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Acronym List

Cal-IPO	California Invasive Plant Council
CDFA	California Food and Agriculture
CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Database
FONR	Fort Ord Natural Reserve
GIS	geographic information system
GPS	global positioning system
GWETS	groundwater and extraction and treatment system
HLA	Harding Lawson Associates
OU-1	operable unit 1
NRRP	Natural Resource Protection Plan
TCE	trichloroethene
VOC	volatile organic compound
USFWS	U.S. Fish and Wildlife Service

SECTION 1

Introduction

Proposed remedial activities in Operable Unit-1 (OU-1) of the former Fort Ord military base in Monterey County, California, have the potential to impact plant species and habitat. Therefore, these impacts will be monitored while remedial activities are underway, and afterward to monitor and document impacts to rare plants and habitat. Rare plant surveys were conducted in May 2005 to demarcate the locations of two federally-listed plant species and monitoring plots were established in areas proposed for impact and in reference locations. Vegetation data were collected in June 2005 within monitoring plots to assess pre-project plant species cover. Surveys were conducted in selected work areas/remediation sites and will provide baseline data for comparison. The locations of the survey areas are shown in Figure 1. These data supplement the rare plant surveys conducted elsewhere within OU-1, in 2004 (CH2M HILL 2004).

Activities conducted at the former Fort Ord OU-1 between 1962 and 1985 resulted in the release of contaminants to soils and groundwater. Although 10 separate volatile organic compounds (VOCs) were identified as contaminants of concern in groundwater underlying OU-1, trichloroethene (TCE) is the contaminant that was detected at the highest concentrations and across the greatest extent of the affected aquifer. A groundwater extraction and treatment system (GWETS) was constructed in 1988 to remediate TCE and other groundwater contaminants. Despite the steady overall decline in contaminant levels, the need for re-evaluation and expansion of the GWETS became apparent in 1997 when contaminants were detected in groundwater downgradient from the extraction zone. The proposed system expansion will consist of new extraction wells and installation of additional capacity to treat the increased flow volume. Infiltration trenches, possibly augmented by injection wells, will be used to return treated groundwater to the aquifer.

1.1 Property History and Location

Fort Ord was established in 1917 as a military training base for infantry troops. The former Fort Ord is located near Monterey Bay approximately 80 miles south of San Francisco. The base encompasses approximately 28,000 acres near the cities of Seaside, Sand City, Monterey, Del Rey Oaks, and Marina. Monterey Bay marks the western boundary of the former Fort Ord. Toro Regional Park borders the base to the southeast and land use to the east is primarily agricultural.

In January 1991, the Secretary of Defense announced the downsizing/closure of the base. In August 1994, portions of the property were transferred to the University of California and the 605-acre Fort Ord Natural Reserve (FONR) was established in June 1996.

OU-1 occupies approximately 590 acres of the FONR in the southwestern corner of the former Fritzsche Army Airfield, west of Imjin Road and north of Reservation Road. The dominant habitats in this area include coast live oak woodland, maritime chaparral, and annual grassland. The history of the site is presented in detail in the *Draft Operable Unit 1*

Project Management Plan, Fritzsche Army Airfield Fire Drill Area, Former Fort Ord, California (HydroGeoLogic, 2004).

1.2 Protected Plant Species in Study Area

Two federally-listed plant species, sand gilia (*Gilia tenuiflora* ssp. *arenaria*) and Monterey spineflower (*Chorizanthe pungens* var. *pungens)* and other special-status plants occur at the FONR. Species that are federally-listed as endangered are those plant species, subspecies, or varieties that are in danger of extinction throughout all or a significant portion of their range. Federally threatened species are those plant species, subspecies, or varieties that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. These plants are considered "federally-listed" or "listed" because a final rule on their status has been published in the Federal Register.

In addition to the federally-listed sand gilia and Monterey spineflower, several special-status plants occur at FONR. Special-status species is a broad category that includes plants and animals with different status codes based on the degree of rarity for each species. The term special-status includes species that are:

- Federally-listed as threatened or endangered
- Not federally-listed, but may meet the qualifications of listing under the state and/or federal Endangered Species Acts
- A state or federal species of concern
- Naturally rare or restricted in their distribution
- Associated with limited or declining habitats

The special-status plant species that occur at FONR include Monterey manzanita (*Arctostaphylos montereyensis*), sandmat manzanita (*Arctostaphylos pumila*), Monterey ceanothus (*Ceanothus cuneatus* var. *rigidus*), Eastwood's goldenbush (*Ericameria fasciculata*), and coast wallflower (*Erysimum ammophilum*) (CH2M HILL, 2004). None of these special-status species are federally-listed.

The objectives of these surveys were to map the locations of the federally-listed sand gilia and Monterey spineflower within areas not previously surveyed, and obtain baseline information on plant cover within permanent monitoring plots within selected areas of OU-1. These data will provide a basis by which post-remedial site conditions can be compared so that impacts can be evaluated and mitigated, if necessary. Information on other special-status plant populations that may be present at OU-1 was not collected and is not provided in this report. Detailed species descriptions for those two plant species that were monitored—sand gilia and Monterey spineflower—are provided below.

1.2.1 Sand Gilia

Sand gilia is a small annual in the phlox family (*Polemoniaceae*) (see Figure A-1, contained in Appendix A). Plants range in height from two to six inches with a small, basal rosette of leaves. The lower branches of the stem generally are densely glandular, and they often have

a cobwebby base. Plants typically bloom from April through June and have funnel-shaped flowers with narrow, purple to pinkish petal lobes and a purple throat. This species occurs in open sandy soils in dune scrub, coastal sage scrub, and maritime chaparral habitats. The sand gilia is a seral species that has adapted to periodic disturbance and shifting sands (Harding Lawson Associates [HLA], 1998). Sand gilia is endemic to Monterey Bay and the peninsular dune complexes. A search of the California Natural Diversity Database (CNDDB) revealed that there are 29 occurrences of sand gilia within Monterey County, 26 of which are presumed extant, including the occurrences at Fort Ord (California Department of Fish and Game [CDFG], 2005). CNDDB reports on the known occurrences of sand gilia are included in Appendix B.

1.2.2 Monterey Spineflower

Monterey spineflower is a small, prostrate annual in the buckwheat family (*Polygonaceae*) that blooms from April to June (see Figure A-1 in Appendix A). The white to rose floral tube of Monterey spineflower distinguishes it from the more common, but closely related diffuse spineflower (*Chorizanthe diffusa*), which has a lemon-yellow floral tube. Monterey spineflower typically occurs on open sandy or gravelly soils in coastal dune, coastal scrub, and maritime chaparral habitats. Similar to the sand gilia, the Monterey spineflower has adapted to periodic disturbance. There are 19 records of Monterey spineflower in Monterey County, all presumed to be extant (CDFG, 2005; Appendix B). The largest known population occurs on lands associated with the former Fort Ord military base where the plants typically occur along roads, in sandy openings between shrubs and other areas of disturbance (U.S. Fish and Wildlife Service (USFWS), 1998).

SECTION 2

Methods

CH2M HILL biologists inventoried and mapped populations of sand gilia and Monterey spineflower within selected areas of OU-1 (as shown on Figure 1). Rare plant surveys were conducted between May 16 and May 20, 2005. In addition, 25 vegetation monitoring plots were installed, and photographs were taken at 34 permanent photo-station locations. Invasive weed monitoring was conducted within the established plots on June 23, 2005. CH2M HILL staff performing or overseeing the surveys were: Amy Hiss, Aviva Rossi, Michael Clary, and Russell Huddleston.

