plan\Figure 2 - RMDP Slender Mariposa Lily Vicinity Proposal.mxd

INTENTIONALLY LEFT BLANK

2.2 Preliminary Schedule for Implementation

Implementation of the Mitigation Program will occur in two phases. The first phase of the Mitigation Program will be to enhance/restore suitable vegetation communities within the designated receptor sites prior to the introduction of slender mariposa lily. Once the vegetation communities have been adequately established (see Section 4.2), then the second phase of the Mitigation Program will be implemented. The second phase of the Mitigation Program includes the introduction and establishment of slender mariposa lily at the receptor sites. The two phases may occur independently multiple times at individual sites as the build-out of the Specific Plan Area occurs. It is projected that implementation of the build-out portion of the Specific Plan area will occur over the next 20 to 25 years.

The Mitigation Program includes a combination seed salvage and bulb transplantation. Timing of the bulb and seed salvaging and planting work will be determined based upon seasonal weather constraints and timing of scheduled project grading. Harvesting of slender mariposa lily bulbs should occur when the plants are dormant (summer and fall); ideally just before the onset of the rainy season (late fall or early winter). Transplantation work for this project would generally occur in the fall or early winter (October–December) over multiple years as individual portions of the project begin. Seed collection will likely also occur over multiple seasons and will be timed to occur when seeds are mature, but before seed has dehisced from seed capsules (usually in May – June). The anticipated sequence for implementation includes:

Mitigation Activity	Approximate Activity Sequence
PHASE 1	
Site clearing and installation of irrigation system	Beginning of Year 1 (summer)
Receptor site preparation – weed control	Year 1
Installation of native mulch and plant propagules	Beginning of Year 2 (fall)
Maintenance and monitoring of native vegetation establishment	Year 2
PHASE 2	
Flagging existing lily plants in RMDP development areas or other collection sites	Year 2 (Spring-during blooming period)
Seed collection	Year 2 (Summer)
Bulb excavation	Beginning of Year 3 (fall-prior to onset of rainy season)
Receptor site preparation and installation of bulbs and seed	Beginning of Year 3 (late fall or early winter)
5-year maintenance and monitoring period	Years 3-7

2.3 Time Frame for Success

Success will be defined by meeting the stated requirement in the *Newhall Ranch Resource Management and Development Plan* (Dudek 2008) which states that "[T]he plan shall replace or transplant the number of individual plants to be removed at a 1:1 ratio and/or enhance and protect existing populations of the species." The time frame to measure success of the program is during the 5-year maintenance and monitoring period. The goal of the programs is to demonstrate the ability of the planted slender mariposa lily to persist during the 5-year maintenance and monitoring period, and to demonstrate at least a 1:1 ratio of growth (vegetative evidence) of the salvaged and relocated plants and seeds to the number of individuals impacted during any one of years 3, 4 or 5 of the total 5-year program. If success criteria are met during Years 3 through 5, then early release of the project may be possible with concurrence from the County and CDFG. A reference on-site population of naturally occurring slender mariposa lily near the mitigation site will be used to compare against the transplanted plants in order to determine whether or not there have been appropriate seasonal conditions (i.e., temperature and rainfall) to induce vegetative growth and flowering.

2.4 Rationale for Expecting Success

As previously described, the proposed slender mariposa lily receptor sites will be located within the High Country SMA or Salt Creek area and will be preferentially sited adjacent to or near existing populations of slender mariposa lily that have been preserved. The close proximity of the proposed receptor sites to a natural population with appropriate soils, hydrology, elevation, and slope exposure will help ensure that the introduced individuals experience the same environmental conditions in which the natural population presently exists. The physical and chemical similarities of the sites increase the probability for success of the mitigation program. Other suitable locations may be planted with slender mariposa lily and associated vegetative communities with concurrence from the County and CDFG.

Dudek's previous work with salvaging, transplanting, and establishing *Calochortus* (both *Calochortus clavatus* var. *gracilis* and *Calochortus plummerae*) at another Newhall Land project, RiverVillage, indicates that successful results can be achieved at the RMDP area by following procedures developed for that project. In the autumn of 2005, seed and 687 bulbs were salvaged from the RiverVillage footprint and planted into selected sites in similar habitat in late 2005 and early 2006 (Dudek 2006c). Despite two successive years of drought following transplantation, there was a success rate of 69% in 2005–6, 34% in 2006–7, and 93% in 2007–8 (Dudek 2007b, 2007c; Thomson 2008). Of particular interest is documentation of the success of seeding efforts. Each year for the first three years of the program, persisting juveniles from the

seeding efforts were documented. Some of this success is attributable to adaptive management measures, wherein during extreme drought conditions in the first and second years, some supplemental hand-watering of the plots occurred. By comparison, almost no naturally occurring *Calochortus* in the nearby reference population were observed in 2005–6, none were observed in 2006–7, and approximately 75% of known individuals were observed flowering in 2007–8. The number of individuals observed each year has corresponded with rainfall amounts, with declining numbers in low rainfall years, and increasing numbers in higher rainfall years.

