FINAL REPORT
2020-2021 WINTER HOME RANGE ASSESSMENT OF COASTAL CALIFORNIA GNATCATCHER IN RECENTLY BURNED HABITAT ABOARD MARINE CORPS BASE CAMP PENDLETON, CALIFORNIA

Prepared for:

Naval Facilities Engineering Systems Command Southwest

and

Marine Corps Base Camp Pendleton

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Cover Photographs:

Top: Coastal California gnatcatcher (*Polioptila californica californica*) after banding effort, by Kyle McCann

Bottom: Coastal California gnatcatcher (*Polioptila californica californica*) in hand, by Anička Kratina-Hathaway

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EXECUTIVE SUMMARY

During the 2020-2021 nonbreeding season, Vernadero Group Inc. (Vernadero) continued a multiyear study of the coastal California gnatcatcher (*Polioptila californica californica*; CAGN). This study was initiated in 2016 by Hercules Joint Venture and continued by Vernadero in 2017 and 2019 (no study was conducted in 2018-2019) to determine the species' winter home range and habitat use in and adjacent to areas of recently burned vegetation. The results of this study provide Marine Corps Base Camp Pendleton with a better understanding of what habitats CAGN uses in the winter and how wintering CAGN respond to the mosaic of burned habitat on the Base. Information from this study will be used to improve the efficiency and effectiveness of management strategies for ecosystem recovery of burned habitats and the protection of CAGN habitats. This study had two main goals:

- Determine the location and size of winter home ranges, corresponding vegetation associations, and habitat use across years.
- Analyze home range and habitat use associated with burned and unburned areas.

CAGN pairs were selected throughout the Base for home range mapping and vegetation sampling, with a goal of identifying and banding 130 pairs. Adults were banded in the spring and early summer to facilitate following the pairs in the winter. Home range monitoring occurred from September 2020 through January 2021.

Vernadero's biologists attempted to map each CAGN pair on at least six separate occasions spaced by two-week intervals. The goal for the end of the season was to obtain 72 observational points. We performed an analysis on the pairs that reached the minimum sample threshold of 47 points. The observational points formed the data set from which winter home range polygons were calculated. Fixed-kernel analysis using ArcGIS software produced a polygon for the home range based on the coordinates collected.

Vernadero measured the vegetation at two scales. At the landscape scale, our mapping effort used a relevé technique consistent with *Manual of California Vegetation* standards. Vegetation assemblages were mapped within the boundaries of the polygon produced by the fixed-kernel analysis. The assemblages were consistent with those already used by Marine Corps Base Camp Pendleton. At the microsite scale, our mapping effort included recording the plant species we observed being used by CAGN during home range mapping. When a location point was taken, the plant species was also recorded. These data were compared using logistic regression to point-intercept transect data collected within the foraging area on the sampling day. The transect data determined the availability of each plant species in the area. This allowed us to identify preferential foraging species during the winter period, as well as plant species that were used less often than expected based on their availability.

Vernadero surveyed territories with previously banded birds and territories where pairs had been identified but not banded in 2016, 2017, and 2019. In total, we visited 70 territories in the spring and fall. Birds were resighted in 60 of the 70 territories, and points were collected for 60 pairs. However, some pairs disappeared through the season or were difficult to find consistently.

Consequently, only 44 pairs reached the minimum threshold of 47 home range mapping points needed to be included in the analyses. The average home range size (defined as the 95 percent adaptive kernel) was 10.56 acres. The largest home range (21.44 acres) was found in the Juliet Training Area (TA) and the smallest (6.20 acres) in the cantonment area surrounding Lake O'Neill. The average core range size (defined as the 50 percent adaptive kernel) was 2.98 acres. The largest core range size (defined as the 50 percent adaptive kernel) was for the same pair in the Juliet TA (6.53 acres), and the smallest core range was found for the same pair near Lake O'Neill (1.45 acres).

CAGN was observed to prefer 11 plant species during the 2020-2021 nonbreeding season. CAGN proportionally used those species more frequently than expected based on their availability within territories ($P < 0.05$). Those species were coyote brush (*Baccharis pilularis*), mule fat (*Baccharis salicifolia*), black mustard (*Brassica nigra*), fennel (*Foeniculum vulgare*), telegraph weed (*Heterotheca grandiflora*), laurel sumac (*Malosma laurina*), coast prickly pear (*Opuntia littoralis*), lemonade berry (*Rhus integrifolia),* white sage (*Salvia apiana*), black sage (*Salvia mellifera*), and elderberry (*Sambucus nigra*).

Forty-five percent (20 of 44) of CAGN home ranges were in areas that had burned during the past 43 years. Most of the historical fires were older burns that occurred between 30 and 45 years ago. Only four CAGN home ranges were located completely or almost completely within a recently burned area (less than 15 years). CAGN home range size did not vary significantly between burned and unburned areas when analyzed for individual study years or the four study years as a cumulative data set. No differences were detected between years since fire categories with respect to core or home range size.

Vegetation Alliances dominated by California sagebrush (*Artemisia californica*) constituted 70 percent of the total area within the mapped home ranges. *Bromus* (*B. diandrus, B. hordeaceus*) – *Brachypodium distachyon* Seminatural Stands (a nonnative Alliance; 8 percent) was the only vegetation Alliance other than those dominated by California sagebrush that composed more than 1 percent of the vegetation within mapped home ranges.

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LIST OF ACRONYMS AND ABBREVIATIONS

Avg.	Average
CAGN	Coastal California Gnatcatcher
°F	Degrees Fahrenheit
GIS	Geographic Information System
GPS	Global Positioning System
ID	Identification Number
JV	Joint Venture
MANOVA	Multivariate Analysis of Variance
MCBCP	Marine Corps Base Camp Pendleton
MDS	Multidimensional Scaling
PERMANOVA	Permutational Multivariate Analysis of Variance
PRIMER	Plymouth Routines in Multivariate Ecological Research
SD	Standard Deviation
SE	Standard Error
TA	Training Area
USGS	United States Geological Survey
Vernadero	Vernadero Group Inc.

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1.0 INTRODUCTION

During the 2020-2021 nonbreeding season, Vernadero Group Inc. (Vernadero) continued a multiyear study of the coastal California gnatcatcher (*Polioptila californica californica*; CAGN) aboard Marine Corps Base Camp Pendleton (MCBCP) that was initiated in 2016-2017 by Hercules Joint Venture (JV) and furthered by Vernadero in 2017-2018 and 2019-2020 nonbreeding seasons. Much of Vernadero's methodology for this follow-up study was drawn from the Hercules JV's unpublished final report (Hercules JV 2018). Section 2.0 discusses the study methodology used for this project in detail, noting where we have made modifications that diverged from the original study.

1.1 Scope

Vernadero was tasked with identifying and characterizing the winter home ranges and classifying and measuring vegetation used by CAGN in burned and unburned areas across MCBCP.

1.2 Purpose

The purpose of this project was to continue the study of the CAGN that commenced in 2016-2017 (Hercules JV 2018) and continued in 2017-2018 (Vernadero 2018) and 2019-2020 (Vernadero 2021) to determine CAGN home range and habitat use in and adjacent to areas of recently burned vegetation aboard MCBCP. The results of this study provide a better understanding of what habitat CAGN uses during winter within the context of the fire mosaic on MCBCP. Information gathered from this study will be used to inform future management strategies for ecosystem recovery of burned habitats and for the protection of CAGN habitat. This multiyear study had two main goals:

- Determine the location and size of the CAGN wintering home range, habitat use, and vegetation associations in burned and unburned areas on MCBCP.
- Analyze the CAGN home range and habitat associated with burned and unburned areas.

It is well known that CAGN wintering home ranges are larger than the species' breeding home ranges (Preston et al. 1998; Hunsaker et al. 2000); therefore, this study continued the 2016, 2017, and 2019 studies focus on determining the size of home ranges and vegetative resources used throughout the winter at MCBCP (Hercules JV 2018). The two previous studies observed preferential use of seven and eight plant species by CAGN, respectively, during the winters of 2016-2017 and 2017-2018 when comparing areas that had recently burned versus historically unburned areas. Our survey expanded this into a data set to determine if these observations remained consistent over multiple winters.

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2.0 STUDY AREA

MCBCP is a 125,000-acre military facility in northwestern San Diego County, California. MCBCP is characterized by warm, dry summers and cool, wet winters typical of the semiarid Mediterranean climate of southern California. MCBCP's topography varies from coastal bluffs and mesas in the western portion of the Base to steep-sided canyons in the eastern portion. The study area includes areas of suitable CAGN habitat throughout MCBCP, primarily in coastal sage scrub and Diegan coastal sage scrub habitats (Figure 2-1).

2.1 Methodology

The purpose of this study was to determine winter home ranges of CAGN, identify the corresponding vegetation associations being used, and analyze home range size and habitat use in the context of fire history on MCBCP.

To present an overall picture of the methodological approach to the study, we provide the following simplified study design outline:

1. Banding Search Area
   Vernadero examined CAGN pairs banded in 2016, 2017, and 2019. Using the location of these pairs, we were able to identify a more focused search area in which to band.

2. CAGN Pair Selection
   Vernadero selected CAGN pairs throughout MCBCP for home range mapping and vegetation sampling. Adults were banded in the spring of 2020 to facilitate following the pairs in the winter. Home range and vegetation monitoring occurred from September 2020 through January 2021, with vegetation surveys continuing through April 2021.

3. Home Range Mapping
   a. CAGN home ranges of banded birds mapped in 2016, 2017, 2019, and 2020 were visited to determine if pairs were still present.
   b. An attempt was made to map each pair on at least six separate occasions spaced by two-week intervals. The goal for the end of the season was 72 observational points, with an analysis performed on pairs that reached the minimum sample threshold of 47 points. A minimum threshold of 50 points was used for previous survey protocol (Hercules JV 2018; Vernadero 2018; Vernadero 2021). This study utilized 47 as a minimum threshold in order to be able to include three additional pairs in the study. The observational points formed the data set from which winter home range polygons were calculated.
   c. Fixed-kernel analysis using ArcGIS software produced a polygon for the home range based on the coordinates collected.

4. Vegetation Measurement at Two Scales
   a. At the landscape scale, we used a relevé technique consistent with the *Manual of California Vegetation* standards (Sawyer et al. 2009). Vegetation assemblages

were mapped within the boundaries of the polygon produced by the fixed-kernel analysis. The assemblages were consistent with those already used by MCBCP.

b. At the microsite feature scale, Vernadero recorded the plant species CAGN was observed using during home range mapping. When a location point was taken, the plant species was also recorded. These data were compared using logistic regression to point-intercept transect data collected within the foraging area on the sampling day. The transect data determined the availability of each plant species in the area. This allowed us to identify preferential foraging species during the fall/winter period, as well as plant species that were used less often than would be expected based on their availability.

2.2 Survey Area and Pair Selection

Vernadero utilized pair data from the 2016, 2017, and 2019 field seasons to maintain consistency. As a starting point, we attempted to relocate all pairs from the 2016, 2017, and 2019 seasons. In addition to searching for previously banded birds, surveys were conducted to locate unbanded pairs to target for banding. We proceeded by attempting to band and then resight as many pairs as possible.

2.2.1 Consistency between Study Years

For consistency in data gathering and analysis, Vernadero's procedures primarily followed the methodology outlined by Hercules JV (2018). Vernadero searched extensively for the pairs banded in 2016, 2017, and 2019 in an effort to obtain multiyear home range data. However, most of the previously banded birds could no longer be located, which limited the data collected.

2.3 Banding

Adults were banded in the spring of 2020 to help identify the birds that would be followed in the winter. Banding occurred from March through May. Nest searches were conducted to enable banding of the adults. One metal U.S. Geological Survey (USGS) numbered band (size 0A) and one metal color band (with either one, two, or three colors) were attached to the bird after capture, resulting in a unique identifier for each individual. This allowed trained observers to identify the birds from a distance. Appendix A provides representative photographs showing examples of banded birds.

All banding was done by Dana Kamada, who is permitted to color band CAGN under a U.S. Fish and Wildlife Service endangered species recovery permit and federal bird banding permit (Appendix B), and Pete Bloom, who is a permitted to band CAGN under Kamada's permit. At least one assistant was present to prepare the bands for application, hand tools to the bander, help close nets, and maintain the welfare of the animals at all times.

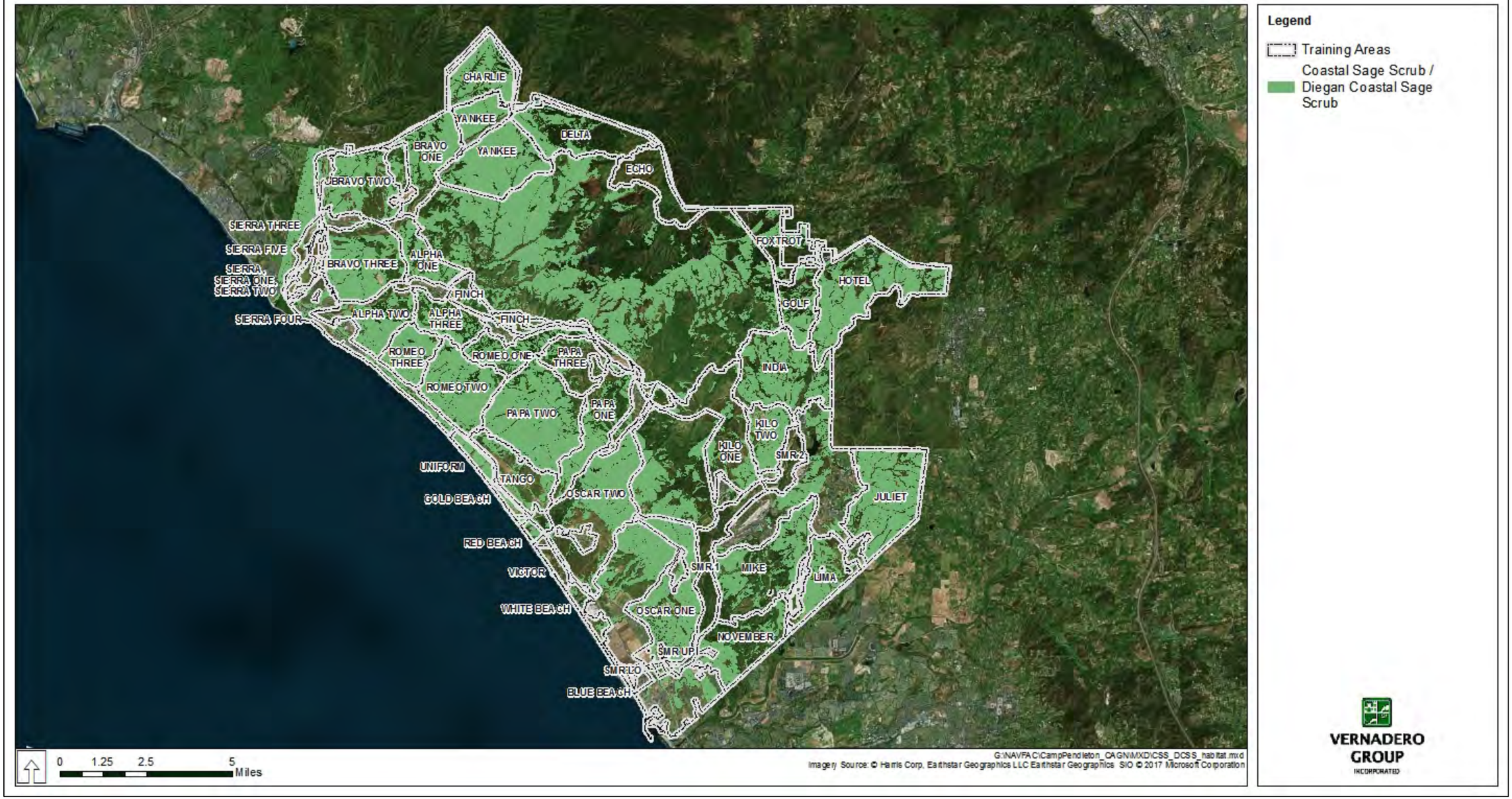

Figure 2-1. Marine Corps Base Camp Pendleton Coastal Sage Scrub and Diegan Coastal Sage Scrub Habitat

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Nest searches were conducted by personnel who held permits to find nests. Once a nest was found, its contents (i.e., eggs, chicks, or empty) were identified to allow biologists to estimate when to return to band the adults. The nest location was recorded with a global positioning system (GPS) unit. The location itself was not marked in the field; however, the surveyors flagged the vegetation on each side of the nest, with the nest at the approximate center point between the flags. This allowed the banding crew to return to the site and find the nest again with the least possible disturbance to the CAGN pair.

To the extent possible, Vernadero banded adult CAGN during the incubation or brood nesting phases; however, because there was a delay in starting the fieldwork, several of the first nesting attempts were missed and pairs were found with fledglings. In these instances, the pair was visited again to see if they produced a second nest.

Prior to setting up mist nets, the bander scanned areas for predators. If predators were nearby, the bander decided to either postpone banding or wait to see if the predators moved away from the area. Banding typically occurred between 0800 and 1700 hours when ambient temperatures were higher than 55 degrees Fahrenheit (°F) and lower than 90°F. Multiple disturbances to nests were kept to a minimum. Typically, two to four trips to the area immediately adjacent to the nest were needed. This included one trip to set up nets, up to two trips to remove each adult, and a fourth trip to take down the nets. Additional trips were needed if nontarget birds were caught in the net or a wind gust made the net visible by tangling it in the adjacent vegetation.

The banding team placed two or more 6-meter-long, 24-millimeter mesh mist nets within 3 to 7 meters of the nest site. Because each nest site was different, the team determined the specific placement in the field based on gaps in the vegetation. Typically, the banding team watched for the route the birds used for ingress and egress from the nest and then determined an appropriation location for the nets along that route. Following net erection, the banding team closely monitored the activities of the nesting CAGN pair and waited until the non-incubating or non-brooding bird approached the nest to exchange incubation or brooding duties with its mate. The nets were set with the goal of capturing the birds without human intervention, such as by playing a prerecorded call; however, on occasion an adult was flushed off a nest into a net. Typically, the bird approaching the nest was captured, and the incubating bird was captured when it left the nest. The banders attempted to capture and band the adult pair quickly, so the nest was left unattended only for the four to five minutes it took to process one of the birds.

Captured adults were processed a short distance (at least 15 meters) away from the nest. Each adult bird received two bands—one USGS band and one anodized color band. Each bird was equipped with a size 0A aluminum USGS band on the right leg; the left leg was banded with a single USGS size 0A anodized aluminum color band modified using one or more narrow strips of automotive pinstripe tape. Anodized color bands were prepared following the methods described by Koronkiewicz et al. (2005). Aluminum “blank” bands were anodized to one of five colors: black, red, blue, gold, or silver. Anodized bands were then further differentiated by adding strips of colored tape around the upper or lower half to create two-color band combinations, or around the upper, middle, and/or lower one-third of the band to create three-

color band combinations. For example, a red anodized band with white tape applied to the lower half would be assigned the combination “R/W” for “red over white” (two-color combination). A blue anodized band with a white stripe added to the middle one-third of the band would be assigned the combination “B/W/B” for “blue over white over blue” (three-color combination).

Vernadero maintained a log of banded birds and included data such as band number, color band combination, date banded, GPS coordinates of the nest, age, and sex. We recorded data on standardized banding data sheets and submitted them to the USGS Bird Banding Laboratory, as required by the banding permit.

In addition to color banding, the birds were sexed and examined for overall health. Birds were aged based on the presence or absence of molt limits (Pyle 1997; Pyle and Unitt 1998).

2.4 Home Range Mapping

The pairs banded in 2020 and those that could be relocated from the 2016, 2017, and 2019 banding efforts were visited throughout the 2020-2021 winter to map their home range. To maintain consistency, Vernadero continued the home range mapping techniques employed by Hercules JV in 2016-2017 and Vernadero in 2017-2018 and 2019-2020. The home range mapping method consisted of a modified version of burst sampling (Barg et al. 2005; Wick and Wang 2010; Warning and Benedict 2015). Burst sampling is a technique in which successive observations are recorded separately using a short, regular time interval with a longer time interval between the sampling sessions (Barg et al. 2005; Wick and Wang 2010; Warning and Benedict 2015). Our study selected the time between recording points, the amount of time spent following the birds, the amount of time between sampling sessions, and the target number of points for analysis based on our knowledge of the behavior of CAGN.

To summarize, the home range mapping methodology was as follows:

- In September 2020, surveys were conducted for the pairs that were banded in the spring/summers of 2016, 2017, 2019, and 2020, and the first mapping session took place.
- Identified pairs were visited on a two-week cycle from September 2020 through January 2021.
- No longer than 90 minutes were spent following a pair in a day. Playback calls were not utilized.
- Each pair was visited until 72 points were collected (if possible). Points were primarily collected over six visits (6 visits x 12 points = 72 points). However, some pairs proved difficult to follow; in that case, surveyors made additional visits to obtain the minimum number of points.
- No more than 12 points were collected during a visit unless the pair moved into an area where they had never been mapped before, after the maximum number of points had

been collected. A full set of points was not collected during a session if the behavior of the birds was too difficult to track or weather conditions changed.

- A point was gathered every three minutes or after a bird moved at least 15 meters. If the birds in the pair were within 5 meters of each other, they were mapped as one point. If both birds were visible and were more than 5 meters apart from each other, and they could be accurately mapped, two points were collected simultaneously, one for each member of the pair.

- Mapping was conducted in the morning through the early afternoon. Work was not conducted if it was too cold, windy, or if it was raining. Ambient temperatures needed to be higher than 45°F and lower than 90°F for accurate data collection.

- Bright-colored clothing was avoided. The observer made every effort to blend in with the surroundings.

- If a CAGN individual appeared to be perturbed by the biologist's presence, as evidenced by increased calling, tail flicking, or other behavior interpreted as agitation, the biologist backed off at least 5 meters and sat down to allow the bird to calm down. However, behavioral display data were not collected as bird behavior was often not entirely visible.

- Observations were made from high points or other areas that provided a clear view without disturbing the birds being observed. Efforts were made to not disturb vegetation within the foraging area.

All CAGN home range point data were collected on an electronic data sheet embedded in the ESRI application ArcGIS Collector.

2.5 Vegetation Surveys

Vegetation surveys followed the methodology described in Hercules JV 2018 and Vernadero 2018. Specifically, Vernadero measured vegetation at two different scales. At the larger scale, we measured vegetation using a relevé technique consistent with *Manual of California Vegetation* standards (Sawyer et al. 2009). Using this methodology allowed our biologists to map CAGN winter habitat use areas in a manner consistent with the vegetation mapping currently used by MCBCP. An example of the relevé data sheet can be found in Appendix C.

We also mapped the vegetation within the home range polygons produced by the fixed-kernel analysis, using *Manual of California Vegetation* standards (Sawyer et al. 2009). This enabled us to quantify the vegetation community within the mapped home range. This method relies on a relevé technique using visual estimates of percent cover of dominant species within a 50-meter radius of a point. Vegetation was then classified into associations and Alliances based upon dominant species composition (greater than 50 percent relative cover) and subdominant (greater than 5 percent absolute cover), along with their absolute cover.

At a finer scale, our biologists identified and recorded individual plant species utilized by foraging CAGN. Using a point-intercept method, we also measured the relative percent cover of plant species available within the winter use area.

The vegetation sampling methodology at a finer scale was conducted as follows:

- Biologists recorded the plant species that CAGN used for foraging. The biologists recorded the species in which the bird was observed and took a point every three minutes. The bird's behavior was also recorded, including whether it was foraging, simply moving, or perching in the shrub. Additional recorded behaviors included perching/resting, preening, exhibiting alertness, feeding, and defending territory.

  As with the home range mapping, there was a goal of 72 observations per individual. A data set of 72 points per pair was consistent with the sample size produced by the point-intercept method discussed below and provided a suitable sample size for comparison. These data allowed for an analysis of plant species to determine which provided the preferred foraging substrates for CAGN during the nonbreeding season.

- We sampled two 10-meter-long point-intercept transects based on the observation points collected during home range mapping. We recorded the percent cover of shrubs within the home ranges of the banded CAGN to determine how the percentage of time a particular plant species was utilized by CAGN compared with the percent cover of that plant species on the landscape. Toward the end of the winter season, 10-meter-long transects were established and extended in a random direction. The percent cover of shrubs along each transect was recorded at 0.5-meter intervals using a point-intercept method (Godínez-Alvarez et al. 2009; Toledo et al. 2010). This technique provided an unbiased sample of percent cover of shrub species on the landscape. The resulting data were pooled for each home range area and provided a percent cover of each available plant species.

2.6 Resource Selection Model

Vernadero utilized the same resource selection model described in Vernadero 2018 and 2021. This resource selection model was used to analyze which covariates might be associated with the location of home ranges during the winter. Resource selection functions or models used a point and several covariates to predict the probability of that unit being used by an organism (Manly et al. 2002). For this study, the model consisted of a desktop exercise that incorporated many landscape features that could correlate to site selection by CAGN. Each mapped home range was compared to a list of covariates. Covariates that were used for this study included:

- Fire history (years since the last fire)
- Distance to closest burned area if the home range was not within a burned area
- Distance to a road
- Distance to riparian habitat

- Distance to the coast
- Slope
- Aspect
- Elevation
- Percent coastal sage scrub

2.7 GIS Attributes, Data Collection, and Analysis

To maintain consistency in data analysis between the Hercules JV study and the Vernadero studies, we collected and analyzed data in the manner described in the Hercules JV 2018 report. The synopsis in Section 2.7.1 lists the data that Vernadero collected and the analyses we performed on those data.

2.7.1 Geographic Information System

All survey data were collected via the ESRI application ArcGIS Collector and provided as a geographic information system (GIS) deliverable. Photographs taken at the observation sites were included with spatial data, geotagged, and placed in a stand-alone folder. Banding and resight locations and associated vegetation associations were provided as point data. CAGN home range locations and vegetation community mapping were provided as polygon data.

General data collected included the following:

1. Pair identification number (ID): Predetermined
2. Survey area: Predetermined
3. Date: YYYYMMDD
4. Start time: 24-hour clock
5. Time bird first detected: 24-hour clock
6. End time: 24-hour clock
7. Cloud cover: Percentage
8. Wind speed: Beaufort scale
9. Temperature: Fahrenheit
10. Observer initials: Initials of the biologist documenting CAGN activity
11. Notes: A field where anything noteworthy can be recorded

CAGN-specific point data collected included:

1. Sex: A drop-down menu consisting of F = female, M = male, P = pair, I = unbanded individual, U = sex unknown
2. Band combinations: This was a text entry. (A drop-down menu was created for previously banded birds/combinations.)
3. Time: 24-hour clock
4. Shrub species: Chamise (*Adenostoma fasciculatum)*, California sagebrush (*Artemisia californica)*, coyote brush (*Baccharis pilularis*), mule fat (*Baccharis salicifolia*), telegraph weed (*Heterotheca grandiflora*), black mustard (*Brassica nigra*), California brickellbush (*Brickellia californica*), California encelia (*Encelia californica*), California buckwheat (*Eriogonum fasciculatum*), fennel (*Foeniculum vulgare*), toyon (*Heteromeles arbutifolia*), shortpod mustard (*Hirschfeldia incana*), bladderpod (*Peritoma arborea*), Menzies' goldenbush (*Isocoma menziesii*), chaparral mallow (*Malacothamnus fasciculatus*), laurel sumac (*Malosma laurina*), coast prickly pear (*Opuntia littoralis*), lemonade berry (*Rhus integrifolia*), white sage (*Salvia apiana*), willow (*Salix spp.*), black sage (*Salvia mellifera*), elderberry (*Sambucus nigra*), other species
5. Behavior: A drop-down menu consisting of flying, perching, preening, foraging, moving through, other

Point data for vegetation data (percent cover of shrubs):

1. Pair ID: Predetermined
6. Point number: 0.5-meter intervals
7. Shrub species: Chamise, California sagebrush, coyote brush, mule fat, telegraph weed+, black mustard, California brickellbush, California encelia, California buckwheat, fennel, toyon, shortpod mustard, bladderpod, Menzies' goldenbush, chaparral mallow, laurel sumac, coast prickly pear, lemonade berry, white sage, willow species, black sage, elderberry, other species

Our biologists conducted vegetation community mapping using the relevé technique consistent with *Manual of California Vegetation* standards (Sawyer et al. 2009). A standard data sheet is provided in Appendix C.

2.7.2 Burned versus Unburned Determination

All mapped home ranges received a determination as to whether the territory would be mapped as burned or unburned. Territories were categorized as burned when 50 percent or greater of the territory had burned in the last 43 years. Fire GIS data aboard MCBCP only go back to 1976; it is possible that areas mapped as unburned had burned before 1976 but, without the data to support that, determinations were made based on data from 1976 moving forward.

2.7.3 Home Range Size Statistical Analysis

This study used the fixed-kernel method to estimate home range size. Fixed-kernel analysis involves taking the coordinates of all observations for a selected pair and producing a home range estimate in the form of a polygon. The kernel method consists of placing a kernel (a probability density) over each observation point (Worton 1989). A rectangular grid is superimposed on the data, and an estimate of the density of points is obtained from each grid intersection. The estimated density at each intersection is essentially the average of the densities that overlap that point. Thus, observations close to each other will contribute more to the estimate than those far from one another.

Factors driving home and core range size for CAGN were explored by constructing Bray-Curtis Distance matrices of the home range size and core range size estimates, as well as of the Resource Selection Model variables (Section 2.6) within the Plymouth Routines in Multivariate Ecological Research (PRIMER-e 7) software package. The separate Bray-Curtis Distance matrices constructed for home range size and core range size were tested for correlation with the dissimilarity matrix constructed for the Resource Selection Model variables using the RELATE procedure in PRIMER-e 7. The RELATE procedure calculates a Spearman rank correlation (rho) for the relationship between the home range or core range size estimate distances and those of the Resource Selection Model variables. It then tests for statistical significance by randomly permutating the order of the distances a specified number of times (in this case 999 permutations were performed) and calculated rho for each permutation. Statistical significance is assessed by the relative proportion of the randomly permutated rho values that are larger than the true rho value calculated for the relationship between home range or core range sizes and the Resource Selection Model variables. The categorical variables “burned/unburned” (Section 2.7.2) and aspect, whether the home or core range was situated within an area that had a northern-, southern-, northwestern-, or southwestern-facing, etc. slope were included as factors within permutational multivariate analysis of variance (PERMANOVA), also within PRIMER-e 7. PERMANOVA provides a nonparametric hypothesis-testing framework similar to parametric multivariate analysis of variance (MANOVA). MANOVA relies on partitioning variance based on a sum-of-squares calculated from transformed or untransformed raw data (i.e., counts, biomass), whereas PERMANOVA uses measures of distance (dissimilarity) between pairs of individual multivariate observations defined by the user and calculates a probability of the null hypothesis of no between-group difference by randomly permutating observations a specified number of times; in this case, 999 permutations were performed. PERMANOVA, therefore, is more robust regarding departures from the assumption of a normal distribution to which ecological data rarely conform.

Similarly, comparisons between core and home range sizes over the different survey years and between different categorical variables (i.e., burned versus unburned) were conducted by testing PERMANOVA models that included the sampling year (2016, 2017, 2019, and 2020) as factors.

2.7.4 Statistical Analysis of the Use of Plant Species

Vernadero used two sets of logistic regression models to evaluate microsite-level habitat use preferences of CAGN. The first set evaluated whether CAGN selected certain plant species over others present in their territories for use. The independent variable for this set consisted of counting plants that were present along a randomly placed 10-meter vegetation transect within the mapped home range territory to determine the proportion of cover for each plant species within the mapped home range. This logistic regression analysis included plant species (Table 2-1) and cover types as categorical predictor variables of CAGN use as a binomial response variable scored as “1” if surveyors observed CAGN using (foraging/perching/roosting/etc.) the plant species or cover type during survey events and “0” if surveyors did not observe CAGN using the plant species for each point.

The second set of regression models was constructed to evaluate if the relative cover of a plant species within a territory influenced the likelihood that it would be used by CAGN. This analysis used relative cover as a continuous predictor variable and CAGN use as a binomial response variable scored as “1” if surveyors observed CAGN using (foraging/perching/roosting/etc.) the plant species during survey events and “0” if surveyors did not observe CAGN using the plant species for each point. A separate data matrix, as described, was constructed for each species that had the potential for probability of use to vary with relative cover from point to point (i.e., CAGN were observed using the plant species in some points but not in others).

Both sets of logistic regressions were tested in the statistical software package SYSTAT 13.

Table 2-1. Plant Species Used in Logistic Regression Models

Scientific Name	Common Name	Abbreviation
Artemisia californica	California sagebrush	ARTCAL
Baccharis pilularis	Coyote brush	BACPIL
Brassica nigra	Black mustard*	BRANIG**
Brickellia californica	California brickellbush	BRICAL
Deinandra fasciculata	Clustered tarweed	DEIFAS**
Eriogonum fasciculatum	California buckwheat	ERIFAS
Foeniculum vulgare	Fennel*	FOEVUL**
Isocoma menziesii	Menzies’ goldenbush	ISOMEN
Malosma laurina	Laurel sumac	MALLAU
Opuntia littoralis	Coast prickly pear	OPULIT
Rhus integrifolia	Lemonade berry	RHUINT

Scientific Name	Common Name	Abbreviation
Salvia apiana	White sage	SALAPI
Sambucus nigra	Elderberry	SAMNIG

* Nonnative species

** Species differ from the 2016 analysis.

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3.0 RESULTS

3.1 Pairs and Banding

In total, Vernadero visited 70 territories for the spring and fall work. We resighted birds in 60 of those territories and collected points for those pairs. Only 44 pairs reached the minimum threshold of 47 points to be included in the analysis (Appendix D). The locations of birds that were in banded in 2016, 2017, 2019, and 2020 are shown in Figure 3-1.

Of the pairs with at least one bird banded in 2016, only 1 of the 45 pairs (that were banded in 2016) were found, had winter home range points collected in 2020-2021 (1/45; 2.2 percent), and was included in the analysis of this study. Of the pairs bird banded in 2017, 1 of the 44 pairs (that were banded in 2017) were observed during banding efforts but was not found during home range surveys and therefore was not included in the study (0/44; 0 percent). Of the pairs banded in the previous study year 2019-2020, only 6 of the 44 pairs were found (that were banded in 2019) and had winter home range points collected in 2020-2021; of this 6, 5 pairs (5/44; 11.4 percent) were included in the study. Pairs were not included if the minimum point threshold of 47 was not reached.

3.2 Home Range

A minimum of 47 home range mapping points were collected for 44 pairs and used for analyses (Appendix D). The average home range size (defined as the 95 percent adaptive kernel) was 10.56 acres. The largest home range (21.44 acres) was found in the Juliet Training Area (TA) and the smallest (6.20 acres) in the cantonment area surrounding Lake O'Neill. The average core range size (defined as the 50 percent adaptive kernel) was 2.98 acres. The largest core range size was for the same pair in the Juliet TA (6.53 acres), and the smallest core range was found for the same pair near Lake O'Neill (1.45 acres). Maps of all territories included in the analysis are provided in Appendix E. Winter home range acreages are given in Table 3-1. A comparison of the overall home and core range numbers from all four years of the study can also be seen in Table 3-1. Territories that were included in the 2016, 2017, 2019, and 2020 field years are shown in Table 3-2.

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Figure 3-1. All Coastal California Gnatcatcher Pairs Banded in 2016, 2017, 2019, and 2020

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Table 3-1. Comparison of Winter CAGN Home Range Acreages for 2016, 2017, 2019, and 2020

Type	2016			2017			2019			2020		
	Minimum Acres	Maximum Acres	Avg. Acres Mean*	Minimum Acres	Maximum Acres	Avg. Acres Mean (SD)	Minimum Acres	Maximum Acres	Avg. Acres Mean (SD)	Minimum Acres	Maximum Acres	Avg. Acres Mean (SD)
Core Range (50% adaptive kernel)	0.47	12.94	3.56	1.45	6.53	2.98 (1.19)	0.48	9.50	2.09 (1.73)	1.45	6.53	2.98 (1.19)
Home Range** (95% adaptive kernel)	1.92	46.37	13.68	6.20	21.44	10.56 (3.55)	2.04	60.84	9.20 (10.07)	6.20	21.44	10.56 (3.55)

Avg. – average; **SD** – standard deviation

* Vernadero does not have the raw 2016 data and cannot determine standard deviation for the 2016 work.

** Includes core range value.

Table 3-2. Home Range Acreages for CAGN Pairs Included in the 2016, 2017, 2019, and/or 2020 Years of the Study*

Pair ID	2016		2017		2019		2020	
	Core Range	Home Range	Core Range	Home Range	Core Range	Home Range	Core Range	Home Range
JU-02-2017	–	–	3.3	13.3	2.44	8.87	–	–
OO-05-2017	–	–	0.66	2.89	2.83	11.27	–	–
OO-06-2017	–	–	1.54	7.16	2.37	9.48	–	–
SM-01-2017	–	–	1.55	6.96	4.3	7.94	–	–
TA-01-2017	–	–	0.56	2.7	2.26	8.65	–	–
MI-06-2016	2.13	9.67	1.44	5.68	–	–	–	–
MI-10-2016	1.55	8.28	1.68	6.43	–	–	–	–
MI-11-2016	4.48	14.32	1.81	11.06	–	–	–	–
SM-02-2016	2.65	12.07	2.18	8.52	–	–	–	–
SM-07-2016	2.39	7.9	0.95	4.00	–	–	–	–
STM-01-2016	2.83	9.6	1.14	4.93	–	–	2.49	10.19
TA-10-2016	2.28	11.52	0.82	3.07	–	–	–	–
WM-03-2016	3.47	12.56	1.3	5.36	–	–	–	–
WM-15-2016	1.51	5.40	2.16	6.77	–	–	–	–
WM-17-2016	0.74	2.76	2.11	11.3	–	–	–	–
WM-18-2016	3.07	10.31	0.63	3.21	–	–	–	–
AT-07-2019	–	–	–	–	2.02	8.29	2.07	8.54
BTH-01-2019	–	–	–	–	3.32	8.65	2.28	8.63
OTW-02-2019	–	–	–	–	1.8	7.26	2.8	11.25
SM-01-2019	–	–	–	–	2.62	7.68	1.71	7.6

ID – identification number

***** All pairs were included in two of the four study years.

3.3 Vegetation

Of the vegetative cover found in mapped territories, 73 percent was shrub, 21 percent was forb, and 1 percent was grass. CAGN home ranges were dominated by California sagebrush, with this species making up 56 percent of vegetative cover. Additional common species included shortpod and black mustards at 8 percent, coyote brush at 8 percent, and deerweed (*Acmispon glaber*) at 6 percent.