Rare plant monitoring was initially planned to include ten 10 X 10 meter plots, with six plots located in remedial action areas and four plots located in reference locations. Monitoring of rare plants was to follow methods developed and used by FONR. On May 15, 2005, Sean McStay from the FONR met with the CH2M HILL biologists in the field to describe in detail monitoring protocols using one of the existing FONR monitoring plots (McStay, 2005).

It was noted during this training session that much of the sand gilia was no longer in flower and therefore obtaining accurate counts of individuals for this species would not be possible. The majority of the potential direct impacts of the remediation project would be associated with the installation of the pipeline, adjacent to the existing main roadway. It was therefore determined that the large monitoring plots (10 X 10 meters) were impractical for the configuration of the proposed remedial action areas. The following day, Amy Hiss of CH2MHill contacted Dr. Maggie Fusari, Director of the University of California Santa Cruz Natural Reserve program, by telephone to discuss how best to collect rare plant and invasive species data given the constraints of seasonal timing and limited area in which to locate large monitoring plots. Based on consultation with Dr. Fusari, it was determined that the emphasis of the rare plant monitoring should focus on determining the spatial extent of plant populations, rather than actual plant numbers (Fusari, 2005). It was also determined that given the configuration of the remediation area, smaller plots would be better suited for monitoring remedial action areas (e.g. the proposed pipeline route) and selected off-road and reference locations. Consequently, the number of monitoring plots was increased from 10 to 25 and the size of each plot was reduced to 1 X 2 meters.

Survey areas included Area A, the proposed pipeline route, potential equipment staging areas for upcoming HydroGeoLogic field activities, and access roads R1 and R3 (Figure 1). Within the study areas, patches of dense woody vegetation with closed canopy cover were excluded from the survey because they lacked suitable habitat for both sand gilia and Monterey spineflower. In 2005, the existing roadways were surveyed to approximately 10 feet from each side to encompass the maximum possible extent of direct impact associated with the proposed pipeline; however, many populations extend beyond 10 feet from the roadway and these were not completely delimited in the 2005 survey. Incidental observations of rare species made outside of the specific study areas were noted when encountered, but these areas were not systematically surveyed as this was beyond the scope of this survey effort.

Rare plant locations and invasive weed monitoring plots were mapped in the field using a Trimble GeoXT Global Positioning System (GPS) with sub-meter accuracy. The survey boundaries were identified on a georeferenced background aerial image, which was also used for navigation during the surveys.

Before initiating the surveys, known populations of sand gilia and Monterey spineflower were examined in the field with Sean Mc Stay, the FONR Steward, to determine the flowering status and ensure proper identification of both species. The timing of the survey was determined to be approximately two weeks past the peak blooming period for sand gilia. It was determined that sand gilia would likely still be identifiable in the field and patches (or polygons) of sand gilia could still be delimited, but that individual plant counts would be significantly reduced compared to the number of plants present earlier in the season.

2.1 Sand Gilia and Monterey Spineflower Survey

CH2M HILL performed surveys to map the geographical extent and estimate the size of sand gilia and Monterey spineflower populations within designated areas (Figure 1). Individual sand gilia plants and small populations of Monterey spineflower were mapped as GPS points and the number of plants was enumerated for each mapped population. Large populations of sand gilia and Monterey spineflower were mapped as GPS polygons. Polygon boundaries were mapped based on the maximum distribution of Monterey spineflower at a given location and the density of the plants as determined by areal cover estimates.

Individual plant counts were made for all sand gilia populations, but counts of Monterey spineflower were determined only for small sub-populations (i.e., comprising 5 or fewer easily distinguished individual plants). Density estimates were made for large populations of Monterey spineflower based on percent absolute cover classes; Very Sparse (corresponding to an absolute cover of less than 3 percent), Sparse (3-25 percent), Medium (26-75 percent), Medium High (76-97 percent), or Very High (>97-100 percent). This percent cover classification method is used by the FONR. GPS data was then exported to a Geographic Information System (GIS) database and mapped on high resolution aerial photograph base maps (Figures 2 through 9).

2.2 Vegetation Monitoring Plots

Twenty-five 1 X 2-meter rectangular plots were identified and inventoried to establish baseline habitat conditions near proposed work areas and in selected reference locations (Figures 2-8). The proposed project design successfully avoided the large majority of sand gilia and Monterey spineflower polygons. Therefore, only two of these plots contain sand gilia. Twenty-two of the 25 plots contain Montery spineflower. The 25 plot locations are categorized as follows:

- 14 “remedial action” plots were positioned adjacent to the pipeline road, access routes and proposed work sites where direct impact to these federally-listed species is most likely to occur.

- 6 "off-road reference" plots were located in areas that would not be subject to disturbance during construction of the pipeline route but that otherwise provide habitat comparable to that of the potential work areas.
- 5 plots were installed adjacent to access roads that are not expected be used, and these are referred to as "roadway reference" plots.

The percentage of total ground cover by vegetation (specifying type and specific plant(s), where possible), soil crust, litter, and bare ground was visually estimated for each plot. Monterey spineflower population densities were recorded using the plant cover classification method established for the Monterey spineflower survey. All sand gilia plants were individually counted in each reference plot.

2.3 Habitat and Invasive Species Monitoring

2.3.1 Field Surveys

Habitat and invasive species surveys were conducted in each of the 25 established monitoring plots on June 23, 2005. The baseline data will be compared to data from subsequent years to determine whether vegetative composition and cover within the plots is indirectly impacted by remedial activities within OU-1, and if these changes result in deleterious impacts to the federally-listed species.

Surveys were conducted after some of the annual species had flowered and dried, making identification of some species difficult. Nine species, including one annual grass, could not be identified. Invasive species include any plant species which is listed as a noxious weed by the California Department of Food and Agriculture (CDFA), included on any of the invasive plant lists maintained by the California Invasive Plant Council (Cal-IPC), or considered to be a problematic species by the FONR natural resource staff.

The California Food and Agriculture Code, Section 5004 defines a noxious weed as "any species of plant that is, or is liable to be, troublesome, aggressive, intrusive, detrimental, or destructive to agriculture, silviculture, or important native species, and is difficult to control or eradicate…" The U. S. Department of Agriculture and the CDFA have compiled regulatory "noxious weed lists" that rank plant species that threaten agricultural production (both cultivated crops and rangeland) and other economic interests. Species are ranked as either A, B, C, or Q. Mitigation requirements for each classification are summarized below:

- A-ranked species require eradication, containment, rejection, or other holding action at the state or county level, with quarantine interceptions to be rejected or treated at any point in the state;
- B-ranked species require discretional eradication, containment, control, or other holding action;
- C-ranked species require State endorsed holding action and eradication only when found in a nursery;
- Q-ranked species require a temporary "A" action outside of nurseries at the state or county level pending determination of a permanent rating.

Cal-IPC has compiled a similar list that focuses on invasive, non-native plant species that damage native ecosystems by displacing or hybridizing with native species, altering biological communities, and/or altering ecosystem processes. Cal-IPC ranks invasive species as high, medium, low, or alert. Species ranked as "high" have severe ecological impacts on ecosystems, plant and animal communities, and vegetation structure. "Medium" ranked species have substantial and apparent—but generally not severe—ecological impacts on ecosystems, plant and animal communities, and vegetation structure. Species with a "low" rank have minor ecological impacts. The "alert" rank is for species in either the high or medium category, but whose current ecological amplitude and distribution are limited.