2.5 Backup Contingency Measures

The Mitigation Program will utilize an adaptive management approach, wherein, during the 5-year monitoring period, if problems affecting the survival and/or successful establishment of slender mariposa lily are detected, then corrective measures will be implemented. For example, if during the 5-year monitoring period rainfall is significantly below average during the growing season for slender mariposa lily (as determined by the qualified biologist), supplemental water may be supplied to the receptor sites in order to help sustain the population and mimic average rainfall conditions. Additional backup contingency measures may be implemented as unforeseen issues arise that could potentially affect the success of the Mitigation Program.

The Mitigation Program will likely occur over a several year period, as the build-out of the Specific Plan area occurs. During that time, it will become apparent if initial efforts are failing. Slender mariposa lily seed will be collected from source populations (impact areas and/or preserve areas, as appropriate) and used to supplement plants at the receptor sites. Due to the high annual variability of floral and seed production in this species, slender mariposa seed will be collected during a "good" year and stored in appropriate conditions to be used as a propagule source when necessary. Viability of slender mariposa seed is for a relatively short period when stored at room temperature. The viability of stored seed can be significantly lengthened by storage at freezing temperatures.

Slender mariposa lily may also be grown from seed into bulbs that can be planted at selected receptor sites. Because it can take several years to grow a seed into a bulb, seed propagation will begin early in the Mitigation Program (e.g., as soon as seed is salvaged from the proposed development area). If the seed source from individuals from the project site is exhausted, slender mariposa lily seed will be harvested from individuals within the preserve area in the High Country SMA. Slender mariposa lily will be grown from seed at a native plant nursery. In the event that the initial planting effort is not successful and the success criteria have not been met, then slender mariposa lily propagated at a nursery from seed may be transplanted to appropriate receptor sites at the appropriate time of year (fall or early winter). Transplantation of propagated

plants will only occur when the condition of the plants is considered satisfactory by the qualified biologist.

3.0 SALVAGE AREA AND RECEPTOR SITE DESCRIPTIONS

3.1 Slender Mariposa Lily Salvage Areas

The salvage areas are where slender mariposa lily occurs within the impact footprint of the proposed development. Slender mariposa lily occurs in the project site on slopes and ridgelines in native California sagebrush scrub in the Specific Plan area, the Entrada project area, and the VCC project area (Figure 3).

During surveys for special-status plants conducted in 2002, 2003, 2004, 2005 and 2006, slender mariposa lily individuals were found on site and mapped (Dudek and Associates 2002, 2004a, 2004b, 2006a, and 2006b). The number of individuals of this species detected varies every year due to natural population phenology (i.e., natural population increase and decrease cycles and their reliance on rainfall to bloom); therefore, it is unknown what percentage of the total occurrence of slender mariposa lily onsite is represented by the observed individuals. Based on the multiple years of survey information, and upon the proposed project design, it has been estimated that a maximum of 72 acres of cumulative occupied area are within the development footprint.

3.2 Slender Mariposa Lily Receptor Sites

Receptor sites will be located within the High Country SMA in the Specific Plan area, and within the Salt Creek area to the south and west of the RMDP area. The High Country SMA is located in Los Angeles County along the border with Ventura County and west of the City of Santa Clarita. The Salt Creek area is located adjacent to the High Country SMA on the west within Ventura County. Environmental conditions at the receptor site are appropriate for slender mariposa lily, evidenced by the fact that this species naturally occurs at this location. Other appropriate receptor sites may be selected with concurrence from the County and CDFG.