For individual plant species, the average cover and total number of territories where it was found are provided in Table 3-3.

3.3.1 Plant Species Used versus Available

Two hypotheses regarding CAGN utilization of plant species were tested using different logistic regression models. The first hypothesis was that CAGN will utilize certain plant species, within their territories, for the purpose of foraging and/or roosting behaviors. The second hypothesis was that the relative cover of a plant species, within a CAGN territory, will have an effect on the probability of CAGN utilizing that plant species for foraging and/or roosting.

The first hypothesis was tested using a single logistic regression model that consisted of 15 plant species (Table 3-4) documented within CAGN territories entered as categorical independent predictor variables; whether CAGN used a given plant species when it was present in the territory was entered as a binary, dependent, response variable (1=used, 0 = available but not used). The logistic regression was analyzed in SYSTAT 13 (with the binomial distribution specified) to test nonnumerical, categorical predictor variables (names of plant species).

Logistical regression can be problematic when used for habitat use versus availability studies, when random sampling is not used (Keating and Cherry 2004; Nad'o and Kanuch 2018). However, the vegetation sampling transects were selected randomly, were representative of the vegetation cover within the territory, and were sufficiently long (10 meters) to capture diversity and variation in relative cover contributions. The unused (0) species were not drawn from a pool of a preselected number of known unused plants, nor were they drawn from a pool of known used plants. Therefore, the sampling design is most similar to the random sampling design described in Keating and Cherry (2004) and Nad'o and Kanuch (2018), and logistic regression is the appropriate analytical technique.

Based on the considerations and analysis described above, we infer a statistically significant positive relationship between CAGN use (i.e., foraging, moving, or perching) and coyote brush, mule fat black mustard, fennel, telegraph weed, laurel sumac, coast prickly pear, lemonade berry, white sage, black sage, and elderberry where CAGN was at least 60 times more likely to use these species when they were present (Table 3-4). There was also a statistically significant negative relationship between CAGN use and shortpod mustard where CAGN were more than 60 times less likely to use this species when present (Table 3-4).

Table 3-3. Average and Standard Deviation Cover and Number of Territories Found for Individual Plant Species

Species	Average Coverage (SD)	Number Territories Where Found*
Acmispon glaber	6.07 (6.56)	15
Ambrosia psilostachya	0.36 (0.81)	3
Artemisia californica	44.34 (8.50)	42
Baccharis pilularis	8.42 (7.98)	18
Baccharis salicifolia	0.72 (1.00)	2
*Brassica nigra***	0.54 (0.40)	4
Brickellia californica	1.38 (1.50)	2
*Centaurea melitensis***	2.82 (1.92)	16
*Conium maculatum***	0.78 (3.5)	2
Deinandra fasciculata	2.41 (1.68)	14
Diplacus aurantiacus	1.68 (1.97)	6
*Elymus repens***	1.14 (3.50)	2
Encelia californica	0.12 (0)	1
Eriogonum fasciculatum	4.03 (4.64)	11
*Foeniculum vulgare***	1.68 (3.16)	8
Galium angustifolium	1.32 (3.09)	8
*Hirschfeldia incana***	7.82 (4.25)	22
Isocoma menziesii	0.72 (1.22)	4
Malosma laurina	0.66 (0)	1
Non-native grass	1.08 (1.82)	6
Opuntia littoralis	0.60 (1.26)	5
Oxalis spp. (possibly**)	0.42 (0.83)	4
Penstemon spp.	1.2 (5.25)	3
Pseudognaphalium sp.	0.42 (0.83)	4
Rhus integrifolia	1.14 (6.85)	3
Salvia apiana	1.68 (4.50)	3
Salvia mellifera	0.18 (0.50)	2
Sambucus nigra	0.24 (0.48)	3
Stephanomeria diegensis	2.47 (4.28)	8
Stipa spp.	0.72 (2.62)	3
Verbena lasiostachys	0.60 (3.30)	3

SD – standard deviation
* Out of 44 mapped territories
** Nonnative species

Table 3-4. Availability Logistic Regression Models with Significant Results

Model	Estimate	SE	Z	p-value	Lower 95% Confidence Interval	Upper 95% Confidence Interval
California sagebrush	0.389	0.416	0.936	0.349	0.426	1.205
Coyote brush	0.938	0.459	2.044	0.041*	0.039	1.838
Mule fat	1.792	0.847	2.117	0.034*	0.133	3.451
Black mustard	2.015	0.645	3.121	0.002*	0.750	3.280
California brickellbush	0.693	0.940	0.738	0.461	1.149	2.535
California buckwheat	0.693	0.548	1.266	0.206	0.380	1.767
Fennel	1.056	0.549	1.922	0.055*	0.021	2.133
Shortpod mustard	-2.398	0.824	-2.910	0.004*	-4.013	0.783
Coastal goldenbush	1.558	0.660	2.360	0.018*	0.264	2.852
Laurel sumac	2.890	1.090	2.651	0.008*	0.753	5.027
Coastal prickly pear	0.875	0.645	1.356	0.175	0.390	2.141
Lemonade berry	1.540	0.734	2.100	0.036*	0.103	2.978
White sage	1.792	0.723	2.479	0.013*	0.375	3.208
Black sage	1.792	0.847	2.117	0.034*	0.133	3.451
Elderberry	2.037	0.714	2.852	0.004*	0.637	3.437

SE – standard error
* Statistically significant p-value of less than 0.05
** Nonnative species

The second hypothesis was tested by performing 14 separate logistic regression analyses. The relative cover measurements of 1 of the 14 species for which CAGN preference could potentially vary with relative cover (Table 3-5, one logistic regression per species) was entered as a numerical independent predictor variable, and CAGN preference (1=used, 0=available but not used) was entered as a binary response variable. Each logistic regression was performed using the logistic function in SYSTAT 13. For logistic regression analysis, SYSTAT provides an output that includes an intercept value, which corresponds to the log odds of a CAGN use when the relative cover value is zero; a variable coefficient, which corresponds to the expected change in the log odds of CAGN use for a one-unit increase in the relative cover value (the size of the number is a measure of magnitude of effect, the sign is the direction of the effect); the odds ratio; the t-ratio and p-value, interpreted as the hypothesis test statistic and assessment of statistical significance respectively; and the standard error. For plant species that exhibited a statistically significant relationship between relative cover and CAGN use, we calculated and plotted the probability of use as a function of relative cover using the following equations and workflow:

Log Odds = Intercept + (Relative Cover x Coefficient)

Odds = e^(Log Odds)

Probability = Odds/1+ Odds

From the analysis described above, we infer that one species exhibited a relationship between relative cover and CAGN use (Table 3-5; Figure 3-2). The probability of CAGN use of California sagebrush increased significantly as relative cover of California sagebrush increased.

Table 3-5. Habitat Use versus Relative Cover Logistic Regression Models

Model	Intercept	Coefficient	Odds Ratio	z	SE	P-value
Artemisia californica	-4.78	14.19	78.09	4.92	2.925	0.000*
Baccharis pilularis	-0.551	3.16	0.042	1.248	2.531	0.212
*Brassica nigra***	-0.645	66.97	7.89	1.526	43.90	0.127
Eriogonum fasciculatum	1.537	-8.717	1.533	-1.223	7.130	0.221
*Foeniculum vulgare***	-0.584	8.923	1.064	0.897	9.945	0.370
*Hirschfeldia incana***	-1.953	3.213	0.040	0.371	8.668	0.711
Isocoma menziesii	-0.939	-11.788	1.000	0.768	15.341	0.442
Opuntia littoralis	-0.048	21.1064	1.884	0.951	22.158	0.342
Rhus integrifolia	1.941	-8.398	0.594	0.797	10.51	0.426
Salvia apiana	-1.647	-1.163	0.312	-0.188	0.970	0.851
Salvia mellifera	-1.716	114.603	4.319	1.205	95.099	0.228
Sambucus nigra	-0.572	84.955	5.806	1.208	70.298	0.227

SE – standard error
* Statistically significant p-value of less than 0.05
** Nonnative species

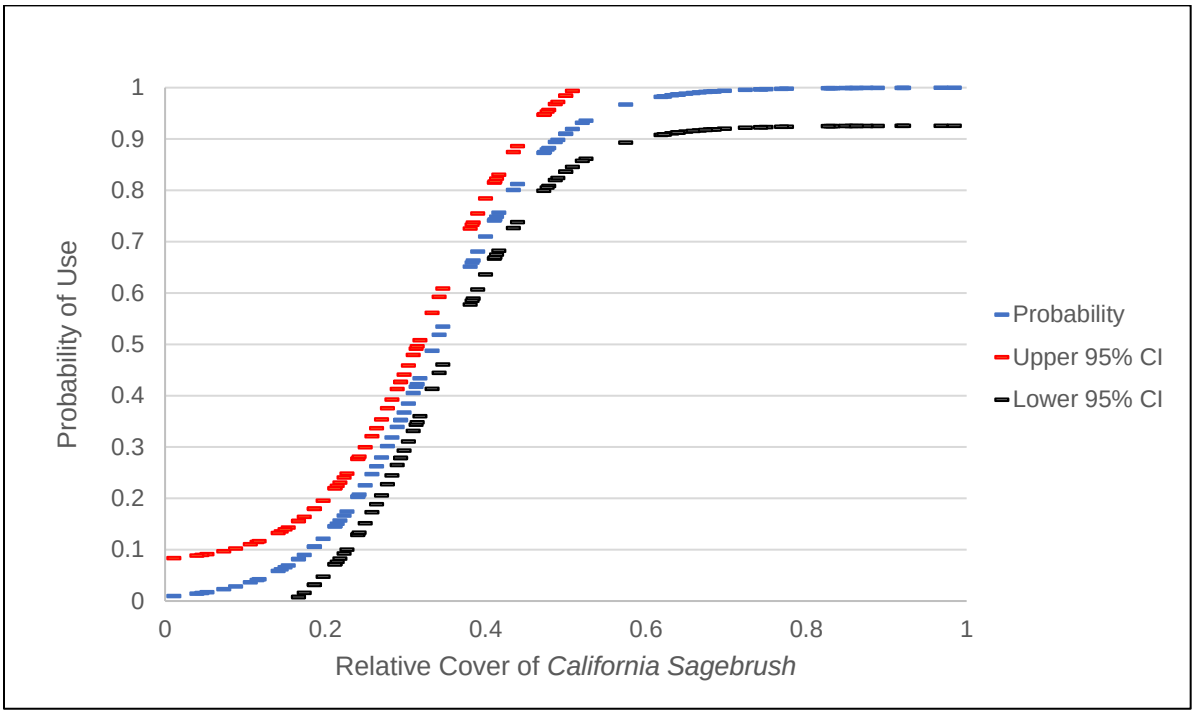

Figure 3-2. Probability of Use versus Availability for *California Sagebrush*

3.3.2 Territories Included in the Analysis and Years since Fire

Out of the 44 territories included in the analysis, 19 were in areas that had burned in the last 44 years (Table 3-6). A total of 24 of the territories included in the analysis had not burned within the last 44 years, but 4 were within 300 feet of areas that had burned within the last 44 years (Table 3-7). A total of seven territories were in areas where fires had occurred in the last 44 years (labeled as 0 feet as the distance to the closest fire in Table 3-7); however, the extent of the territory that burned at these seven territories was less than 50 percent and thus not categorized as burned for our analysis.

Table 3-6. Coastal California Gnatcatcher Territories Included in the Analysis That Burned in the Last 44 Years

CAGN Territory	Time since Last Burn	Percent of Territory Burned
BTH-01-2019	44	100.0
AT-08-2020	44	99.6
KI-04-2020	41	100.0
JU-01-2020	41	70.4
TA-05-2020	39	100.0
MI-01-2020	32	100.0
MI-08-2020	32	100.0
MI-02-2020	32	97.3

CAGN Territory	Time since Last Burn	Percent of Territory Burned
AT-05-2020	30	92.6
AT-04-2020	30	78.2
OO-01-2020	29	100.0
OTW-02-2019	27	82.5
OTW-06-2019	27	72.7
OTW-02-2020	27	66.8
KI-02-2020	23	73.9
AT-01-2020	13	86.3
OTW-01-2020	13	72.3
AT-02-2020	13	63.2
AT-07-2019	13	51.8
CAGN Territories by Time since Last Burn		
<15 Years	**15 – 30 Years**	**30 – 44 Years**
4	7	8

CAGN – coastal California gnatcatcher

Table 3-7. Coastal California Gnatcatcher Territories Included in the Analysis That Have Not Burned within the Last 44 Years

CAGN Territory	Years Since Most Recent Proximate Fire	Distance to Closest Fire (feet)
AT-06-2020	44	N/A
JU-02-2020	41	N/A
LO-03-2020	40	1,677
SMR-01-2020	40	1,344
LO-01-2020	40	1,294
WM-03-2020	40	796
WM-01-2020	40	770
WM-04-2020	40	473
LO-07-2020	40	275
LO-05-2020	40	N/A
JU-06-2020	37	459
TA-04-2020	35	1,050
JU-05-2020	32	N/A
MI-03-2020	32	N/A
STM-03-2020	29	1,178
OO-03-2020	29	N/A

CAGN Territory	Years Since Most Recent Proximate Fire	Distance to Closest Fire (feet)
TA-01-2020	28	25
STM-02-2020	14	1,957
STM-01-2016	14	1,754
AT-09-2020	13	N/A
JU-07-2020	12	1,152
JU-08-2020	12	621
MI-04-2020	12	14
SM-01-2019	6	85

CAGN – coastal California gnatcatcher

3.3.3 Home and Core Range Size, Aspect, and Years since Fire

Neither home size nor core range size varied significantly between burned and unburned or with different aspects (Tables 3-8 and 3-9). Previously burned sites averaged 2.6 (0.71 standard deviation [SD] of the mean) acres for the core range, whereas unburned sites averaged 2.6 (0.68 SD) acres. The home range size averaged 10.4 (2.18 SD) acres in burned sites and 9.9 (2.14 SD) acres in unburned sites. Home range sizes for CAGN are provided in Tables 3-10 and 3-11.

Table 3-8. Results of PERMANOVA Analysis Comparing Coastal California Gnatcatcher Home Range Sizes between Burned and Unburned Areas and across Aspects

Source	Pseudo-F	p	Number of Unique Permutations
Burned/Unburned	1.738	0.186	999
Aspect	1.978	0.117	999
Interaction	0.731	0.535	999

Table 3-9. Results of PERMANOVA Analysis Comparing Coastal California Gnatcatcher Core Range Sizes between Burned and Unburned Areas and across Aspects

Source	Pseudo-F	p	Number of Unique Permutations
Burned/Unburned	1.138	0.281	999
Aspect	2.167	0.07	999
Interaction	1.087	0.383	999

Table 3-10. Home Range Size of California Gnatcatcher Territories That Have Burned in the Last 44 Years

CAGN Territory	Years since Last Burn	Core Range (acres) (50% of adaptive kernel)	Home Range (acres) (95% of adaptive kernel)*
AT-01-2020	13	2.15	7.85
AT-02-2020	13	2.18	11.41
AT-04-2020	30	1.57	6.48
AT-05-2020	30	1.99	10.95
AT-07-2019	13	2.07	8.54
AT-08-2020	44	2.29	9.72
BTH-01-2019	44	2.28	8.63
JU-01-2020	41	2.31	9.01
KI-02-2020	23	2.51	9.73
KI-04-2020	41	4.12	15.14
MI-01-2020	32	1.81	8.75
MI-02-2020	32	3.60	13.31
MI-08-2020	32	2.58	10.90
OO-01-2020	29	3.80	12.86
OTW-01-2020	13	3.87	13.55
OTW-02-2019	27	2.48	9.05
OTW-02-2020	27	2.37	10.66
OTW-06-2019	27	1.89	7.85
TA-05-2020	39	2.15	7.85

CAGN – coastal California gnatcatcher
* Includes the core range.

Table 3-11. Home Range Size of Coastal California Gnatcatcher Territories That Have Not Burned in the Last 44 Years

CAGN Territory	Core Range (acres) (50% of adaptive kernel)	Home Range (acres) (95% of adaptive kernel)*
AT-06-2020	1.87	7.68
AT-09-2020	1.87	7.61
JU-02-2020	3.23	11.05
JU-05-2020	3.16	12.14
JU-06-2020	2.64	9.81
JU-07-2020	2.57	9.93
JU-08-2020	2.24	8.29
LO-01-2020	3.49	11.84
LO-03-2020	2.75	9.30
LO-05-2020	2.68	11.25
LO-07-2020	2.78	10.01
MI-03-2020	2.18	9.03
MI-04-2020	4.10	15.02
OO-03-2020	3.62	14.07
OTW-06-2019	2.80	11.25
SM-01-2019	1.71	7.60
SMR-01-2020	3.00	10.21
STM-01-2016	2.49	10.19
STM-02-2020	3.02	11.13
STM-03-2020	2.94	11.90
TA-01-2020	1.44	6.10
TA-04-2020	3.11	11.04
WM-01-2020	1.51	6.31
WM-03-2020	3.33	12.01
WM-04-2020	2.26	9.06

CAGN – coastal California gnatcatcher
* Includes core range.

The highest elevation territory was found at approximately 481 feet above sea level (KI-04-2020). Thirteen territories were completely covered with vegetation (with grasses considered in the calculation). The highest proportion of cover of coastal sage scrub habitat was within the MI-08-2020 territory, which was mapped as having 98.6 percent coastal sage scrub habitat coverage (Appendix F).

Furthermore, when comparing the time since burned categories within themselves (<15 years, 15 to 30 years, 30 to 44 years) to the unburned territories, no significant differences were determined in core and home range size between the groupings (Home Range: Pseudo-F =

1.60, df = 3, p = 0.203; Core Range: Pseudo-F = 1.8, df = 3, p =0.165). Tables 3-12 and 3-13 provide the mean and standard deviation for home and core range sizes across the different burn categories.

Table 3-12. Home Range Sizes of Different Burned Categories

Home Range Comparisons		
Years since Burned	**Mean Territory Acreage**	**Standard Deviation Territory Acreage**
<15	9.61	2.29
15-30	13.64	1.95
30-44	10.37	2.40
Unburned	10.04	2.14

Table 3-13. Core Range Sizes of Different Burned Categories

Core Range Comparisons		
Years since Burned	**Mean Territory Acreage**	**Standard Deviation Territory Acreage**
<15	2.39	0.75
15-30	3.71	0.66
30-44	2.54	0.74
Unburned	2.68	0.66

3.3.4 Vegetation Mapping in Home Ranges

All areas of vegetation within CAGN home ranges were mapped according to the *Manual of California Vegetation* standards (Sawyer et al. 2009). Vegetation maps of all territories are included in Appendix F.

Vegetation Alliances which contained California sagebrush as the dominant or secondarily dominant species accounted for the majority of mapped habitat, covering 306.9 acres of the 438.3 acres (70.0 percent; Tables 3-14 and 3-15). Only one vegetation Alliance not dominated by California sagebrush (excluding Developed areas), *Bromus (diandrus, hordeaceus) – Brachypodium distachyon Seminatural Stands* (8 percent) accounted for more than 1 percent of the mapped territories.

Table 3-14. Acreage of Vegetation Association within the Coastal California Gnatcatcher Home Ranges Included in the Study (n = 44; proportion in parentheses)

Vegetation Association	Total Acreage
Artemisia californica	144.2 (0.32)
Artemisia californica – Eriogonum fasciculatum-Malosma laurina	28.6 (0.07)
Artemisia californica – *Eriogonum fasciculatum – Opuntia littoralis/Dudleya*	57.9 (0.13)
Artemisia californica – Mimulus aurantiacus	1.7 (<0.01)
Artemisia californica – Salvia mellifera	14.8 (0.03)
Baccharis pilularis/Herbaceous	5.4 (0.01)
Baccharis salicifolia	4.6 (0.01)
Brassica (nigra) and Other Mustards Seminatural Stands	5.9 (0.01)
Bromus (*B. diandrus, B. hordeaceus*) – *Brachypodium distachyon* Seminatural Stands	35.4 (0.08)
Conium maculatum Seminatural Stands	4.7 (0.01)
Deinandra fasciculata Herbaceous	2.6 (0.01)
Deinandra paniculata Association	0.32 (<0.01)
Developed – Disturbed	50.7 (0.12)
Encelia californica Shrubland	3.0 (<0.01)
Encelia californica – Artemisia californica	6.9 (0.02)
Eriogonum fasciculatum	0.5 (<0.01)
Eucalyptus (*E. globulus, E. camaldulensis*) Seminatural Stands	1.0 (<0.01)
Herbaceous Wetland	0.6 (<0.01)
Hydrophytic Herbaceous Vegetation	0.9 (<0.01)
Isocoma menziesii Provisional	0.4 (<0.01)
Leymus condensatus	0.73 (<0.01)
Mediterranean California Naturalized Annual and Perennial Grassland Seminatural Stands	5.65 (0.01)
Nassella pulchra	0.2 (<0.01)
Rhamnus crocea Provisional	0.1 (<0.01)
Salix lasiolepis	3.8 (0.1)
Salvia apiana – Artemisia californica	56.7 (0.13)
Stipa pulchra	0.5 (<0.01)
Unvegetated Stream Channel	1.0 (<0.01)
Total Territory Acreage Mapped	**438.3**

Table 3-15. Acreage of Vegetation Alliances within the Home Ranges of Coastal California Gnatcatchers Classified by Burned or Unburned

Vegetation Alliance	Burned (acres)	Proportion of Home Range Categorized as Burned	Unburned (acres)	Proportion of Home Range Categorized as Unburned
Artemisia californica	104.0	0.40	40.2	0.23
Artemisia californica – Eriogonum fasciculatum – Malosma laurina	11.4	0.04	17.2	0.10
Artemisia californica – *Eriogonum fasciculatum – Opuntia littoralis/Dudleya*	38.2	0.15	19.8	0.11
Artemisia californica – Mimulus aurantiacus	0.0	0	1.7	<0.01
Artemisia californica – Salvia mellifera	1.4	<0.01	13.3	0.08
Baccharis pilularis/Herbaceous	0.0	0	5.4	0.03
Baccharis salicifolia	2.1	0.01	2.4	0.01
Brassica (nigra) and Other Mustards Seminatural Stands	2.0	0.01	3.9	0.02
Bromus (*B. diandrus, B. hordeaceus*) – *Brachypodium distachyon* Seminatural Stands	29.9	0.11	5.4	0.03
Conium maculatum Seminatural Stands	4.7	0.02	0.0	0
Deinandra fasciculata Herbaceous	1.9	<0.01	0.0	0
Deinandra paniculata Association	0.3	<0.01	0.0	0
Developed – Disturbed	24.6	0.09	26.1	0.15
Encelia californica Shrubland	0.00	0	3.0	0.02
Encelia californica – Artemisia californica	6.9	0.03	0.0	0
Eriogonum fasciculatum	0.5	<0.01	0.0	0
Eucalyptus (*E. globulus, E. camaldulensis*) Seminatural Stands	0.0	0	1.0	<0.01
Herbaceous Wetland	0.6	<0.01	0.0	0
Hydrophytic Herbaceous Vegetation	0.0	0	0.6	<0.01
Isocoma menziesii Provisional	0.4	<0.01	0.0	0
Leymus condensatus	0.7	<0.01	0.0	0

Vegetation Alliance	Burned (acres)	Proportion of Home Range Categorized as Burned	Unburned (acres)	Proportion of Home Range Categorized as Unburned
Mediterranean California Naturalized Annual and Perennial Grassland Seminatural Stands	0.7	<0.01	5.0	0.03
Nassella pulchra	0.2	<0.01	0.0	0
Rhamnus crocea Provisional	0.0	0	<0.01	<0.01
Salix lasiolepis	0.8	<0.01	3.0	0.02
Salvia apiana – Artemisia californica	28.0	0.10	28.4	0.16
Stipa pulchra	0.3	<0.01	0.2	<0.01
Unvegetated Stream Channel	1.0	<0.01	0.0	0
Total Burned	**260.9**		**Total Unburned**	**177.4**

3.3.5 Resource Model Results

The results of the RELATE tests did not indicate any variables within the Resource Selection Model were significantly correlated with either home range size (Spearman's rank static; (rho) = 0.041, p = 0.164, permutated statistics ≥ rho = 163; Figure 3-3) or core range size (rho = 0.032, p = 0.204, permutated statistics ≥ rho = 203; Figure 3-4).

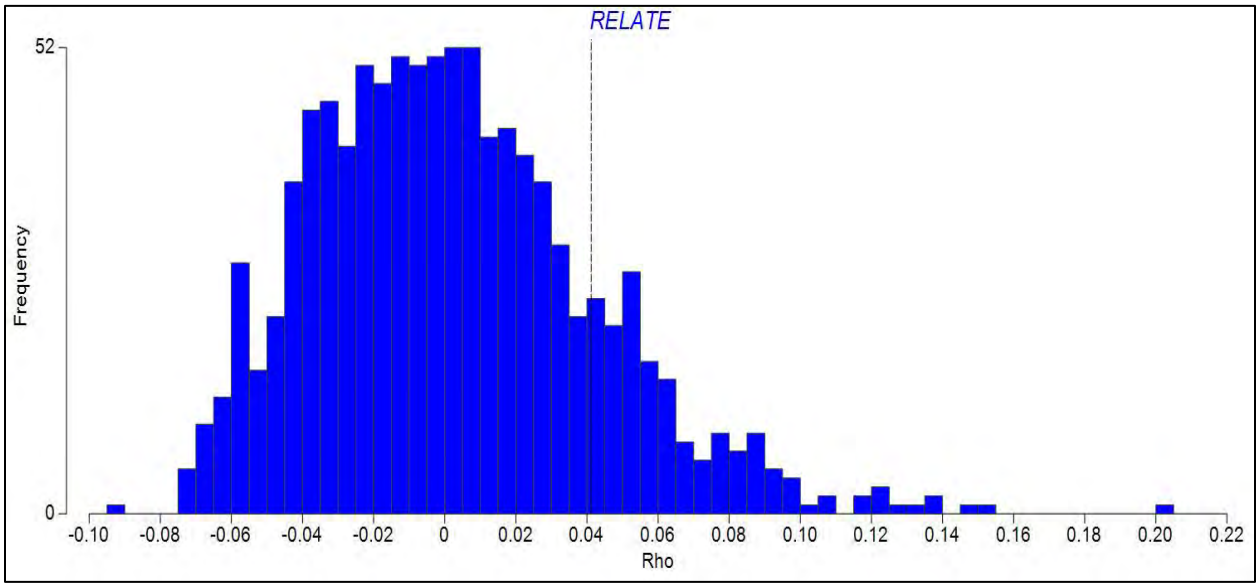

Figure 3-3. Histogram of Randomly Permutated Spearman's Rank Static (rho) Distribution Compared to the True Rho Value (0.041) for the RELATE Test for Correlation between the Resource Selection Model Variables and Coastal California Gnatcatcher Home Range Size

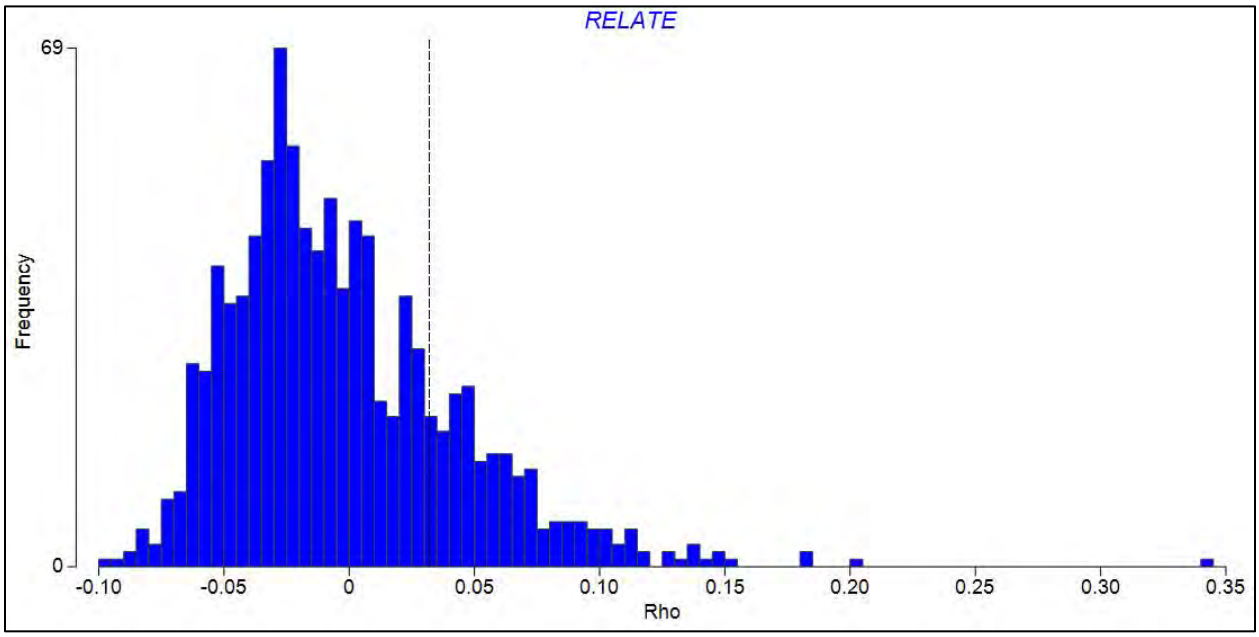

Figure 3-4. Histogram of Randomly Permutated Spearman's Rank Static (rho) Distribution Compared to the True Rho Value (0.032) for the RELATE Test for Correlation between the Resource Selection Model Variables and Coastal California Gnatcatcher Core Range Size

3.4 Territories Included in Multiple Years of Study

Each year only a handful of territories (between four and nine) were found to contain the birds that were banded and followed the previous year in the same territory. In total, 18 pairs had their territories mapped across multiple years. Only one pair, STM-01-2016, was mapped in three study winters (2016-2017, 2017-2018, 2020-2021). Figure 3-5 shows the core range values of territories that could be followed over multiple years; Figure 3-6 shows the home range values for the same territories. The overall trend line is displayed in red, and individual territories are semitransparent and in blue.

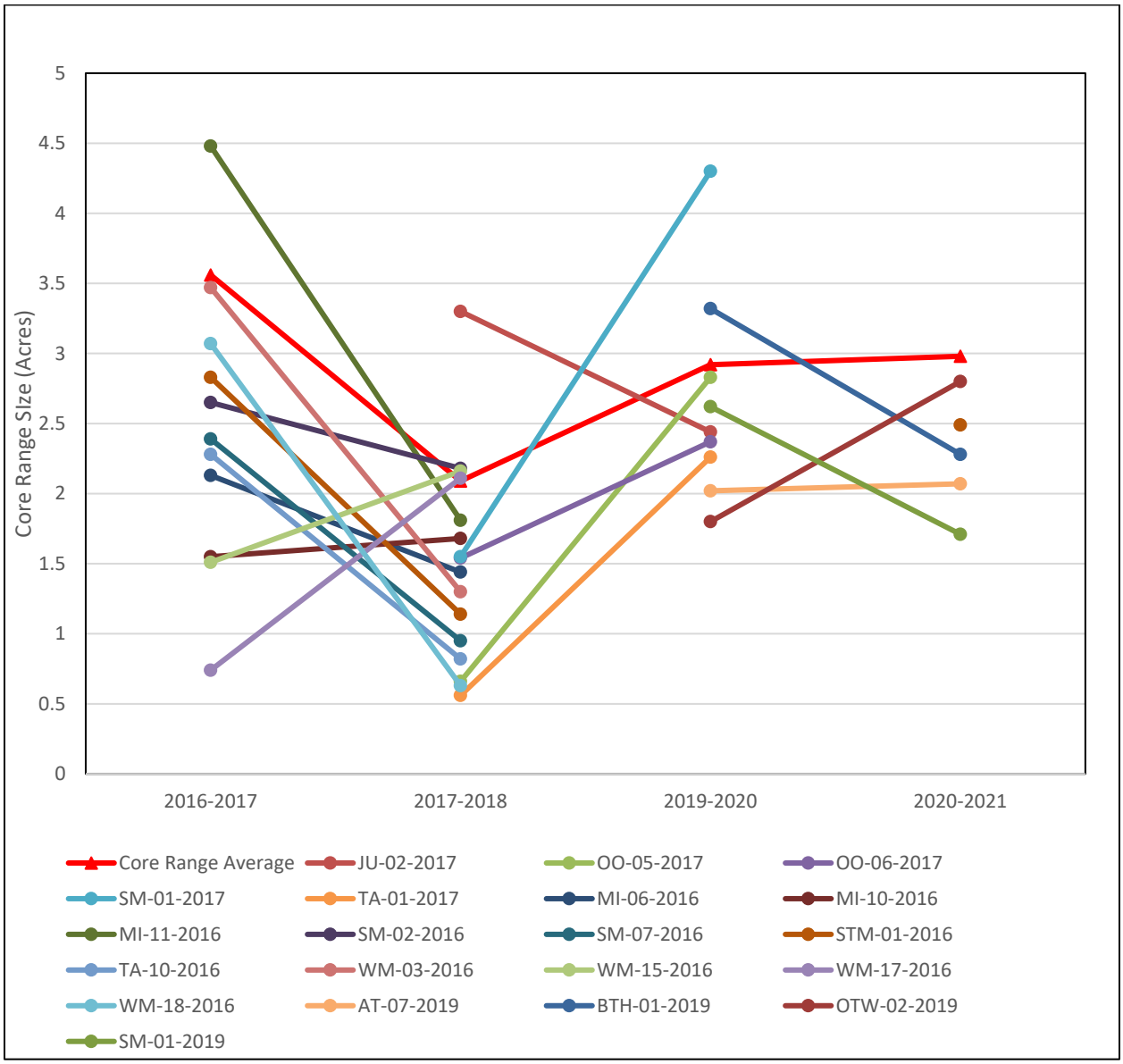

Figure 3-5. Trend of Core Range Territory Size over the Four Study Years (both overall trend and individual territories included in multiple study years)

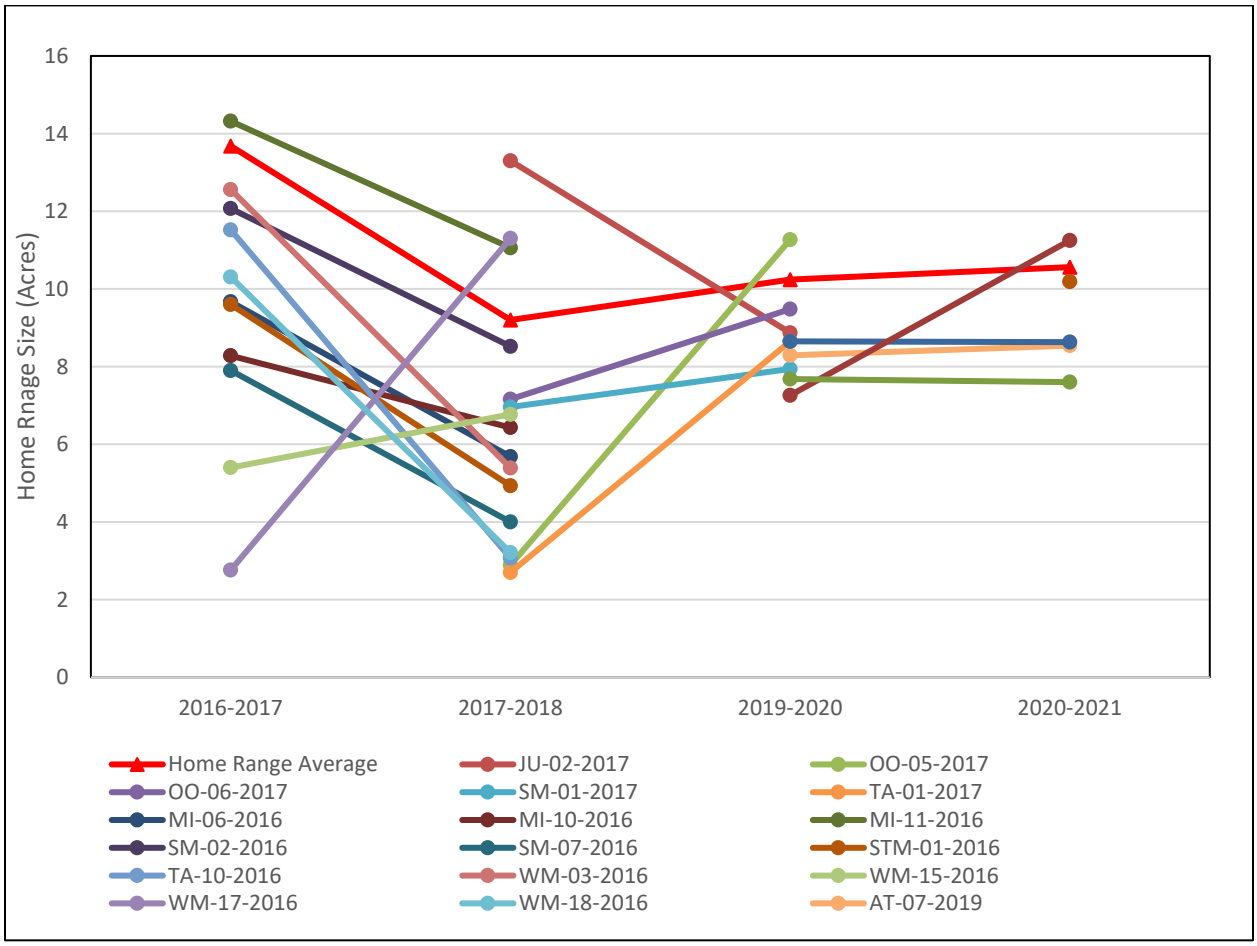

Figure 3-6. Trend of Home Range Territory Size over the Four Study Years (both overall trend and individual territories included in multiple study years)

4.0 DISCUSSION

4.1 Home Range and Comparisons between Study Years

The average winter home range size found in this study was 10.2 (SD 2.18) acres, with the average home range sizes in 2018 and 2019 at 9.2 acres and 10.6 respectively (Vernadero 2018, 2021). All home range average sizes are smaller than the results of the Hercules JV 2018 study (13.7 acres), as well as studies that conducted similar work (Preston et al 1998: 14.0 acres; Hunsaker et al. 2000: 14.8 acres). We performed PERMANOVA tests to compare the home range and core range sizes in the current study to those in 2018 and 2019. We found a significant difference in both home range (Pseudo-F = 11.77, df=2, p = 0.001, unique permutations = 999) and core range (Pseudo-F = 14.53, df = 2, p = 0.001, unique permutations = 997) sizes between years. Home range and core range sizes were significantly more variable and smaller in 2018 than in either 2019 (Home Range: t = 3.67, p = 0.001; average similarity = 83.59; Core Range: t = 4.33, p = 0.001, average similarity = 66.24) or 2020 (Home Range: t = 3.93, p = 0.001, Average Similarity = 71.5; Core Range: t = 4.14, p = 0.001, average similarity = 68.82). The 2019 and 2020 home and core range size comparisons were not significantly different (Home Range: t = 0.478, p = 0.692, average similarity = 85.67; Core Range: t = 1.38 p = 0.18, average similarity = 82.65). Bray-Curtis distances between home range and core range size observations were ordinated using nonmetric multidimensional scaling (MDS). The distances are represented in Figures 4-1 and 4-2. All statistical outputs for this study can be found in Appendix G.