The list of invasive species for the FONR includes noxious weeds listed by CDFA and species listed by Cal-IPC as well as other species that are believed to have deleterious effects to sand gilia and Monterey spineflower habitat (Appendix D). Non-native grasses including rip-gut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madratensis* ssp. *rubens*), wild oat (*Avena barbata*), and annual fescue (*Vulipa* spp.) are common and widespread in all habitats throughout OU-1 and are of particular concern in terms of habitat impacts for sand gilia.

2.3.2 Photomonitoring

Photographs of the remediation area were taken at each of the 34 permanent photostation locations established in 2004 (Figures 2-9). The GPS coordinates and map datum information for each photostation are contained in Table 5. The 2005 photographs and plot location information are provided in Appendix C.

SECTION 3

Results and Discussion

Sand gilia was identified at 102 locations during the May, 2005 survey, primarily along the western and southern part of the OU-1 survey area (see Figures 3 through 8, and Table 1). Monterey spineflower was observed scattered throughout most of the study area at 201 locations (Figures 2 through 9, and Table 2). Often these two species co-occur, but Monterey spineflower is more common and widespread. General descriptions of the Monterey spineflower and sand gilia plant populations and habitats within the remediation area are provided below. A limitation of the 2005 survey is that the surveys were conducted too late in the season to accurately count individual sand gilia plants and these population counts are low.

Several invasive species, including non-native annual grasses, were also identified during the surveys. Invasive species were observed during the June, 2005 survey within 23 of the 25 monitoring plots. Natural habitats observed in the study area included coast live oak woodland, central maritime chaparral, and annual grassland. Boundaries between habitat types are relatively diffuse, with elements of the three habitats often intermixed. A discussion of incidental special- status wildlife species sightings is also provided.

3.1 Federally-Listed Plant Species

3.1.1 Sand Gilia

Sand gilia were observed at 102 locations of during the May 2005 survey (Table 1). Population size estimates ranged from single isolated individuals up to approximately 100 plants, with an average of 5 plants per population. Mapped areas included 29 polygons with between 4 and 100 plants, and 73 GPS points with 1 to 8 plants per point. Only 16 locations had populations of 10 or more sand gilia and only 2 of those exceeded 25 plants (50 were seen at location G004 and 100 at G008). Most locations (66 out of 102; or approximately two-thirds) had fewer than 5 plants.

Sand gilia was found in open sandy areas and along access roads in the coast live oak woodland and maritime chaparral habitats, but was not observed in areas with dense woody vegetation or high cover of non-native annual grasses. Sand gilia was typically found growing in large open areas with coarse, sandy soil and relatively sparse vegetative cover in the coast live oak woodland habitat. In the maritime chaparral habitat, sand gilia was observed primarily in openings and at the edges of manzanita shrubs in sandy coarse soils. All populations were found in areas that also contained Monterey spineflower (Figures 3 through 8). Common associated species include filaree (*Erodium* spp.), sandmat (*Cardionema ramosissimum*), annual fescue, rip-gut brome, trefoil (*Lotus* sp.), and occasionally sandmat manzanita, but total plant cover associated with sand gilia observations was generally low.

3.1.2 Monterey Spineflower

A total of 203 sub-populations of Monterey spineflower was observed within the survey area. Approximately 36 percent (74 out of 203) of these were small populations (ranging from 1 to 5 individuals) that could be easily counted. Approximately half of these small populations (39 out of 73) contained only a single plant. Small populations were mapped as GPS points and direct plant counts were made for these populations. The remaining 128 locations were larger populations that were mapped as polygons.

Plant density estimates in the polygon areas were typically very sparse (less than 3 percent absolute cover) or sparse (3-25 percent absolute cover) (Table 2). Approximately 90 percent (182 of the 203 populations) fell into these two categories. Very sparse populations outnumbered sparse populations by 2:1 (60 percent of the total versus 30 percent). Note that all of the populations with individual counts are also included by definition in the "very sparse" category. The remaining polygons were medium density (absolute cover between 26 and 75 percent) with a single high density (76-97 percent absolute cover) population at S100.

Monterey spineflower was observed in all habitat types and was usually restricted to open sandy areas with sparse vegetative cover. In the live oak woodland and maritime chaparral habitats, this species was often found along access roads and other disturbed areas such as existing well locations, and in naturally occurring sandy or grassy open areas. In the annual grassland habitat, Monterey spineflower was most often restricted to relatively open micro-sites around the perimeter of shrubs, small areas of disturbance, and along existing access roads, but was also observed in grassy areas near the Armstrong Ranch fence. Common associated species include stork's bill geranium (*Erodium botrys*), sandmat, annual fescue, rip-gut brome, and catchfly (*Silene gallica*). Populations of Monterey spineflower were often observed in areas with sparse to moderately abundant non-native annual grass cover, suggesting that this species may be somewhat more tolerant of annual grass cover than sand gilia.

3.2 Rare Plants Observed in the Monitoring Plots

The number of sand gilia and the density classes of Monterey spineflower observed in the monitoring plots during the May 2005 survey are presented in Table 3. Sand gilia was observed in only 2 of the 25 plots. Plot P1, a remedial action plot at the southern end of the pipeline road (Figure 8), contained 4 sand gilia plants and plot P15, a roadway reference plot in Area R3 (Figure 5), contained 5 plants. Monterey spineflower was observed in 22 of the 25 plots with density classes ranging from very sparse (less than 3 percent cover) in 12 of the 25 plots to medium (>26 to 75 percent cover) in 5 of the 25 plots. Monterey spineflower was not observed in remedial action plots P17, P18, and P19 (Figure 4).

3.3 Habitat Conditions and Invasive Species Observed in the Monitoring Plots

Results of the habitat and invasive species monitoring conducted in June 2005 are presented in Table 4. Total vegetative cover observed in the monitoring plots ranged from 46 to 90 percent with average cover of approximately 70 percent. Total annual grass cover was approximately 16 percent with a range in total cover from 0 to 45 percent. Plots 21, 23, and

24 appeared to have been mown before the noxious weed survey, and much of the vegetation in plot 21 was completely removed during the time between plot designation in May and the follow-up survey in June, accounting for the high percentage of bare ground in this plot.

Italian thistle (*Carduus pycnocephalus*) was the only CDFA listed noxious weed species observed in the monitoring plots. This species was found only in monitoring plot P25, with an estimated 5 percent cover (Table 4). Italian thistle has a "C" ranking on the CDFA noxious weed list, indicating that it requires state-endorsed holding action and eradication only when found in a nursery.

An additional 9 invasive species, listed by CAL-IPC, were observed in 23 of the 25 monitoring plots. Red brome was the only high-ranked species and was observed in 4 plots with cover ranging from 1 to 10 percent.

Medium-ranked species included rip-gut brome, which was observed in 18 plots with estimated cover between 1 and 40 percent; wild oat was observed in 8 plots with cover between 1 and 24 percent; and sheep sorrel (*Rumex acetosella*) was observed in 8 plots with cover between 1 and 10 percent.

The remaining 5 low-ranking species were stork's bill geranium (*Erodium botrys*), observed in 13 plots with cover between 1 and 40 percent; annual fescue was observed in 12 plots with cover between 1 and 15 percent; silver hairgrass (*Aira caryophyllea*), was observed in 8 plots with cover ranging from 1-10 percent; soft chess was observed in 4 plots with cover between 1 and 24 percent; and red-stem filaree (*Erodium cicutarium*) was observed in 1 plot with an estimated cover of 2 percent. Cut-leaved plantain (*Plantago coronopus*) is not listed by the CDFA or Cal-IPC, but is considered to be an invasive species in the FONR, was observed in 18 of the plots and had cover values between 1 and 20 percent.