Approximately 500 acres of potentially suitable areas for planting slender mariposa lily were identified in the Draft Newhall Ranch Mitigation Feasibility Study (Dudek 2007a). Out of this total acreage, 87 acres were identified as having the combined potential to restore California sagebrush scrub habitat and plant slender mariposa lily. As habitat enhancement/restoration is a requirement of the Mitigation Program, the areas where both California sagebrush scrub enhancement/restoration and slender mariposa lily planting can occur will be prioritized. All planted seed and any transplanted bulbs will be located within suitable habitat for slender

mariposa lily adjacent to or near existing populations of slender mariposa lily in the High Country SMA and Salt Creek area (Figure 2). General planting areas will be designated prior to or during the blooming period for slender mariposa lily during the planting year so that existing slender mariposa lily individuals can be located and marked for avoidance. Specific planting locations will be determined in the field by the qualified biologist. The receptor sites will be marked with stakes and recorded by a global positioning system (GPS) in the field to facilitate relocation during the monitoring period. The receptor sites will remain as open space in perpetuity.

4.0 IMPLEMENTATION PLAN

4.1 Phase 1 – Habitat Enhancement/Restoration

The first phase of the Mitigation Program will be to enhance/restore suitable vegetation communities within the designated receptor sites prior to the introduction of slender mariposa lily. The primary vegetation community will be California sagebrush scrub, as this is the predominant community where slender mariposa lily occurs within the proposed development area. The species composition of this vegetation community will include native grasses and other native grassland species to occupy, in part, the shrub understory and interstices. Ultimately, the enhanced/restored vegetation community may include California sagebrush scrub with patches of native grassland.

4.1.1 Site Preparation – Phase 1

The majority of areas to be enhanced/restored consist of a predominance of non-native grasses and weedy forbs. There is likely an extensive non-native species seed bank present in most of these areas, and competition from aggressive non-native species will likely be the most significant challenge to successful habitat restoration. Therefore, site preparation will include an extended weed control period to minimize the competitive weed seed bank, as necessary. The weed control period will occur over the course of the first rainy season, and will include repetitive weed control events as weeds continue to germinate and grow. Additionally, in areas where access to irrigation and system set-up is feasible, installation and operation of an irrigation system will be used to encourage weed seed germination and growth that will extend the weed control period through the first year. Site preparation activities are detailed below.

- Areas designated as receptor areas will be cleared of all non-native vegetation, including thatch and duff. Depending on access, slope and terrain, the initial clearing may occur with hand crews or machinery. The cleared material will be removed from the site and disposed of properly.
- An initial weed control period will be implemented to control non-native species. During the initial weed control period, weeds will be controlled prior to seed set. Weed control methods will

include manual, mechanical and chemical treatment techniques, depending on species, season and specific site conditions.

- Erosion and sediment control materials will be installed in cleared areas to control erosion and the loss of sediment during the rainy season.

4.1.2 Habitat Restoration/Enhancement

After the site preparation activities are complete, the designated sites will be planted with native seed and/or container plants to encourage habitat establishment. Depending on particular site circumstances, a variety of planting techniques may be used, including hand seeding, hydroseeding, seed imprinting, transplanting, and container plant installation. The target vegetation community will be California sagebrush scrub, with variations or subtypes as appropriate. Specific plant composition for each receptor site will be based on reference habitat in the vicinity, but in general will include common dominant sage scrub elements such as California sagebrush (*Artemisia californica*), purple sage (*Salvia leucophylla*), black sage (*Salvia mellifera*), California buckwheat (*Eriogonum fasciculatum*), and deerweed (*Lotus scoparius*). Additionally, herbaceous and nurse crop species will include common species in the region, such as purple needlegrass (*Nassella pulchra*), foothill needlegrass (*Nassella lepida*), miniature lupine (*Lupinus bicolor*), tidy-tips (*Layia platyglossa*), California poppy (*Eschscholzia californica*), California brome (*Bromus carinatus*) and common goldfields (*Lasthenia californica*), among others. Plants and seed will be installed with standard native habitat restoration techniques. Specific details regarding planting methods, plant spacing, quantities, plant sizes, planting palettes, source locations, etc. will be outlined in the final RMDP Slender Mariposa Lily Mitigation and Monitoring Plan.

4.2 Phase 2 – Slender Mariposa Lily Introduction

The second phase of the Mitigation Program will be to introduce slender mariposa lily into the receptor sites. This will occur after two conditions have been met: 1) Percent cover and species richness of native species reach 50 percent of the cover and species richness at undisturbed occupied slender mariposa lily habitat at reference sites, and 2) the restored habitat has persisted at least one summer without irrigation. Introductions of slender mariposa lily will use source material (seed or bulbs) from no more than 1.0 mile distant and no more than 500 feet elevational distance from the receptor site, unless otherwise approved by CDFG.

4.2.1 Site Preparation – Phase 2

Site preparation for the second phase of the Mitigation Program will begin in the fall of the planting year. Site preparation activities are detailed below.