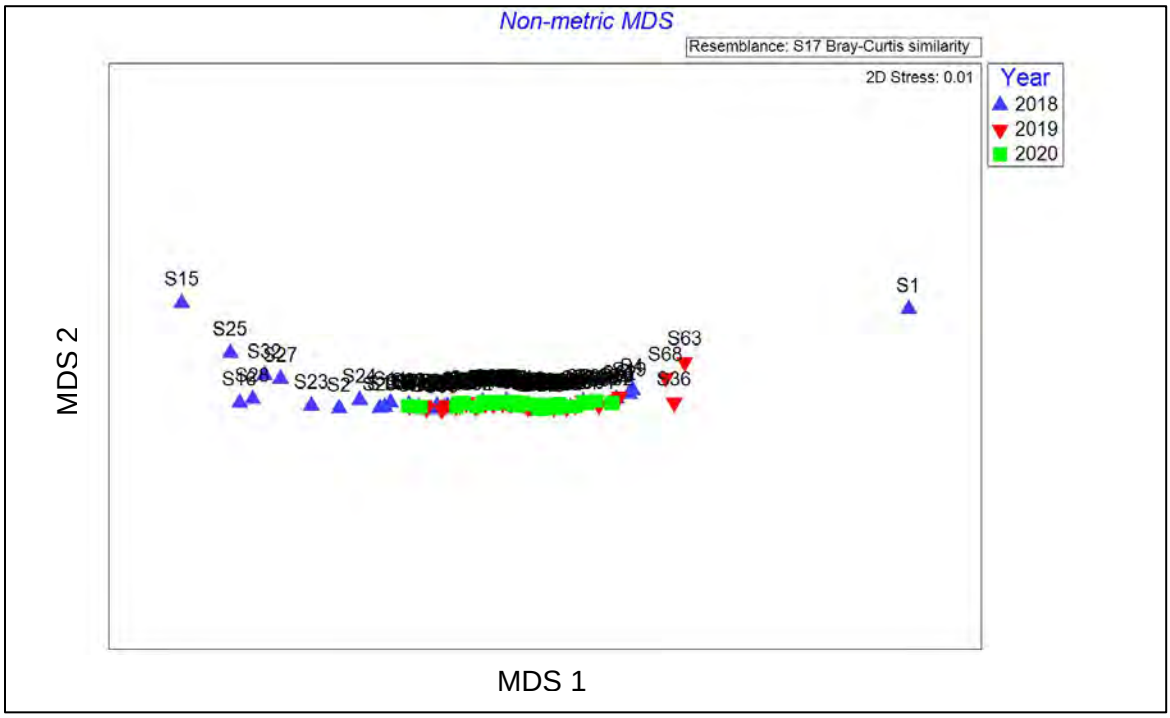

Figure 4-1. Nonmetric Multidimensional Scaling (MDS) Ordinations of Bray-Curtis Distances between Home Range Size Measurements between Sample Years 2018, 2019, and 2020

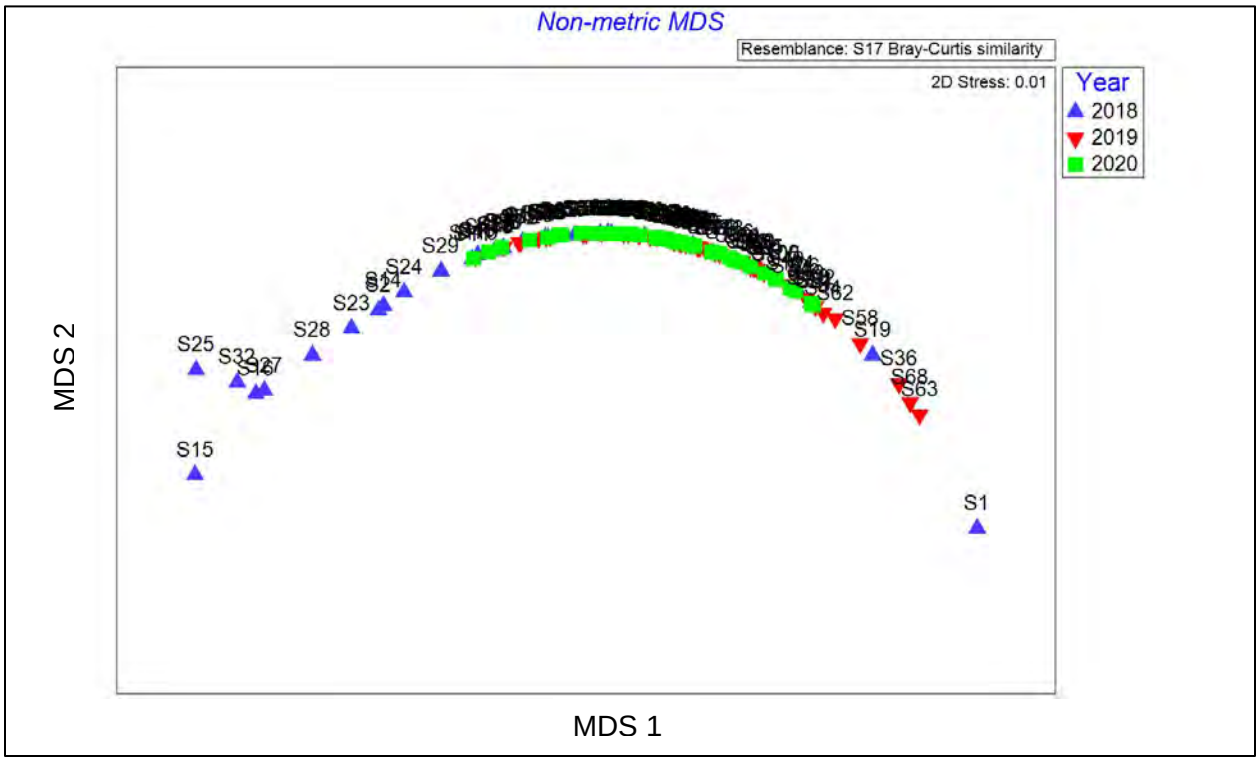

Figure 4-2. Nonmetric Multidimensional Scaling (MDS) Ordinations of Bray-Curtis Distances between Core Range Size Measurements between Sample Years 2018, 2019, and 2020

Observing differences between the study years is not surprising. Most likely, CAGN are responding to ecological cues that this study does not have the ability to measure, such as prey base abundance or fire intensity/frequency. The average core and home ranges in the 2020-2021 study year are statistically similar to the 2019-2020 data and have a higher variance from the 2018-2019 study year. Overall (including the 2016 data as well), we have not detected correlations in core or home range size in abiotic factors such as years since the last fire, distance to closest burned area, distance to a road, distance to riparian habitat, distance to the coast, slope, aspect, and elevation. While we have had significant findings in the resource models (for example, aspect in the current study year), these outliers have not been consistent over time and are most likely a function of habitat selection bias (such as coastal sage scrub being found predominantly on south-facing slopes) and not a driver of core and home range size differences. Considering the four years of data, we do not see a significant relationship between these abiotic factors and CAGN core and home range size.

Comparing territory sizes in the context of time since they last burned can provide us with insight into how CAGN respond to fire and how long it takes them to recolonize an area after it burns. Since we are only able to study home and core range sizes in areas that have been recolonized by CAGN after a fire (or were never abandoned), we cannot speak to areas that have been abandoned/became inhabitable after fire or repeated fires. This may occur because of a loss of resources (prey base) or vegetation changes over time after frequent exposure to

fire or other factors such as drought. Our two years of study data have confirmed what is already well known about CAGN habitat (Preston et al 1998; Hunsaker et al. 2000; Hercules JV 2018); namely, that it is dominated by California sagebrush. If habitats are burned frequently enough to cause a dominant vegetation community change to grassland or invasive species (i.e., type conversion), undoubtedly CAGN occupancy would decline.

What our study has failed to document—granted, with limited territories in recently (<15 years, n=8) burned territories—is a change in territory size, either core or home range, in response to the time since the territory last burned. Our criterion for including a territory in the "burned" analysis was that greater than 50 percent of the territory had burned since MCBCP began keeping detailed fire data. Counting the last two years of our study data, we mapped 41 territories as burned and 35 as unburned. PERMANOVA analysis detected no difference in core and home range sizes (acres) between burned and unburned CAGN winter territories (Section 3.3.3).

Knowing the CAGN's post-fire responses in habitat that is recolonized or was never abandoned during a fire event is vital for MCBCP's planning purposes. Fires are a reality in coastal sage scrub habitat, but more so on military bases where ignition sources from training are common. Four years of data have shown that, in habitat where CAGN persist, there are no significant differences in their home range size during the winter regardless of the time since burned within the territory or whether there were fires in the territory at all. If coastal sage scrub habitat is the dominant vegetation community, it appears that time since fire does not affect winter range size.

4.2 Vegetation

As with the previous three studies, we found that CAGN selectively utilized certain plant species during the winter season. We had overlap with seven of the eight previously documented species that were preferred, consisting of coyote brush, laurel sumac, coast prickly pear, lemonade berry, white sage, elderberry, and fennel. Additionally, this season we found CAGN preferring California sagebrush as its frequency increased in the environment. These data further indicate what has previously been established with CAGN: that California sagebrush is the dominant plant species in most of the mapped CAGN territories and an indicator of healthy, suitable CAGN habitat.

We recommend seven native species documented as preferred by CAGN in the three studies be included in restoration efforts/seed mixes to be used on projects across the Base. Fennel was excluded from this list, as planting invasive nonnative species is not recommended. Those seven native species are California sagebrush, coyote brush, laurel sumac, coast prickly pear, lemonade berry, white sage, and elderberry. During the study, these seven species were found predominately in the coastal-sage-scrub-dominated Alliances. Therefore, plantings/seed mixes should contain ratios of plants similar to those found in these Alliances aboard MCBCP and should avoid oversaturating the habitat (from a CAGN's perspective) with lemonade berry if the purpose of the restoration efforts are providing or enhancing suitable CAGN habitat. To further enhance suitable CAGN habitat, and in addition to planting native species, nonnative plants

such as black mustard and fennel can also be treated. Nonnative plants can be physically removed and/or treated with appropriate herbicides.

4.3 Future Studies

Between the data collected for this study, Vernadero data collected in 2018-2019, 2019-2020, 2020-2021 and the work done by Hercules JV in 2016, MCBCP now has four years of data on CAGN territories and vegetation use aboard MCBCP during the winter season. These data indicate that CAGN has selected certain plant species in excess of their availability in the habitat during winter seasons. Knowing which plant species CAGN prefers and selects will enable MCBCP to develop plans for the protection of these plant species and vegetation Alliances where they are dominant. The species also could be used as plant palette recommendations for habitat enhancement and restoration projects.

One outcome of this study (and the previous three studies) was a low observation rate of previously banded individuals across study years. Only 18 out of 165 territories included in the winter home range analysis were able to be compared across multiple study years as a result of being found in an additional study year other than the one they were banded in. This less 10.9 inclusion rate year to year is only exasperated by the fact that we often banded multiple birds in a territory, including both mating partners and the fledglings. Even with this extensive banding effort over four separate seasons, we did not many birds resighted across seasons. Our best hypothesis is that this is due to a high attrition rate. No doubt that some of the inability to resight banded individuals across years is because of dispersal and movement of animals year to year. However, given that we only had one two individuals that moved year to year and established a territory in a new location, it seems unlikely dispersal (at least local dispersal) was a large contributor to this. Additionally, given the geographic breadth of our surveys, it is logical to expect our surveyors to find most of the individuals if they moved a territory or two over, moved across roads or even had larger dispersals; our surveys covered all possible CAGN base aboard MCBCP. Perhaps there is high attrition year to year in CAGN populations. If the Base wished to determine the cause of this inability to resight individuals across years, a telemetry study could provide this information. If the Base was able to follow individuals movements, year-round after individuals were captured, banded and released, then the Base would be able to determine where individuals were going and if the lack of ability to resight individuals year to year was due to dispersal factors or attrition.

In addition to the goal of collecting data on CAGN vegetation use, this report and the Hercules JV 2016 studies had the goal of gathering data for MCBCP environmental management regarding CAGN use of post-burn areas during the winter season. However, the lack of CAGN pairs observed occupying recently burned (<15 years) areas makes it difficult to offer informed conclusions. This study only included four pairs of CAGN in areas that had burned in the last 15 years; in 2019-2020, the study included only six pairs; in 2017-2018, the study included only two pairs; in 2016-2017, there were only four. This total of 16 pairs across all study years in areas that have burned in the last 15 years is still a low number. This inability to locate and band birds in recently burned areas is most likely because low numbers of CAGN occupy the recently burned areas, possibly due to reduced prey base abundance.

If CAGN are choosing to not occupy recently burned areas, that knowledge could help MCBCP make informed environmental management decisions for future planning and restoration. Those areas could be prioritized for development due to the lack of potential impacts on active CAGN territories. Conversely, if MCBCP wishes to increase the availability of CAGN habitat, recently burned areas could be prioritized for restoration to structural and species compositions that CAGN have been shown to prefer, which could allow CAGN to expand into these areas and increase the occupied habitat on MCBCP. So far, cumulatively, the four study years have documented that CAGN do not change their home range size in response to time since a fire.

To further understand CAGN response to fire, Vernadero recommends a study examining CAGN use in recently burned habitat where study sites consist of paired locations (recently burned versus unburned). Fires burn every year on MCBCP and provide an opportunity to study the immediate response to fires by CAGN in areas where they were known to occupy prior to the fire(s). These studies could consist of banding individuals and following them throughout the year to observe burned versus unburned habitat usage, using simple presence/absence surveys in burned and unburned areas. This larger post-burn picture would give MCBCP's management an improved understanding of CAGN use of recently burned and unburned areas, allowing for more informed decisions regarding training and/or restoration activities in those areas.

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Appendix A. Bird Banding Examples

FORMAT PAGE

Figure A-1. Photograph of Banding of Male from Territory AT-10-2019

Figure A-2. Photograph of Banding of Female from Territory AT-09-2019

Figure A-3. Photograph of Banding of Female from Territory LO-02-2019

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Appendix B. U.S. Fish and Wildlife Service Permits and 15-Day Notification Letter

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United States Department of the Interior
U.S. GEOLOGICAL SURVEY
PATUXENT WILDLIFE RESEARCH CENTER
BIRD BANDING LABORATORY
12100 BEECH FOREST ROAD STE-4037
LAUREL, MD 20708-4037
301-497-5790

FEDERAL BIRD BANDING PERMIT

Permittee: Personal	Permit Number:	Action:	Action Date:	Issue Date:	Valid Until:
DANA K KAMADA	22956	Renew	04/04/19	03/22/99	06/30/22
3413 CALLE LA VETA	Signature of Issuing Official, Chief, Bird Banding Laboratory: Bruce Peterjohn				
SAN CLEMENTE, CA 92672 4855	Signature of Permittee: Dana Kamada — Digitally signed by Dana Kamada DN: cn=Dana Kamada, o, ou, email=dkamada@cox.net, c=US Date: 2019.04.04 15:01:44 -07'00'				

Permittee agrees to band in accordance with the general conditions of this permit and with the specific authorization/s listed below:

Permittee is Authorized To Band:

All Species Except Waterfowl and Eagles
* Threatened and Endangered species are not included in groups unless specified.

California Gnatcatcher
Least Bell's Vireo
Southwestern Willow Flycatcher

In the States of:

CA *

With Special Authorization to:

Band
Take, possess and transport blood samples-not to exceed 1% body mass
Take, possess and transport feather samples
Use Mist nets
Trap

And Additionally Authorized to Use The Following Auxiliary Marking Authorization/s:

Marker Type	Species	Colors of marker	Locations	Seg #
Plastic Color Leg Band (01A)	California Gnatcatcher	Black, Blue, Green, Mauve, Miscellaneous, Orange, Purple, Red, White, Yellow	Orange, CA	2

Comments
MISC COLORS=SPLIT RED/WHI AND LT GRN/YEL; ALSO ANODIZING FEDERAL BANDIN COOPERATION WITH OTHER CAGN RESEARCHERS

Marker Type	Species	Colors of marker	Locations	Seg #
Plastic Color Leg Band (01A)	Cactus Wren	Black, Blue, Green, Hot Pink, Light Green, Multi-color, Orange, Purple, Red, White, Yellow	Orange, CA	3

Comments
Stripes = splits of dk blu/mauve & red/whi. ALSO PERMISSION TO ANODIZE THE FEDERAL BAND

Permittee: Personal	Permit Number:	Action:	Action Date:	Issue Date:	Valid Until:
DANA K KAMADA	22956	Renew	04/04/19	03/22/99	06/30/22
3413 CALLE LA VETA	Signature of Issuing Official, Chief, Bird Banding Laboratory: Bruce Peterjohn				
SAN CLEMENTE, CA 92672 4855	Signature of Permittee: Dana Kamada — Digitally signed by Dana Kamada, DN: cn=Dana Kamada, o, ou, email=dkamada@cox.net, c=US, Date: 2019.04.04 15:02:19 -07'00'				

Permittee agrees to band in accordance with the general conditions of this permit and with the specific authorization/s listed below:

Marker Type	Species	Colors of marker	Locations	Seg #
Transmitter (obsolete) (89)	Cactus Wren		Orange, CA	4

Comments
NTE 3% total body weight, Rappole backpack harness, 164-167 MHz

Marker Type	Species	Colors of marker	Locations	Seg #
Anodized Color Leg Band (01B)	Cactus Wren	Blue, Gold, Purple	Orange, CA	5

Comments
Anodized Federal bands

The following Subpermittee/s are authorized to band under the direction of the above permittee, in accordance with the same general conditions, and the subpermittee specific authorizations listed below:

22956 - B PETER H BLOOM 13611 HEWES AVENUE SANTA ANA, CA 92705

Is Authorized To Band:

Cactus Wren

In the States Of:

CA *

With Special Authorization to:

Band
Auxiliary mark
Take, possess and transport blood samples-not to exceed 1% body mass
Take, possess and transport feather samples
Use Mist nets
Trap

22956 - C ROBERT A HAMILTON 316 MONROVIA AVENUE LONG BEACH, CA 90803

Is Authorized To Band:

Cactus Wren

In the States Of:

CA *

With Special Authorization to:

Band
Auxiliary mark
Take, possess and transport feather samples
Use Mist nets
Trap

Permittee: Personal	Permit Number:	Action:	Action Date:	Issue Date:	Valid Until:
DANA K KAMADA	22956	Renew	04/04/19	03/22/99	06/30/22
3413 CALLE LA VETA	Signature of Issuing Official, Chief, Bird Banding Laboratory: Bruce Peterjohn				
SAN CLEMENTE, CA 92672 4855	Signature of Permittee: Dana Kamada — Digitally signed by Dana Kamada DN: cn=Dana Kamada, o, ou, email=dkamada@cox.net, c=US Date: 2019.04.04 15:02:52 -07'00'				

Permittee agrees to band in accordance with the general conditions of this permit and with the specific authorization/s listed below:

22956 - D KARLEY MOORE 37 BRIGMORE AISLE IRVINE, CA 92603

Is Authorized To Band:

Cactus Wren

In the States Of:

CA *

With Special Authorization to:

Band
Auxiliary mark
Take, possess and transport blood samples-not to exceed 1% body mass
Take, possess and transport feather samples
Use Mist nets
Trap

Comments:

Blood sampling by toe nail clip only after successful training.

22956 - F DANIEL S COOPER 5850 WEST 3RD STREET #167 LOS ANGELES, CA 90036

Is Authorized To Band:

Cactus Wren

In the States Of:

CA *

With Special Authorization to:

Band
Auxiliary mark
Take, possess and transport blood samples-not to exceed 1% body mass
Take, possess and transport feather samples
Use Mist nets
Trap

FEDERAL BIRD BANDING PERMIT

Under the provisions of Regulations issued under the Migratory Bird Treaty Act of July 3, 1918 (40 Stat. 755) as amended, or the Bald Eagle Act of June 8, 1940 (54 Stat. 250) as amended, the person named hereon is authorized to capture, for scientific banding or marking purposes, those migratory birds described hereon and to salvage birds accidentally killed during normal banding activities.

This permit is subject to the terms, exceptions and restrictions expressed herein or on the reverse side hereof and is further subject to any applicable Territorial, State, Tribal or Federal Regulations.

This permit is invalid unless accompanied by any required State permits or licenses.

GENERAL CONDITIONS

1. The Permittee is not authorized to capture or possess migratory birds for any reason other than banding, marking or salvage of banding mortalities for scientific purposes. NOR IS THE PERMITTEE ALLOWED TO HOLD MIGRATORY BIRDS FOR A PERIOD OF MORE THAN 24 HOURS. Live birds shall be released as soon as practical after capture.
2. You may donate dead migratory birds or any parts thereof (except bald eagles and golden eagles, and species listed as threatened and endangered) without additional authorization from the migratory bird permit issuing office to public institutions (as specified in 50 CFR 10.12) or individuals or entities authorized by permit to acquire and possess migratory bird specimens for educational purposes. All dead specimens that you do not transfer to another authorized party must be disposed of by such means as are necessary to ensure that they are not exposed to animals in the wild.
3. You may not salvage and must immediately report to the USFWS Office of Law Enforcement any dead or injured migratory birds that you encounter that appear to have been poisoned, shot, electrocuted, have collided with industrial power generation equipment, or were otherwise killed or injured as the result of potential criminal activity. Please contact BBL for more information.
4. All eagle feathers and/or whole eagle carcasses must be shipped to the National Eagle Repository. Contact: U.S. Fish and Wildlife Service, National Eagle and Wildlife Repository, 5650 Havana St., RMA, Building 128, Commerce City, Colorado 80022, (303) 287-2110.
5. The Permittee shall keep RECORDS accounting for the use of all bands received. Periodic RECORDS COVERING THE USE OF THESE BANDS shall be submitted to the Bird Banding Laboratory in accordance with the instructions received there from. Failure to provide data in accordance with the instructions received from the Bird Banding Laboratory is sufficient justification for the revocation of this permit. The Permittee shall keep records of disposition of salvaged banding mortalities for a period of five years and shall be reported to the Bird Banding Laboratory upon request.
6. The holder of this permit shall not sell, exchange, or transfer bands to unauthorized banders or to the general public. All transfers to authorized banders must be communicated to the Bird Banding Laboratory prior to the transfer of bands. Any unused bands remaining when this permit is voluntarily returned, revoked, or expired must be returned to the Bird Banding Laboratory.
7. The Permittee shall, at all reasonable hours, allow any authorized representative of the U. S. Geological Survey or the U.S. Fish and Wildlife Service to ENTER and INSPECT the premises where operations authorized by this permit are being conducted and shall allow such representative to inspect the records relating to such operations.
8. This permit may be SUSPENDED or REVOKED by the Director of the U.S. Geological Survey or authorized representative, if the Permittee violates any of the provisions in the regulations under which this permit is issued or if the Permittee fails to render promptly any reports required. This permit is, at all times, subject to suspension or revocation at the discretion of the Director or representative.
9. This permit is not transferable and must be in possession of the Permittee when exercising the authorizations granted herein.
10. All traps, nets or other capture devices shall bear a TAG or LABEL showing the name, address and permit number of the Permittee; alternatively the trapping area shall be adequately marked with POSTERS provided by the Bird Banding Laboratory. The Permittee's name, address and permit number shall be legibly displayed on such posters.
11. This permit DOES NOT authorize the capture of any birds on any property, public or private without the CONSENT OF THE OWNER OR CUSTODIAN THEREOF.
12. All Banding under this permit is in accordance with the principles, spirit, and intent of the Animal Welfare Act of 1970 and the most recent revision of The Ornithological Council's Guidelines in the Use of Wild Birds in Research.
13. Unless specifically noted on the reverse, the following ARE NOT AUTHORIZED:

a. The taking of blood or feather sampling from any bird.

b. The use of ANY BAND, clip, paint, dye, signal-sending device or any marking device other than the official numbered leg bands issued by the Bird Banding Laboratory.

c. The use of MIST NETS or other nets for the capturing of birds.

d. The use of TRANQUILIZING DRUGS OR OTHER CHEMICALS for the purpose of capturing birds.

e. Trapping or disturbing the nests or nestlings, for the purpose of banding or marking, of species designated by the Secretary of Interior as "ENDANGERED "or "THREATENED."

f. The handling of any PREVIOUSLY BANDED BIRD in any manner which may bias data on file in the Bird Banding Laboratory which pertain to that bird or which may alter that bird's survival potential, behavior or other normal characteristics. This specifically includes adding markers to or removing markers from previously banded birds.

14. If a bird is found injured, the bander must assess the injury to determine if treatment and rehabilitation would lead to the bird's recovery. If it is likely that treatment will allow the bird to recover from it's injuries, the bander should transport the injured bird to an avian rehabilitation facility. If the bander determines that recovery is not likely given the extent of the injuries, they should euthanize the bird using approved euthanasia procedures. Banders operating under IACUC approval should follow their estabished guidelines regarding the application of euthanasia to bird in distress. Other banders should take the most appropriate course of action under the circumstances and consider euthanasia to avoid prolonged distress on birds.

Form 9-475
(February 2018)

NATIVE ENDANGERED & THREATENED SP. RECOVERY - E & T WILDLIFE
MIGRATORY BIRDS

Permit Number: TE799568-9

Effective: 12/11/2018 Expires: 12/10/2023

Issuing Office:

Department of the Interior
U.S. FISH & WILDLIFE SERVICE
Endangered Species Permit Office
2800 Cottage Way, Suite W-2606
Sacramento, CA 95825-1846
permitsR8ES@fws.gov

SCOTT SOBIECH, ACTING FIELD SUPERVISOR DEC 18 2018

Permittee:

Dana K. Kamada
3413 CALLE LA VETA
San Clemente, CA 92672
U.S.A.

Authority: Statutes and Regulations: 16 USC 1539(a), 16 USC 1533(d), 16 USC 703-712; 50 CFR 17.22, 50 CFR 17.32, 50 CFR 21.23 & 21.27, 50 CFR 13.

Location where authorized activity may be conducted:
ON LANDS SPECIFIED WITHIN THE ATTACHED SPECIAL TERMS AND CONDITIONS

Reporting requirements:
ANNUAL REPORT DUE: 1/31
See permit conditions for further reporting requirements.

Authorizations and Conditions:
D. Further conditions of authorization are contained in the attached Special Terms and Conditions

SPECIAL TERMS AND CONDITIONS
Dana Kamada

1. This permit was previously issued on May 3, 2013. The terms and conditions set forth in that permit are hereby superseded by this amendment.

2. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the "General Permit Procedures and Permit Regulations for Native Endangered and Threatened Wildlife Species Permits," 50 CFR Part 13, 50 CFR 17.21 and 17.22 (endangered wildlife) and/or 50 CFR 17.31 and 17.32 (threatened wildlife), as applicable found at: http://www.fws.gov/carlsbad/r8permits/permitprocedures-regulations.htm

3. The permittee must have all other applicable State and Federal permits prior to the commencement of activities authorized by this permit. In addition, this permit does not authorize access to Federal, Tribal, State, local government, or private lands as it is the responsibility of the permittee to obtain land owner permission prior to commencing permitted activities on such lands.

4. The permittee is authorized to take (harass by survey, locate and monitor nests, remove brown-headed cowbird (*Molothrus ater*) chicks and eggs from parasitized nests, capture, handle, band, color-band, collect tail feathers, and release) the coastal California gnatcatcher (*Polioptila californica californica*); take (harass by survey, locate and monitor nests, capture, handle, band, color-band, and release) the southwestern willow flycatcher (*Empidonax traillii extimus*); take (locate and monitor nests, and remove brown-headed cowbird eggs and chicks from parasitized nests; capture, handle, band, and release) the least Bell's vireo (*Vireo bellii pusillus*); and take (pursuit by survey) the Quino checkerspot butterfly (*Euphydryas editha quino*) in conjunction with surveys and population monitoring activities for the purpose of enhancing their survival, as specified in the permittee's November 8, 2016 permit renewal request, in accordance with the conditions stated below.

5. Permitted activities are restricted to the following geographic areas in California:

   a. For surveying the southwestern willow flycatcher, coastal California gnatcatcher and Quino checkerspot butterfly:

      Throughout the range of each species.

   b. For all other activities for the coastal California gnatcatcher:

      Restricted to the home range study located at Marine Corps Base Camp Pendleton.

   c. For locating and monitoring nests for the southwestern willow flycatcher:

      Restricted to the Western Foundation of Vertebrate Zoology study along the Santa Clara River.

d. For locating and monitoring nests and remove brown-headed cowbird eggs and chicks from parasitized nests for the least Bell's vireo:

Restricted to the Western Foundation of Vertebrate Zoology studies along the Santa Clara River and the Ventura River.

e. For banding the southwestern willow flycatcher and the least Bell's vireo:

Restricted to existing and currently authorized MAPS station sites.

Notifications to conduct activities at the above authorized locations pursuant to this permit shall be submitted in writing to the Recovery Permit Coordinator at the appropriate Fish and Wildlife Office (FWO) of the U.S. Fish and Wildlife Service (Service) at least 15 days prior to conducting such activities. The appropriate FWO is determined as follows:

Carlsbad Fish and Wildlife Office (CFWO):
2177 Salk Avenue, Suite 250, Carlsbad, California 92008 (telephone: 760-431-9440).

Sacramento Fish and Wildlife Office (SFWO):
2800 Cottage Way, W-2605, Sacramento, California 95825 (telephone: 916-414-6600).

Ventura Fish and Wildlife Office (VFWO):
2493 Portola Road, Suite B, Ventura, California 93003 (telephone: 805-644-1766).

For permit coordinator contact information for each field office specified herein, please reference our Region 8 permitting webpage at:
https://www.fws.gov/cno/es/minqual.html
Contacts will be on lower right side of webpage.

For guidance regarding field office jurisdiction please reference:
http://www.fws.gov/carlsbad/r8permits/R8JurisdictionalMaps.html
If still in doubt in determining the jurisdictional boundary lines within any jurisdictional field office, contact the Recovery Permit Coordinator of the applicable FWO to ensure your activities are conducted and reported within the correct jurisdiction.

Notifications shall include, as appropriate: (a) an explanation of the purpose of the study and a clear description of methods, including the names of field personnel and the number and dates of surveys; (b) the number of individuals proposed to be captured and/or collected; (c) a map (at a minimum, a 1:24,000 scale U.S. Geological Survey (USGS) topographical map) depicting the location of the survey site(s); (d) the assessor's parcel number (APN) for the site (if possible); and (e) geographic information system (GIS) data depicting the survey site or global positioning system (GPS) coordinates (if possible). Information may be submitted electronically if pre-arranged with the Recovery Permit Coordinator.

After 15 days of the Service's receipt of the notification, the permittee may commence activities authorized by this permit unless authorization is denied by the Service. If the permittee is denied authorization to conduct the proposed activities or activities at the requested location(s), including previously authorized sites, a request for reconsideration may be submitted to the Endangered Species Division Chief at the Service's Regional Office for the Pacific Southwest Region (Region 8), 2800 Cottage Way, Room W-2606, Sacramento, California 95825-1846, as provided in 50 CFR 13.29. The procedures specified in 50 CFR 13.29(b) must be followed.

6. Authorized individuals:

Only individuals on the attached List of Authorized Individuals (List) are authorized to conduct activities pursuant to this permit. The List, printed on Service letterhead, may identify special conditions or circumstances under which individuals are authorized to conduct permitted activities and must be retained with these Special Terms and Conditions. Each named individual will be responsible for compliance with the terms and conditions of this permit.

To request changes to the List, the permittee must submit written requests to the Recovery Permit Coordinator at the CFWO at least 30 days prior to the requested effective date. The request must be signed and dated by the permittee and include:

a. The permit number.

b. The name of each individual to be appended to the List.

c. The resume/qualifications statement of each person to be appended to the List, detailing their experience with each species and type of activity for which authorization is requested.

d. The names, phone numbers and email addresses of a minimum of two references including letters of reference. Letters of reference should address the individual's qualifications for the specific activities to be conducted.

e. The names of the individuals to be deleted from the List.

Note: This procedure is for personnel changes only. For requests to renew/amend this permit, a complete application must be submitted to the Region 8 office.

7. Taking of the coastal California gnatcatcher (gnatcatcher):

The permittee is authorized to conduct surveys for gnatcatchers using recorded vocalizations, locate and monitor nests, remove brown-headed cowbird chicks and eggs from parasitized gnatcatcher nests, capture, handle, band, color-band adults, collect no more than two tail feathers, and release within 30 minutes, adults and nestlings within the

geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. The permittee conducts all presence/absence surveys in accordance with the approved Coastal California Gnatcatcher Presence/Absence Survey Guidelines, dated February 28, 1997 for gnatcatcher surveys unless authorized in advance by the Recovery Permit Coordinator at the appropriate FWO. The current approved survey guidelines can be retrieved at the following address: (https://www.fws.gov/pacific/ecoservices/endangered/recovery/documents/CCalGnatcatcher.1997.protocol.pdf)

b. Recorded vocalizations are used only until individuals have been initially located and not to elicit further behavior.

c. Activities are not conducted during inclement weather conditions that would significantly reduce the detectability of the species or expose nest contents to the elements (e.g., rain, strong wind, fog).

d. For locating and monitoring nests:

   i. Nest locating and monitoring will be conducted by no more than two individuals during any visit.

   ii. The permittee will use behavioral clues (calls between mates, following flight directions, and observing gnatcatchers carrying food items) as a guide to the nesting area and nest, rather than using random searching or meandering through suitable habitat. Once a nest is located, the permittee will observe the behavior of the adult(s) to determine the current reproductive stage (nest building, egg-laying, incubation, or chick rearing/fledging). Permittees will leave the nest area by a different route then the one used to approach the nest.

   iii. The permittee will use an extension pole with a mirror or micro-camera to check nest contents only when necessary and with the minimal amount of time needed.

   iv. Nests are not to be visited more than once per day and no more than three times during the nesting season.

   v. Nests are not visited if brown-headed cowbirds, western scrub jays (*Aphelocoma californica*), or other corvid or accipiter species are detected in the immediate vicinity.

e. The removal of brown-headed cowbird chicks and eggs is accomplished with minimal disturbance to gnatcatcher eggs, chicks, or nesting adults. Replacement of cowbird eggs with dummy eggs (to preclude the abandonment of small clutches) shall be done at the discretion of the permittee.

f. No more than two mist nets will be used. Mist nests will be closely monitored at all times.

g. For banding adult gnatcatchers:

i. All banding and color-banding will be conducted under a valid Federal Migratory Bird Banding Permit with auxiliary marking authorization.

ii. The permittee is authorized to apply up to four bands (including a Service band) per bird and no more than two bands (including a Service band) per leg.

h. No more than two tail feathers may be collected from adult gnatcatchers. The collection of blood is <u>not</u> authorized pursuant to this recovery permit.