Cape (German) ivy (*Delairea odorata*) was observed within Area A during the rare plant surveys, but was not encountered in any of the monitoring plots. Cape ivy has a severe ecological impact on ecosystems, plant and animal communities, and vegetation structure, and is therefore ranked high on the Cal-IPC list of invasive non-native species.

The northern boundary of OU-1 is adjacent to a large expanse of non-native grassland and non-native grasses and weedy forbs (herbaceous plants) are already present throughout much of OU-1. Transmission of non-native grasses into OU-1 is accelerated by the prevailing winds, which blow the seeds from the annual grassland habitat north of the FONR to the south and into the OU-1 area. The spread of invasive species, especially non-native grasses, into newly disturbed areas could result in population declines of the federally-listed plants, and sand gilia in particular as it is less tolerant of plant cover than the Monterey spineflower.

A Biological Information Report for activities within the FONR considered invasion by non-native plant species such as ice plant (*Carpobrotus edulis*) and rip-gut brome among the principle threats to the long term survival of both sand gilia and Monterey spineflower (HLA, 1998). Ice plant was noted to be of particular concern because it forms dense, continuous mats of vegetation with few or no open spaces, and once established can spread rapidly by vegetative means. This species was not observed in any of the monitoring plots or survey areas in 2005.

3.4 Habitat Types

3.4.1 Coast Live Oak Woodland

The coast live oak woodland habitat is characterized by a mosaic of dense coast live oaks (*Quercus agrifolia*), intermixed with chaparral, grassy openings, and open sandy areas. Areas with a dense canopy cover of coast live oak generally lack shrubs and have a near continuous herbaceous layer of non-native annual grasses such as rip-gut brome, wild oat, and annual fescue. Chaparral areas intermixed within the coast live oak woodland habitat contain scattered coast live oak with patches of dense poison oak (*Toxicodendron diversilobum*), California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), and manzanita (*Arctostaphylos* spp.). Common herbaceous species in these areas include miner's lettuce (*Claytonia perfoliata*), goose-grass (*Galium aparine*), rip-gut brome, and annual fescue. Grassy openings in the woodland habitat contain scattered coast live oak and shrubs with generally dense growth of annual grasses such as rip-gut brome, annual fescue, red brome, and wild oat, often with small open sandy areas that support rare plant species. The open sandy areas are more sparsely vegetated and contain species such as Monterey spineflower, sand gilia, sandmat manzanita (*Arctostaphylos pumila*), rush rose (*Helianthemum scoparium*), sandmat, filaree, rip-gut brome, and annual fescue.

3.4.2 Central Maritime Chaparral

Sclerophylous (thick-leaved, evergreen) shrubs such as shaggy bark manzanita (*Arctostaphylos tomentosa*), Monterey manzanita (*Arctostaphylos montereyensis*), and sandmat manzanita characterize the central maritime chaparral habitat. Coyote brush, poison oak, and California sagebrush are also common throughout this community. Other species include coast live oak, black sage (*Salvia mellifera*), sticky monkey flower (*Mimulus aurantiacus*), and silver bush lupine (*Lupinus albifrons*). Common herbaceous species include rush rose, sandmat, filaree, rip-gut brome, annual fescue, and red brome.

3.4.3 Annual Grassland

The annual grassland habitat is characterized by a dense cover of rip-gut brome with other non-native annual grasses such as wild oat, soft chess, Italian ryegrass (*Lolium multiflorum*), and annual fescue. Sky lupine (*Lupinus nanus*), and weedy forbs (weedy plants that are not woody and are not grasses) such as filaree and cat's ears (*Hypochaeris* spp.), are also common in this habitat. Shrubs species such as coyote brush, California sagebrush, and coffee berry (*Rhamnus californica*) occur scattered throughout.

3.5 Special-Status Wildlife Species

Several California coast horned lizards were observed in scattered locations throughout OU-1 during the 2005 surveys. This species is a federal and California state species of concern. The frequency of these incidental sightings suggests that the California coast horned lizard may be fairly common within OU-1. Several active dens of American badger (*Taxidea taxus*), also a California state species of concern, were observed during the surveys.

SECTION 4

Conclusions and Recommendations

Sand gilia and Monterey spineflower were both observed in the study area during the 2005 surveys. Monterey spineflower was abundant and widespread throughout the survey areas and sand gilia was also present, but was not as widely distributed as the Monterey spineflower. Population sizes of sand gilia observed were much smaller than those of Monterey spineflower. Based on conversations with Sean McStay on May 16, 2005, peak flowering period for the sand gilia in 2005 was generally between mid-April and the first week of May. Mr. McStay noted that considerably fewer sand gilia plants were present in one of the FONR permanent plots on May 16, 2005, than had been previously observed during the April –May 2005 annual monitoring that had occurred just a few weeks prior to the start of field work. While sand gilia was in flower at the time of the 2005 surveys, it was past the peak blooming period ; therefore, counts of individuals for this species were underestimated.

Results from the previous surveys of OU-1 conducted in April of 2004 suggest that the sand gilia population in this area is less than one-tenth as large as Monterey spineflower population (CH2M HILL, 2004). The results from 2005 surveys are generally consistent with this observation in that sand gilia was found in only 8 percent of the monitoring plots while Monterey spineflower was observed in 88 percent of the plots. Sand gilia populations were seldom extensive enough to require polygons to delineate the distribution (see Figures 2–9). In contrast, 129 of the 201 Monterey spineflower populations identified were sufficiently extensive to require polygons to delineate the areal extent. The difference in both the distribution and numbers of these species in the monitoring plots may, in part, reflect the greater tolerance of Monterey spineflower for annual grasses and other annual species relative to sand gilia.

Permanent monitoring were established in 25 locations in order to collect baseline data on the habitat conditions and percent cover of invasive species, as well as track the general persistence of rare species. The data collected in the 2004 surveys provide baseline information on the overall distribution of sand gilia and Monterey spineflower within OU-1. In addition data collected from the FONR permanent monitoring plots will provide quantitative information on overall population trends, as well as information on the annual variation in these plant populations due to natural effects within OU-1.

Guidelines to minimize adverse effects to these species were outlined in the Biological Information Report (HLA, 1998), and more recently, in the Natural Resource Protection Plan (NRRP) (CH2M HILL, 2004b). The Biological Information Report did not consider driving on access roads during the dry season to be a deleterious impact to sand gilia or Monterey spineflower, because they are seral species that are adapted to periodic disturbance and shifting sands. Secondary impacts to sand gilia and Monterey spineflower could occur as a result of the colonization of invasive species into newly disturbed areas. Invasive species were identified as a threat to the plants and Measure 10 of the Biological Information Report requires implementation of invasive weed control (HLA, 1998). Baseline data collected from

the 25 permanent monitoring plots will provide quantitative data on habitat conditions such as amount of open ground and cover by invasive species in both disturbed and undisturbed areas.

Populations of sand gilia and Monterey spineflower have been avoided to the maximum degree possible during the remediation design process. However, complete avoidance of all the populations within OU-1 may not be practical given the large number of populations present and their broad and variable distribution throughout the OU-1 area, depending on the environmental conditions in any given year. With the implementation of the mitigation measures outlined in the NRPP (CH2M HILL, 2004b) and the Biological Information Report (HLA, 1998), remedial actions should not result in the decline of sand gilia and Monterey spineflower populations; however, the loss of some individual plants within affected populations may occur.