- The areas where slender mariposa lily are known to occur on site within the development footprint will be marked in the field and fenced with temporary construction fencing until the slender mariposa lily plants can be removed from the site. Ideally, these locations will be marked in the field during the blooming period to facilitate an accurate delineation of specific salvage areas.
- Individual slender mariposa lily plants will be marked in the field, both at the salvage areas and the receptor sites, during the blooming period in the spring prior to the year of planting, which is estimated to be during April and/or May (but may be done earlier or later depending on floral development). At the salvage areas, individual slender mariposa lily locations will be marked with a pin flag. Additionally, a small strip of flagging tape may be tied to the base of the stem of individuals to facilitate relocation for salvaging after the plants have gone dormant. At the receptor site, areas where individuals and/or groups of individuals occur will be flagged so that they can be avoided during planting activities.
- In order to ensure that the individuals occurring within the project site bloom in the following spring (so that their specific locations can be marked in the field for salvaging purposes), supplemental water may be recommended and applied to the area during extended periods without precipitation at critical times during the growing period for this species.
- Planting plots will be designated at the receptor sites. The qualified biologist will determine appropriate planting locations within the receptor sites based on biological conditions important to the survival of the planted individuals (e.g., soils, slope, and aspect) and on the existing locations of slender mariposa lily. The plots will be established within small openings in the restored habitat.
- Any non-native plant species that are potentially invasive and/or pose a threat to the establishment, development, or persistence of slender mariposa lily will be controlled prior to planting.
- All equipment maintenance, staging, dispensing of fuel or oil, or any other such activities will occur in designated upland areas.

4.2.2 Salvaging and Planting Slender Mariposa Lily

The following general methods are proposed for the salvaging and transplantation of slender mariposa lily:

- Slender mariposa seed will be planted in plots within the receptor sites. The plots may be various sizes, but a typical planting plot will measure approximately 2 feet by 2 feet. Detailed notes about planting locations will be kept by the qualified biologist to enable follow-up monitoring. The plots will be distributed in natural openings in the habitat at the receptor site. Seeded plot areas will be prepared by removing all weedy debris, scarifying the soil to approximately 1 inch in depth and sowing the seed at 0.25 to 0.50 inch in depth. The soil scarification will be done by small rototiller, shovel, and/or rake, and the seeding will be done by hand.
- Prior to salvaging any slender mariposa lily bulbs at the salvage areas, seeds will be collected from flagged individuals once the seed has matured, but prior to the seed capsules opening to disperse the seed. Seed will be stored in breathable paper bags in a cool, dry, and dark place until planted at the receptor site or used for nursery propagation. After seeds are completely dried out, seed storage in the freezer has been determined to extend the length of seed viability (Andrew Thomson, personal communication).
- Special seed collections from preserved occurrences of slender mariposa lily will be arranged as necessary to acquire the necessary amount of seed for planting, and to meet maximum source distance and elevation variances recommended by CDFG.
- A portion of the collected seeds may be transported to an appropriate native plant nursery facility to begin seed propagation as a backup contingency measure. Seed shall be grown in a nursery setting at a minimum equivalent to 10% of the populations impacted as a contingency measure. The remainder of the seed will be retained for planting within the receptor sites and for long-term storage for future use.
- Slender mariposa lily bulbs may also be salvaged from known locations within the project limits of grading. A backhoe, digging spade, or shovel will be used to salvage bulbs, depending on access constraints and the number of individuals at each particular location.
- An attempt will be made during bulb salvage to collect the bulbs with their surrounding soil and associated biomass intact. Due to the soil type found on site, the soil may not stay consolidated as a solid mass. If soil masses will not stay consolidated, the bulbs will be collected separate from the soil and stored in appropriate storage conditions (cool, dark and dry location) until planted at the receptor site.
- After the bulbs have been removed from the salvage areas, a crew of laborers will sort through the remaining disturbed soil to locate any remaining bulbs exposed during salvaging.