8. Taking of the southwestern willow flycatcher (flycatcher):

The permittee is authorized to conduct surveys for flycatchers using recorded vocalizations, locate and monitor nests, remove brown-headed cowbird eggs and chicks from parasitized nests, capture, handle, band, color-band, and release within 30 minutes flycatchers within the geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. The permittee conducts all presence/absence surveys in accordance with the approved protocols for flycatcher surveys unless authorized in advance by the Recovery Permit Coordinator at the appropriate FWO:

Sogge, M.K., Ahlers, D., and Sferra, S.J. 2010. A natural history summary and survey protocol for the southwestern willow flycatcher: U.S. Geological Survey Techniques and Methods 2A-IO, 38 p. The current approved survey protocols can be retrieved at the following address: (http://pubs.er.usgs.gov/publication/tm2A10)

b. Recorded vocalizations are used only until individuals have been initially located and not to elicit further behavior.

c. Activities are not conducted during inclement weather conditions that would significantly reduce the detectability of the species or expose nest contents (i.e., chicks, eggs) to the elements (e.g., rain, strong wind, fog).

d. For surveys in Kern County, California, the permittee will contact Mary Whitfield at the Southern Sierra Research Station and the Recovery Permit Coordinator at the SFWO prior to conducting surveys to coordinate efforts and avoid duplicative survey efforts.

e. For locating and monitoring nests:

i. Nest locating and monitoring will be conducted by no more than two individuals during any visit.

ii. The permittee will use behavioral clues as a guide to the nesting area and nest, rather than using random searching or meandering through suitable habitat. Once a nest is located, the permittee will observe the behavior of the adult(s) to determine the current reproductive stage (nest building, egg-laying, incubation, or chick rearing/fledging). This can be done with binoculars or a scope from a distance.

iii. Flycatcher nest trees, nests, and eggs will not be touched or handled unless otherwise stipulated below. The permittee will use an extension pole with a mirror or micro-camera to check nest contents only when necessary and with the minimal amount of time needed. Permittees will leave the nest area by a different route then the one used to approach the nest.

iv. Nests are not to be visited more than once per day and no more than four times during the nesting season. The permittee may use following time periods to help determine developmental stage of the nestlings:

A. Nest construction: 3 to 8 days

B. Egg-laying: 3 to 5 days after nest completion

C. Incubation: 12 to 13 days after clutch completion

D. Fledging: 12 to 15 days after hatching

v. Nests are not visited if brown-headed cowbirds, western scrub jays, or other corvid species are detected in the immediate vicinity.

f. The removal of brown-headed cowbird chicks and eggs is accomplished with minimal disturbance to flycatcher eggs, chicks, or nesting adults. Replacement of cowbird eggs with dummy eggs (to preclude the abandonment of small clutches) will be done at the discretion of the permittee.

g. The permittee will report, within 24 hours, all detections and locations of potentially breeding flycatchers to the appropriate FWO.

h. The permittee will report any incidental detections and locations of potentially breeding least Bell's vireos (*Vireo bellii pusillus*) and yellow-billed cuckoos (*Coccyzus americanus*) to the appropriate FWO.

i. All banding and color-marking are done under a valid Federal Migratory Bird Banding Permit with auxiliary marking authorization.

i. No more than two mist nets are used, and are closely monitored at all times.

ii. Mist nets are not operated in rain, wind, and extreme heat. If the nets are already open when these conditions occur, they shall be closed.

iii. No more than 4 bands, including a Service band, are used per adult, and no more than 2 bands per leg. No more than 2 bands, a Service band and a color band, are used per chick, and no more than 1 band per leg.

iv. Nestlings are banded between 7 and 11 days of age or on the day of fledging.

v. Individuals are released at the point of capture.

j. Biological sampling (feather or blood collection) is <u>not</u> authorized pursuant to this recovery permit.

9. Taking of the least Bell’s vireo (vireo):

The permittee is authorized to locate and monitor nests and remove brown-headed cowbird chicks and eggs from parasitized vireo nests, and capture, handle, band, color-band, and release within 30 minutes the vireo within the geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. The permittee conducts all presence/absence surveys in accordance with the approved *Least Bell's Vireo Survey Guidelines*, dated January 19, 2001, for vireo surveys unless authorized in advance by the Recovery Permit Coordinator at the appropriate FWO. The current approved survey guidelines can be retrieved at the following address: (http://www.fws.gov/cno/es/surveypro.html)

b. Activities are not conducted during inclement weather conditions that would significantly reduce the detectability of the species or expose nest contents to the elements (e.g., rain, strong wind, fog).

c. For locating and monitoring nests:

i. Nest locating and monitoring will be conducted by no more than two individuals during any visit.

ii. The permittee will use behavioral clues as a guide to the nesting area and nest, rather than using random searching or meandering through suitable habitat. Once a nest is located, the permittee will observe the behavior of the adult(s) to determine the current reproductive stage (nest building, egg-laying, incubation, or chick rearing/fledging). This can be done with binoculars or a scope from a distance.

iii. The permittee will use an extension pole with a mirror or micro-camera to check nest contents only when necessary and with the minimal amount of time needed.

iv. Nests are not to be visited more than once per day and no more than four times during the nesting season.

v. Nests are not visited if brown-headed cowbirds, western scrub jays (*Aphelocoma californica*), or other corvid species are detected in the immediate vicinity.

d. For vireo banding activities:

i. Activities are not conducted during inclement weather conditions that would significantly reduce the detectability of the species or expose nest contents to the elements (e.g., rain, strong wind, fog).

ii. Nestlings are banded between 7 and 11 days of age or on the day of fledging.

iii. A maximum of four bands, including a Service band, are used per bird, and no more than two bands per leg.

iv. All banding and color-banding are done under a valid Federal Migratory Bird Banding Permit with auxiliary marking authorization.

e. The removal of brown-headed cowbird eggs and chicks is accomplished with minimal disturbance to any vireo eggs, chicks, or nesting adults. Replacement of cowbird eggs with dummy eggs (to preclude the abandonment of small clutches) shall be done at the discretion of the permittee.

f. The permittee shall report any incidental detections and locations of potentially breeding southwestern willow flycatchers and yellow-billed cuckoos (*Coccyzus americanus*) to the appropriate FWO.

g. Playing recorded vocalizations, or biological sampling (feather or blood collection) is <u>not</u> authorized pursuant to this recovery permit.

10. Taking of the Quino checkerspot butterfly (Quino):

The permittee is authorized to conduct surveys for Quino through pursuit by survey within the geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. The permittee must have successfully passed the most recent version of the Service's practical examination for the Quino prior to initiating focused surveys in accordance with the *Minimum Qualifications Guidelines to be permitted for Presence/Absence Surveys for Adult Butterflies*, dated September 18, 2003, unless authorized in advance by the Recovery Permit Coordinator at the CFWO. The current minimum qualification guidelines can be retrieved at the following address: (http://www.fws.gov/cno/es/minqual.html).

b. The permittee conducts all presence/absence surveys in accordance with the approved *Quino Checkerspot Butterfly Survey Guidelines*, dated December 15, 2014, unless authorized in advance by the Recovery Permit Coordinator at the CFWO. The current approved survey guidelines can be retrieved at the following address: (http://www.fws.gov/carlsbad/TEspecies/Quino_Monitor.htm)

c. Site assessments shall be conducted before the first Quino survey and will involve conducting a general field survey and mapping of excluded areas and survey areas on a U.S. Geological Survey 7.5' (1:24,000) topographic quadrangle map enlarged 200 percent.

d. Quino surveys shall not be conducted concurrently with any other focused survey [e.g., Quino host plant or coastal California gnatcatcher].

e. The permittee is expected to assess weather conditions during the survey period, and to also assess seasonal weather patterns (e.g., drought) that could lead to inaccurate conclusions regarding the species' presence/absence.

f. Within 24-hours of first observation of a suspected or known Quino adult or larva at a survey site, a report shall be submitted to the CFWO following the reporting format specified within the current approved guidelines.

g. Within 45 days following completion of the last final survey, a report shall be submitted to the CFWO following the reporting format specified within the current approved guidelines (as specified in condition 10.b above).

h. Host and nectar plants are not to be collected and removed from the field.

i. The capture, handle, and release of Quino is not authorized pursuant to this recovery permit.

11. Within 45 days following completion of a presence/absence survey for all species authorized in this permit, a report shall be submitted to the Recovery Permit Coordinator at the appropriate FWO that includes: a) a map (at a minimum, a 1:24,000 scale USGS

topographic map) depicting the location and boundary of the survey area(s); b) a qualitative description of the plant communities (including dominant species and habitat quality) on and adjacent to the survey area; c) a complete description of survey methods including the names of personnel, the number of acres surveyed per biologist per survey-day, the number and dates of surveys, survey routes, the temperature and weather conditions at the beginning and end of each survey, and how frequently recorded vocalizations were used, if at all; d) the number, age, and sex of all species detected including brown headed cowbirds, and these data shall also be plotted on 1:24,000 scale map(s) of the survey area; e) the assessor's parcel number for the site (if possible); f) GIS data or GPS coordinates (if possible); g) a conclusion section that specifically provides recommendations for recovery of the species; h) other pertinent observations made during survey efforts; and i) the following certification statement signed by each surveyor(s) performing activities in independent status pursuant to this permit: "I certify that the information in this survey report and attached exhibits fully and accurately represents my work." The date of signature and the surveyor's permit number shall be included. All survey reports must be submitted electronically. Please follow the electronic reporting requirements below in condition 21 below. On the cover page of the report, include the title, location, permit number, permittee name, date and time frame of the activity, and date of preparation on the report.

12. Minor deviation from the stipulated terms and conditions may be authorized on a case-by-case basis when approved by the applicable FWO unless an amendment to this permit would be required. Changes that would require an amendment to this recovery permit include but are not limited to changes in study plan or research proposal, location, activity, amount or type of take, or species to be covered by the permit.

13. This permit does not cover any activities authorized pursuant to a biological opinion or habitat conservation plan (HCP). All such activities must be authorized by the office that wrote the biological opinion, issued the section 10(a)(1)(B) incidental take permit based on an HCP, or is the lead field office implementing the HCP. Note also that this permit is not to be construed as meaning that the permittee or other authorized individuals are qualified to conduct activities pursuant to a biological opinion or HCP except insofar as the activities are similar to those authorized in this permit. Their qualifications for activities to be done pursuant to the biological opinion are subject to review and written approval for the specific activities by the office that wrote the biological opinion, issued the section 10(a)(1)(B) incidental take permit based on an HCP, or is the lead field office implementing the HCP.

14. This permit does not authorize take of federally listed species that are not specifically authorized pursuant to this permit. However, the Service acknowledges that incidental take of a co-occurring federally listed species could potentially occur while conducting certain permitted activities. When applicable, the following conditions now apply to all federally listed animals that the permittee is not authorized to take pursuant to this permit, but which may be incidentally sighted, encountered, captured, injured, or killed:

    a. Each individual authorized pursuant to this permit shall be knowledgeable about potentially co-occurring listed species that may occur throughout the habitats in

which permitted activities are conducted. Additionally, individuals must be observant and cautious to the extent practicable in order to minimize take.

b. Any federally listed animal that the permittee is not authorized to take pursuant to this permit, but is incidentally captured during the course of conducting authorized activities, shall be released immediately at the point of capture.

c. During the course of permitted activities, if an incidental injury or mortality occurs to a federally listed species not authorized in this permit, the permittee shall follow instructions specified in condition 15 below.

d. Any incidental capture, injury or mortality of a federally listed species not authorized in this permit shall be recorded and reported in the annual report submitted pursuant to this permit.

e. All incidental encounters, sightings, capture, injury, or mortality of other federally listed species not authorized under this permit shall be recorded and reported in the annual report submitted pursuant to this permit. We request that it also be reported to the California Natural Diversity Database (CNDDB) as specified in condition number 18 below.

15. In the event that an individual specimen authorized under this recovery permit is injured or killed during the performance of permitted activities, the permittee must:

a. Notify the Recovery Permit Coordinator of the appropriate FWO where the incident occurred by telephone or by email within 24 hours. Within 3 working days (or when back from the field), the permittee must follow-up such notification in writing by email to the Regional Recovery Permit Coordinator at permitsr8es@fws.gov, and the Recovery Permit Coordinator of the appropriate FWO.

b. With the written notification, the permittee is to provide a report of the circumstances that led to the injury or mortality. A description of the changes in protocols that will be implemented to reduce the likelihood of such injury or mortality from happening again should be included, if appropriate. The incident will also be discussed in the annual report that is subsequently submitted. A copy of this notification will also be sent to the California Department of Fish and Wildlife (CDFW), Attention: Permit Biologist, Wildlife Branch, 1812 Ninth Street, Sacramento, California 95811 (telephone: 916-445-3764).

c. Dead specimens and/or appropriate parts of dead specimens that are taken pursuant to this section will be preserved in accordance with standard museum practices. Within 120 days, the preserved specimen(s) will be properly labeled and deposited with one of the designated repositories specified below. The permittee will supply the repository with a copy of this permit to validate that the specimens supplied to the museum were taken pursuant to a permit. Collection data (e.g., dates and location) and depositions of carcasses by the permittee must

be reported in the subsequent annual report.

16. The permittee is authorized to salvage all authorized species' carcasses and provide them to one of the designated repositories within 120 days by following condition number 15.c above. Any specimens salvaged will be documented and specified in the annual report submitted to the appropriate field office.

17. Designated repositories:

    a. For the Quino:

       The Entomological Museum, University of California, Riverside, California.

    b. For the gnatcatcher, flycatcher, and vireo:
       The Los Angeles County Museum of Natural History, Los Angeles, California; the San Diego Natural History Museum, San Diego, California; or the San Bernardino County Natural History Museum, Redlands, California.

18. California Natural Diversity Database forms shall be completed, as appropriate, for each listed species addressed herein and submitted to the Biogeographic Data Branch, CDFW, 1700 9th Street, 4th Floor, Sacramento, California 95811 (also accessible online at: https://www.wildlife.ca.gov/Data/CNDDB). Copies of the form can be obtained from the CDFW at the above address (telephone: 916-322-2493). The appropriate field office will be notified via email when the forms are submitted. This can consist of a one sentence email simply stating the forms were submitted.

19. All reports or other documents that include information gathered under the authority of this permit (e.g., reports prepared by consulting firms for their clients, theses, or scientific journal articles) shall reference this permit number. Copies of such documents shall include a transmittal letter and be provided to the Recovery Permit Coordinator at the appropriate FWO upon their completion. Draft documents, raw/field data, and other information resulting from work conducted under the authority of this permit shall be submitted to the Service upon request.

20. Two types of annual reports shall be submitted to the Recovery Permit Coordinator at the appropriate FWO by January 31, following each year this permit is in effect as specified below. Note electronic reporting requirements below.

    a. Annual summary report:

       In order to track, document, and assess all activities conducted pursuant to this permit, we are requiring an annual summary report be submitted that summarizes all of the activities conducted pursuant to this permit during the previous calendar year. Activities that are continuous (i.e., overlapping in two or more calendar years), must be reported each year the activity is in effect. Each FWO specified in condition number 5 above shall receive separate, independent summary reports specifying only those permitted activities conducted within their respective

jurisdictions. The annual summary report shall be in the following format to include and not be limited to the following:

i. Permittee name and number with date of expiration;

ii. A section listing all authorized activities conducted for each permitted species during the previous calendar year. This information can be in tabular format and should provide a summary of each activity for each species authorized in this permit. This section shall include but not be limited to:

A. The name and title of each permitted activity conducted during the previous calendar year (preferably the same title as the reports previously or concurrently being submitted to the Service as specified in conditions 11 above and 20(b) below);

B. The specific location of the project site, including the County;

C. The common and scientific names of the listed species for which the permitted activity was conducted;

D. Whether or not the species was observed;

E. The date and name of the Service office where each individual report(s) have been or will be submitted;

F. Whether or not GIS data was submitted; and

G. The version of each activity report (draft or final) and the report date. If a draft report was submitted, indicate the reason (ongoing activities; processing/analysis of data, final report in review, final report in progress, etc.) and the anticipated final report finish date.

iii. Number of individuals incidentally injured and/or killed, including dates, locations, circumstances of take, and depository receiving the preserved specimen(s). If no injuries or mortalities occurred, please state this in writing in your annual summary report.

iv. Other pertinent observations made regarding the status or ecology of the species.

v. Planned future activities, if authorized under this permit.

vi. If no activities were conducted with any or all species authorized under the permit during the previous year within any field office jurisdiction, you must state this in writing in your annual summary report to that field office.

b. Comprehensive project reports:

i. For each project-specific activity conducted pursuant to this permit not addressed in condition number 11 above, the permittee shall submit a comprehensive annual report to the appropriate FWO in the following format:

(i) an introduction section addressing reasons and objectives for taking the species; (ii) a methodology section which includes an overview of the study design and methods used to collect and analyze data; (iii) a results section that provides and summarizes the data collected, including information on any other federally listed species detected while conducting activities authorized under this permit; and (iv) a conclusion section that specifically provides recommendations for recovery of the species and any plans for future studies. Activities that are continuous (i.e., overlapping in two or more calendar years), must be reported each year the activity is in effect to the appropriate FWO. The annual report shall include, but not be limited to:

A. On the cover page of the report, include the title, location, permit number, permittee name, date and time frame of the activity, and date of preparation on the report.
B. Summary presentations and brief discussions of survey and monitoring results;
C. Locations sampled or study area(s) delineated on a 7.5 minute U.S. Geological Survey topographic map at 1:24,000 scale. The name of the USGS map identified;
D. The names of all personnel conducting the activity and associated permit numbers.
E. The results of all sampling efforts, including the numbers and life stage of each listed species observed, dates of observation, and estimates of population sizes; and
F. Other pertinent observations made during sampling efforts regarding the status or ecology of the species.

21. Electronic Reporting requirements:

All reports must be submitted electronically. Electronically submitted reports must be sent using the following conditions:

a. Hard copy reports are no longer accepted.

b. Each report must be saved as one PDF only. Zipped files, other file formats, and Excel spreadsheets are not accepted. One exception: Statements of no activity may still be sent in the body of an email.

c. Each report must "stand alone" from any correspondence or transmittal, and must contain the permittee name and permit number at minimum.

d. Emails are limited to 25 megabytes in size. If emails with attachments exceed this size limitation, please: (1) send the attachments in separate emails (but do not break up individual reports; again, only one PDF per report), or (2) submit them on a DVD or CD. Again, do not zip the file(s) and do not send file formats other than PDF. Links for file download and thumb drives are not accepted.

e. Unless a report is revised, please send each report only once. Do not send duplicates.

f. Please only send GIS files if the field office Recovery Permit Coordinator previously arranged for receipt of these data from you.

g. Please include your recovery permit number in the subject line or body of all emails.

22. Failure to comply with reporting requirements may result in non-renewal or suspension/revocation of this permit.

DEC 18 2018

Scott Sobiech, Acting Field Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region
2800 Cottage Way, Suite W-2606
Sacramento, California 95825-1846

LIST OF AUTHORIZED INDIVIDUALS
TE-799568-9

1. Individual authorized to independently conduct all activities pursuant to this permit:

   Dana Kamada.

2. Individual authorized to independently conduct survey, locate and monitor nests, capture, handle, band, color-band, and collect tail feathers from adults and incidentally captured juveniles, and release activities for the coastal California gnatcatcher for the home range study at Marine Corps Base Camp Pendleton pursuant to this permit:

   Dr. Peter H. Bloom.

Supervised individuals may conduct activities pursuant to this permit only under the direct, on-site supervision of an individual authorized to independently conduct activities listed above. "On-site supervision" is defined as an unauthorized person conducting activities within 3 meters (9.8 feet) of an authorized individual.

DEC 18 2018

Scott Sobiech, Acting Field Supervisor

This List is only valid if it is dated on or after the permit issuance date.

Dana K. Kamada
Biologist
3413 Calle la Veta
San Clemente, CA 92672

DKamada@cox.net
(949) 939-3818

07 November 2019 TE799568-9

Ms. Stacey Love
U.S. Fish and Wildlife Service
2177 Salk Avenue, Ste. 250
Carlsbad, California 92008

[via email: stacey_love@fws.gov]

SUBJECT: TE799568-9 Fifteen-day notification to conduct color-banding and monitoring of California Gnatcatcher (*Polioptila californica*), at Marine Corps Base Camp Pendleton in San Diego and Orange Counties, California.

Dear Ms. Stacey Love,

Mr. Dana Kamada has been retained by Vernadero Group, Inc. (Vernadero) to assist in a study of California Gnatcatcher (*Polioptila californica*) habitat use on Marine Corps Base Camp Pendleton (MCBCP) in San Diego and Orange Counties, California. The goal of the study is to understand winter use of previously burned versus unburned habitats by California Gnatcatchers (hereafter "CAGN"). This will be accomplished by uniquely marking breeding CAGN with colored leg bands during the nesting season and following their movements in the winter season.

This work will be completed by a team of biologists from three firms, including Vernadero (team lead), Kidd Biological, Inc. (KBI) (conducting the CAGN survey/monitoring/resighting), and Dana, (conducting the CAGN banding) together comprising the Vernadero Team. The key personnel for the banding operations of the project are listed on the next page (Table 1), with their respective 10(a)(1)(A) T&E recovery, and BBL banding permit numbers that apply to covered activities associated with the study they may be responsible for carrying out independently, as described in greater detail below.

2020 will be the fourth year of the study, which was initiated during the 2016 breeding season by Hercules Joint Venture (P.I. Kylie Fischer), and implemented by the Vernadero Team starting in 2017 moving forward. The 2020 project methods will be the same as those described in the original Study Proposal/Design and conducted in 2016, 2017 and 2019. Please let me know if you wish to have another file of the Study Design sent to you, which would be the same file as you received in 2016.

We intend to begin conducting activities described in this notification letter during the breeding season (as early as February to as late as August 2020). If you have any questions or comments regarding this letter, please feel free to contact Mr. Kamada at dkamada@cox.net or call his mobile phone at 949-939-3818.

Sincerely,

Digitally signed by Dana Kamada
DN: cn=Dana Kamada, o, ou, email=dkamada@cox.net, c=US
Date: 2019.11.07 16:21:47 -08'00'

Dana Kamada, TE 799568-9

***Table 1**. MCBCP CAGN Winter Habitat Use Banding Team Members*

Name	Affiliation	Role	Permit #
Dana Kamada	Sub-contractor for Vernadero	Primary Bander for Mist-netting and color-banding	TE 799568-9 BBL 22956

SURVEY AREA DESCRIPTION

All CAGN habitats found within the delineated Survey Area shown in Figures 1-14 will be potentially targeted for mist-netting, banding, monitoring and resighting activities described in greater detail below.

PROPOSED COVERED ACTIVITIES

CALIFORNIA GNATCATCHER MONITORING AND RESIGHTING
Vernadero and KBI biologists possessing the appropriate permits will search for CAGN in suitable habitat to achieve two main objectives:

1. Locate unbanded pairs of breeding birds to target for color-banding,
2. Resight color-banded birds to determine home range during the winter non-breeding season.

During all CAGN monitoring and resighting activities, biologists will record the GIS coordinates and band status, including colored band combinations, of detected CAGN. Biologists will wear drab-colored clothing, stay at least 5 meters away from CAGN, and leave the area for 15 minutes if the bird(s) become agitated.

<u>Locate Unbanded Breeding Pairs of CAGN</u>
During the breeding season (February through August), biologists will visit suitable CAGN habitat within the Survey Area and observe CAGN to identify where unbanded and banded breeding birds are located. This effort will be used to inform and direct banding efforts. Biologists will look for and note behaviors indicative of nesting, to confirm breeding, but will not seek out nest locations or intentionally approach nests. Banding efforts will be directed toward territories in which one or both territorial adults are found to be unbanded. Each territory visit will be 2 hours or less in duration. Once the status of both adults is determined, territories will not be visited again until the territorial adults are targeted for capture (see CAGN Mist-netting and Color Banding, below). If they are found to be already banded, the territory will not be visited again until the winter resighting period (next sub-section).

<u>Resight Color-banded CAGN during the Non-breeding Season to Document Winter Habitat Use</u>
During the non-breeding season in winter months (September 2020 through February 2021 or until breeding activity is observed), KBI and Vernadero biologists will visit territories to determine home range and habitat use of color-banded CAGN. Each territory visit will be 2 hours or less in duration. Visits to each territory will be spaced at least one week apart, and no more than 12 visits to the same territory will occur during the winter months.

CALIFORNIA GNATCATCHER MIST-NETTING AND COLOR BANDING

During the breeding season (February through August 2020), biologists will use mist-nets to capture and band CAGN. Work is planned to begin in spring 2020 (ideally beginning by early March 2020, depending on weather conditions) and will continue through mid-May or as late as May 31/early June, if required. Capture and banding will be conducted by Dana Kamada. If needed, Dr. Peter H. Bloom would participate as an alternate bander. Mr. Kamada and Dr. Bloom possess the appropriate permits to capture and mark CAGN with auxiliary markers (Table 1). Mr. Kamada will be aided by at least one field assistant during mist-netting and banding activities. The assistant(s) will remove non-target bird species from mist-nets and help with processing captured target birds at the Mr. Kamada's direction.

The objective is to capture and place color bands on both members of 60 pairs of CAGN. Unbanded territorial pairs of CAGN, identified during monitoring efforts described above, will be targeted for capture by placing mist-nets measuring 7'x18' or 7'x42' with 1 ¼" or 1 ½" mesh in areas the birds frequent. Net locations will be selected based on observed or anticipated flight patterns of the birds, and gaps in vegetation within core areas of use. If nest locations are known, mist net deployment will focus on probable flight routes to and from nests. Care will be taken not to disturb active nests. Nets will be placed far enough from nests that the action of setting up the net will not disturb nesting behavior. Gnatcatchers feeding fledged young will also be targeted when applicable. If necessary, vegetation will be temporarily moved out of the way to create openings for mist net placement. Banding will not occur during extreme temperatures or adverse conditions that might cause undue stress to captured birds, or when predators are in the area that could pose a risk to adult or a nest attempt.

Each captured adult (and incidentally captured juvenile CAGN) will be equipped with a size 0A aluminum U.S. Geological Survey (USGS) band on the left or right leg, and with a single anodized aluminum (size 0A) color band, modified using one or more narrow strips of automotive pin-stripe tape, on the opposite leg. Anodized color bands will be prepared following methods described by Koronkiewicz et al. (2005). Briefly, aluminum "blank" bands will be anodized to one of five colors: black, red, blue, gold, or silver. Anodized bands will then be further differentiated by adding strips of colored tape (black, white, yellow, green, orange and/or red) around the upper or lower half to create 2-color band combinations, or around the upper, middle and/or lower one-third of the band to create 3-color band combinations. For example, a red anodized band with white tape applied to the lower half, would have the combination "r/w" for "red over white" (2-color combination). A blue anodized band with a white stripe added to the middle one-third of the band would have the combination "b/w/b" for "blue over white over blue" (3-color combination).

Captured adults will be processed far enough from active nests to avoid disturbance. Newly banded birds will be photographed before being released to document the actual position and color of the leg bands. Data will be recorded on standardized banding data sheets, and will be submitted to the USGS Bird Banding Laboratory, as required by the banding permit. Collected data will include, USGS band number, color band combination, date banded, GPS coordinates of the capture location, age, and sex. In addition, captured birds will be measured (wing chord and tail length), assessed for subcutaneous fat, body molt, and flight feather molt. Birds will be aged based on plumage and the presence or absence of molt limits (Pyle 1997, Pyle and Unitt 1998). Birds will be weighed (to the nearest 0.5 gram) using a Pesola scale. Birds will be released near their location of capture. The entire processing period should take no more than 3-4 minutes per bird.

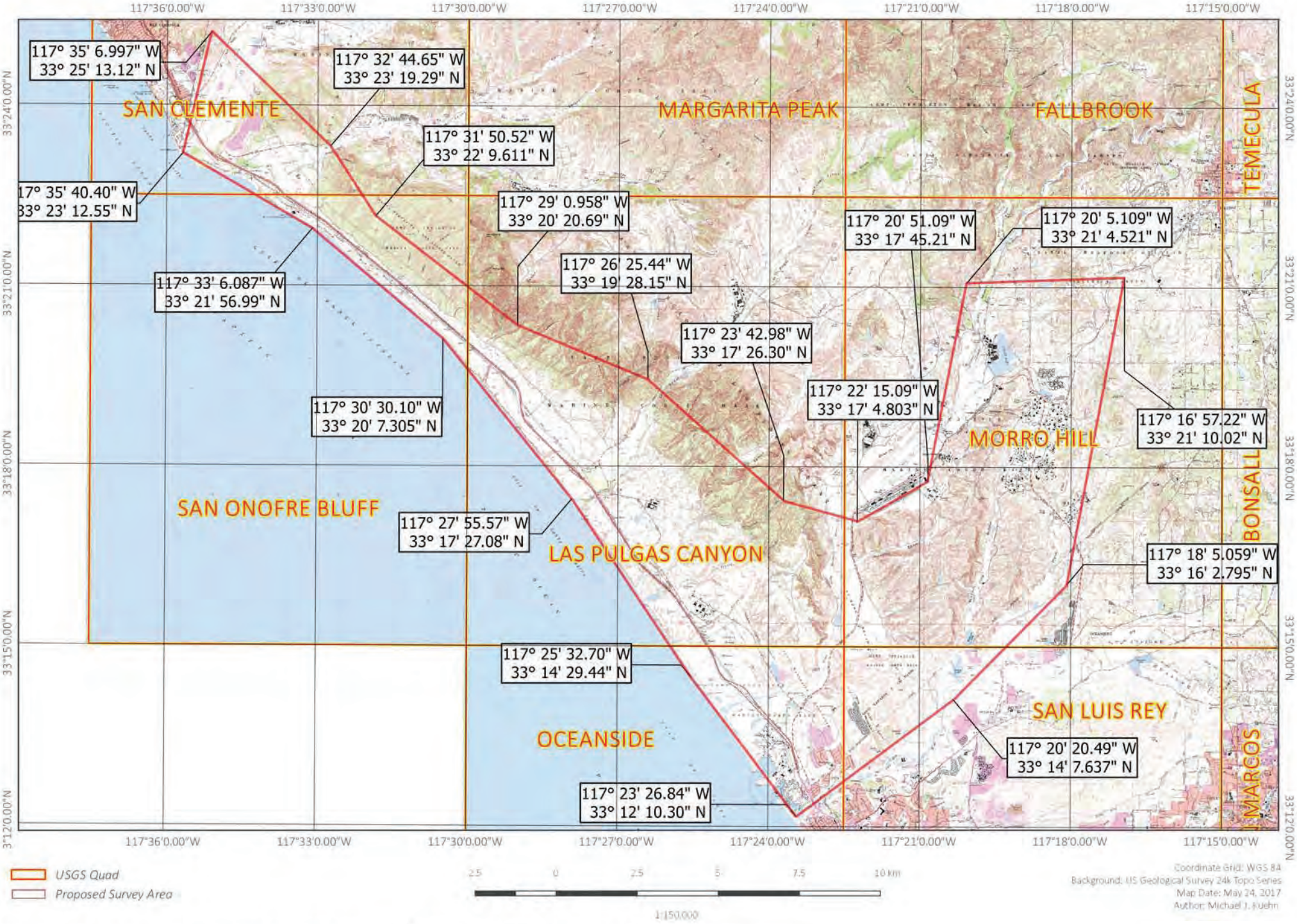

Figure 1. California Gnatcatcher Banding and Resighting Survey Area (Overview)

Vernadero MCBCP CAGN Winter Habitat Use Study | San Diego County, California

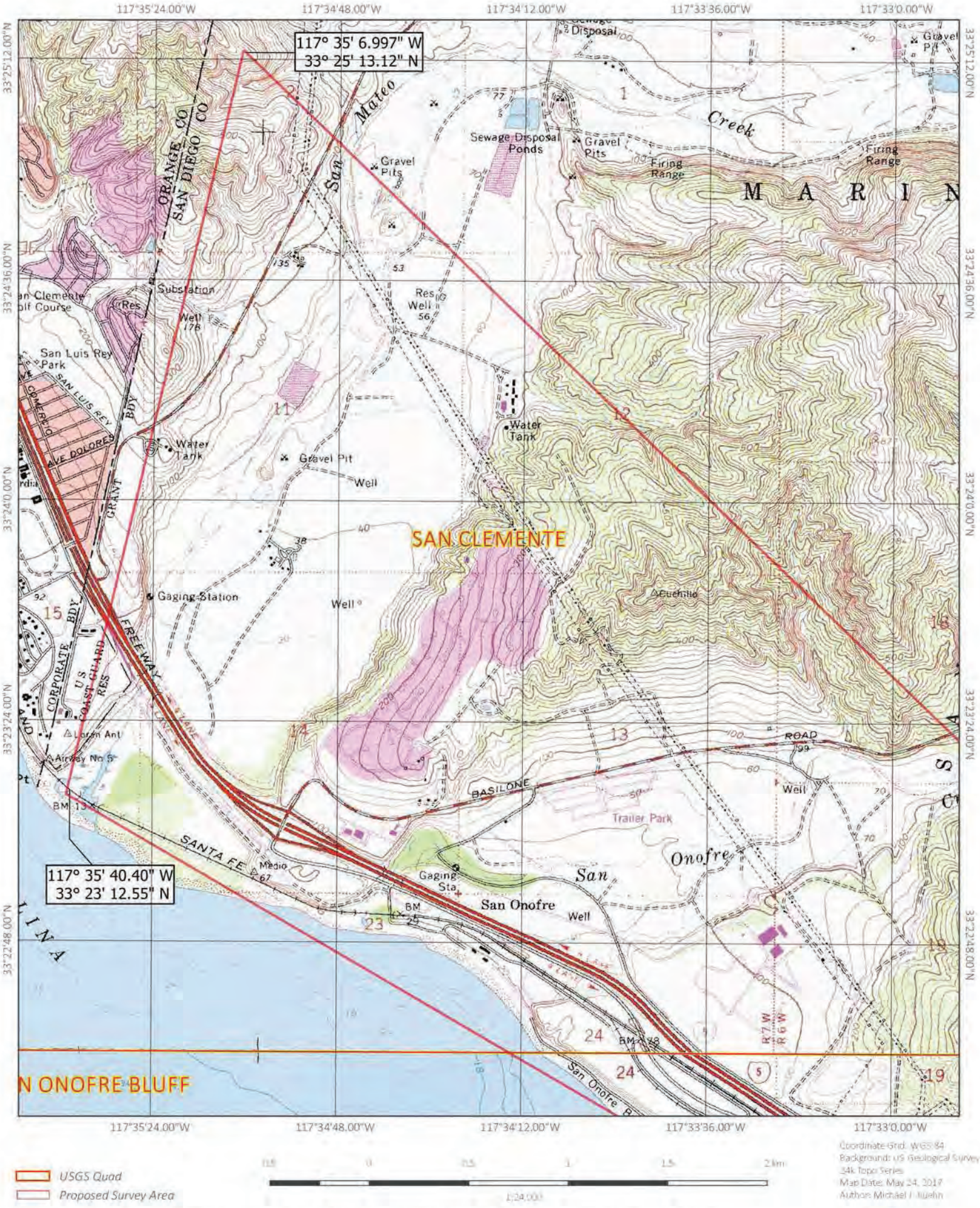

Figure 2. California Gnatcatcher Banding and Resighting Survey Area (Part 1 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

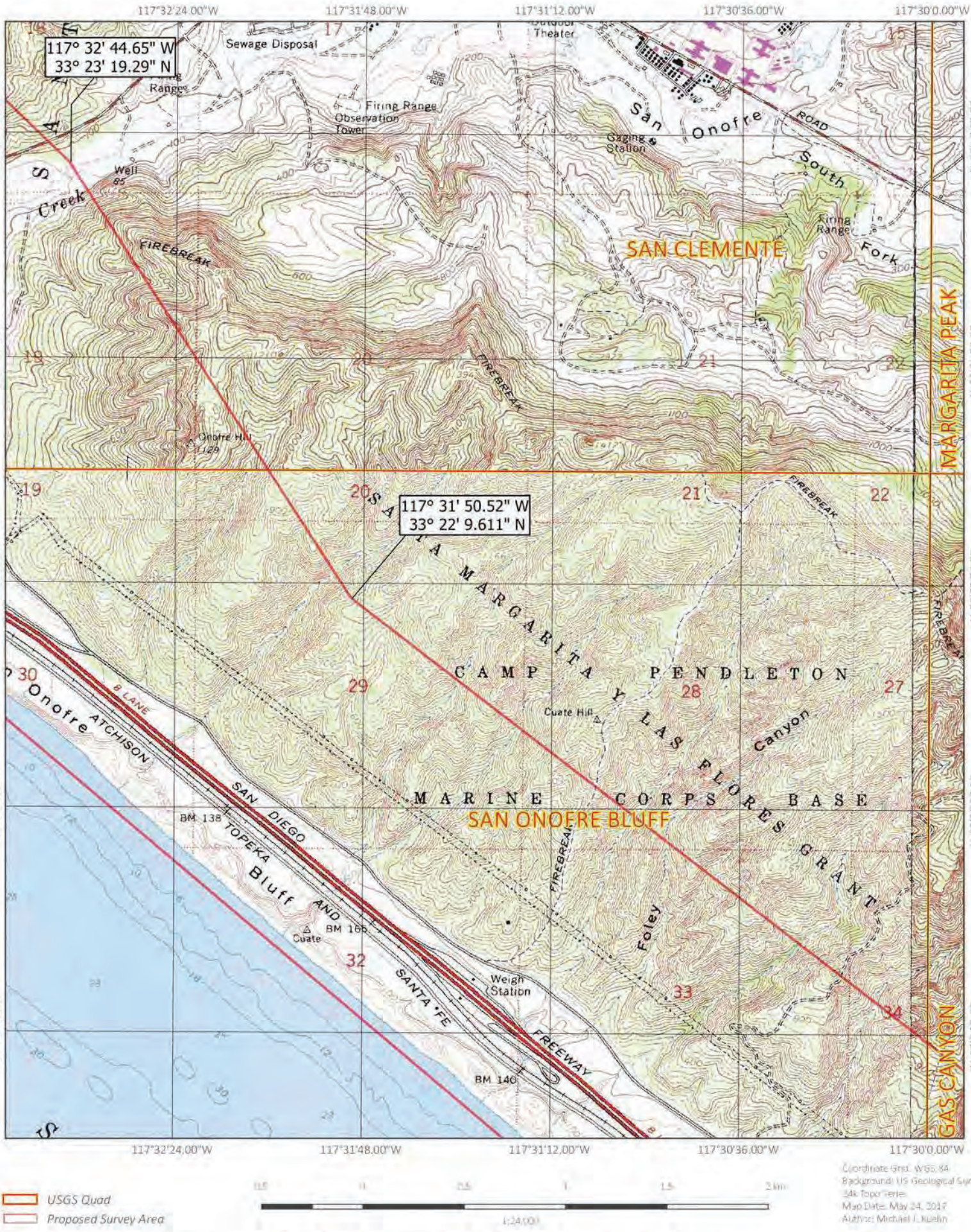

Figure 3. California Gnatcatcher Banding and Resighting Survey Area (Part 2 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

Figure 4. California Gnatcatcher Banding and Resighting Survey Area (Part 3 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