SECTION 5

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Tables

TABLE 1
Sand Gilia Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Number of Individuals
G001	5	N/A	GILIA	16
G002	5	N/A	GILIA	5
G003	5	N/A	GILIA	7
G004	5	N/A	GILIA	50
G005	5	AREA A	GILIA	25
G006	5	N/A	GILIA	10
G007	5	N/A	GILIA	20
G008	5, 7	N/A	GILIA	100
G009	5	N/A	GILIA	5
G010	5	AREA R3	GILIA	21
G011	5	N/A	GILIA	14
G012	5	AREA A	GILIA	7
G013	5	N/A	GILIA	6
G014	5	N/A	GILIA	4
G015	5	N/A	GILIA	6
G016	5, 7	AREA R3	GILIA	18
G017	5, 7	AREA R3	GILIA	15
G018	5, 7	AREA R3	GILIA	11
G019	5, 7	AREA R3	GILIA	6
G020	5, 7	N/A	GILIA	9
G021	5, 7	N/A	GILIA	14
G022	5	AREA R3	GILIA	8
G023	5	AREA R3	GILIA	16
G024	5, 7	N/A	GILIA	11
G025	7	AREA R3	GILIA	5
G026	7	AREA R3	GILIA	5
G027	7	AREA R3	GILIA	11
G028	8	N/A	GILIA	14
G029	5	N/A	GILIA	6
G030	8	PIPELINE ROAD	GILIA	2

TABLE 1
Sand Gilia Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Number of Individuals
G031	8	PIPELINE ROAD	GILIA	1
G032	8	PIPELINE ROAD	GILIA	1
G033	5	AREA R3	GILIA	1
G034	5	AREA R3	GILIA	1
G035	5	AREA R3	GILIA	1
G036	5	AREA R3	GILIA	1
G037	5	AREA R3	GILIA	2
G038	5	AREA R3	GILIA	2
G039	5	AREA R3	GILIA	1
G040	5	AREA R3	GILIA	1
G041	5	AREA R3	GILIA	2
G042	5	AREA R3	GILIA	1
G043	5	AREA A	GILIA	2
G044	3, 4	AREA A	GILIA	1
G045	8	N/A	GILIA	1
G046	7	AREA R3	GILIA	6
G047	7	AREA R3	GILIA	4
G048	7	N/A	GILIA	1
G049	5, 7	N/A	GILIA	3
G050	5	AREA R3	GILIA	1
G051	5	AREA R3	GILIA	2
G052	5	N/A	GILIA	2
G053	5	AREA R3	GILIA	2
G054	5	N/A	GILIA	2
G055	5	AREA R3	GILIA	2
G056	5	N/A	GILIA	4
G057	5	N/A	GILIA	3
G058	5, 7	N/A	GILIA	5
G059	5, 7	AREA R3	GILIA	1
G060	5, 7	AREA R3	GILIA	2

TABLE 1
Sand Gilia Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Number of Individuals
G061	5, 7	N/A	GILIA	1
G062	5, 7	N/A	GILIA	3
G063	5	AREA A	GILIA	1
G064	3, 4	AREA A	GILIA	2
G065	5	N/A	GILIA	1
G066	5	N/A	GILIA	2
G067	5	N/A	GILIA	1
G068	5	N/A	GILIA	3
G069	7	AREA R3	GILIA	1
G070	7	AREA R3	GILIA	1
G071	7	AREA R3	GILIA	1
G072	7	N/A	GILIA	2
G073	7	N/A	GILIA	2
G074	7	N/A	GILIA	2
G075	7	AREA R3	GILIA	2
G076	7	AREA R3	GILIA	2
G077	7	AREA R3	GILIA	1
G078	7	AREA R3	GILIA	1
G079	7	AREA R3	GILIA	2
G080	7	AREA R3	GILIA	1
G081	7	AREA R3	GILIA	1
G082	7	AREA R3	GILIA	1
G083	7	AREA R3	GILIA	2
G084	7	AREA R3	GILIA	1
G085	7	N/A	GILIA	1
G086	5, 7	N/A	GILIA	7
G087	5	N/A	GILIA	3
G088	5	N/A	GILIA	8
G089	5	N/A	GILIA	5
G090	5	N/A	GILIA	5

TABLE 1
Sand Gilia Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Number of Individuals
G091	5	N/A	GILIA	4
G092	5	AREA R3	GILIA	2
G093	5	AREA R3	GILIA	3
G094	5	N/A	GILIA	2
G095	5	N/A	GILIA	2
G096	5	N/A	GILIA	1
G097	5	N/A	GILIA	1
G098	5	N/A	GILIA	1
G099	5	AREA A	GILIA	2
G100	5	AREA A	GILIA	2
G101	5	N/A	GILIA	3
G102	5	N/A	GILIA	1
Total Estimated Number of Sand Gilia				**520**

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S001/S127*	8	N/A	SPINEFLOWER	VERY SPARSE
S002	6	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S003	3	AREA A	SPINEFLOWER	VERY SPARSE
S004	8	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S005	9	AREA R1	SPINEFLOWER	VERY SPARSE
S006/S007*	9	N/A	SPINEFLOWER	SPARSE
S008	9	N/A	SPINEFLOWER	SPARSE
S009	9	N/A	SPINEFLOWER	MEDIUM
S010	9	N/A	SPINEFLOWER	SPARSE
S011	9	N/A	SPINEFLOWER	SPARSE
S012	9	N/A	SPINEFLOWER	SPARSE
S013	9	N/A	SPINEFLOWER	SPARSE
S014/S015*	9	N/A	SPINEFLOWER	SPARSE
S016	9	N/A	SPINEFLOWER	MEDIUM
S017	9	N/A	SPINEFLOWER	MEDIUM
S018	9	N/A	SPINEFLOWER	SPARSE
S019	5	N/A	SPINEFLOWER	VERY SPARSE
S020	5	AREA R3	SPINEFLOWER	VERY SPARSE
S021	3	AREA A	SPINEFLOWER	MEDIUM
S022/S152*	3	AREA A	SPINEFLOWER	MEDIUM
S023	3	AREA A	SPINEFLOWER	SPARSE
S024	3	AREA A	SPINEFLOWER	SPARSE
S025/S154*	3	AREA A	SPINEFLOWER	SPARSE
S026	5	AREA A	SPINEFLOWER	MEDIUM
S027	5	AREA R3	SPINEFLOWER	SPARSE
S028	5	AREA R3	SPINEFLOWER	SPARSE
S029	5	N/A	SPINEFLOWER	SPARSE
S030	5	AREA R3	SPINEFLOWER	SPARSE
S031	5	AREA R3	SPINEFLOWER	SPARSE
S032/S071*	5	AREA R3	SPINEFLOWER	SPARSE