- The soil from areas where slender mariposa lily bulbs were abundant may be salvaged. The top 8 to 12 inches of soil may be removed and then spread 6 to 8 inches deep at planting locations within the receptor sites.
- If slender mariposa lily bulbs are detected during the excavation of receptor sites or in disturbed soils within the salvage areas, they will be planted at the receptor sites at the appropriate soil depth during the transplantation process.
- Salvaged bulbs will be planted at the receptor site in plots. The plots may be various sizes, but a typical planting plot will measure approximately 2 feet by 2 feet with 9 salvaged bulbs planted in each plot. Planted bulbs will typically be arranged in a grid pattern to facilitate monitoring; however, alternative configurations may be used, as appropriate. Detailed notes about planting locations will be kept by the qualified biologist to enable follow-up monitoring. The plots will be distributed in natural openings in the habitat at the receptor site.
- Bulbs will be planted at a depth of approximately 2 to 6 inches (depending on the size of the bulb). Smaller bulbs will be planted shallower and larger bulbs will be planted deeper. Bulbs will be oriented correctly (roots down, stem up) in the soil during planting.
- Herbivore-exclusion fencing may be installed surrounding planting plots or groups of planting plots to prevent plant herbivory. Herbivore-exclusion fencing will be constructed of poultry netting (or similar) and will be installed at least 18 inches below ground surface and will extend to approximately 30 inches above ground level. Herbivore-exclusion fencing may also be installed to cover the top of each plot.
- Markers will be installed and maintained at each plot at the slender mariposa lily receptor site locations to identify the planted slender mariposa lily locations during the 5-year long-term maintenance and monitoring period. The markers may consist of 2-inch by 2-inch by 24-inch wooden survey hub stakes, or equivalent, driven into the ground next to each plot. The plot locations will also be recorded with a GPS after planting to facilitate relocating the plots for monitoring and reporting in subsequent years.
- Receptor sites will be watered-in to prevent the formation of cracks and air pockets in the soil. Approximately 1 week after the initial planting period, additional native soil will be spread to fill in gaps or depressions if they form after the soil has settled, and the area will be watered in a second time.
- If seasonal rains are inadequate to keep the soils moist through the first growing season, supplemental irrigation may be supplied to the receptor sites as determined by the qualified biologist. Supplemental irrigation will be conducted on an as-needed basis

approximately every 2 to 4 weeks during the initial growing season, depending on natural rainfall, temperatures, and day length.

4.3 As-Built Conditions

The GPS locations of each plot within the receptor area will be overlaid on an aerial image of the site to document the final plot layouts. The County and CDFG will receive copies of this plot map as part of the initial completion report. The plot map will also serve as a record that will be used for reporting and management purposes during long-term biological monitoring.

5.0 MAINTENANCE PLAN DURING 5-YEAR MONITORING PERIOD

The goal of the Mitigation Program is primarily to sustain the introduced slender mariposa lily. The primary effort of the maintenance program will be concentrated in the first season of growth to help offset the negative effects of site disturbance, non-native weed competition, and exotic invasive plant competition at the slender mariposa lily receptor sites. Subsequent seasons should require less intensive maintenance as the vegetation reaches a state of equilibrium, but persistent weed control of invasive exotic weeds will likely be required. Maintenance issues are described in more detail below.

Weed Control

Weed control within the slender mariposa lily receptor sites should be conducted on a regular basis during the long-term maintenance and monitoring period. Maintenance should be conducted monthly during the growing season (November to May) of the first year and four times annually thereafter until the end of the 5-year maintenance and monitoring period. Weed growth and prevalence will be assessed by the biological monitor and remedial weeding will be directed and completed as necessary based on seasonal conditions.

Target non-native species selected for control in this plan include those non-native plant species that are potentially invasive and/or pose a threat to the establishment, development, or persistence of slender mariposa lily. The primary target species will be those identified and listed by the California Invasive Plant Council in the *California Invasive Plant Inventory* which is available online (Cal-IPC 2006).

Measures to control exotic invasive plant species will consist of the complete removal of selected non-native vegetation (i.e., seed heads, stems, roots). All debris and slash generated from the weed-removal activities will be disposed of off site in a legally acceptable manner.

Weed-control measures will include the following: (1) hand-removal, (2) mechanical removal (e.g., cutting with weed whip machines, hoeing), and (3) herbicide application. The method of weed control will be based on the most effective method for the species being targeted and the stage of plant development. In general, hand-removal of weeds is the preferred method of control, with other methods implemented as necessary. Weeds will be controlled when plants are young (i.e., 6 to 10 inches tall) and prior to the formation of seed heads. The maintenance contractor should coordinate with the project biologist to identify specific locations within the site where chemical herbicide treatments would be acceptable. All herbicide treatments must be specified by a licensed pest control advisor and applied under the direction of a licensed pest control applicator.

Fencing

Herbivore-exclusion fencing will remain in place, and repaired as necessary, to effectively protect the subpopulations of slender mariposa lily from browsing as well as act as a deterrent to inadvertent trampling.