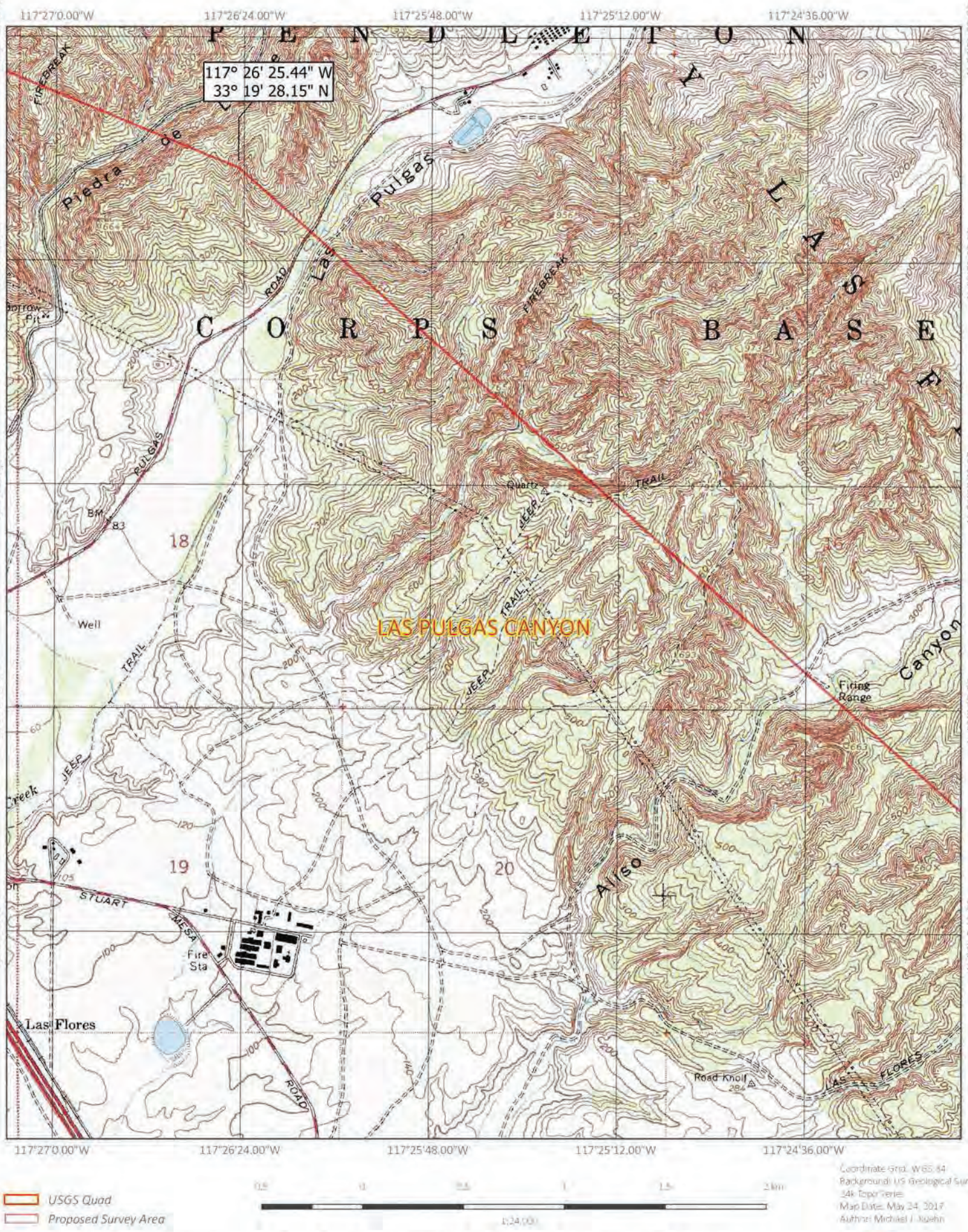

Figure 5. California Gnatcatcher Banding and Resighting Survey Area (Part 4 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

Figure 6. California Gnatcatcher Banding and Resighting Survey Area (Part 5 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

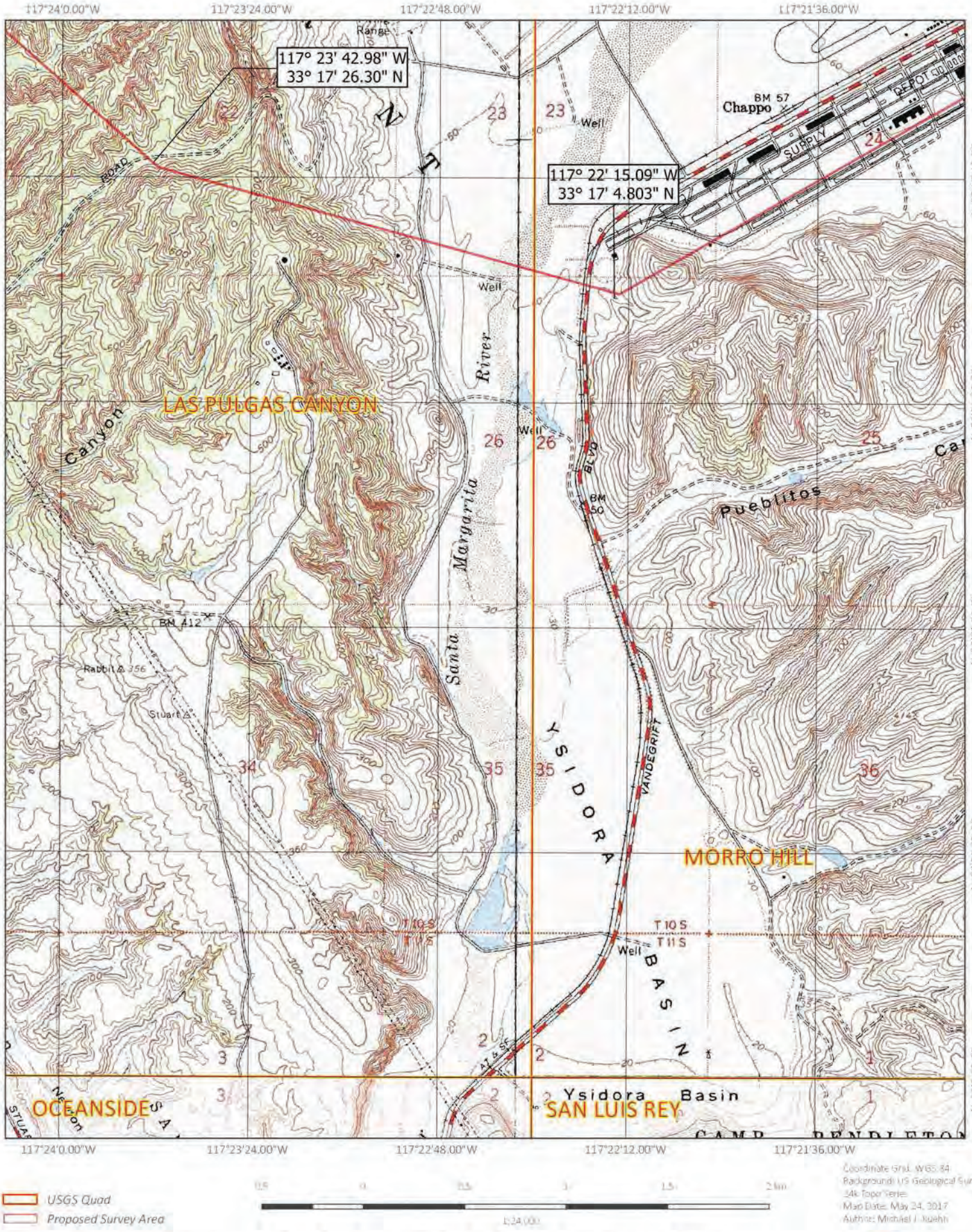

Figure 7. California Gnatcatcher Banding and Resighting Survey Area (Part 6 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

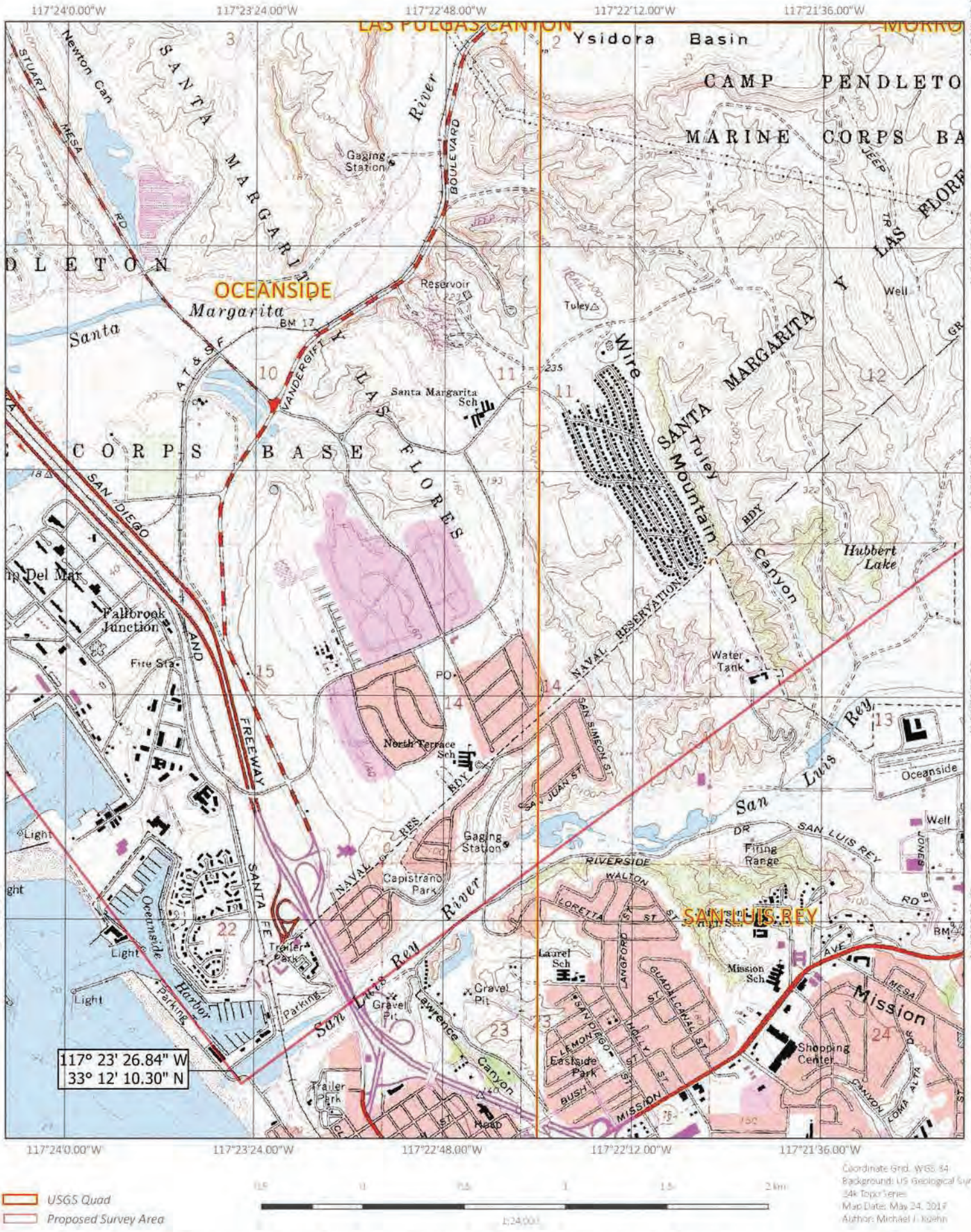

Figure 8. California Gnatcatcher Banding and Resighting Survey Area (Part 7 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

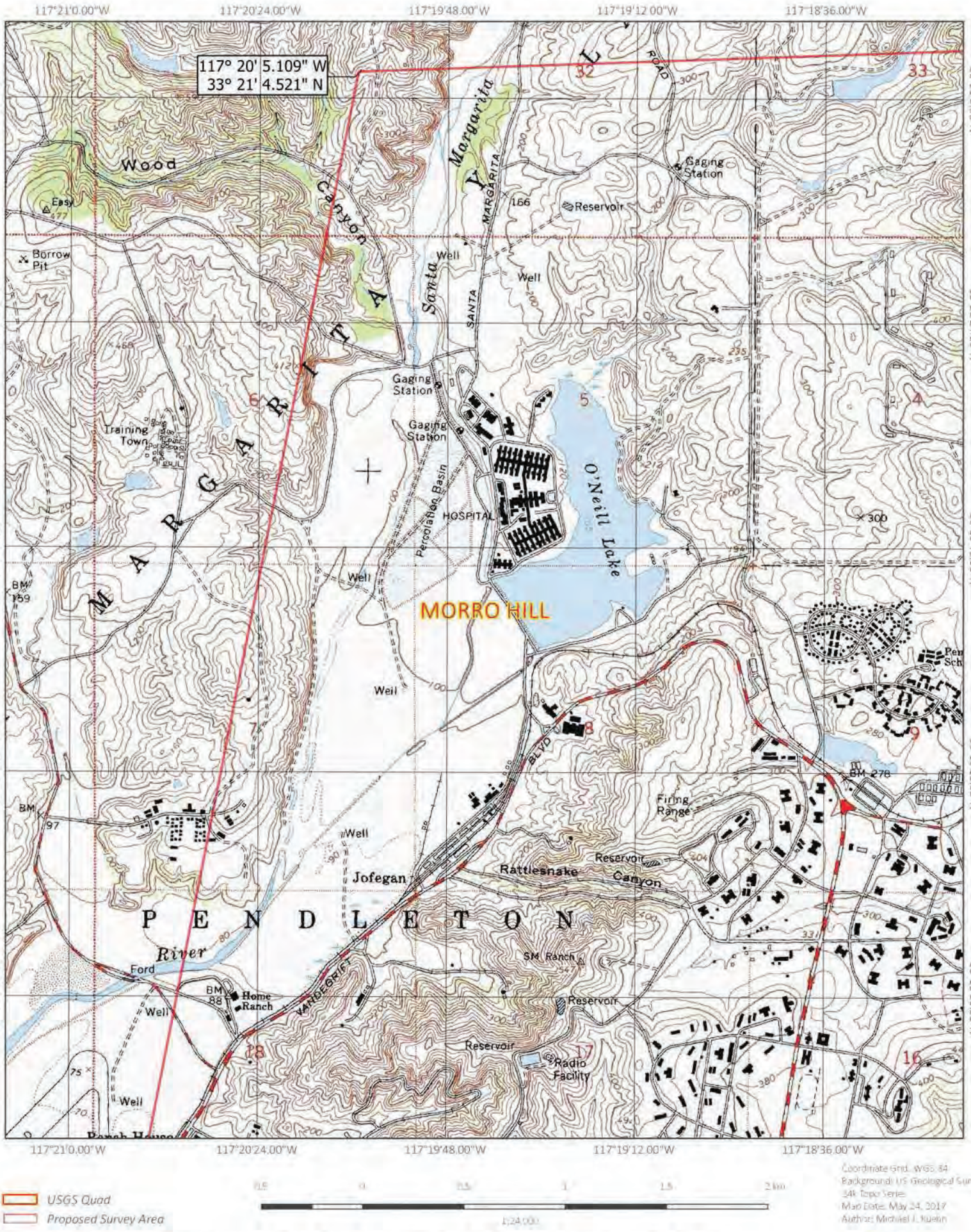

Figure 9. California Gnatcatcher Banding and Resighting Survey Area (Part 8 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

Figure10.California Gnatcatcher Banding and Resighting Survey Area (Part 9 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

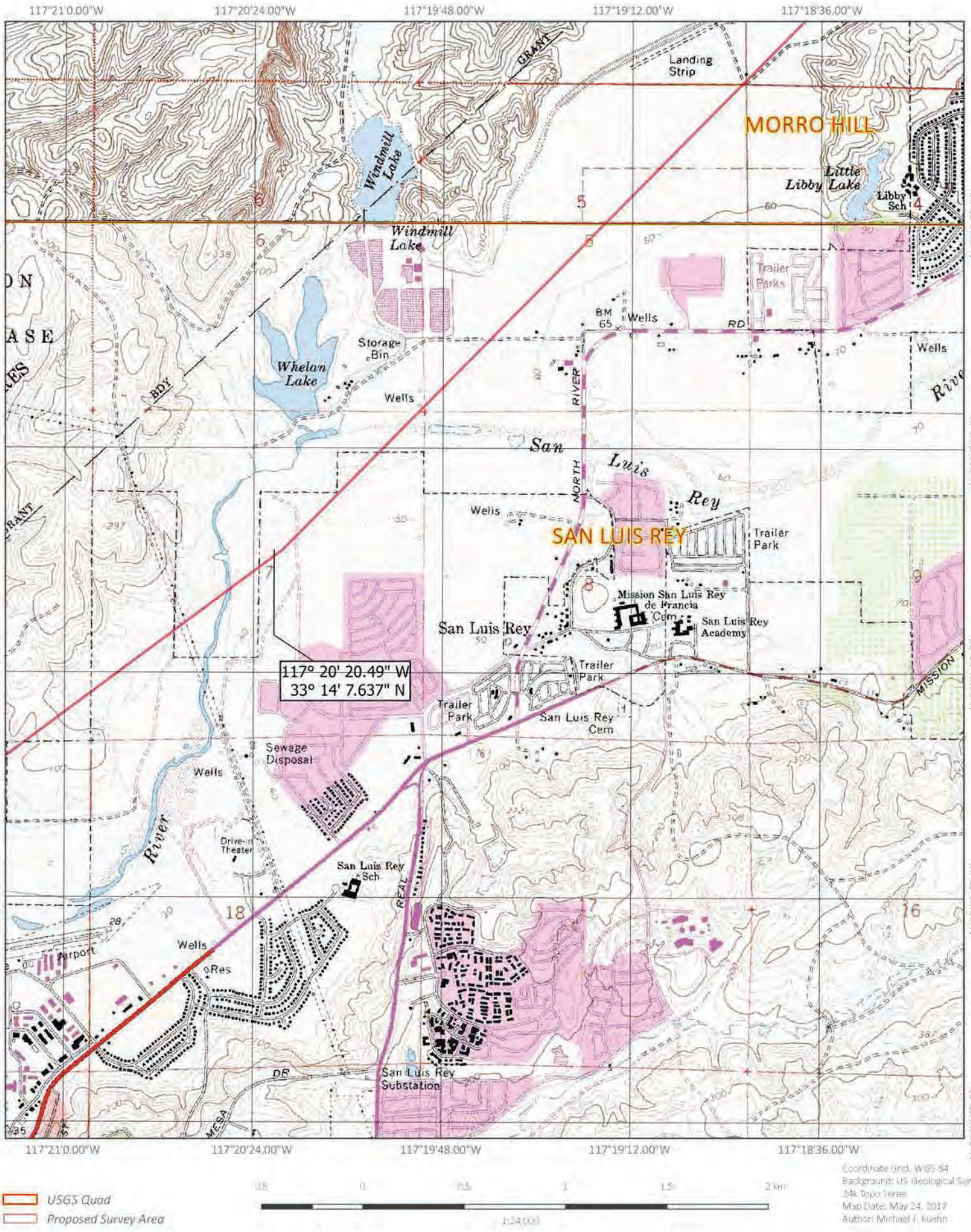

Figure 11. California Gnatcatcher Banding and Resighting Survey Area (Part 10 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

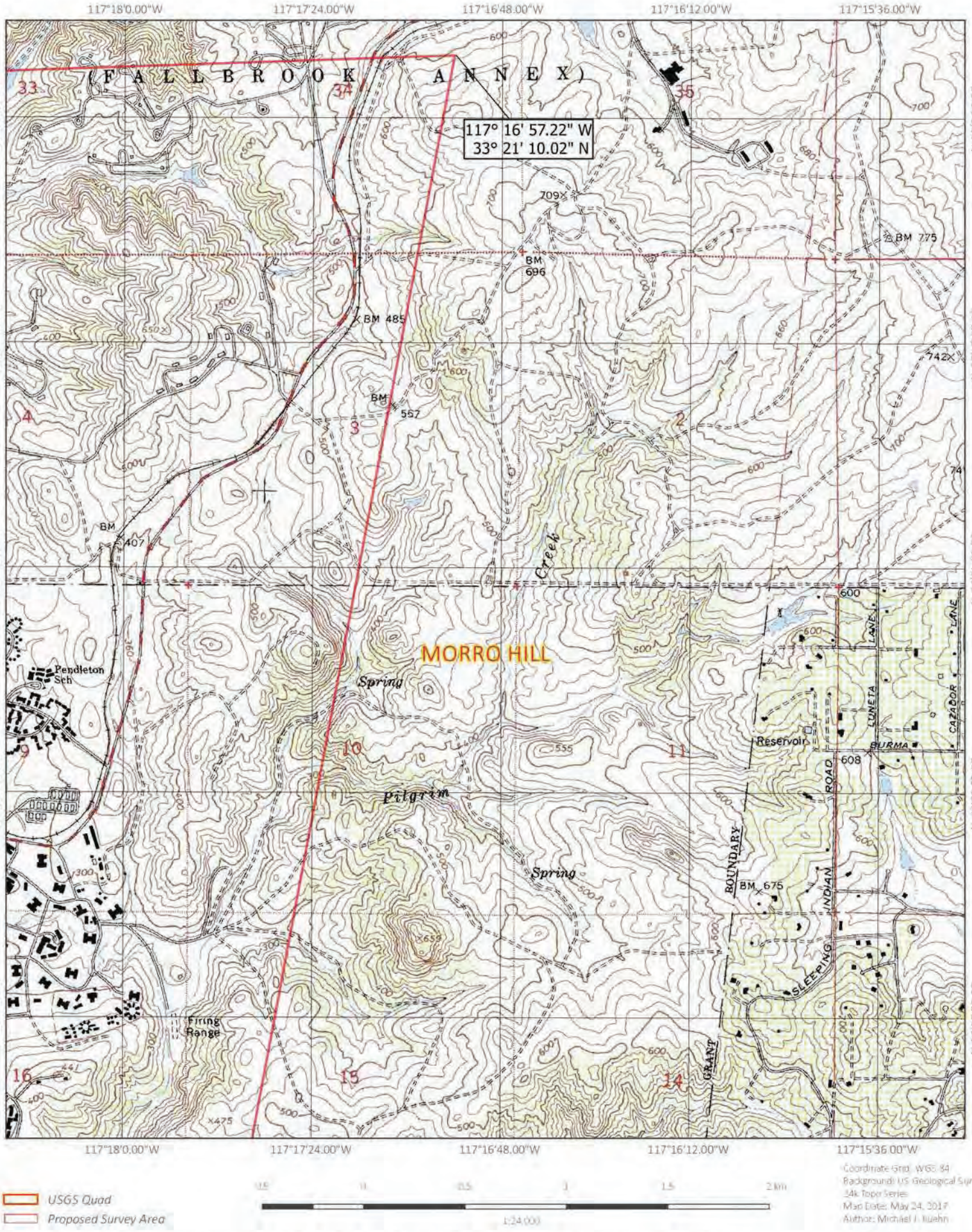

Figure 12. California Gnatcatcher Banding and Resighting Survey Area (Part 11 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

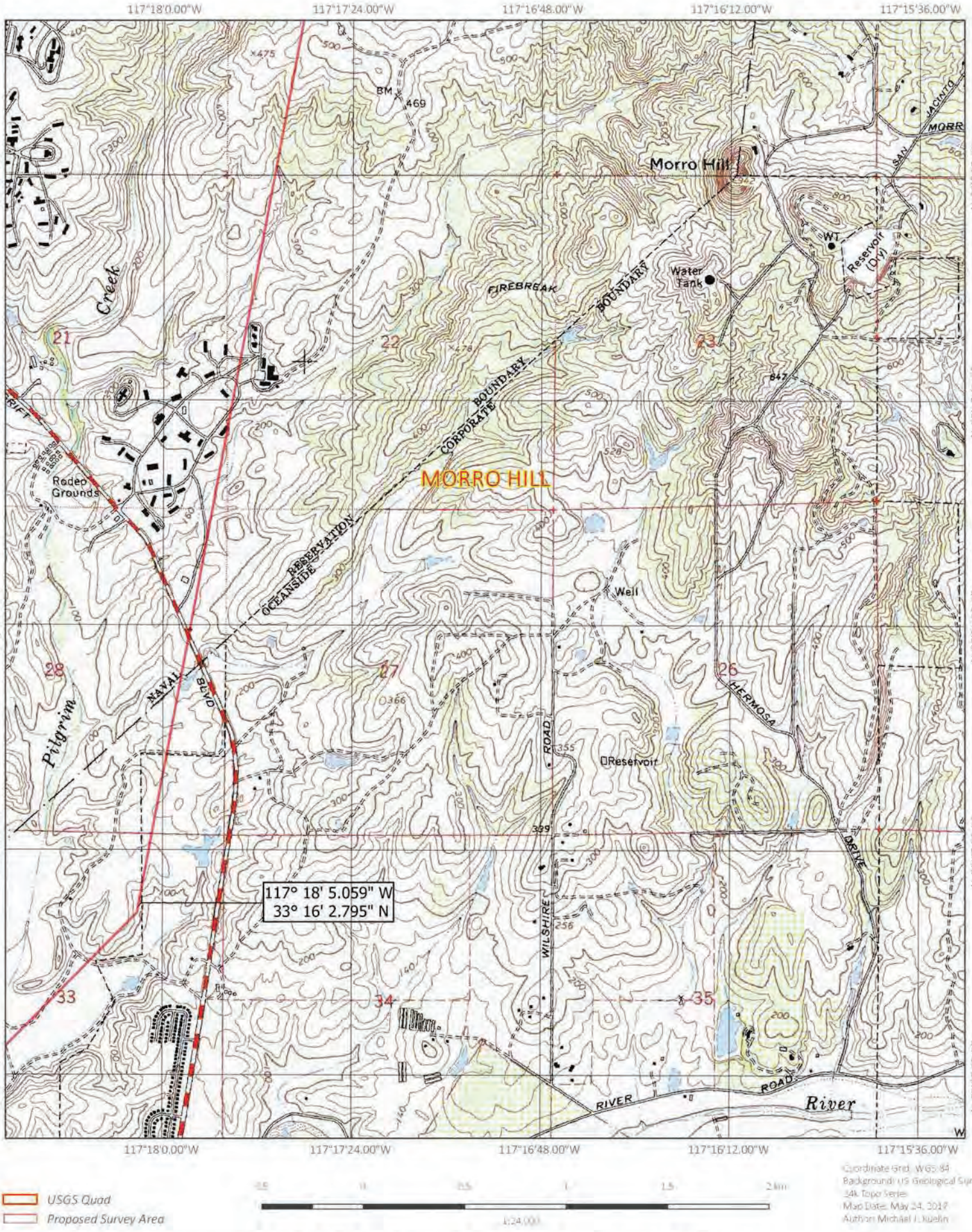

Figure 13. California Gnatcatcher Banding and Resighting Survey Area (Part 12 of 12)

Vernadero- MCBCP CAGN Winter Habitat Use Study | San Diego County, California

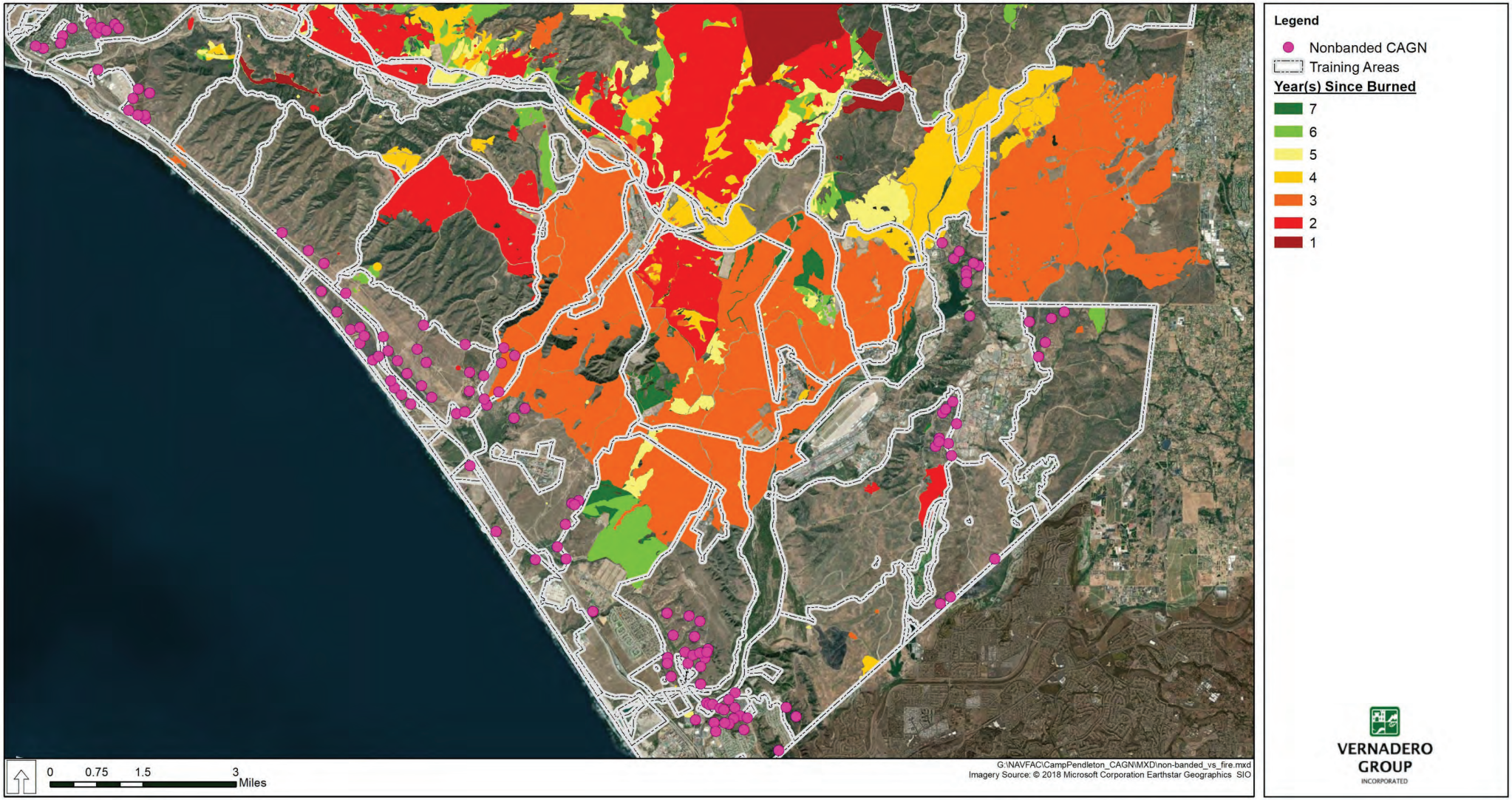

Figure 14. Location of Unbanded California Gnatcatchers Relative to MCBCP Training Areas and Areas Affected by Fire

Appendix C. Relevé Data Sheet

FORMAT PAGE

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION circle: **Relevé or RA**

Database #:

Date:

Name of recorder:

Other surveyors:

Location Name:

GPS name: _____ For Relevé only: **Bearing°,** left axis at ID point_____ **of Long / Short** side

UTME ___ ___ ___ ___ ___ ___ **UTMN** ___ ___ ___ ___ ___ ___ ___ **Zone: 11 NAD83** GPS error: **ft./ m./ PDOP** _____

Decimal degrees: **LAT** ___ ___ . ___ ___ ___ ___ ___ ___ **LONG** ___ ___ ___ . ___ ___ ___ ___ ___ ___

GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) _____ bearing ° _____ inclination ° _____

and record: **Base point ID** _____ **Projected UTMs: UTME** ___ ___ ___ ___ ___ ___ **UTMN** ___ ___ ___ ___ ___ ___

Camera Name: **Cardinal photos at ID point:**

Other photos:

Stand Size (acres): <1, 1-5, >5 | Plot Size (m²): 100 / _____ | Plot Shape ____ x____ m | RA Radius____ m

Exposure, Actual °: _____ NE NW SE SW Flat Variable | Steepness, Actual °: _____ 0° 1-5° > 5-25° > 25

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave undulating

Geology code: _____ Soil Texture code: _____ | Upland or **Wetland/Riparian** (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H_20: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%

% Current year bioturbation _____ Past bioturbation present? Yes / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments:

Disturbance code / Intensity (L,M,H): _____/____ _____/____ _____/____ _____/____ _____/____ **"Other"** _____ / ____

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), **T2** (1-6" dbh), **T3** (6-11" dbh), **T4** (11-24" dbh), **T5** (>24" dbh), **T6** multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), **S2** young (<1% dead), **S3** mature (1-25% dead), **S4** decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), **H2** (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), **2** (2-10ft. ht.), **3** (10-20ft. ht.), **4** (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), **2** (1.5-6" diam.), **3** (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: _____

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: _____/_____, _____/_____

Confidence in Alliance identification: L M H Explain: _____

Phenology (E,P,L): Herb____ Shrub____ Tree____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #: __________

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover:____ Total % Vasc Veg cover:_____ ☐

<u>% Cover</u> - Conifer tree / Hardwood tree: _____/_____ **Regenerating Tree:** _____ **Shrub:** _____ **Herbaceous:** _____ ☐

<u>Height Class</u> - Conifer tree / Hardwood tree: _____/_____ **Regenerating Tree:** _____ **Shrub:** _____ **Herbaceous:** _____ ☐

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination

Unusual species: ____

Appendix D. Birds Banded (2020)

FORMAT PAGE

Each banded coastal California gnatcatcher (*Polioptila californica californica*) adult was equipped with a size 0A aluminum U.S. Geological Survey (USGS) band on the right leg; the left leg was banded with a single USGS size 0A anodized aluminum color band modified using one or more narrow strips of automotive pinstripe tape. Each bird received two bands—one USGS band, and one anodized color band. Aluminum "blank" bands were anodized to one of five colors: black, red, blue, gold, or silver. They were then further differentiated by adding strips of colored tape around the upper or lower half to create two-color band combinations, or around the upper, middle, and/or lower one-third of the band to create three-color band combinations. For example, a red anodized band with white tape applied to the lower half would be assigned the combination "R/W" for "red over white" (two-color combination). A blue anodized band with a white stripe added to the middle one-third of the band would be assigned the combination "B/W/B" for "blue over white over blue" (three-color combination). Table D-1 provides all banded birds' details. Table D-2 shows the acreage of core and home ranges of all territories included in the study.