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S033	5	AREA R3	SPINEFLOWER	SPARSE
S034	5	AREA R3	SPINEFLOWER	SPARSE
S035/S098*	5	N/A	SPINEFLOWER	SPARSE
S036	5	AREA A	SPINEFLOWER	SPARSE
S037	4, 5	AREA A	SPINEFLOWER	SPARSE
S038	5	N/A	SPINEFLOWER	SPARSE
S039	5	N/A	SPINEFLOWER	MEDIUM
S040	5	N/A	SPINEFLOWER	MEDIUM
S041	5	AREA A	SPINEFLOWER	MEDIUM
S042	5	N/A	SPINEFLOWER	SPARSE
S043	5, 6	N/A	SPINEFLOWER	SPARSE
S044	5, 6	N/A	SPINEFLOWER	SPARSE
S045	5, 6	N/A	SPINEFLOWER	SPARSE
S046	3, 4	AREA A	SPINEFLOWER	SPARSE
S047	8	N/A	SPINEFLOWER	SPARSE
S048	2	ARMSTRONG FENCE	SPINEFLOWER	SPARSE
S049	2	ARMSTRONG FENCE	SPINEFLOWER	VERY SPARSE
S050	2	ARMSTRONG FENCE	SPINEFLOWER	VERY SPARSE
S051	3	N/A	SPINEFLOWER	VERY SPARSE
S052	7	AREA R3	SPINEFLOWER	VERY SPARSE
S053	5	AREA R3	SPINEFLOWER	VERY SPARSE
S054	5	AREA R3	SPINEFLOWER	VERY SPARSE
S055	5	AREA R3	SPINEFLOWER	VERY SPARSE
S056	5	AREA R3	SPINEFLOWER	VERY SPARSE
S057	5	N/A	SPINEFLOWER	VERY SPARSE
S058/S109*	3, 4	AREA A	SPINEFLOWER	SPARSE
S059	3, 4, 5	AREA A	SPINEFLOWER	VERY SPARSE
S060	3, 4, 5	AREA A	SPINEFLOWER	SPARSE
S061	5	AREA A	SPINEFLOWER	VERY SPARSE
S062	3	AREA A	SPINEFLOWER	VERY SPARSE
S063	3	AREA A	SPINEFLOWER	SPARSE

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S064	3	AREA A	SPINEFLOWER	SPARSE
S065	3	AREA A	SPINEFLOWER	VERY SPARSE
S066	5, 6	N/A	SPINEFLOWER	MEDIUM
S067	5, 6	N/A	SPINEFLOWER	VERY SPARSE
S068	3	AREA A	SPINEFLOWER	SPARSE
S069	3	AREA A	SPINEFLOWER	SPARSE
S070	3, 4	AREA A	SPINEFLOWER	3
S072	5	N/A	SPINEFLOWER	VERY SPARSE
S073	5	N/A	SPINEFLOWER	SPARSE
S074	5	N/A	SPINEFLOWER	SPARSE
S075	5	N/A	SPINEFLOWER	SPARSE
S076	5	N/A	SPINEFLOWER	SPARSE
S077	5	N/A	SPINEFLOWER	SPARSE
S078/S080/S081*	7, 8	N/A	SPINEFLOWER	SPARSE
S079	8	N/A	SPINEFLOWER	SPARSE
S082	7	AREA R3	SPINEFLOWER	SPARSE
S083	7	AREA R3	SPINEFLOWER	MEDIUM
S084	7	AREA R3	SPINEFLOWER	VERY SPARSE
S085	7	AREA R3	SPINEFLOWER	VERY SPARSE
S086	7	AREA R3	SPINEFLOWER	SPARSE
S087	7	AREA R3	SPINEFLOWER	SPARSE
S088	7	AREA R3	SPINEFLOWER	SPARSE
S089	7	N/A	SPINEFLOWER	SPARSE
S090	5, 7	AREA R3	SPINEFLOWER	SPARSE
S091	5	AREA R3	SPINEFLOWER	SPARSE
S092	5	AREA R3	SPINEFLOWER	SPARSE
S093	5	AREA R3	SPINEFLOWER	SPARSE
S094	5, 7	AREA R3	SPINEFLOWER	VERY SPARSE
S095	5, 7	AREA R3	SPINEFLOWER	VERY SPARSE
S096	5, 7	N/A	SPINEFLOWER	VERY SPARSE
S097	5, 7	N/A	SPINEFLOWER	SPARSE

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S099	2, 3, 4	N/A	SPINEFLOWER	MEDIUM
S100	3, 4	N/A	SPINEFLOWER	HIGH
S101	3, 4	AREA A	SPINEFLOWER	MEDIUM
S102	3, 4	AREA A	SPINEFLOWER	SPARSE
S103	3, 4	AREA A	SPINEFLOWER	VERY SPARSE
S104	3, 4	AREA A	SPINEFLOWER	SPARSE
S105	3, 4	AREA A	SPINEFLOWER	SPARSE
S106	2, 3	AREA A	SPINEFLOWER	MEDIUM
S107/S210*	2, 3	AREA A	SPINEFLOWER	MEDIUM
S108	3, 4	AREA A	SPINEFLOWER	MEDIUM
S110	3, 4, 5	AREA A	SPINEFLOWER	MEDIUM
S111	5	AREA A	SPINEFLOWER	SPARSE
S112	3	AREA A	SPINEFLOWER	SPARSE
S113	9	N/A	SPINEFLOWER	VERY SPARSE
S114	2	ARMSTRONG FENCE	SPINEFLOWER	VERY SPARSE
S115	2	N/A	SPINEFLOWER	VERY SPARSE
S116	2, 3	AREA A	SPINEFLOWER	VERY SPARSE
S117	2, 4	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S118	2, 4	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S119	2, 3, 4	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S120	3	AREA A	SPINEFLOWER	VERY SPARSE
S121	5	N/A	SPINEFLOWER	VERY SPARSE
S122	7	AREA R3	SPINEFLOWER	VERY SPARSE
S123	7	AREA R3	SPINEFLOWER	VERY SPARSE
S124	7	AREA R3	SPINEFLOWER	VERY SPARSE
S125	7	AREA R3	SPINEFLOWER	SPARSE
S126	8	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S128	8	N/A	SPINEFLOWER	VERY SPARSE
S129/S130	6	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S131	6	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S132	9	N/A	SPINEFLOWER	VERY SPARSE

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S133	8	PIPELINE ROAD	SPINEFLOWER	4
S134	8	N/A	SPINEFLOWER	1
S135	8	PIPELINE ROAD	SPINEFLOWER	1
S136	8	PIPELINE ROAD	SPINEFLOWER	5
S137	8	PIPELINE ROAD	SPINEFLOWER	2
S138	8	PIPELINE ROAD	SPINEFLOWER	5
S139	8	PIPELINE ROAD	SPINEFLOWER	3
S140	8	PIPELINE ROAD	SPINEFLOWER	1
S141	8	PIPELINE ROAD	SPINEFLOWER	1
S142	8	PIPELINE ROAD	SPINEFLOWER	1
S143	6	PIPELINE ROAD	SPINEFLOWER	4
S144	6	PIPELINE ROAD	SPINEFLOWER	2
S145	6	PIPELINE ROAD	SPINEFLOWER	3
S146	3	AREA A	SPINEFLOWER	1
S147	9	N/A	SPINEFLOWER	3
S148	9	N/A	SPINEFLOWER	3
S149	9	N/A	SPINEFLOWER	2
S150	2, 3	AREA A	SPINEFLOWER	5
S151	3	AREA A	SPINEFLOWER	1
S153	3	AREA A	SPINEFLOWER	2
S155	5	AREA A	SPINEFLOWER	3
S156	5	N/A	SPINEFLOWER	1
S157	5	AREA R3	SPINEFLOWER	1
S158	5	AREA R3	SPINEFLOWER	1
S159	5	AREA R3	SPINEFLOWER	1
S160	5	AREA R3	SPINEFLOWER	1
S161	5	AREA A	SPINEFLOWER	3
S162	8	N/A	SPINEFLOWER	1
S163	8	N/A	SPINEFLOWER	1
S164	2	ARMSTRONG FENCE	SPINEFLOWER	1
S165	2	ARMSTRONG FENCE	SPINEFLOWER	1