Seeding

Supplemental seeding may be recommended by the qualified biologist to prevent potential erosion and to encourage native species establishment. If seeding is recommended, an appropriate native seed mix will be specified by the qualified biologist, and may include the following proposed plant species:

- Black sage (*Salvia mellifera*)
- California brickellbush (*Brickellia californica*)
- California brome (*Bromus carinatus*)
- California buckwheat (*Eriogonum fasciculatum*)
- California encelia (*Encelia californica*)
- California poppy (*Eschscholzia californica*)
- California sagebrush (*Artemisia californica*)
- Common goldfields (*Lasthenia californica*)
- Deerweed (*Lotus scoparius*)
- Foothill needlegrass (*Nassella lepida*)
- Miniature lupine (*Lupinus bicolor*)
- Purple needlegrass (*Nassella pulchra*)

- Purple sage (*Salvia leucophylla*)
- Tidy-tips (*Layia platyglossa*).

Trash and Debris

All non-organic trash and debris will be removed from the site on a regular basis during maintenance visits.

Erosion Control

The site will be monitored for erosion problems and measures will be taken, as necessary, to help prevent erosion within all plot locations and within all seeded areas.

Access Control

The mitigation areas will be checked regularly during scheduled maintenance visits for evidence of human disturbance, including off-road vehicle use, illegal dumping, vandalism, pedestrian access, and unauthorized brush clearing.

Supplemental Irrigation

The soils at the receptor sites will be monitored for moisture during the growing season. If soil moisture levels appear inadequate to support slender mariposa lily during the growing period, particularly during the first 2 years of the 5-year maintenance and monitoring period, supplemental irrigation may be supplied to the planted slender mariposa lily plants if recommended by the qualified biologist in coordination with Newhall Land.

6.0 MONITORING PLAN DURING 5-YEAR PERIOD

Biological monitoring of the planted slender mariposa lily plants during the 5-year maintenance and monitoring period will measure the establishment of the slender mariposa lily and evidence of species health and proliferation. Field-collected data will provide a quantitative measure of the survival and establishment of the slender mariposa lily subpopulations and flowering/seed production each year. Monitoring will likely rely on observations of flowering individuals, which are easier to locate and identify than non-flowering individuals. However, because the flowering of this species is so variable from year to year, monitoring will also include observations of vegetative growth (leafing out). Monitoring will occur in the winter and spring of each year during the growing season and while the slender mariposa lily is in bloom. Additional monitoring at the site may occur periodically throughout the year to determine the need for maintenance to protect the planted slender mariposa lily plants from weed invasion or other disturbances.

6.1 Receptor Site Monitoring Methods and Schedule

Biological monitoring will be conducted by the qualified biologist to determine the status of the slender mariposa lily plants (through periodic monitoring and collection of quantitative data) and the need for any remedial measures. This work will include a quantitative biological assessment each year, to be timed during the growing season and with the flowering of slender mariposa lily, and qualitative assessments to assess overall site conditions and maintenance activities (Table 1).

Table 1
Receptor Site Monitoring Schedule

		Status/Completed																							
		Yr. 0				Yr. 1				Yr. 2				Yr. 3				Yr. 4				Yr. 5			
		Quarter				Quarter				Quarter				Quarter				Quarter				Quarter			
Phase	Task Description	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Salvaging & Transplantation Phase	Flag existing slender mariposa lily plants		X																						
	Collect slender mariposa lily seed		X	X																					
	Salvage slender mariposa lily bulbs				X																				
	Transplant slender mariposa lily bulbs				X																				
	Install protective fencing				X																				
	Prepare final map & installation completion report				X																				
Maintenance Phase	Weed control – Monthly during growing season of the first year, four times per year thereafter				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Monitoring Phase	Biological monitoring/data collection				X	X	X			X	X			X	X			X	X			X	X		
Site Protection	Verify fencing & make repairs				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reporting	Prepare year-end reports								X				X				X				X				X
Remedial Measures	To be determined each year and at end of monitoring period								X				X				X				X				X
Final Sign-Off**	County and CDFG to verify site conditions																								X

* The actual date/timing for final sign-off by the County and CDFG will be based upon actual achievement of success criteria.

The purposes of the monitoring visits will be to document weed problems, site security and maintenance issues, and the growth, flowering, and seed production of slender mariposa lily

within the receptor sites. At each monitoring visit, the following measurements and observations will be made, as applicable.