Table D-1. Birds Banded in 2020

USGS Band No.	Date	Pair Code	Color Combination Code		Color Band Combination	Sex	Age
			Right	Left			
224084574	5/25/2020	AT-01-2020	USGS	G/V/Y	Green/Lavender/Yellow	F	AHY
224084575			USGS	K/V	Black/Lavender	M	AHY
224084576	5/25/2020	AT-02-2020	USGS	W/G/W	White/Green/White	M	ASY
224084587	5/28/2020		USGS	W/G/Y	White/Green/Yellow	F	AHY
224084577	5/25/2020	AT-03-2020	USGS	G/Y/K	Green/Yellow/Black	M	ASY
224084578	5/25/2020	AT-04-2020	USGS	W/K/S	White/Black/Silver	M	SY
224084579	5/25/2020	AT-05-2020	USGS	V	Lavender	M	ASY
224084580			USGS	W/V/S	White/Lavender/Silver	F	SY
224084581	5/26/2020	AT-06-2020	USGS	K/G/W	Black/Green/White	F	ASY
224084582	5/26/2020	AT-07-2020	USGS	Y/W/G	Yellow/White/Green	M	SY
224084585	5/27/2020	AT-08-2020	USGS	Y/V/S	Yellow/Lavender/Black	F	ASY
224084586			USGS	Y/W/Y	Yellow/White/Yellow	M	SY
224084588	5/28/2020	AT-09-2020	USGS	S/V	Silver/Lavender	M	ASY
224084589			USGS	S/K/Y	Silver/Black/Yellow	F	AHY
224084563	5/21/2020	JU-01-2020	USGS	W/Y/K	White/Yellow/Black	M	SY
224084564			USGS	K/G/Y	Black/Green/Yellow	F	ASY
276026461	5/21/2020	JU-02-2020	USGS	W/K/Y	White/Black/Yellow	M	ASY
224084566			USGS	S/K/G	Silver/Black/Green	M	ASY
224084567	5/22/2020	JU-03-2020	USGS	K/W/G	Black/White/Green	F	ASY
224084569	5/24/2020	JU-05-2020	USGS	Y/V/K	Yellow/Lavender/Black	F	AHY
224084570			USGS	W/S/G	White/Silver/Green	M	AHY
224084571	5/24/2020	JU-06-2020	USGS	Y/G/K	Yellow/Green/Black	F	SY

USGS Band No.	Date	Pair Code	Color Combination Code		Color Band Combination	Sex	Age
			Right	Left			
224084572	5/24/2020	JU-07-2020	USGS	G/Y/G	Green/Yellow/Green	F	ASY
224084573			USGS	S/K/W	Silver/Black/White	M	ASY
224084597	5/30/2020	JU-08-2020	USGS	S/V/W	Silver/Lavender/White	M	ASY
224084598	5/30/2020	JU-09-2020	USGS	K/G/S	Black/Green/Silver	F	ASY
224084599			USGS	W/V/K	White/Lavender/Black	M	ASY
224084554	5/17/2020	KI-01-2020	USGS	G/V/S	Green/Lavender/Silver	F	AHY
224084556	5/17/2020	KI-02-2020	USGS	K/Y/G	Black/Yellow/Green	M	ASY
224084557			USGS	S/G/K	Silver/Green/Black	F	ASY
224084558	5/19/2020	KI-03-2020	USGS	K/V/S	Black/Lavender/Silver	M	ASY
224084559			USGS	G/O	Green/Orange	F	AHY
224084560	5/19/2020	KI-04-2020	USGS	Y/S/Y	Yellow/Silver/Yellow	M	SY
224084561			USGS	G/S/G	Green/Silver/Green	F	AHY
224084562	5/20/2020	KI-05-2020	USGS	S/V/S	Silver/Violet/Silver	F	ASY
224084516	4/21/2020	LI-01-2020	USGS	K/D	Black/Gold	M	SY
224084517	4/21/2020	LI-02-2020	USGS	K/R/Y	Black/Red/Yellow	M	ASY
224084501	3/30/2020	LO-01-2020	K/D/G	USGS	Black/Gold/Green	M	ASY
224084502	3/30/2020	LO-02-2020	USGS	R/D/O	Red/Gold/Orange	M	SY
224084504			USGS	W/D/O	White/Gold/Orange	F	SY
224084503	3/30/2020	LO-03-2020	USGS	G/D/O	Green/Gold/Orange	M	ASY
224084508	4/11/2020		USGS	W/B/W	White/Blue/White	F	SY
224084540	5/1/2020	LO-04-2020	USGS	G/W/Y	Green/White/Yellow	F	ASY
224084541			USGS	Y/V/Y	Yellow/Lavender/Yellow	M	SY
224084542	5/1/2020	LO-05-2020	USGS	K/V/K	Black/Lavender/Black	M	SY
224084553	5/6/2020	LO-06-2020	USGS	N/A	No color band	M	AHY
N/A			USGS	N/A	Net mortality	F	SY
224084600	5/31/2020	LO-07-2020	USGS	Y/V/G	Yellow/Lavender/Green	M	ASY
224084401			USGS	G/Y/S	Green/Yellow/Silver	F	ASY
224084402	5/31/2020	LO-08-2020	USGS	O/V	Orange/Lavender	L	U
224084505	4/4/2020	MI-01-2020	USGS	D/K	Gold/Black	M	SY
224084506			USGS	G/B/Y	Green/Blue/Yellow	F	SY
224084507	4/4/2020	MI-02-2020	USGS	K/D/K	Black/Gold/Black	M	SY
224084551	5/5/2020		USGS	W/V/Y	White/Lavender/Yellow	F	AHY
224084519	4/23/2020	MI-03-2020	USGS	G/D/R	Green/Gold/Red	M	SY
224084520	4/23/2020	MI-04-2020	USGS	Y/R/W	Yellow/Red/White	M	AHY
224084522	4/23/2020		USGS	G/B/W	Green/Blue/White	F	SY
224084521	4/23/2020	MI-05-2020	USGS	Y/B/G	Yellow/Blue/Green	M	ASY
224084523	4/23/2020	MI-06-2020	USGS	R/K/Y	Red/Black/Yellow	M	AHY

USGS Band No.	Date	Pair Code	Color Combination Code		Color Band Combination	Sex	Age
			Right	Left			
224084550	5/5/2020		USGS	V/G	Lavender/Green	F	ASY
224084538	4/30/2020	MI-07-2020	USGS	Y/K/S	Yellow/Black/Silver	F	AHY
224084539			USGS	S/W/G	Silver/White/Green	M	ASY
224084549	5/5/2020	MI-08-2020	USGS	G/W	Green/White	F	ASY
224084513	4/19/2020	OO-01-2020	USGS	G/R/Y	Green/Red/Yellow	M	SY
224084518	4/22/2020	OO-02-2020	USGS	K/R/O	Black/Red/Orange	M	SY
224084532	4/29/2020	OO-03-2020	USGS	W/S/Y	White/Black/Yellow	M	SY
224084533	5/1/2019	OO-04-2020	USGS	Y/K/W	Yellow/Black/White	M	ASY
224084535			USGS	R/K/W	Red/Black/White	F	ASY
224084534	4/29/2020	OO-05-2020	USGS	R/Y	Red/Yellow	M	AHY
224084552	4/17/2020	OO-06-2020	USGS	W/G/K	White/Green/Black	M	ASY
276026476	4/17/2020	OTW-01-2020	USGS	G/K/O	Green/Black/Orange	M	ASY
224084514	4/20/2020	OTW-02-2020	USGS	G/R/W	Green/Red/White	M	SY
224084515			USGS	R/K/G	Red/Black/Green	F	ASY
224084509	4/14/2020	SM-01-2020	USGS	G/B/G	Green/Blue/Green	M	SY
224084584	5/27/2020		USGS	Y/G/Y	Yellow/Green/Yellow	F	SY
224084583	5/27/2020	SM-02-2020	USGS	S/Y/W	Silver/Yellow/White	M	SY
224084590	5/28/2020	SMR-01-2020	USGS	S/V/Y	Silver/Lavender/Yellow	M	ASY
224084591			USGS	G/W/K	Green/White/Black	F	AHY
224084510	4/15/2020	STM-01-2020	USGS	O/B/O	Orange/Blue/Orange	F	ASY
224084511			USGS	R/B/R	Red/Blue/Red	M	ASY
224084524	4/24/2020	STM-02-2020	K/R/K	USGS	Black/Red/Black	F	SY
224084525			O/K/W	USGS	Orange/Black/White	M	ASY
224084526	4/24/2020	STM-03-2020	K/S/Y	USGS	Black/Silver/Yellow	M	ASY
224084527			USGS	Y/K/O	Yellow/Black/Orange	F	ASY
224084528	4/25/2020	TA-12-2020	G/K/G	USGS	Green/Black/Green	M	SY
224084530	4/27/2020		W/K/G	USGS	White/Black/Green	F	AHY
224084529	4/27/2020	TA-02-2020	USGS	Y/R/O	Yellow/Red/Orange	M	ASY
224084545	5/4/2020	TA-03-2020	G/K/S	USGS	Green/Black/Silver	F	AHY
224084546			K/V/W	USGS	Black/Lavender/White	M	ASY
224084547	5/4/2020	TA-05-2020	K/Y/S	USGS	Black/Yellow/Silver	M	AHY
224084548			W/Y/W	USGS	White/Yellow/White	F	AHY
224084531	4/28/2020	WM-01-2020	O/K/R	USGS	Orange/Black/Red	M	SY
224084593	5/29/2020		V/Y	USGS	Lavender/Yellow	F	AHY
224084594			S/Y/G	USGS	Silver/Yellow/Green	U	L
224084536	4/30/2020	WM-02-2020	W/V/W	USGS	White/Lavender/White	F	AHY
224084537			K/Y/W	USGS	Black/Yellow/White	M	ASY

USGS Band No.	Date	Pair Code	Color Combination Code		Color Band Combination	Sex	Age
			Right	Left			
224084592	5/29/2020	WM-03-2020	S/G/W	USGS	Silver/Green/White	F	SY
224084595	5/29/2020	WM-04-2020	K/V/G	USGS	Black/Lavender/Green	F	ASY
224084596			Y	USGS	Yellow	M	SY

USGS –United States Geological Survey; **N/A** – not applicable

Sex and Age Codes

F – female; **M** – male; **AHY** – after hatch year; **ASY** – after second year; **L** – fledgling; **SY** – in second year; **U** – unknown age

Band Colors

B – blue (dark blue); **D** – gold; **G** – green (dark green); **K** – black; **O** – orange; **R** – red; **S** – silver (metallic silver); **V** – lavender; **W** – white; **Y** – yellow

Table D-2. Home and Core Ranges of Coastal California Gnatcatcher Pairs with at Least 47 Resights

Pair ID	2020 Core Range (Acres)	2020 Home Range (Acres)
AT-01-2020	2.15	7.85
AT-02-2020	2.18	11.41
AT-04-2020	1.57	6.48
AT-05-2020	1.99	10.95
AT-06-2020	1.87	7.68
AT-07-2019	2.07	8.54
AT-08-2020	2.29	9.72
AT-09-2020	1.87	7.61
BTH-01-2019	2.28	8.63
JU-01-2020	2.31	9.01
JU-02-2020	3.23	11.05
JU-05-2020	3.16	12.14
JU-06-2020	2.64	9.81
JU-07-2020	2.57	9.93
JU-08-2020	2.24	8.29
KI-02-2020	2.51	9.73
KI-04-2020	4.12	15.14
LO-01-2020	3.49	11.84
LO-03-2020	2.75	9.30
LO-05-2020	2.68	11.25
LO-07-2020	2.78	10.01
MI-01-2020	1.81	8.75

Pair ID	2020 Core Range (Acres)	2020 Home Range (Acres)
MI-02-2020	3.60	13.31
MI-03-2020	2.18	9.03
MI-04-2020	4.10	15.02
MI-08-2020	2.58	10.90
OO-01-2020	3.80	12.86
OO-03-2020	3.62	14.07
OTW-01-2020	3.87	13.55
OTW-02-2019	2.48	9.05
OTW-02-2020	2.37	10.66
OTW-06-2019	2.80	11.25
SM-01-2019	1.71	7.60
SMR-01-2020	3.00	10.21
STM-01-2016	2.49	10.19
STM-02-2020	3.02	11.13
STM-03-2020	2.94	11.90
TA-01-2020	1.44	6.10
TA-04-2020	3.11	11.04
TA-05-2020	1.89	7.85
WM-01-2020	1.51	6.31
WM-03-2020	3.33	12.01
WM-04-2020	2.26	9.06

ID – identification number

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Appendix E. Maps of Territories Included in Home and Core Range Analysis (2020–2021)

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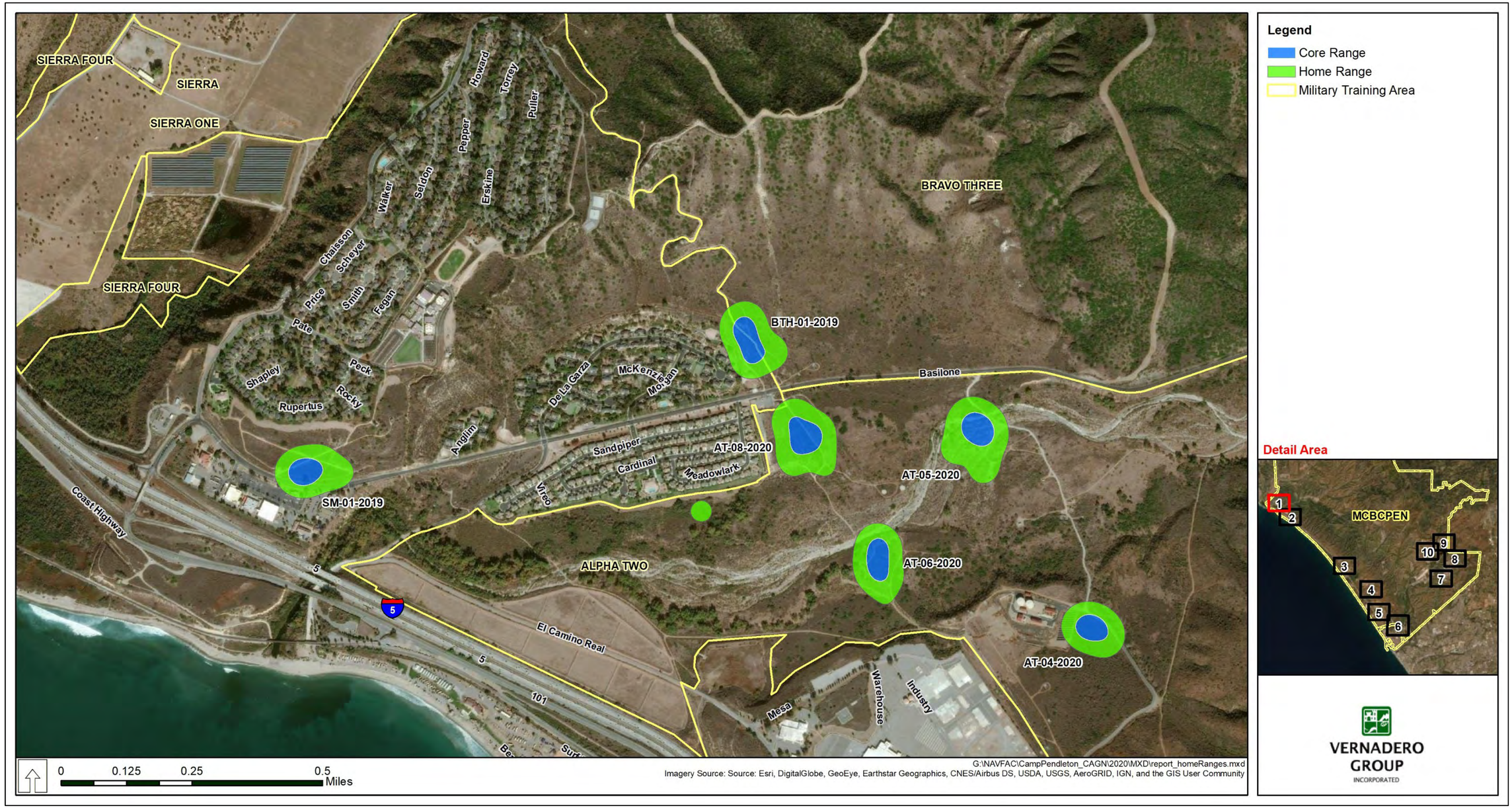

Figure E-1. Home and Core Ranges for Territories in the Northern Cantonment, Alpha Two, and Bravo Three Training Areas

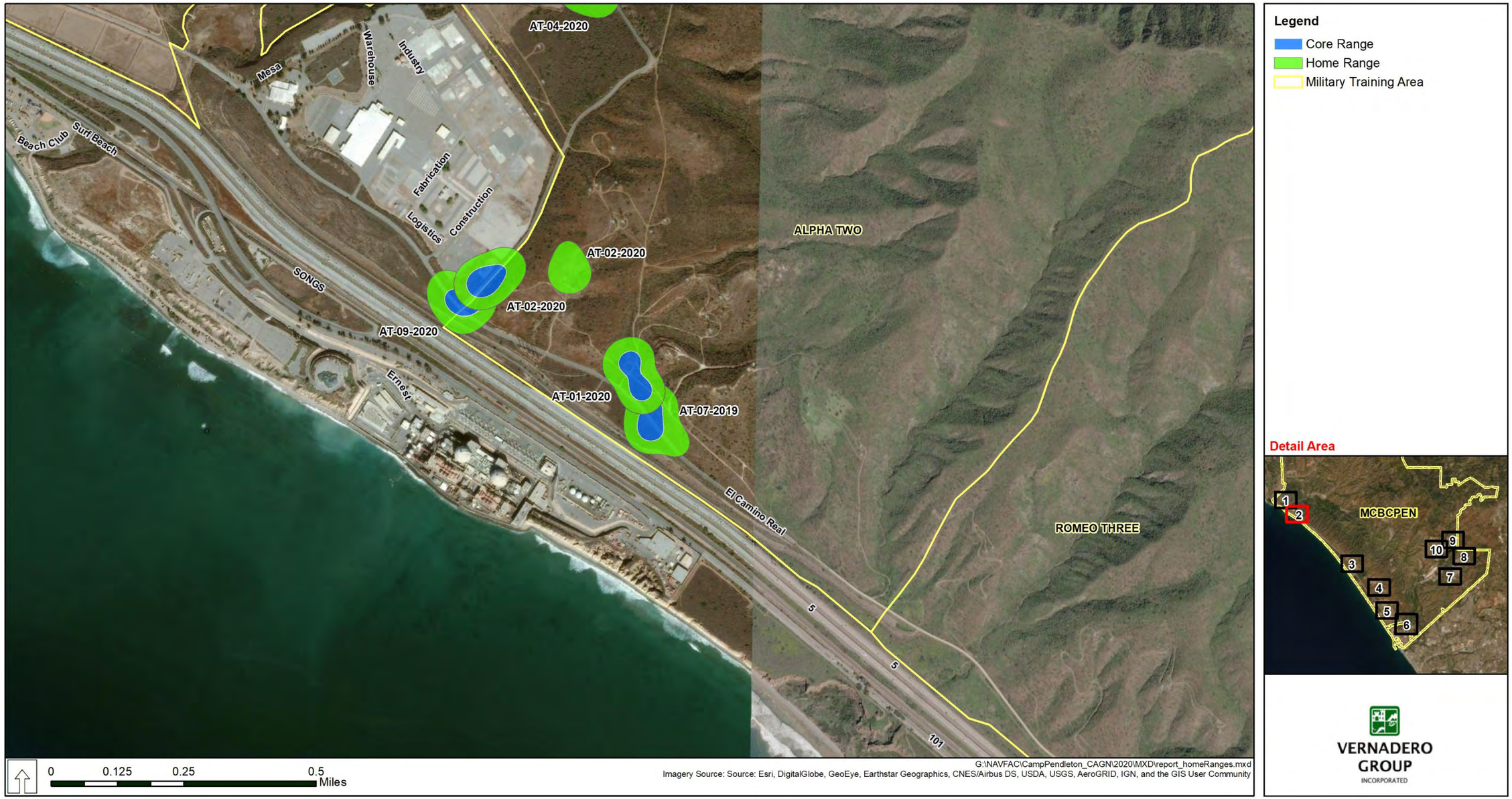

Figure E-2. Home and Core Ranges for Territories in the Alpha Two Training Area

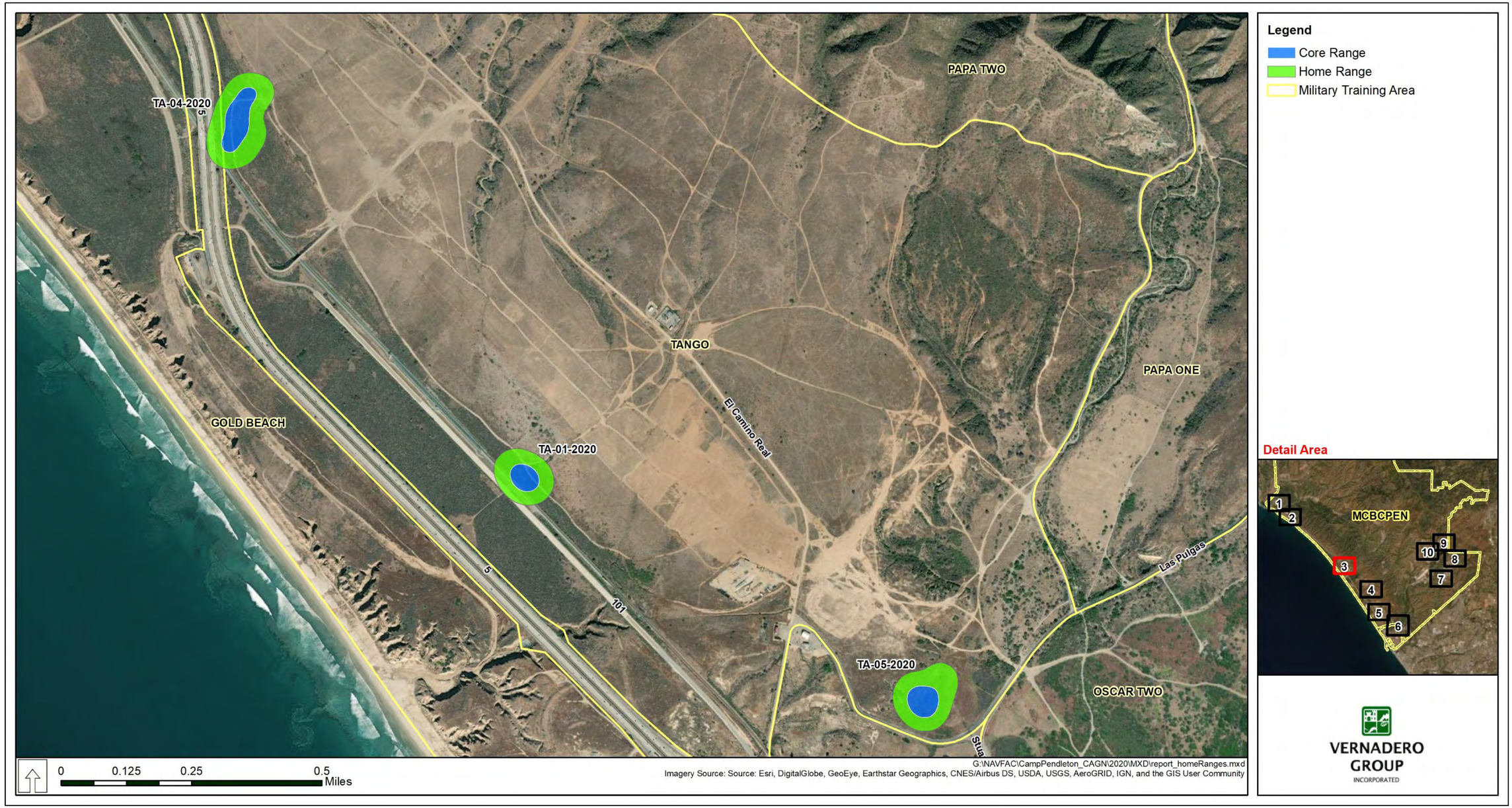

Figure E-3. Home and Core Ranges for Territories in the Tango Training Area

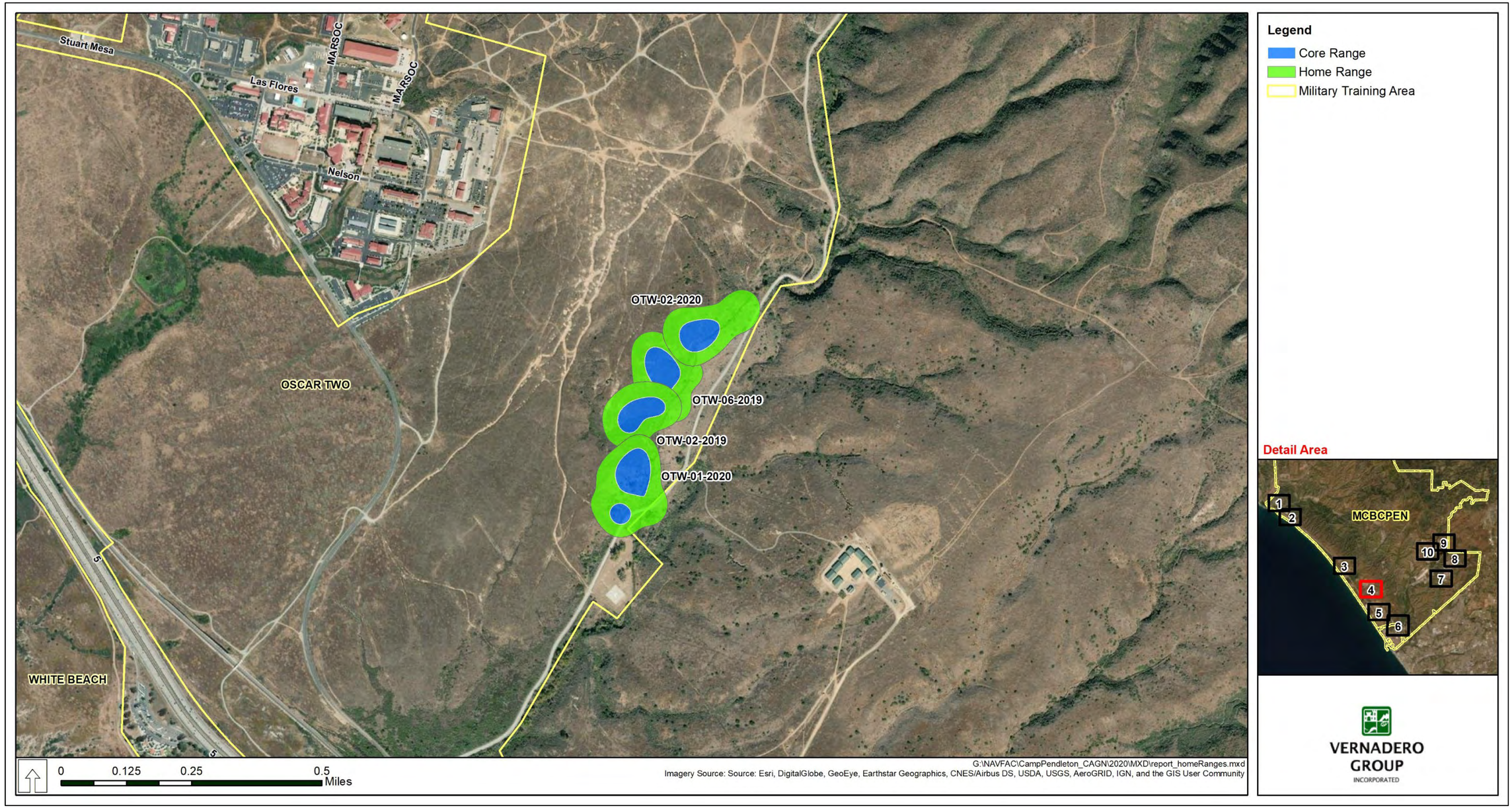

Figure E-4. Home and Core Ranges for the Oscar Two Territories

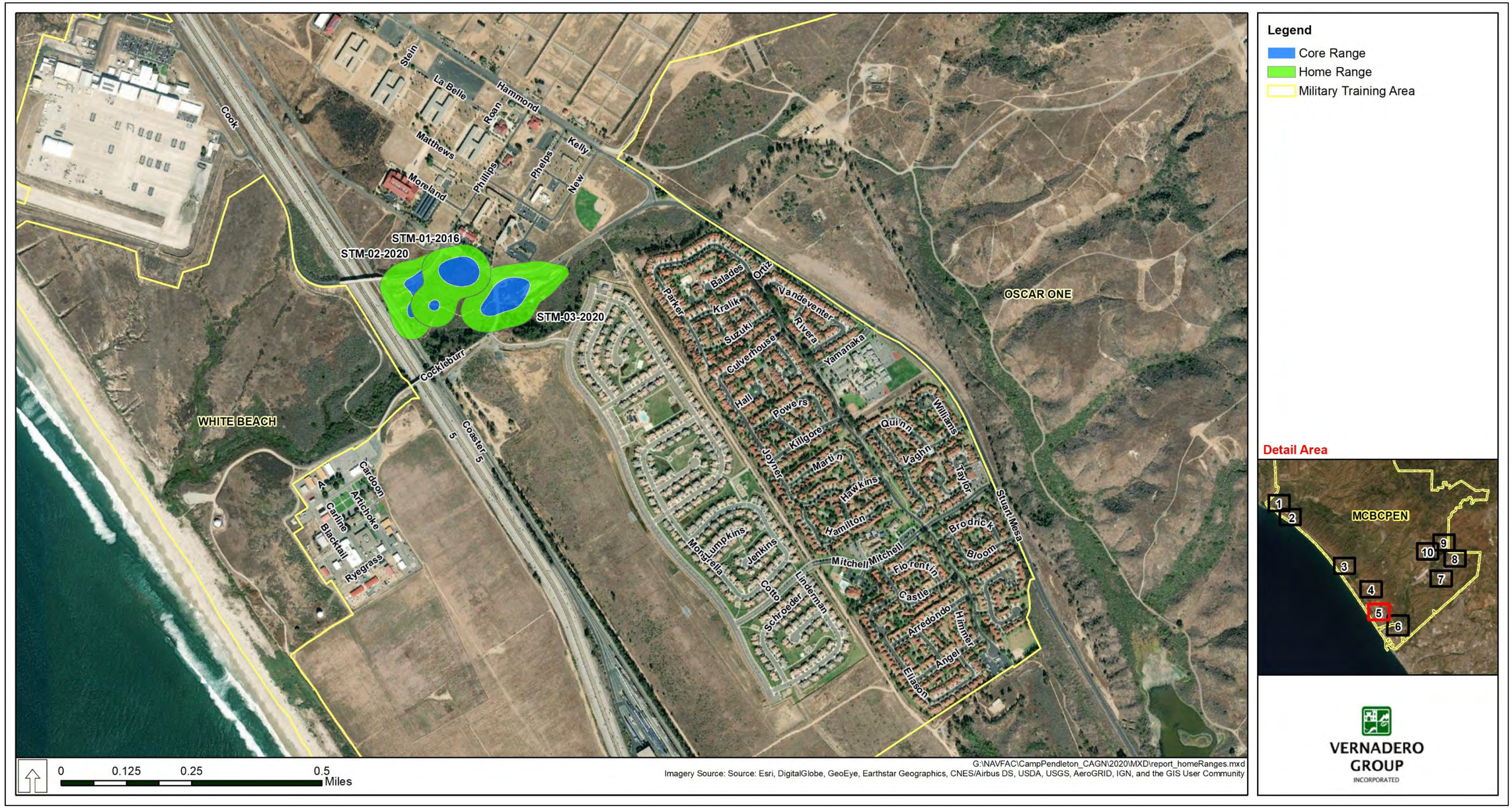

Figure E-5. Home and Core Ranges for Territories adjacent to the Cockleburr Cantonment Area

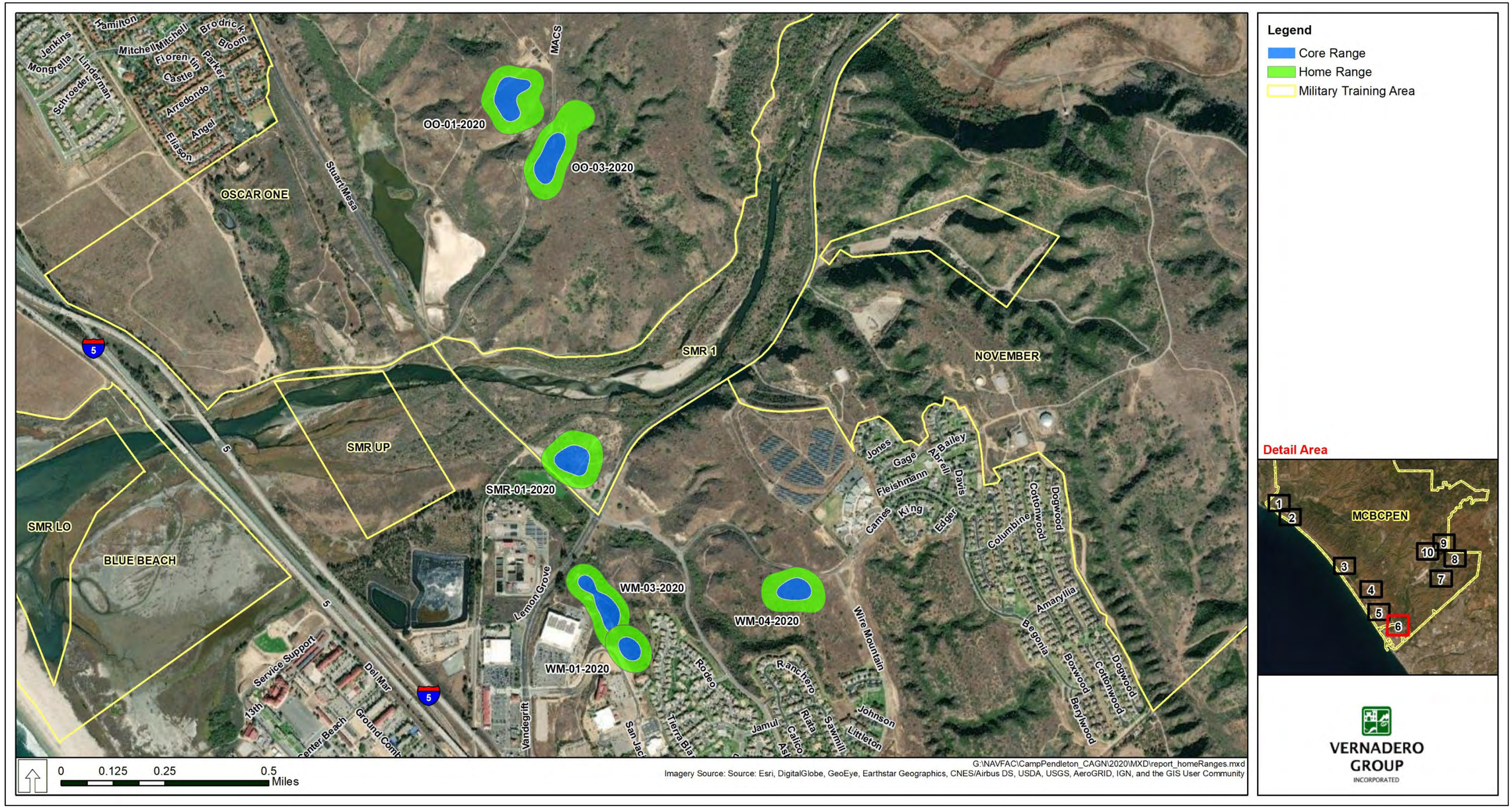

Figure E-6. Home and Core Ranges for Territories in the Oscar One and Santa Margarita River 1 Training Areas and adjacent Cantonment Area

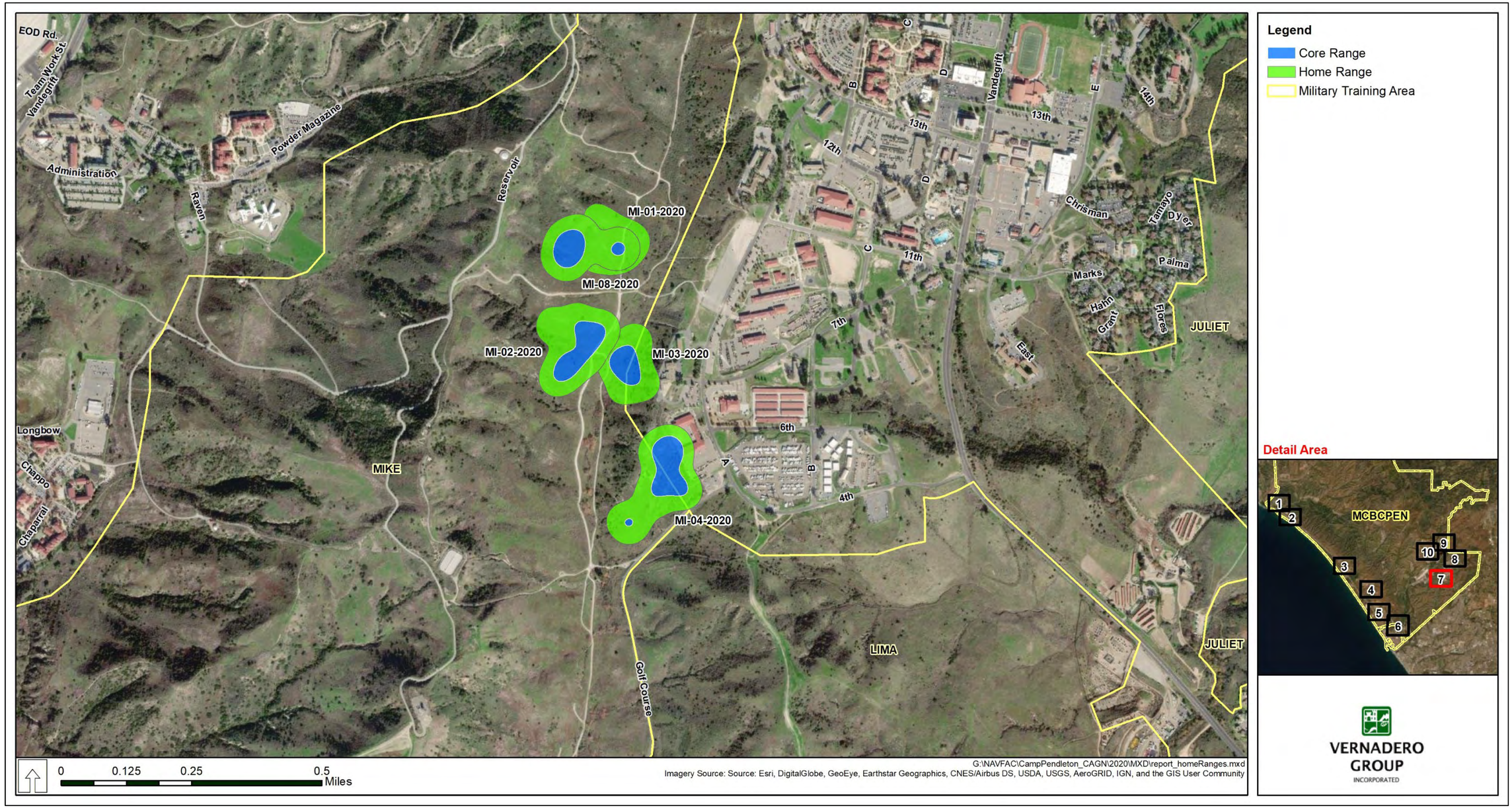

Figure E-7. Home and Core Ranges for Territories in the Mike Training Area

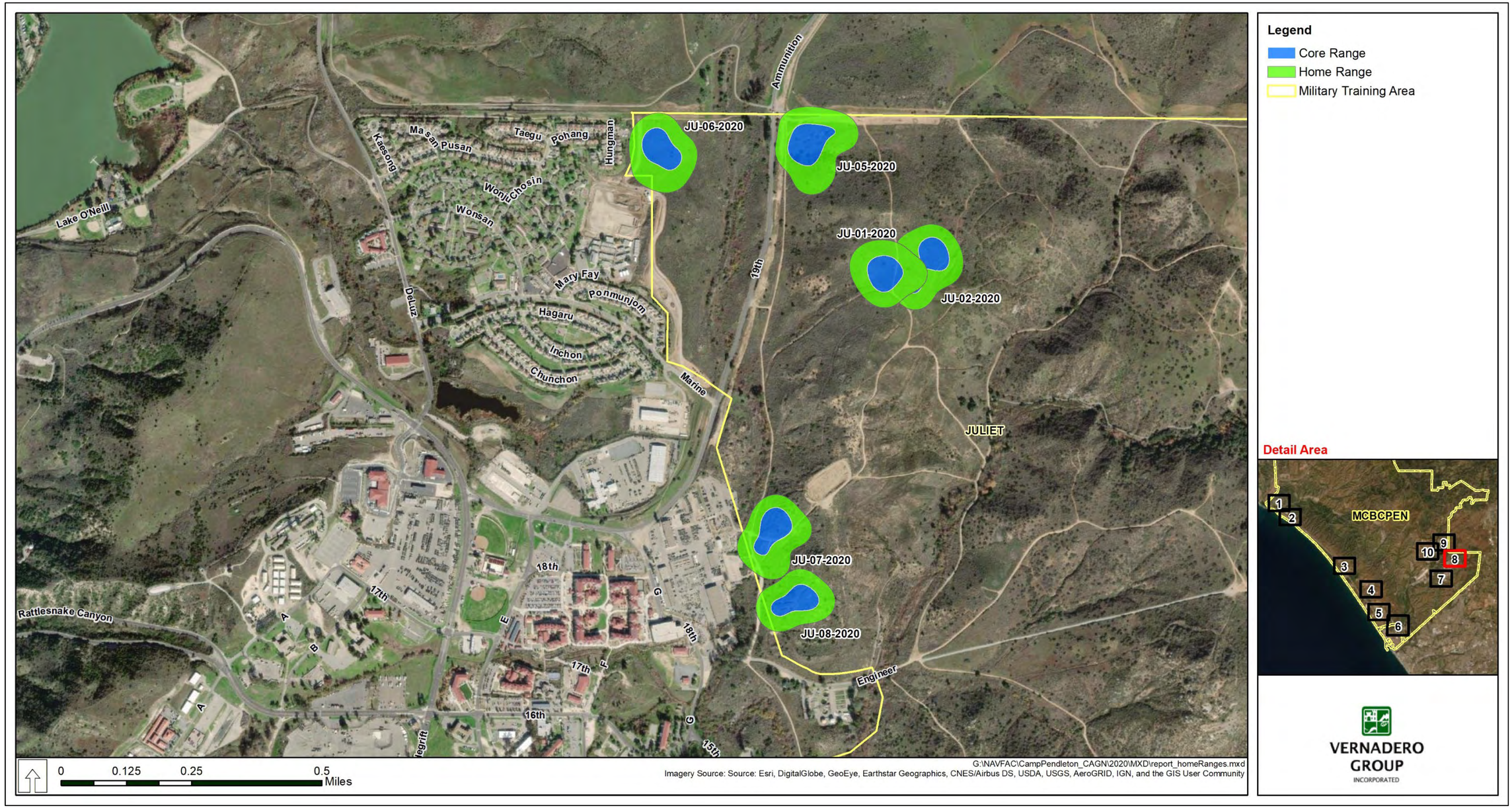

Figure E-8. Home and Core Ranges for Territories in the Juliet Training Area

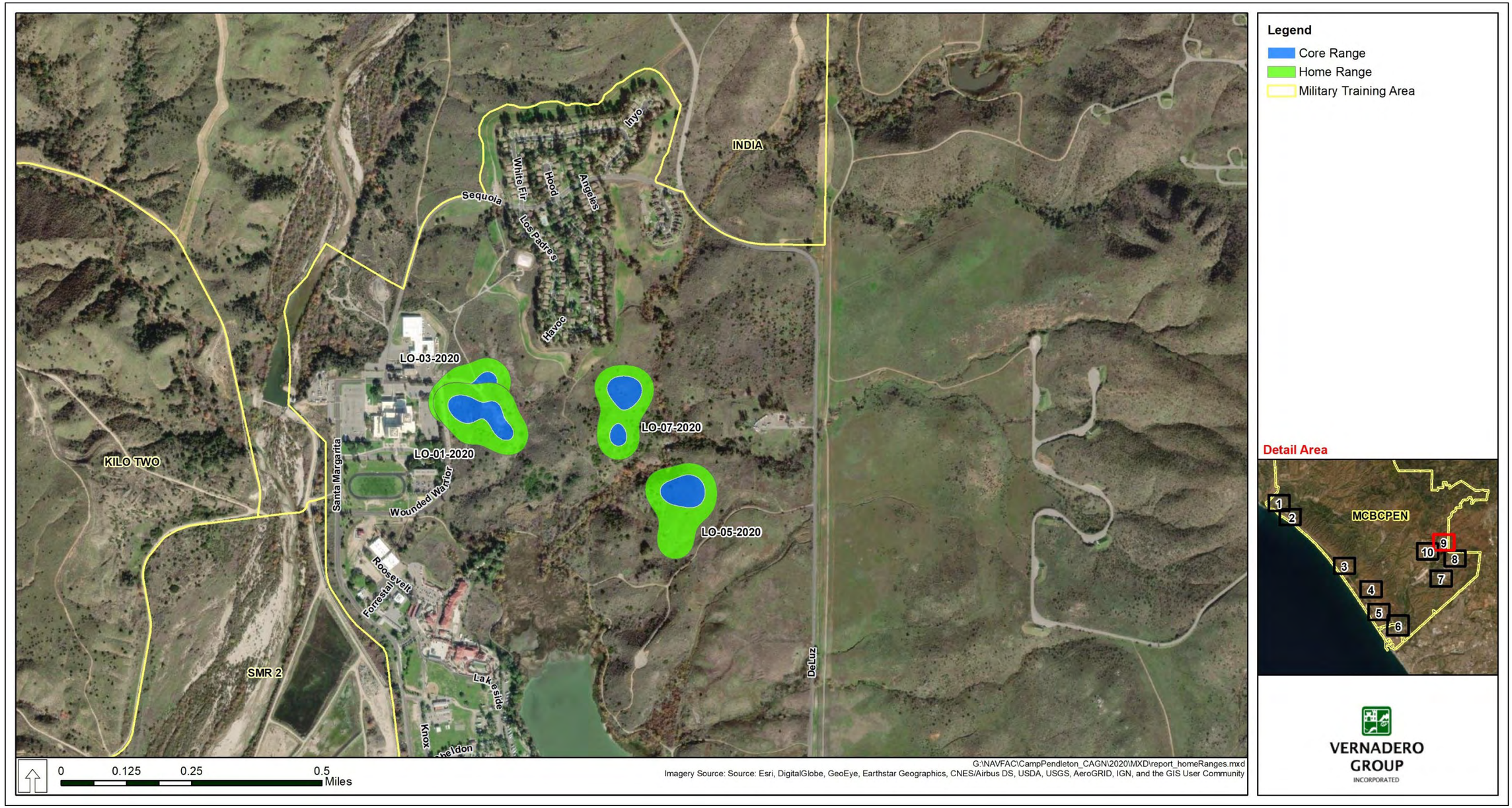

Figure E-9. Home and Core Ranges for Territories in the Lake O'Neill Cantonment Area