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S166	3	N/A	SPINEFLOWER	1
S167	3	N/A	SPINEFLOWER	10
S168	7	AREA R3	SPINEFLOWER	3
S169	7	AREA R3	SPINEFLOWER	1
S170	7	AREA R3	SPINEFLOWER	1
S172	7	AREA R3	SPINEFLOWER	1
S171	7	AREA R3	SPINEFLOWER	1
S173	7	AREA R3	SPINEFLOWER	5
S174	7	N/A	SPINEFLOWER	1
S175	7	N/A	SPINEFLOWER	2
S176	7	N/A	SPINEFLOWER	1
S177	7	AREA R3	SPINEFLOWER	3
S178	7	AREA R3	SPINEFLOWER	1
S179	7	AREA R3	SPINEFLOWER	3
S180	7	AREA R3	SPINEFLOWER	1
S181	7	AREA R3	SPINEFLOWER	1
S182	7	AREA R3	SPINEFLOWER	1
S183	5	AREA R3	SPINEFLOWER	1
S184	5	AREA R3	SPINEFLOWER	2
S185	5	AREA R3	SPINEFLOWER	3
S186	5	N/A	SPINEFLOWER	5
S187	5	N/A	SPINEFLOWER	3
S188	5	AREA A	SPINEFLOWER	2
S189	5	AREA A	SPINEFLOWER	2
S190	5	AREA A	SPINEFLOWER	4
S191	5	AREA A	SPINEFLOWER	1
S192	3	AREA A	SPINEFLOWER	MEDIUM
S193	3	AREA A	SPINEFLOWER	5
S194	3	AREA A	SPINEFLOWER	1
S195	3,4	AREA A	SPINEFLOWER	VERY SPARSE
S196	3, 4	AREA A	SPINEFLOWER	2

TABLE 2
Spineflower Population Estimates
2005 Surveys, OU-1, Fort Ord, California

Population ID Number	Figure Number	Survey Area	Species	Estimated Population Density
S197	5	N/A	SPINEFLOWER	1
S198	5	N/A	SPINEFLOWER	1
S199	5	N/A	SPINEFLOWER	1
S200	7	AREA R3	SPINEFLOWER	1
S201	7	AREA R3	SPINEFLOWER	1
S202	7	AREA R3	SPINEFLOWER	5
S203	5	N/A	SPINEFLOWER	1
S204	5	N/A	SPINEFLOWER	5
S205	5	N/A	SPINEFLOWER	3
S206	5	N/A	SPINEFLOWER	3
S207	5	AREA R3	SPINEFLOWER	1
S208	5	N/A	SPINEFLOWER	1
S209	5	AREA A	SPINEFLOWER	1
S211	2	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE
S212	6	PIPELINE ROAD	SPINEFLOWER	MEDIUM
S213	8	PIPELINE ROAD	SPINEFLOWER	SPARSE
S214	6	PIPELINE ROAD	SPINEFLOWER	MEDIUM
S215	3	PIPELINE ROAD	SPINEFLOWER	VERY SPARSE

Very Sparse – Absolute cover is less than 3 percent

Sparse – Absolute cover is between 3 and 25 percent

Medium – Absolute cover is between 25 and 75 percent

* Sub-Populations originally mapped separately, but were subsequently considered a single occurrence

TABLE 3
Rare Plant Results from Monitoring Plots Recorded in May, 2005.
2005 Surveys, OU-1, Fort Ord, California

Plot ID	Figure Number	Plot Type	Sand Gilia Count	Monterey Spineflower Cover*	% Cover Other Species
P-1	8	Remedial Action	4	Very Sparse	60
P-2	8	Remedial Action	0	Very Sparse	30
P-3	8	Off-Road Reference	0	Medium	30
P-4	8	Remedial Action	0	Very Sparse	50
P-5	7	Roadway Reference	0	Very Sparse	-
P-6	8	Remedial Action	0	Very Sparse	30
P-7	6	Off-Road Reference	0	Sparse	35
P-8	6	Off-Road Reference	0	Sparse	-
P-9	6	Remedial Action	0	Sparse	50
P-10	6	Remedial Action	0	Medium	30
P-11	6	Off-Road Reference	0	Medium	30
P-12	6	Roadway Reference	0	Medium	35
P-13	5	Off-Road Reference	0	Very Sparse	35
P-14	5	Remedial Action	0	Sparse	-
P-15	5,7	Roadway Reference	5	Very Sparse	35
P-16	5	Roadway Reference	0	Very Sparse	75
P-17	4	Remedial Action	0	None	40
P-18	4	Remedial Action	0	None	95
P-19	4	Remedial Action	0	None	85
P-20	3,4	Off-Road Reference	0	Sparse	35
P-21	2,3,4	Remedial Action	0	Very Sparse	98
P-22	2,4	Off-Road Reference	0	Medium	50
P-23	2,3,4	Remedial Action	0	Very Sparse	80
P-24	3	Remedial Action	0	Very Sparse	50
P-25	3	Roadway Reference	0	Very Sparse	25

* Cover classes for Monterey spineflower

Very Sparse – Absolute cover is less than 3 percent

Sparse – Absolute cover is between 3 and 25 percent

Medium – Absolute cover is between 25 and 75 percent

TABLE 4
2005 Fort Ord Natural Reserve Habitat Evaluation and Invasive Species Results From Vegetation Monitoring Plots Recorded in June, 2005.
2005 Surveys, OU-1, Fort Ord, California

Scientific name	Common name*	Native	CDFA rank	Cal-IPC rank	FONR list	Plot																								
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
				Figure Number		8	8	8	8	7	8	6	6	6	6	6	6	5	5	5,7	5	4	4	4	3,4	2,3,4	2,4	2,3,4	3	3	
Aira caryophyllea	silver hairgrass	No		Low		1	1	10			1		5									10		10		3					**8**
Amsinckia menziesii	common fiddleneck	Yes																												2	**1**
Arctostaphylos pumila	sandmat manzanita	Yes				1		5												5											**3**
Avena barbata	wild oat	No		Med	*Yes*			1								1				T		1	1			10	24		20	2	**8**
Briza maxima	rattlesnake grass	No		Low	*Yes*											T															
Bromus diandrus	ripgut brome	No		Med	*Yes*	2	1	2			1	1	3		2	5	15			1			10	3	5	13	5	40	10	2	**18**
Bromus hordeaceus	soft chess	No		Low	*Yes*	1																	24					5		1	**4**
Bromus madritensis	red brome	No		High	*Yes*		10			1											3									5	**4**
Bromus sp.	brome	No			*Yes*														1												**1**
Cardionema ramosissimum	sandmat	Yes				2			6	7	2	7			2			5	5	25	10	3		5				30	8		**14**
Carduus pycnocephalus	Italian thistle	No	*C*	Med																										5	1
Ceanothus cuneatus var. *rigidus*	Monterey ceanothus	Yes								3																					1
Chorizanthe pungens var. *pungens*	Monterey spineflower	Yes				T	3	20	4	3	1	5	10	4	20	20	18	1	10	1	2				10		13	2	3	3	20
Croton californicus	California croton	Yes																									9				1
Eriastrum sp.	woolystar	Yes				10	2		2	3	1	1	5	3	5	4	1	2	5		17	15	5	5	2	5	7	2	5		22
Erodium botrys	longbeak stork's bill	No		Low		1	1		10		1		1		5	2			3		40	5	5	3					5		13
Erodium cicutarium	red stem filaree	No		Low							2																				1
Galium californicum	California bedstraw	Yes										1																			1
Helianthemum scoparium	Bisbee Peak rushrose	Yes				1				8								25													3
Heterotheca grandiflora	telegraphweed	Yes																				A	10	1							2
Hypochaeris sp.	cat's ear	No			*Yes*												5						5	1				3	5		5
Lessingia filaginifolia	common sandaster	Yes											5	4		1		10													4
Lotus sp.	trefoil	—								2	1		1	13	6			5													6
Lupinus sp.	lupine	Yes															T	1													1
Lupinus bicolor	miniature lupine	Yes																				5					9	3	5		4
Madia sp.	tarweed	Yes												2		1															2