- **Observation of evidence of vegetative growth.** Floral structures are needed to conclusively verify that the presumed vegetative growth is in fact slender mariposa lily. However, experienced biologists can often identify mariposa lily in general from vegetative growth only, particularly if the individual planting locations are known. Observation of vegetative growth is better accomplished in the winter or early spring, before leaf shoots begin to senesce. After successive years of monitoring and with knowledge of the known locations of planted slender mariposa lily, it will be possible to estimate the number of individuals present by examining vegetative growth.
- **Observation of flowering and seed production.** All flowering individuals observed within the receptor areas will be counted. Biological monitoring during the blooming period may require multiple visits because there is often an extended blooming period (several weeks) during which time flowering is staggered (i.e., some individuals may have open flowers and be easily detected, while other individuals may have closed flowers or flowers in bud and go undetected). Additionally, the peak blooming period varies from year to year; therefore, multiple visits will aid in capturing a more accurate estimate of flowering individuals. All flowering individuals detected during the monitoring periods will be recorded on data sheets.
- **Reference site monitoring**. In addition to monitoring the planted slender mariposa lily, reference site monitoring will be conducted in the adjacent or nearby undisturbed slender mariposa lily populations. A fixed area (reference site) will be demarcated, wherein all flowering individuals detected will be counted during the annual data collection period to provide comparison data. This will provide consistent, year-to-year data on a discrete portion of the existing population, which will be useful for statistical purposes.
- **Photo-documentation.** Representative photographs will be taken from fixed points within the receptor sites as well as the reference site, including overall and close-up views, from fixed viewpoints, and from representative plots, allowing year-by-year comparison during the monitoring period.
- **Monitor soil moisture and rainfall patterns.** Rainfall patterns and weather forecasts will be researched and soil moisture levels on site will be evaluated to determine if supplemental irrigation is necessary. If it is determined that precipitation during the growing period has been inadequate to support the planted slender mariposa lily, particularly during the first 2 years of the 5-year maintenance and monitoring period,

supplemental irrigation may be recommended, as determined by the qualified biologist in coordination with Newhall Land.

- **General preserve monitoring.** Observations will be made of the general status of fencing, signage, perimeter control (trespass), erosion control, litter, and weeds.

6.2 Annual Reports

An annual monitoring report will be prepared in the fall/winter of each year of the 5-year maintenance and monitoring period, summarizing the information collected during the yearly site visits. Data will be summarized in tabular format where feasible. Each annual report will present the monitoring methods and a description of the current conditions of the receptor sites, and will provide copies of field maps and data sheets, representative photographs, monitoring results, regional precipitation measurements for the year, an analysis of success and/or failure for all portions of the project, and recommendations for future maintenance and possible remedial measures or contingency plans, if necessary.

A discussion of any existing or future potential impacts to the planted slender mariposa lily that are known to the qualified biologist or that may occur as a result of human activities and environmental conditions also will be included. A status report will be provided to the County and CDFG by the end of each calendar year during the maintenance and monitoring period. A final, end-of-the-project monitoring report will be filed with the County and CDFG upon achievement of success criteria and final acceptance will be considered at that time.

7.0 COMPLETION OF MITIGATION AND PERFORMANCE CRITERIA

At the end of each year, the qualified biologist will inform Newhall Land, the County, and CDFG of the progress of the project. When the long-term maintenance and monitoring period is complete, or sooner if the success criteria are achieved early, the County and CDFG will be invited to review the conditions of the receptor sites and to document the status of the planted slender mariposa lily. Final performance criteria are included below in Table 2.

Table 2
Performance Criteria – Slender Mariposa Lily Mitigation Program

Feature	Criteria	Monitoring Frequency	Findings	Action
Habitat restoration / enhancement	Restore/enhance habitat suitable for the occupation of slender mariposa lily at a ratio of 1:1 of that impacted by the development project.	Quarterly for a period of at least two years	Percent cover and species richness at least 50% of natural undisturbed reference habitat and site unirrigated for at least one summer.	Requires site preparation, planting and maintenance. When successful, introduce slender mariposa lily.
Slender mariposa lily seed collection	Collect seed for use at receptor sites and for back-up contingency. Comply with California Native Plant Society seed collection criteria.	Ongoing monitoring of seed collection activities	Quantity of seed collected is of an adequate amount for seeding at receptor sites and for back-up contingency storage	Monitor timing of seed maturation so seed is collected when mature, but prior to dispersal. Ensure proper seed storage conditions.
Slender mariposa lily seeding	Apply seed in appropriate locations as described in plan.	Spring of each year (December–March for vegetative growth; April-May if flowering)	Demonstrated ability to persist at the receptor site by exhibiting evidence of vegetative growth and/or flowering	Monitor seedling success during regularly scheduled monitoring visits. Report results in annual monitoring reports.
Slender mariposa lily bulb salvaging	Salvage slender mariposa lily individuals from within the project limits of grading.	Ongoing monitoring of salvaging operations	Estimate total number of individuals salvaged.	Ensure proper storage of salvaged bulbs until they can be planted at receptor sites
Slender mariposa lily transplantation	Transplant salvaged bulbs and associated soil.	Ongoing monitoring and verification of work	Notify County and CDFG of number salvaged and planted.	Install all bulbs at the predetermined receptor locations according to this plan.
Slender mariposa lily survival (bulbs and seeds)	A minimum 1:1 ratio of the quantity of individuals impacted producing vegetative growth during any of the last 3 years over the 5-year monitoring period	Spring of each year (April–May)	Demonstrated ability to persist at the receptor site by exhibiting evidence of vegetative growth and/or flowering	If successful, program complete. If not, remedial measures or additional maintenance and monitoring are to be implemented, if required.