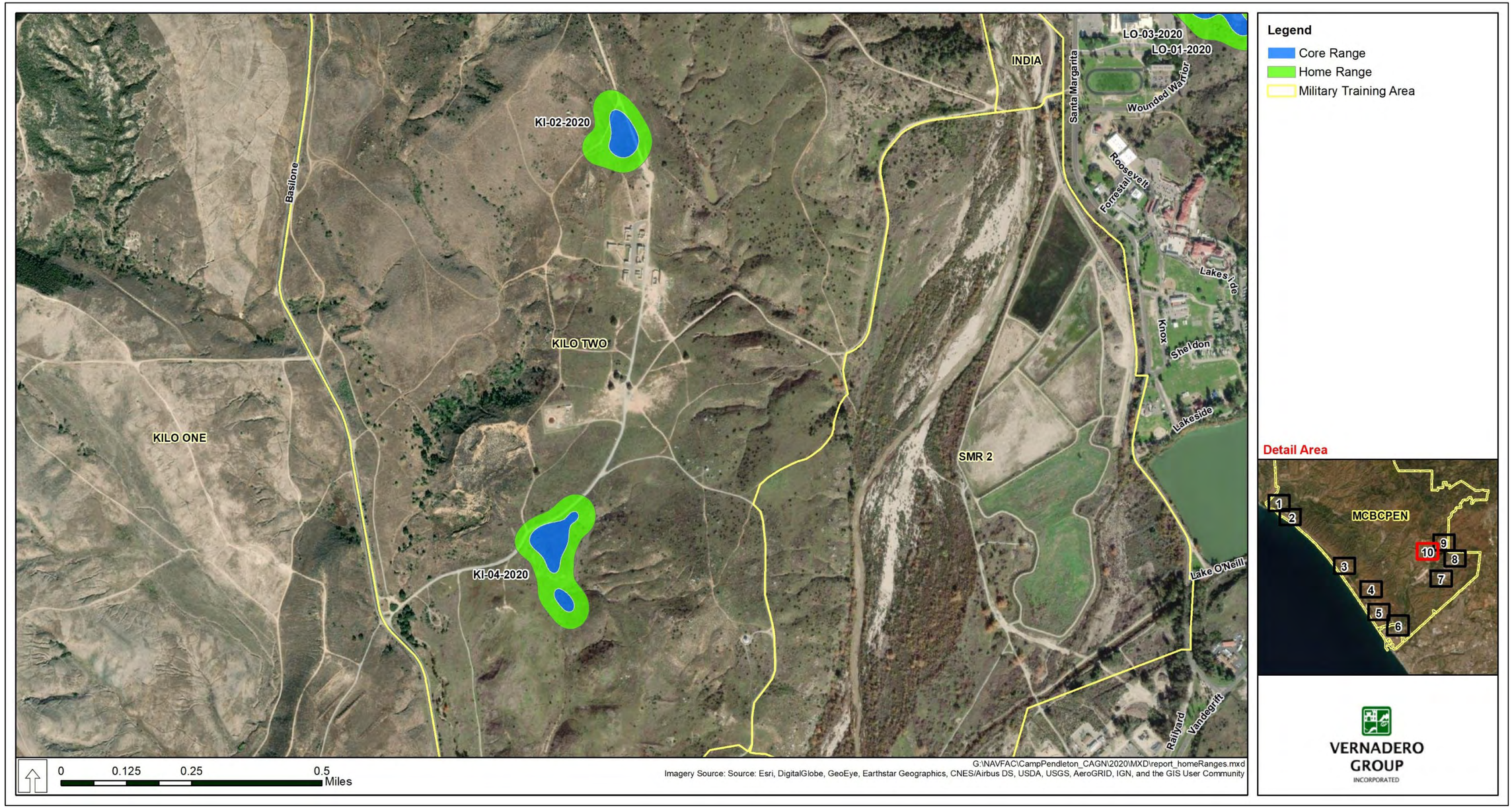

Figure E-10. Home and Core Ranges for Territories in the Kilo Two Training Area

Appendix F. Vegetation Maps of Coastal California Gnatcatcher Territories

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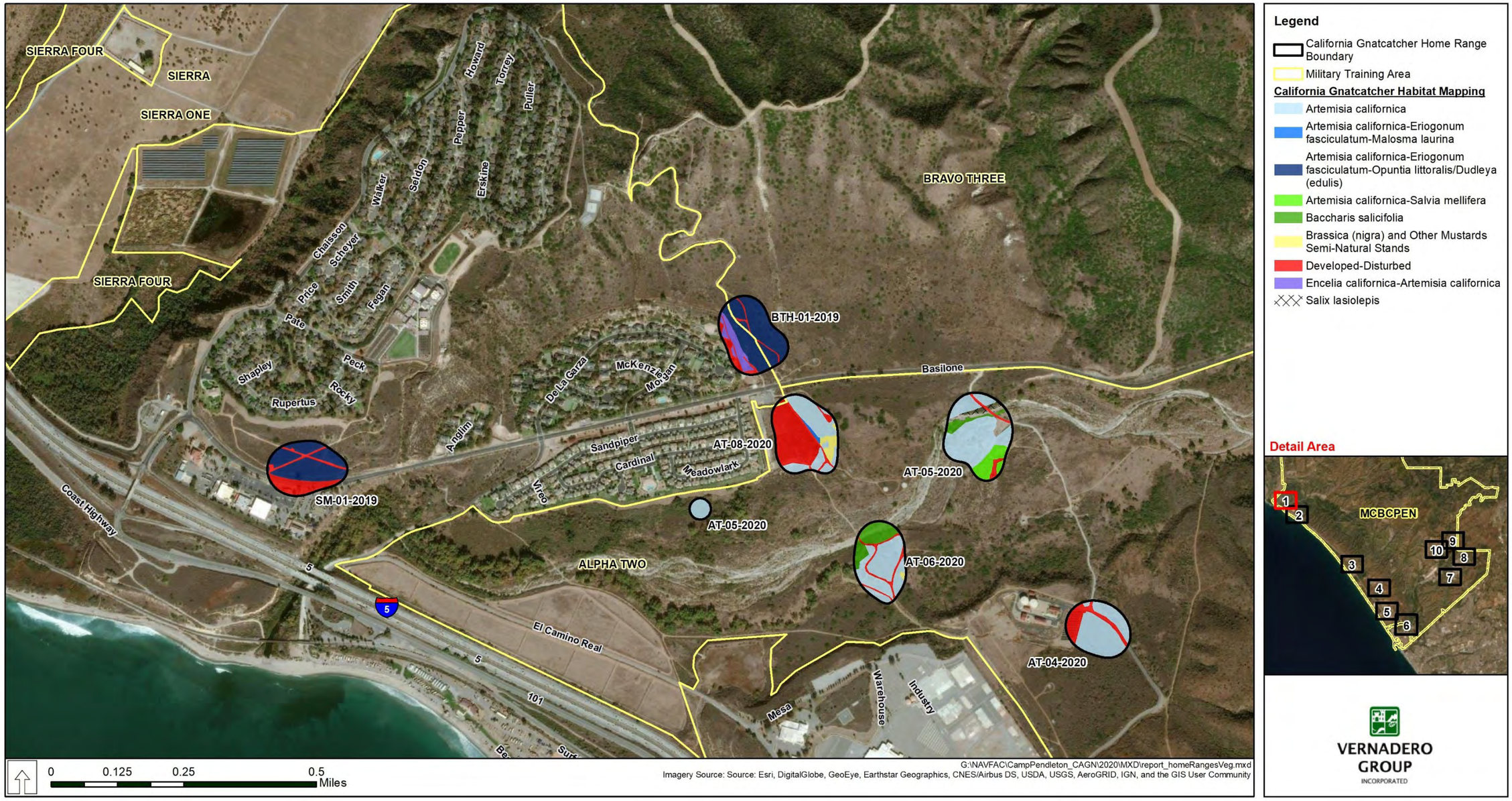

Figure F-1. Mapped Vegetation for Territories in the Northern Cantonment, Alpha Two, and Bravo Three Training Areas

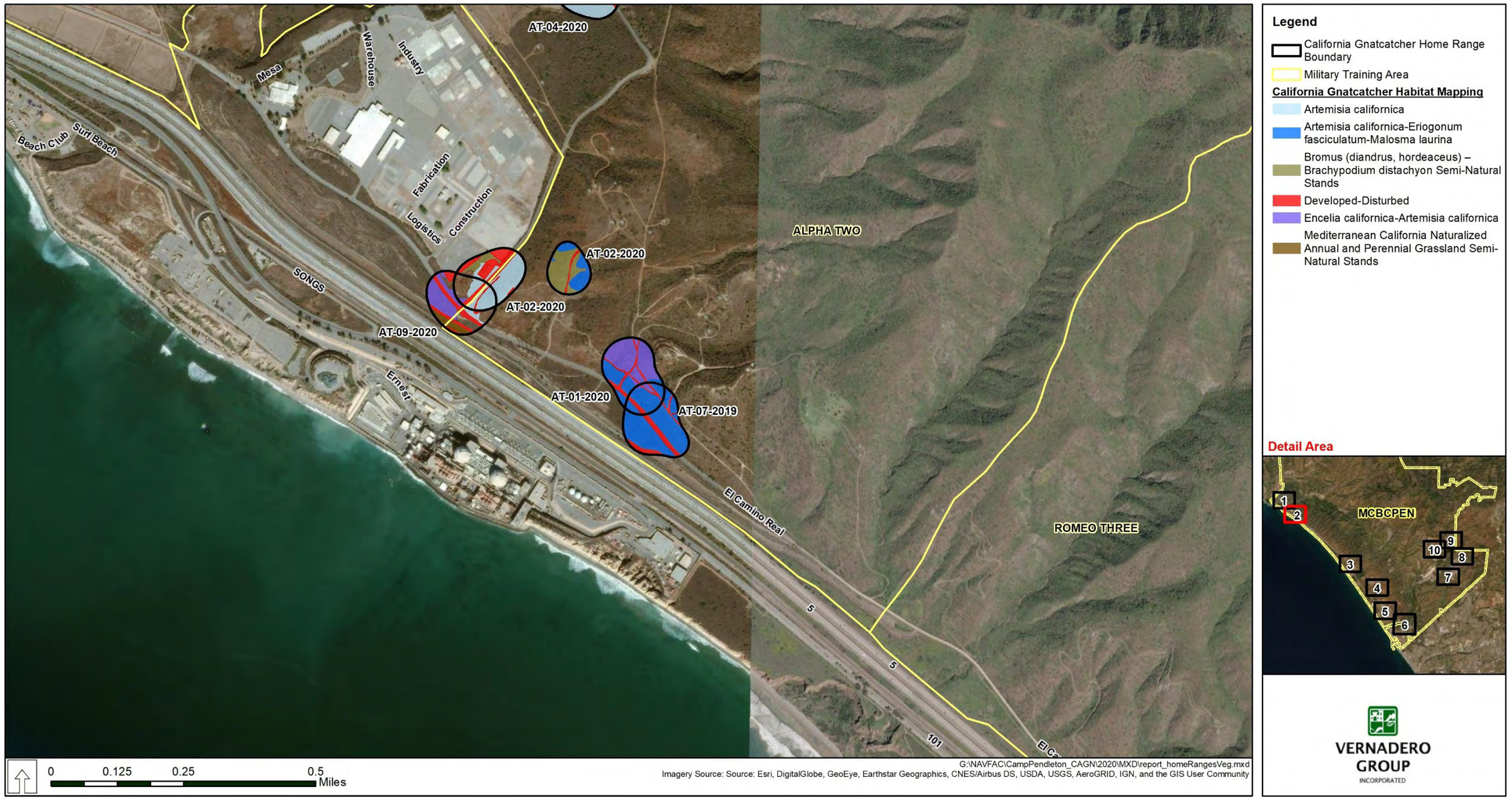

Figure F-2. Mapped Vegetation for Territories in the Alpha Two Training Area

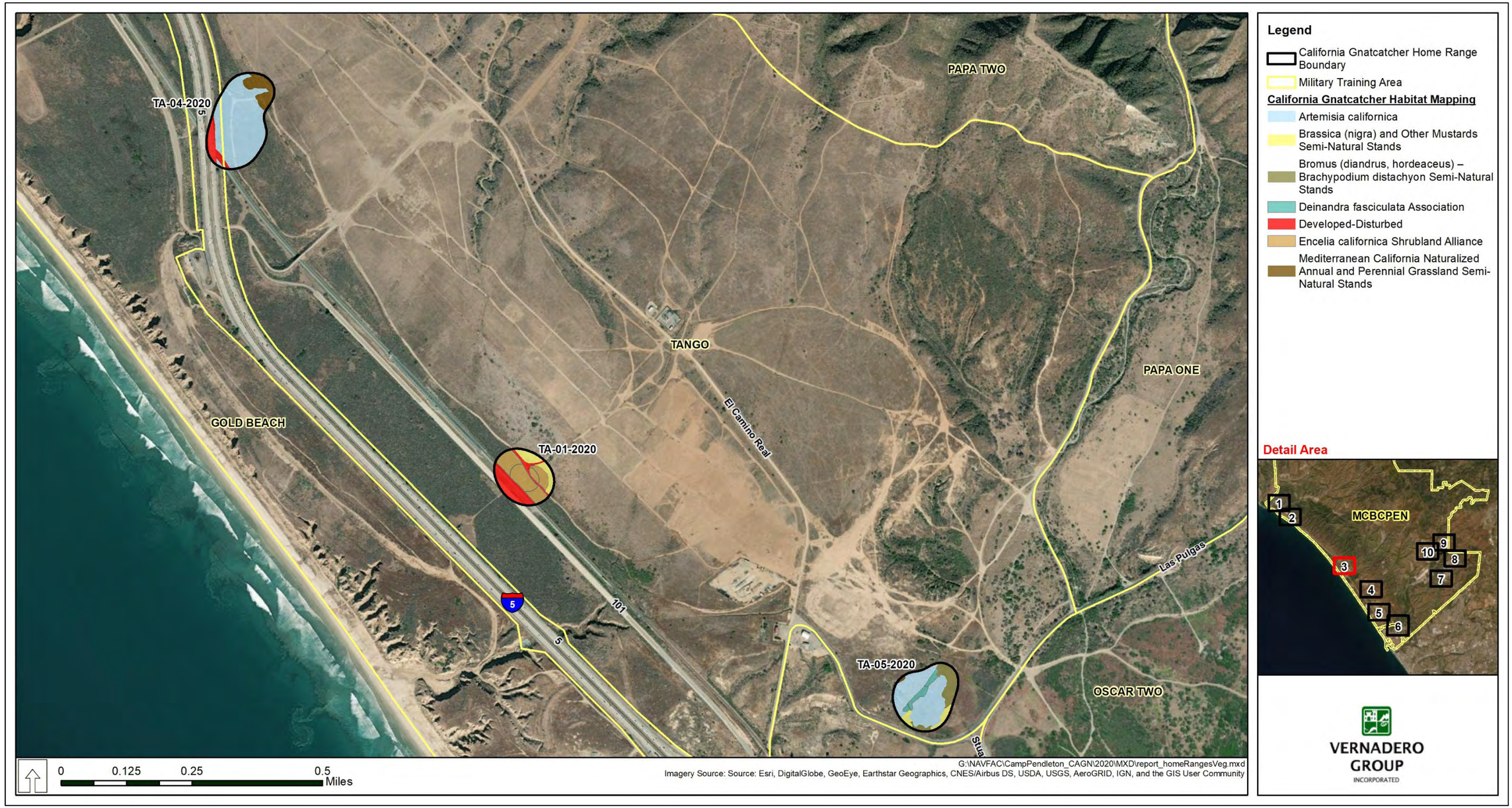

Figure F-3. Vegetation Maps for Territories in the Tango Training Area

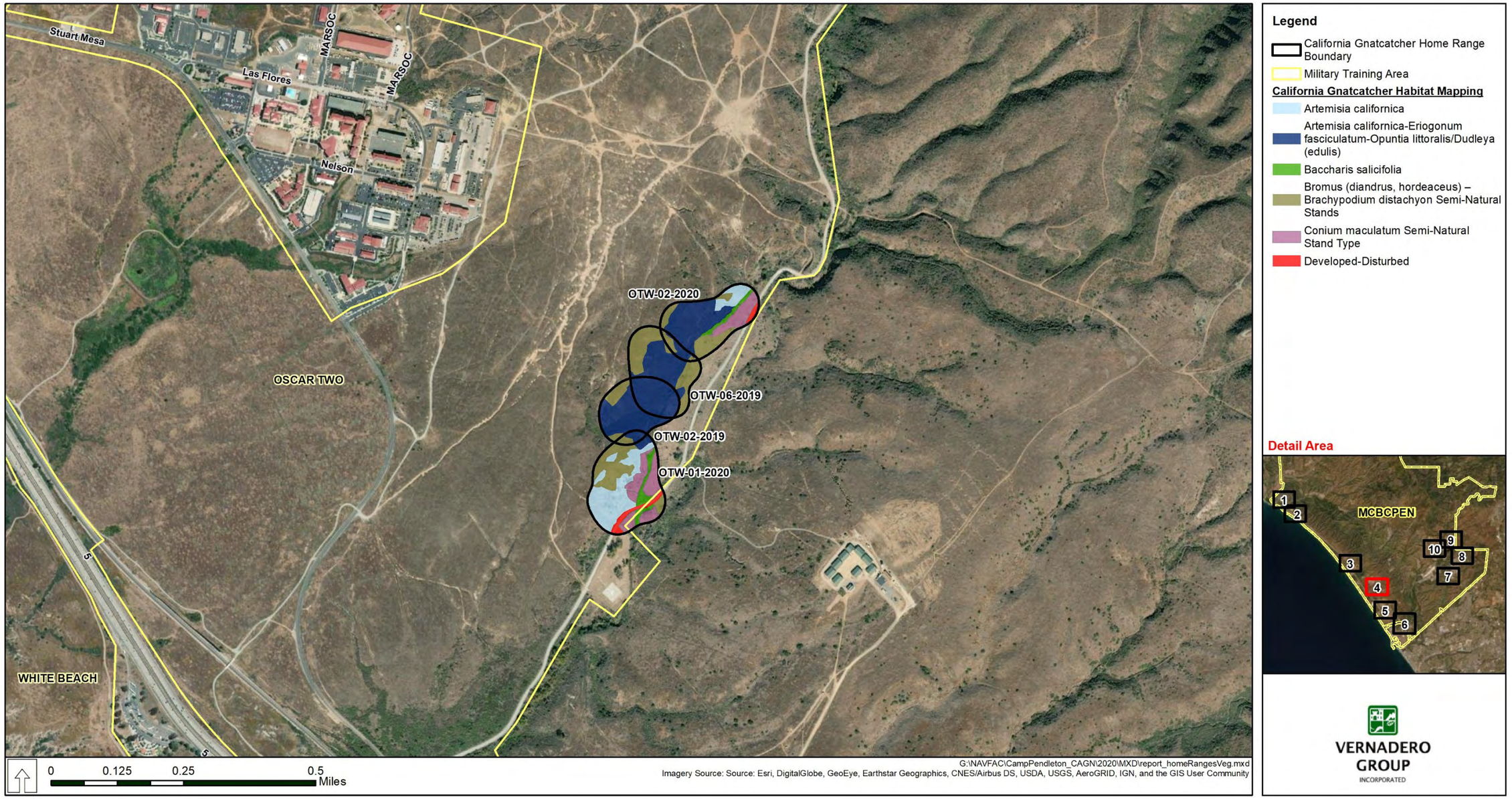

Figure F-4. Mapped Vegetation in the Oscar Two Territories

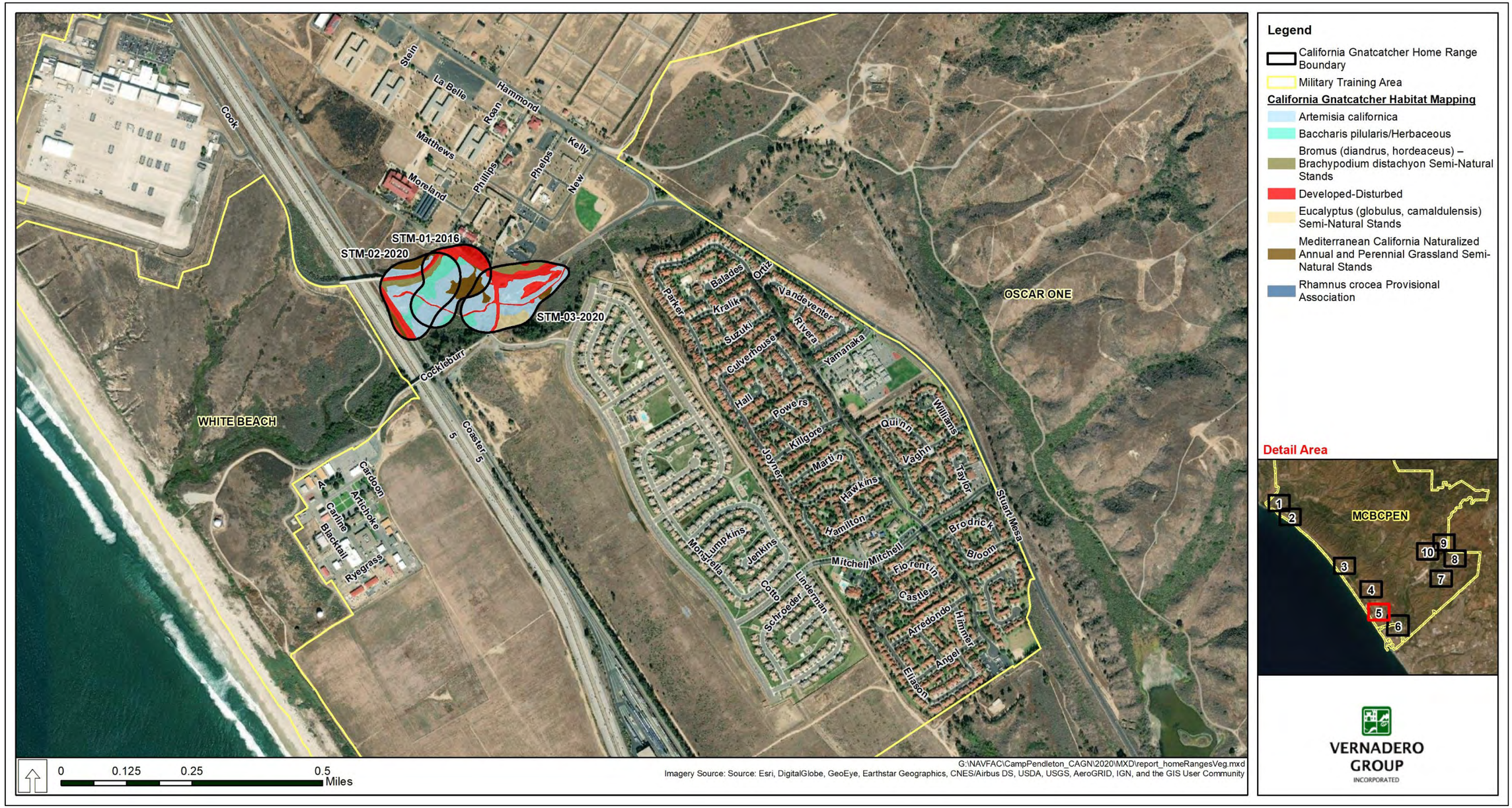

Figure F-5. Mapped Vegetation for Territories adjacent to the Cockleburr Cantonment Area

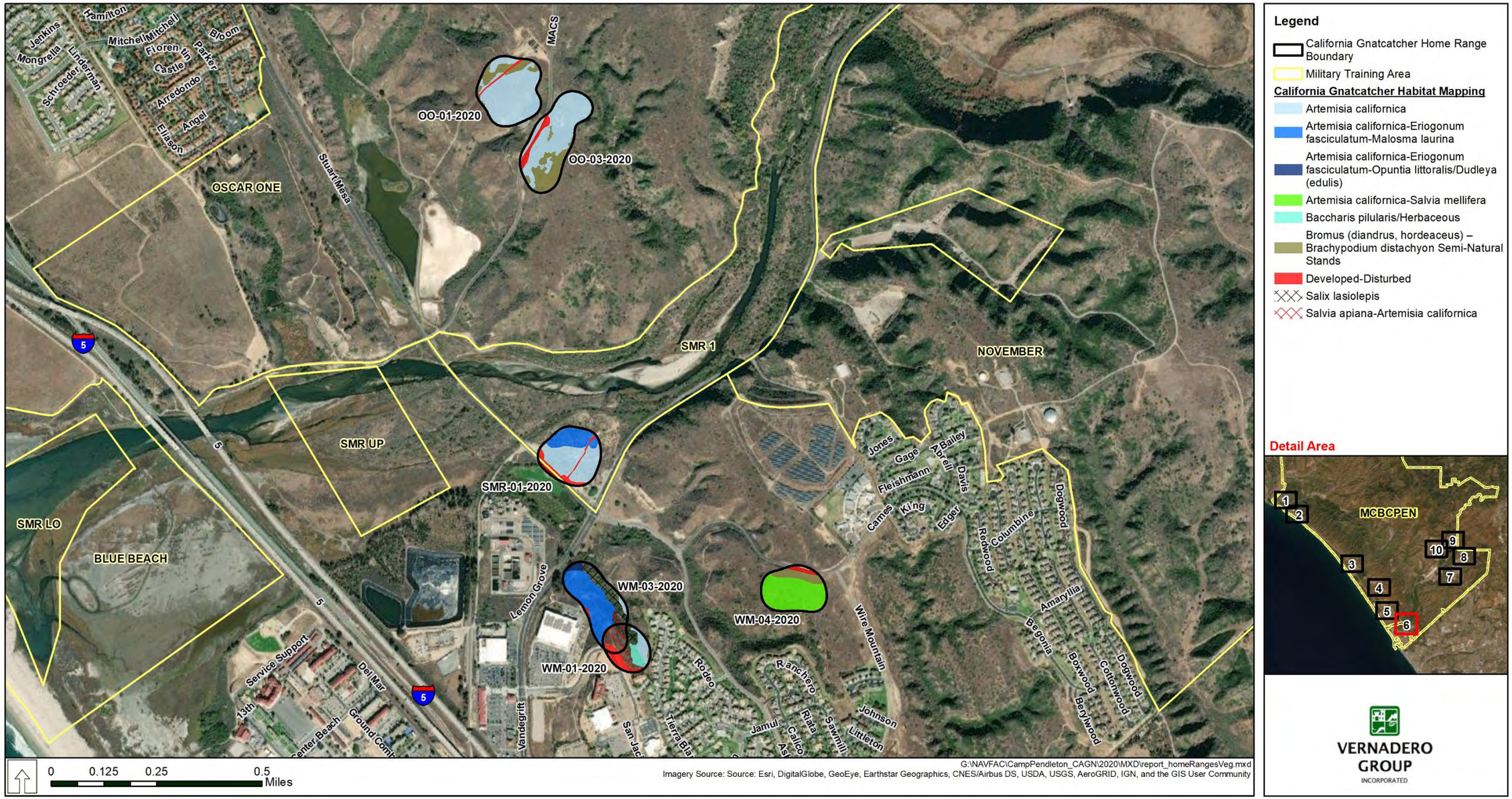

Figure F-6. Mapped Vegetation for Territories in the Oscar One and Santa Margarita River 1 Training Areas and adjacent Cantonment Area

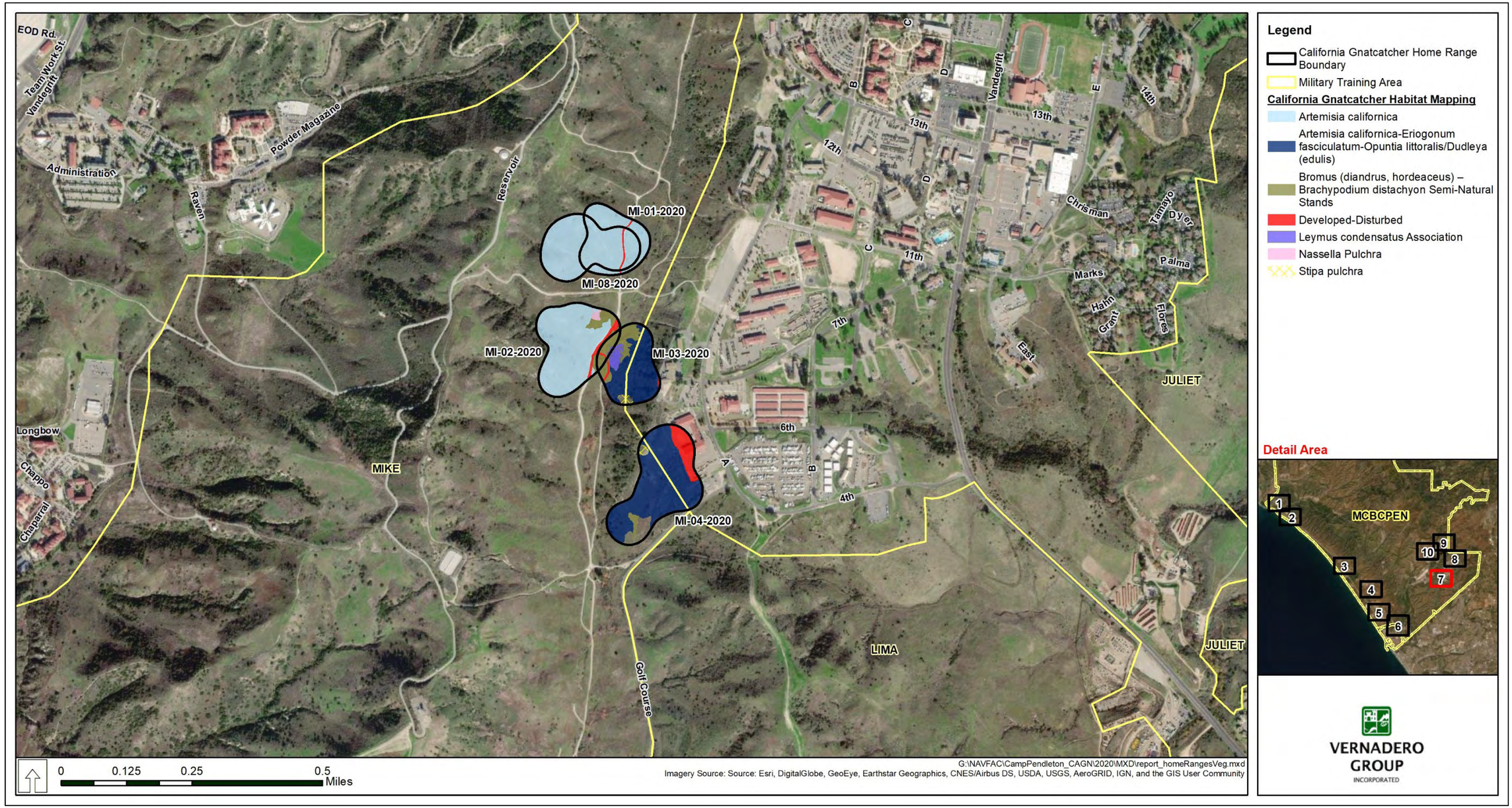

Figure F-7. Mapped Vegetation for Territories in the Mike Training Area

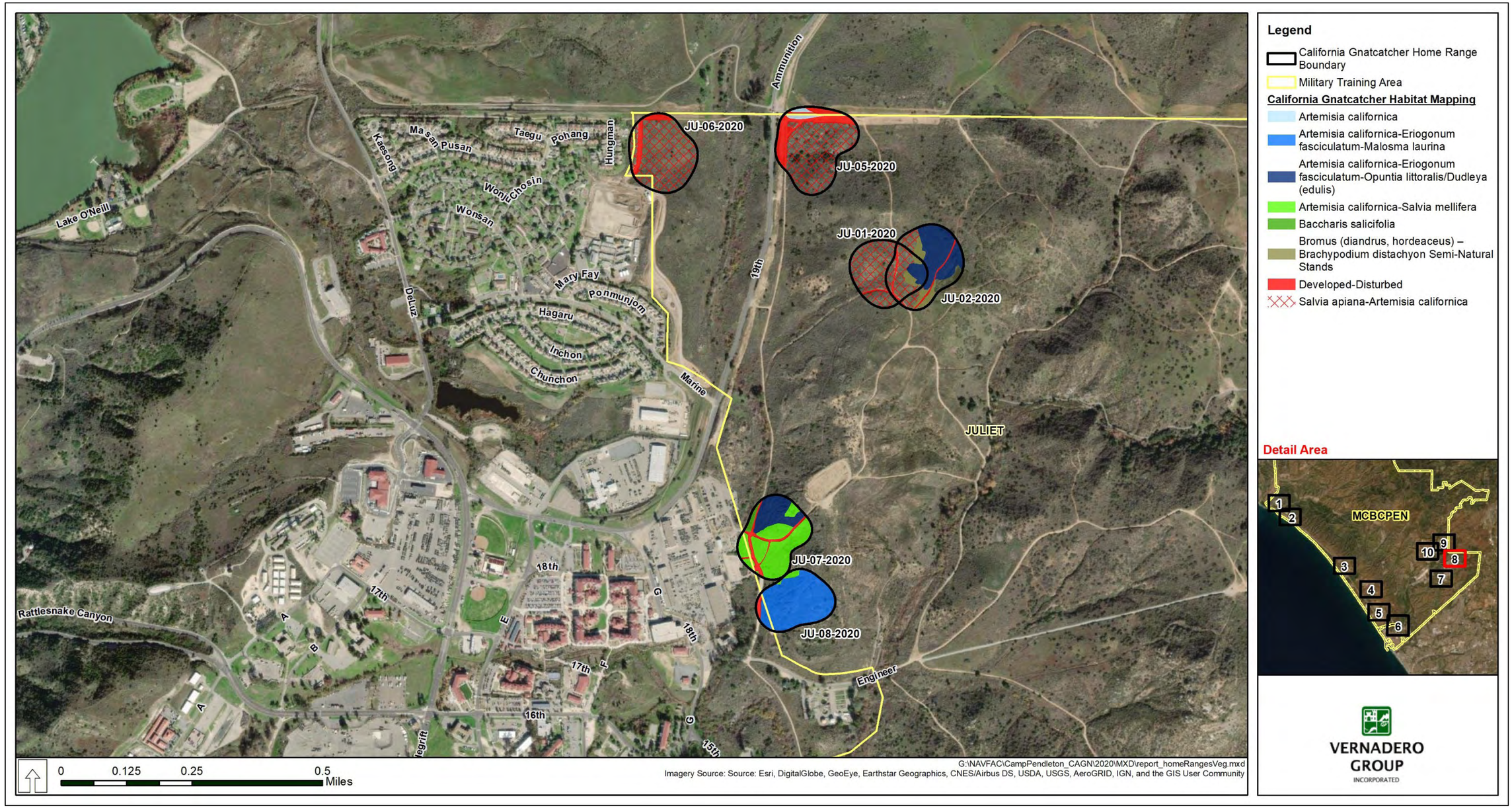

Figure F-8. Mapped Vegetation for Territories in the Juliet Training Area

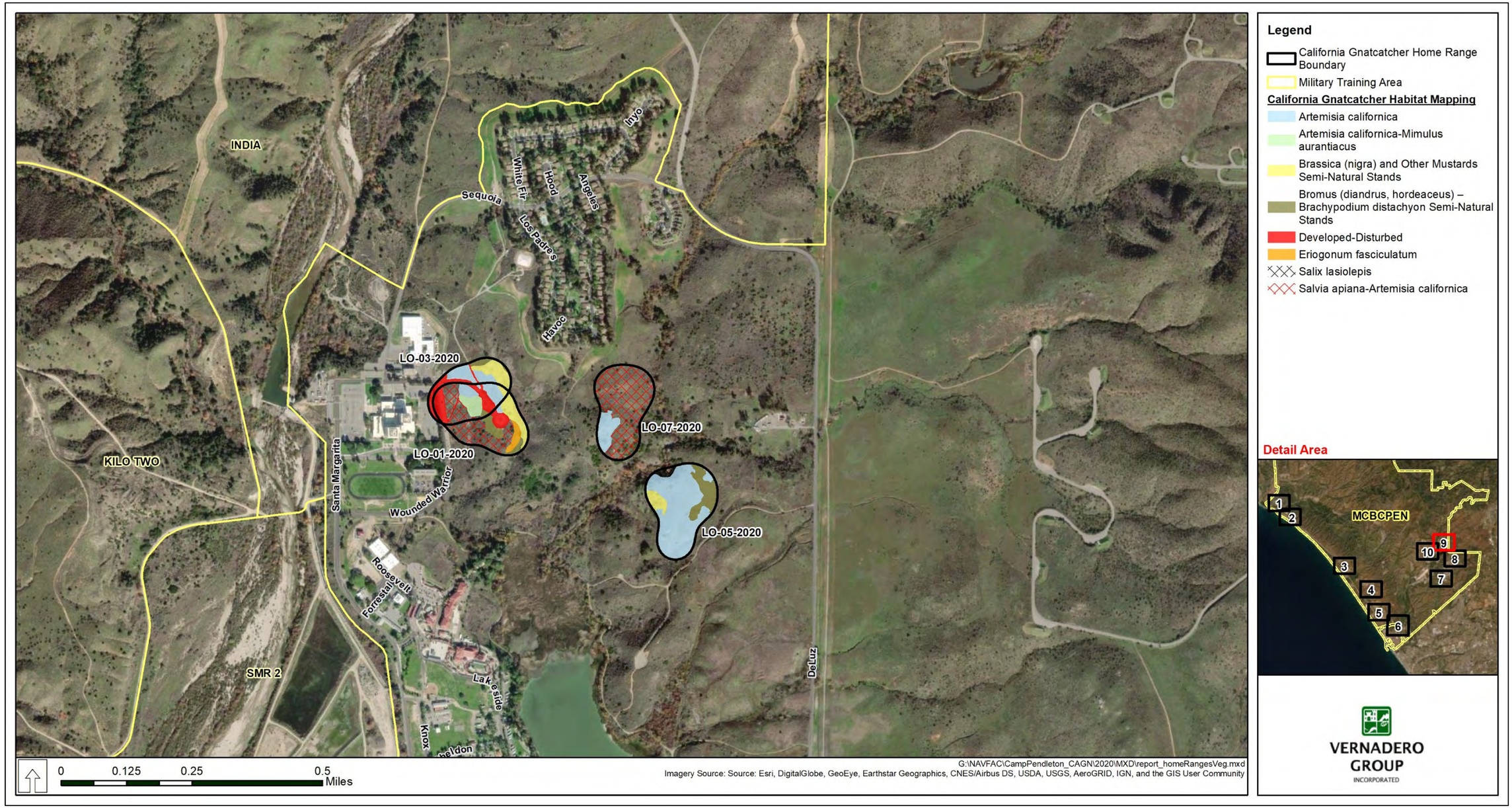

Figure F-9. Mapped Vegetation for Territories in the Lake O'Neill Cantonment Area