TABLE 4
2005 Fort Ord Natural Reserve Habitat Evaluation and Invasive Species Results From Vegetation Monitoring Plots Recorded in June, 2005.
2005 Surveys, OU-1, Fort Ord, California

Scientific name	Common name*	Native	CDFA rank	Cal-IPC rank	FONR list	Plot																									
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
Microseris sp.	dandelion	Yes				15	20	15	60	5	50	10	40	13	25	10	10	5	26	20	5	15	10	15	10						20
Nassella pulchra	purple needlegrass	Yes											7																		1
Plantago coronopus	cutleaf plantain	No			*Yes*	2	4	1	2	5	3	3	1	7			10	8		8	5			20	3	3	9		5		18
Polycarpon sp.	manyseed										10	10	3		1			1													5
Rumex acetosella	common sheep sorrel	No		Med													2				1	5	10	5		4	2			3	8
Silene gallica	common catchfly	No					1		1	2	1	1	2	2	5			2	2	1		5	5			2	3	5			16
Spergularia sp.	Sandspurry	—																											8		1
Vulpia bromoides	brome fescue	No		Low	*Yes*			10		1	A	3	1				5			T			5	10	15	5	7		8	10	12
Unknown basidiocarp	mushroom	Yes										T																			0
Navarretia sp.		Yes					1	10			1																				3
Unknown 01 =						2													1												2
Unknown 03 =						1																									1
Unknown 04 =						7																									1
Unknown 05 =							10	3	1	5		3								2											6
Unknown 06 =							T		2	1					1					1									1		5
Unknown 09 =												7																			1
Unknown 10 =												1																			1
Unknown 11 =												3																			1
Unknown 12 = Ann. grass														10	5																2
Soil crust														8		40			25					15			2			20	6
Total vegetative cover						46	54	77	88	46	75	56	84	66	77	84	66	65	78	62	85	64	90	93	45	45	90	90	83	53	
Vegetative litter						0	16	8	7	5	10	15	10	10	8	5	10	12	5	5	5	5	5	5	10	5	2	2	3	10	
Bare Ground						54	30	15	5	49	15	29	6	24	15	11	24	23	17	33	10	31	5	2	45	50	8	8	14	37	
Litter, bare ground, and vegetative cover						100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

* USDA, NRCS. 2004.

A = Observed outside of but adjacent to monitoring plot

T = Trace (<<1%) cover

Figures

APPENDIX A

Photographs of Sand Gilia and Monterey Spineflower

APPENDIX B

California Natural Diversity Database Records

APPENDIX C

2005 Photo-Station Photographs and Station Location Information

Photostation GPS Coordinates
2005 Surveys, OU-1, Fort Ord, California

Photo Point	Easting	Northing
P-1	5748706.1857	2143029.0308
P-2	5748670.2358	2143015.4673
P-3	5748893.2294	2143510.3926
P-4	5748117.5985	2142838.4897
P-5	5748121.7023	2142928.6667
P-6	5748152.7230	2143050.1030
P-7	5747968.7546	2143235.7417
P-8	5748265.5333	2143180.3403
P-9	5748348.0409	2143110.8955
P-10	5748413.0425	2143245.5678
P-11, 12, 13	5748543.5102	2143590.9392
P-14, 15	5748695.9536	2143646.9995
P-16, 17, 18, 19	5748430.3902	2143999.4574
P-20, 21, 22, 23	5748306.0828	2144151.9604
P-24, 25	5748165.5662	2144215.0317
P-26	5748409.9515	2144365.2772
P-27, 28	5748411.2996	2144335.1761
P-29, 30	5747873.8481	2144550.1904
P-31	5747299.7995	2144685.8126
P-32, 33	5746976.6494	2144926.9144
P-34	5746719.1618	2145129.8220

Map Datum Information: California State Plane NAD 83; Zone 4, US Survey Feet.

APPENDIX D

Fort Ord Natural Reserve Invasive Species List

Fort Ord Invasive Species List
2005 Surveys, OU-1, Fort Ord, California

Scientific Name	Common Name
Acacia spp.	Acacia
Achnatherum brachychaetum	Puna Grass
Arctotheca calendula	Capeweed
Arundo donax	Giant Reed
Atriplex semibaccata	Australian saltbush
Avena barbata	Slender wild oat
Avena fatua	Wild oat
Brassica nigra	Black Mustard
Brassica rapa	Field mustard
Briza maxima	Rattlesnake grass
Briza minor	Little quaking grass
Bromus diandrus	Ripgut brome
Bromus hordeaceus	Soft chess
Bromus madritensis ssp. *rubens*	Red Brome
Carduus pycnocephalus	Italian Thistle
Carpobrotus chilense	Sea fig
Carpobrotus edulis	Hottentot Fig
Centaurea melitensis	Maltese Star-thistle
Centaurea solstitialis	Yellow Star-thistle
Cirsium vulgare	Bull Thistle
Conicosia pugioniformis	Narrow-leaved Iceplant
Conium maculatum	Poison Hemlock
Cortaderia jubata	Purple Pampas Grass
Cotoneaster pannosus	Silverleaf Cotoneaster
Cynodon dactylon	Bermuda grass
Cytisus scoparius	Scotch Broom
Dactylis glomerata	Orchard grass
Delairea odorata (Senecio mikanioides)	Cape Ivy (German Ivy)
Ehrharta calycina	Veldt Grass

Fort Ord Invasive Species List
2005 Surveys, OU-1, Fort Ord, California

Scientific Name	Common Name
Erechtites glomerata	Cutleaf Burnweed
Erechtites minima	Coastal Burnweed
Eucalyptus globulus	Blue Gum
Foeniculum vulgare	Fennel
Genista monspessulana	French Broom
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley
Hordeum marinum ssp. *leporinum*	Barn yard foxtail
Hordeum vulgare	common barley
Hypericum perforatum	Klamath Weed
Hypochaeris glabra	Smooth cats ears
Hypochaeris radicata	Hairy cats ears
Lampranthus spectabilis	Trailing ice plant
Lolium multiflorum	Italian ryegrass
Lolium perenne	Perennial ryegrass
Lupinus arboreus	Yellow Bush Lupine
Malva parviflora	Cheeseweed
Marrubium vulgare	Horehound
Medicago polymorpha	Bur clover
Melilotus alba	White sweet clover
Melilotus indica	Indian melilot
Mentha pulegium	Pennyroyal
Olea europaea	Olive
Onopordum tauricum	Taurian Thistle
Oxalis pes-caprae	Bermuda buttercup
Pennisetum clandestinum	Kikuyu grass
Phalaris aquatica	Harding Grass
Picris echioides	Bristly ox tongue
Plantago coronopus	Cut-leaved plantain
Plantago lanceolata	English plantain
Plantago major	Common plantain

Fort Ord Invasive Species List
2005 Surveys, OU-1, Fort Ord, California

Scientific Name	Common Name
Raphanus sativus	Wild radish
Silybum marianum	Milk thistle
Tetragonia tetragonioides	New Zealand spinach
Torilis nodosa	Knotted hedge-parsley
Trifolium hirtum	Rose clover
Vinca major	Periwinkle
Vulpia spp.	Non-native fescue