Table 2 (Continued)

Feature	Criteria	Monitoring Frequency	Findings	Action
Slender mariposa lily seed propagation at a native plant nursery	Slender mariposa lily seed will be collected from the proposed project area and propagated at a native plant nursery (equivalent to a minimum of 10% of the impacted population). If it is determined that the success criteria are not being met, propagated plants may be planted at the receptor sites.	Coordinate propagation at a native plant nursery.	Document total amount of seed delivered and total bulbs obtained after propagation.	Plant propagated bulbs at receptor site during long-term monitoring period.
Maintenance, weed control, fencing / protection, and monitoring of herbivory	Remove invasive weeds from around and within slender mariposa lily receptor sites. Invasive perennial weeds not to exceed 10% cover at any time during the maintenance and monitoring period. Keep herbivore-exclusion fencing in place and functional. Check for rodent problems.	Monthly during the first-year growing period, quarterly thereafter until the end of the 5-year long-term maintenance and monitoring program	Verify weed maintenance and site protection. Assess herbivory on slender mariposa lily subpopulations.	Take remedial measures and/or make repairs as needed. Control invasive weed species throughout entire 5-year program.

An adaptive management approach has been established in this plan and will be utilized for the 5-year maintenance and monitoring period, wherein backup contingency measures (such as providing supplemental water or planting nursery-grown individuals) will be initiated if it appears as though the project may not meet the established success criteria. In the unlikely event that the project has failed to sustain the planted slender mariposa lily during the 5-year maintenance and monitoring period, the County and CDFG will be consulted to determine contingency measures to be implemented to compensate for the failure of the program, if required.

8.0 LITERATURE CITED

Cal-IPC (California Invasive Plant Council). 2006. *California Invasive Plant Inventory*. Berkeley, California: California Invasive Plant Council. February 2006. http://www.cal-ipc.org/ip/inventory/index.php

Dudek and Associates, Inc. 2002. *2002 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area, Los Angeles County, California*. Prepared for the Newhall Land and Farming Company. November 20, 2002.

Dudek and Associates, Inc. 2004a. *2003 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area, Los Angeles County, California*. Prepared for the Newhall Land and Farming Company. June 2004.

Dudek and Associates, Inc. 2004b. *2004 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area, Los Angeles County, California.* Prepared for the Newhall Land and Farming Company. October 2004.

Dudek and Associates, Inc. 2006a. *2005 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area, Los Angeles County, California*. Prepared for Newhall Land. June 2006.

Dudek and Associates, Inc. 2006b. *2006 Sensitive Plant Survey Results for Newhall Ranch Specific Plan Area, Los Angeles County, California*. Prepared for Newhall Land. October 2006.

Dudek. 2006c. *First Annual Monitoring Report for the RiverVillage (Riverpark) Slender Mariposa Lily and Plummer's Mariposa Lily Transplantation Project*. Prepared for Newhall Land. September 2006.

Dudek. 2007a. *Draft Newhall Ranch Mitigation Feasibility Report*. Prepared for the Newhall Land and Farming Company.

Dudek. 2007b. Site Observation Report for RiverVillage Calochortus translocation. Report 8. January 16, 2007.

Dudek. 2007c. Site Observation Report for RiverVillage Calochortus translocation. Report 14. April 25, 2007.

Dudek. 2008. *Draft Newhall Ranch Resource Management and Development Plan.* Prepared for the Newhall Land and Farming Company. October 2008.

Thomson, A. 2008. Personal observation of lily monitoring results by Andy Thomson (Dudek) at RiverVillage project site, October 7, 2008.