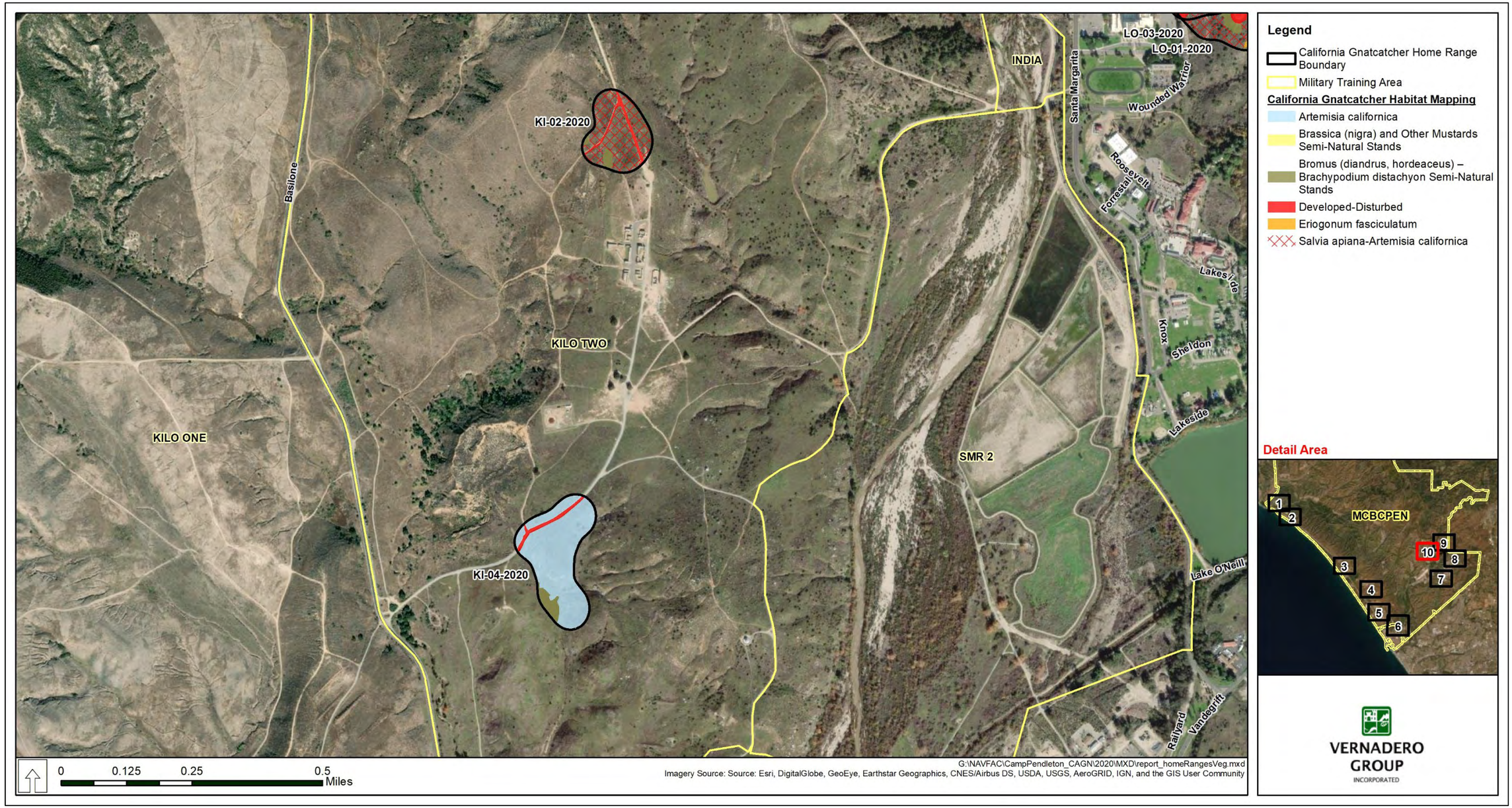

Figure F-10. Mapped Vegetation for Territories in Kilo Two Training Area

Appendix G. Statistical Outputs from the Best-Fit General Linear Models

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HOME RANGE MODELS

►General Linear Model

Dependent Variable	HOME
N	44
Multiple R	0.653
Squared Multiple R	0.426
Adjusted Squared Multiple R	0.412
Standard Error of Estimate	2.721

Regression Coefficients B = $(X'X)^{-1}X'Y$

Effect	Coefficient	Standard Error	Std. Coefficient	Tolerance	t	p-Value
CONSTANT	6.665	0.809	0.000	.	8.234	0.000
ELEV	0.015	0.003	0.653	1.000	5.584	0.000

Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
Regression	230.896	1	230.896	31.184	0.000
Residual	310.979	42	7.404		

Durbin-Watson D-Statistic	2.316
First Order Autocorrelation	-0.169

Information Criteria

AIC	216.910
AIC (Corrected)	217.510
Schwarz's BIC	222.263

▼General Linear Model

Dependent Variable	HOME
N	44
Multiple R	0.519
Squared Multiple R	0.270
Adjusted Squared Multiple R	0.252
Standard Error of Estimate	3.069

Regression Coefficients B = $(X'X)^{-1}X'Y$

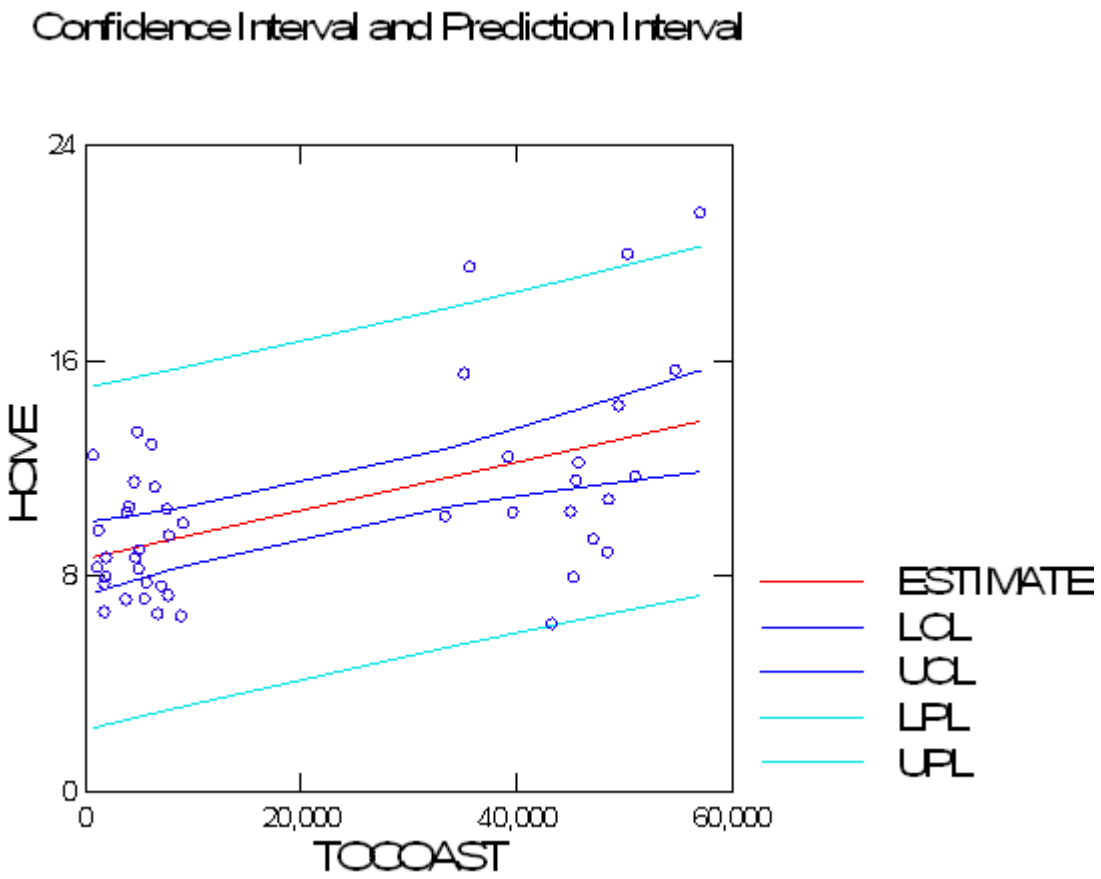
Effect	Coefficient	Standard Error	Std. Coefficient	Tolerance	t	p-Value
CONSTANT	8.651	0.670	0.000	.	12.902	0.000
TOCOAST	0.000	0.000	0.519	1.000	3.939	0.000

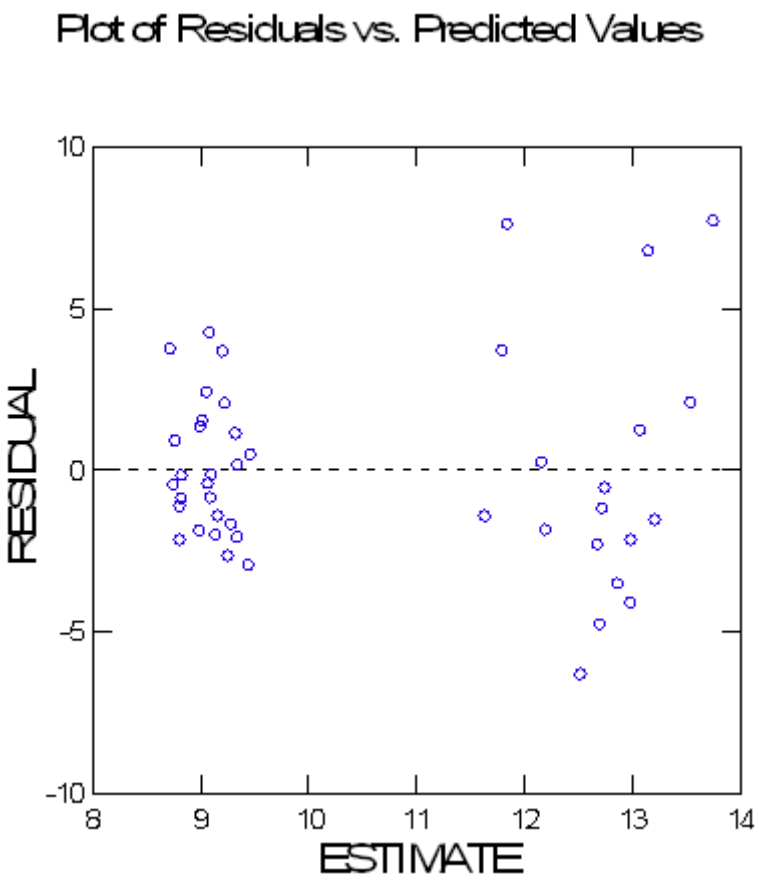
Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
Regression	146.168	1	146.168	15.514	0.000
Residual	395.707	42	9.422		

Durbin-Watson D-Statistic	2.028
First Order Autocorrelation	-0.021

Information Criteria	
AIC	227.512
AIC (Corrected)	228.112
Schwarz's BIC	232.864





▼General Linear Model

Effects coding used for categorical variables in model.

The categorical values encountered during processing are

Variables	Levels				
TA$ (13 levels)	AT	BTH	GOB	JU	KI
	LO	MI	OO	OTW	SM
	SMR	TA	WM		

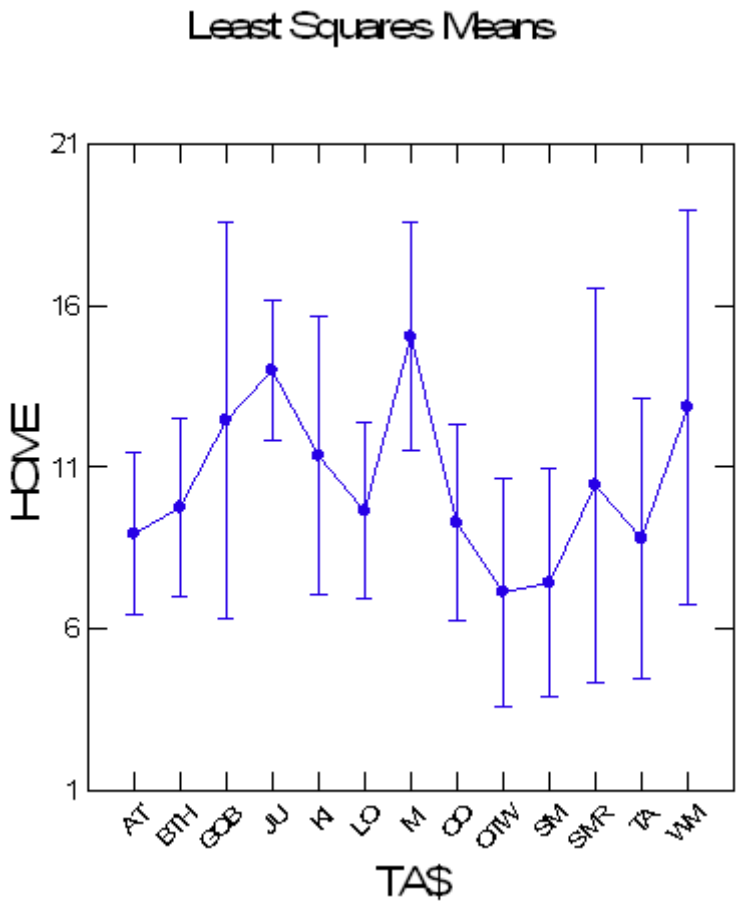
Dependent Variable	HOME
N	44
Multiple R	0.699
Squared Multiple R	0.489

Estimates of Effects B = $(X'X)^{-1}X'Y$

Factor	Level	HOME
CONSTANT		10.551
TA$	AT	-1.606
TA$	BTH	-0.793

Estimates of Effects B = (X'X)$^{-1}$X'Y		
Factor	**Level**	**HOME**
TA$	GOB	1.899
TA$	JU	3.445
TA$	KI	0.814
TA$	LO	-0.909
TA$	MI	4.486
TA$	OO	-1.258
TA$	OTW	-3.404
TA$	SM	-3.131
TA$	SMR	-0.101
TA$	TA	-1.751

Analysis of Variance					
Source	**Type III SS**	**df**	**Mean Squares**	**F-Ratio**	**p-Value**
TA$	264.986	12	22.082	2.472	0.021
Error	276.889	31	8.932		



WARNING

Case 31 is an Outlier (Studentized Residual : 2.983)

Durbin-Watson D-Statistic	2.270
First Order Autocorrelation	-0.140

Information Criteria	
AIC	233.801
AIC (Corrected)	248.284
Schwarz's BIC	258.780

▼General Linear Model

Effects coding used for categorical variables in model.

The categorical values encountered during processing are

Variables	Levels				
TA$ (13 levels)	AT	BTH	GOB	JU	KI
	LO	MI	OO	OTW	SM
	SMR	TA	WM		

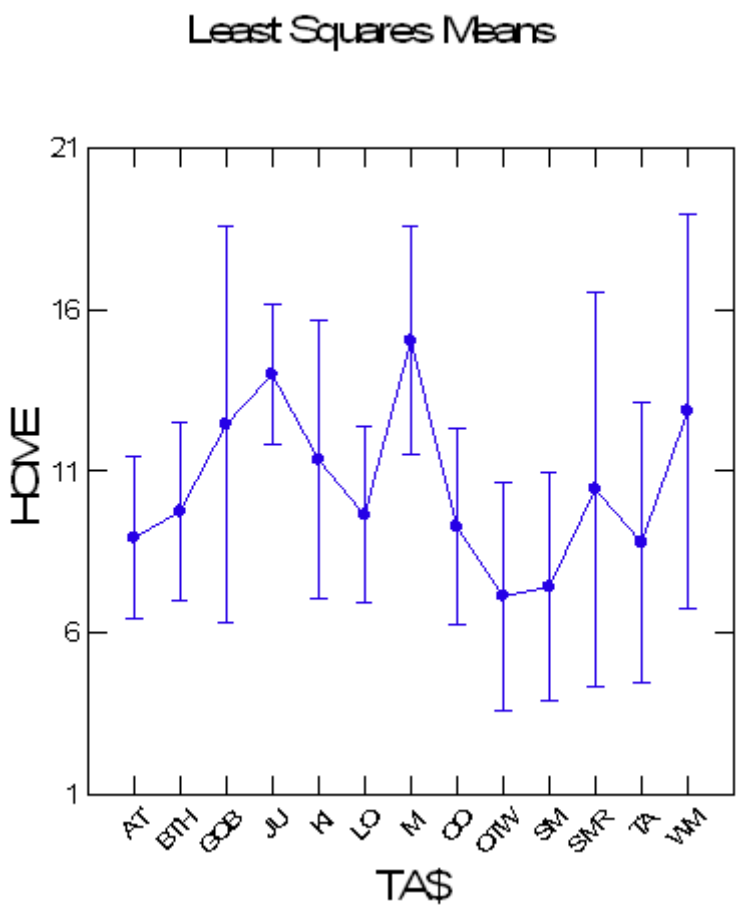
Dependent Variable	HOME
N	44
Multiple R	0.699
Squared Multiple R	0.489

Estimates of Effects B = $(X'X)^{-1}X'Y$

Factor	Level	HOME
CONSTANT		10.551
TA$	AT	-1.606
TA$	BTH	-0.793
TA$	GOB	1.899
TA$	JU	3.445
TA$	KI	0.814
TA$	LO	-0.909
TA$	MI	4.486
TA$	OO	-1.258
TA$	OTW	-3.404
TA$	SM	-3.131
TA$	SMR	-0.101
TA$	TA	-1.751

Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
TA$	264.986	12	22.082	2.472	0.021
Error	276.889	31	8.932		



WARNING

Case 31 is an Outlier (Studentized Residual : 2.983)

Durbin-Watson D-Statistic	2.270
First Order Autocorrelation	-0.140

Information Criteria	
AIC	233.801
AIC (Corrected)	248.284
Schwarz's BIC	258.780

▼General Linear Model

Effects coding used for categorical variables in model.

The categorical values encountered during processing are

Variables	Levels				
TA$ (13 levels)	AT	BTH	GOB	JU	KI
	LO	MI	OO	OTW	SM
	SMR	TA	WM		

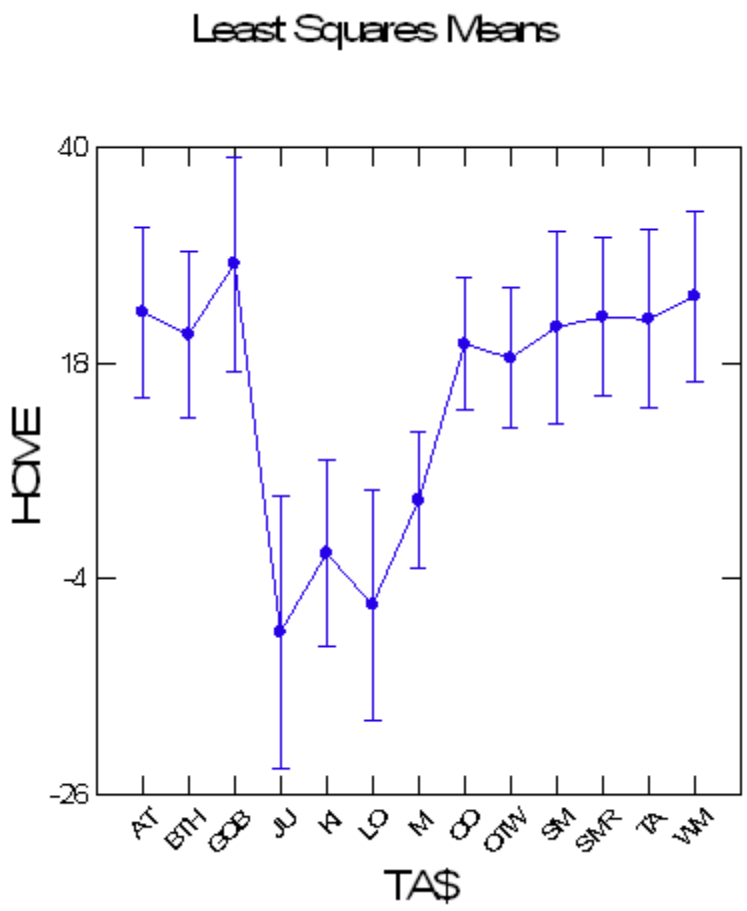
Dependent Variable	HOME
N	44
Multiple R	0.829
Squared Multiple R	0.687

Estimates of Effects B = $(X'X)^{-1}X'Y$

Factor	Level	HOME
CONSTANT		-3.528
ELEV		0.013
TOCOAST		0.001
TA$	AT	8.665
TA$	BTH	6.374
TA$	GOB	13.583
TA$	JU	-23.948
TA$	KI	-15.908
TA$	LO	-21.161
TA$	MI	-10.500
TA$	OO	5.389
TA$	OTW	3.974
TA$	SM	7.137
TA$	SMR	8.162
TA$	TA	7.929

Analysis of Variance

Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
ELEV	25.427	1	25.427	4.354	0.046
TOCOAST	48.818	1	48.818	8.359	0.007
TA$	140.539	12	11.712	2.005	0.062
Error	169.372	29	5.840		



WARNING

Case 4 is an Outlier (Studentized Residual : 3.026)

Durbin-Watson D-Statistic	2.606
First Order Autocorrelation	-0.307

Information Criteria	
AIC	216.175
AIC (Corrected)	236.323
Schwarz's BIC	244.722

CORE RANGE MODELS

Model 1 Rank

▼General Linear Model

Dependent Variable	CORE
N	44
Multiple R	0.582
Squared Multiple R	0.339
Adjusted Squared Multiple R	0.324
Standard Error of Estimate	0.982

Regression Coefficients B = $(X'X)^{-1}X'Y$

Effect	Coefficient	Standard Error	Std. Coefficient	Tolerance	t	p-Value
CONSTANT	1.810	0.292	0.000	.	6.198	0.000
ELEV	0.005	0.001	0.582	1.000	4.644	0.000

Analysis of Variance

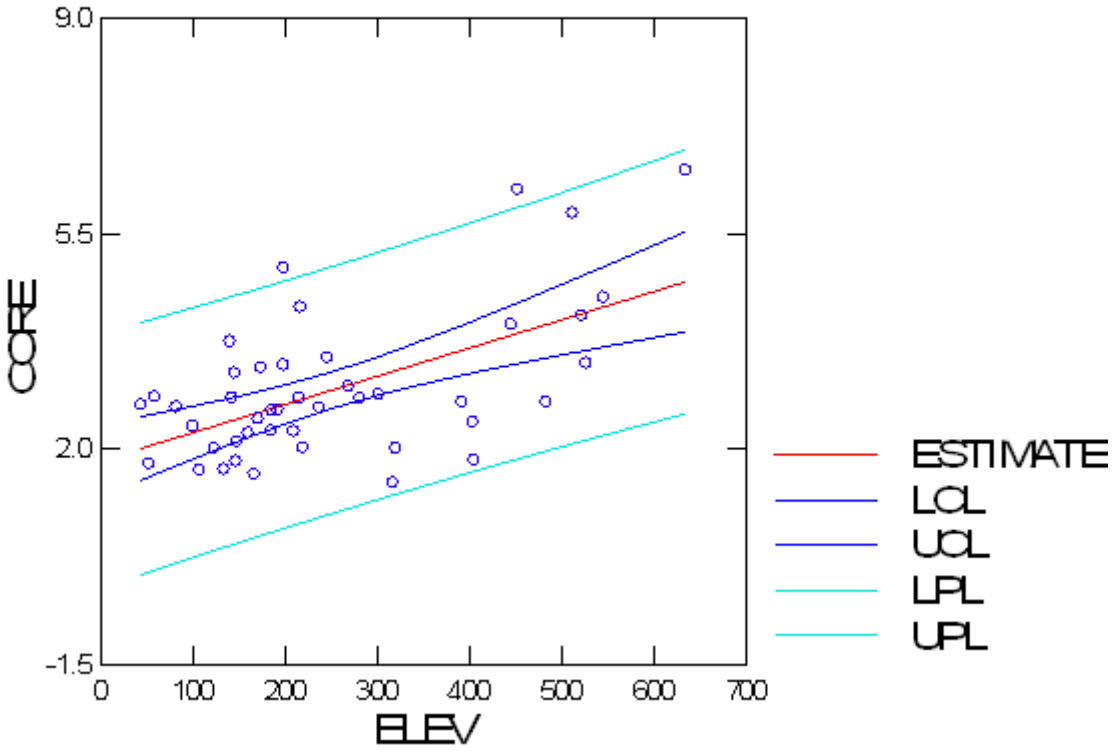
Source	Type III SS	df	Mean Squares	F-Ratio	p-Value
Regression	20.774	1	20.774	21.564	0.000
Residual	40.461	42	0.963		

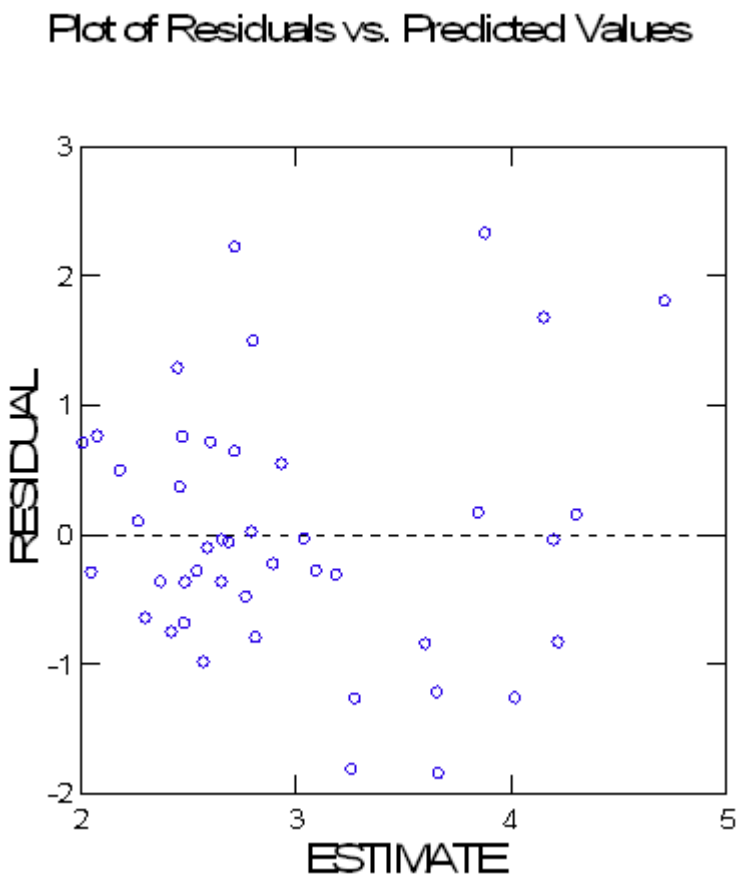
Durbin-Watson D-Statistic	2.073
First Order Autocorrelation	-0.058

Information Criteria

AIC	127.177
AIC (Corrected)	127.777
Schwarz's BIC	132.530

Confidence Interval and Prediction Interval





Model 2 Rank

▼General Linear Model

Effects coding used for categorical variables in model.

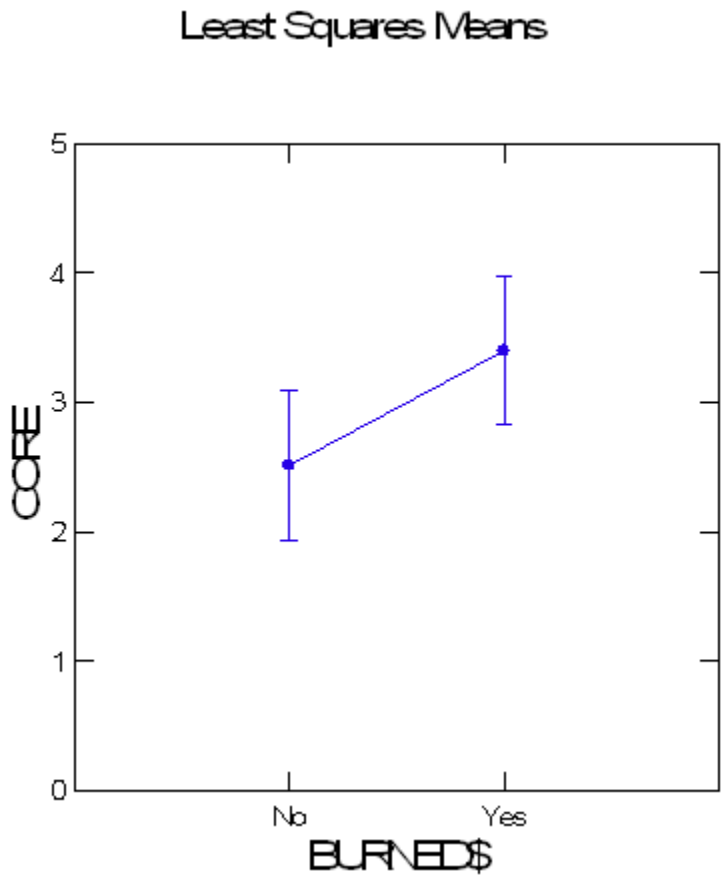
The categorical values encountered during processing are

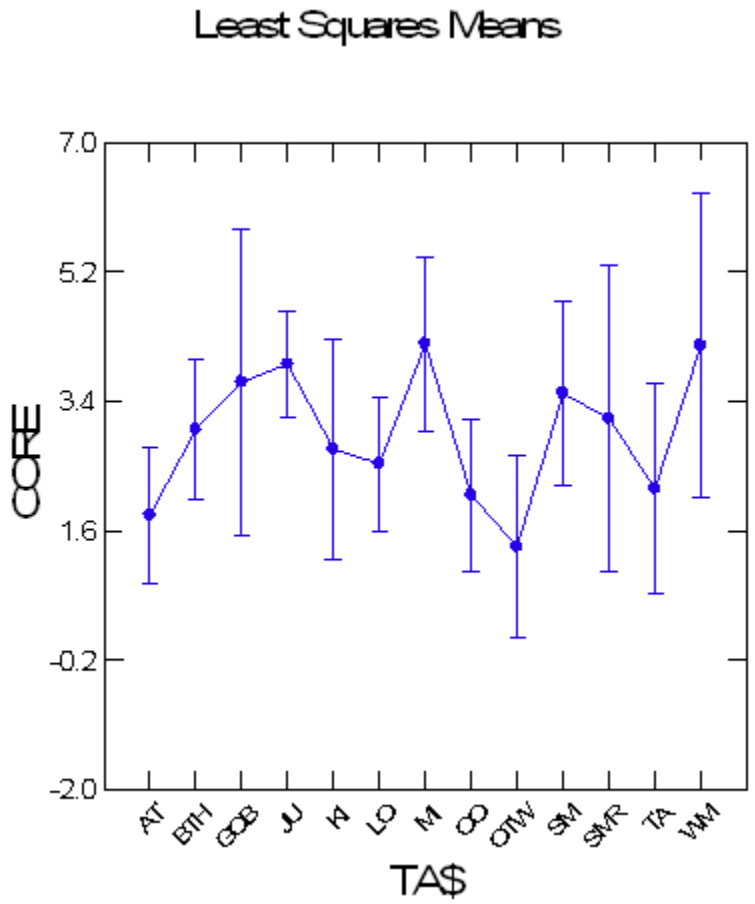
Variables	Levels				
BURNED$ (2 levels)	No	Yes			
TA$ (13 levels)	AT	BTH	GOB	JU	KI
	LO	MI	OO	OTW	SM
	SMR	TA	WM		

Dependent Variable	CORE
N	44
Multiple R	0.701
Squared Multiple R	0.492

Estimates of Effects B = $(X'X)^{-1}X'Y$		
Factor	**Level**	**CORE**
CONSTANT		2.957
BURNED$	No	-0.443
TA$	AT	-1.136
TA$	BTH	0.055
TA$	GOB	0.716
TA$	JU	0.966
TA$	KI	-0.220
TA$	LO	-0.420
TA$	MI	1.246
TA$	OO	-0.858
TA$	OTW	-1.573
TA$	SM	0.560
TA$	SMR	0.206
TA$	TA	-0.767

Analysis of Variance					
Source	**Type III SS**	**df**	**Mean Squares**	**F-Ratio**	**p-Value**
BURNED$	4.644	1	4.644	4.477	0.043
TA$	29.809	12	2.484	2.395	0.026
Error	31.119	30	1.037		





Durbin-Watson D-Statistic	2.313
First Order Autocorrelation	-0.161

Information Criteria	
AIC	139.626
AIC (Corrected)	156.768
Schwarz's BIC	166.388

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