Coastal Cactus Wren & California Gnatcatcher Habitat Restoration Project, Phase III
Year 1 Report
Encanto and Radio Canyons, San Diego, CA

Prepared for

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October 2014

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BACKGROUND

Phase I

In collaboration with Groundwork San Diego-Chollas Creek (Groundwork) and the San Diego Association of Governments (SANDAG), AECOM was selected to enhance and restore existing and potential coastal cactus wren (*Campylorhynchus brunneicapillus*) and coastal California gnatcatcher (*Polioptila californica californica*) habitat in Encanto and Radio Canyons. Groundwork is an independent, not-for-profit environmental organization that works within San Diego's Chollas Creek Watershed to improve the environment, economy, and quality of life in the area through local community projects. Over the past several years, Groundwork has been an integral part of the restoration and enhancement of the Chollas Creek area. The project was funded by SANDAG under the Transnet Environmental Mitigation Program (EMP).

This project was identified as an opportunity to create and enhance habitat for coastal cactus wren (Photo 1) and California gnatcatcher, and to offer a more native landscape for the community. The habitat enhancement and restoration objectives included removal of nonnative plant cover and planting approximately 20,000 new coast cholla cactus (*Cylindropuntia prolifera*), which is preferred nesting habitat for coastal cactus wren. California gnatcatcher would also benefit from the improved habitat, since this species is also present in the project area and uses maritime succulent scrub habitat in conjunction with coastal sage scrub habitat. Enhancement and expansion of areas with existing occupied California gnatcatcher and cactus wren habitats would improve and expand habitat for both species, and improve the chances for the long-term health of local and regional populations. This project also offered a unique opportunity for students and residents within the surrounding canyon communities to play an important role in planning and implementing the habitat restoration program.

Photo 1: Coastal cactus wren perched on its preferred cactus habitat

AECOM and Groundwork collaborated on the execution of project tasks. AECOM led the site mapping, habitat restoration, monitoring, maintenance, and reporting tasks, and Groundwork led the educational, community involvement, and publicity aspects of the project.

The project is located in the community of Encanto in southern San Diego, California, north of Market Street between Euclid Avenue and Merlin Drive (Figures 1 and 2). The total area of the two canyons that are part of this effort is 73.62 acres. Encanto Canyon consists of 37.24 acres, and Radio Canyon consists of 36.38 acres. The entire project area is within the City of San Diego's Multi-Habitat Planning Area (MHPA), and will be preserved in perpetuity. Phase I of the coastal cactus wren habitat restoration project lasted 2 years, beginning in April 2009 and ending in April 2011. Phase I included the following activities:

- Baseline vegetation mapping, species inventories, and cactus wren and California gnatcatcher protocol surveys.

- Coast cholla collection and propagation at Millennial Tech Middle School's EarthLab.

- Dethatching and nonnative species treatment and removal in all planned planting areas (7.8 acres in Encanto Canyon and 9.1 acres in Radio Canyon).

- A "staged" planting strategy was implemented, with a portion of the area planted during Phase I (Stage 1 plantings) and a portion of the area maintained weed free in anticipation of plantings in Phase II (Stage 2 plantings). Coast cholla planting in the Stage 1 cactus planting areas (7.8 acres in Encanto Canyon and 4.4 acres in Radio Canyon) was completed during Phase I.

- Follow-up weed treatment and maintenance visits on all planned planting areas.

- Education and community involvement activities.

A full description of Phase I of the project, including the baseline vegetation mapping and results of the baseline species inventories, can be found in the AECOM and Groundwork report completed in April 2011, titled "Coastal Cactus Wren and California Gnatcatcher Habitat Restoration Project, Encanto and Radio Canyons, Final Report."

Phase II

Phase II of the coastal cactus wren habitat restoration project began in January 2012 and ended on November 30, 2013. This phase was also funded by SANDAG's Transnet EMP, and built on the progress of the restoration program that was begun in Phase I. During both years of Phase

II, weed control was conducted in the planting areas and bird monitoring continued in Radio and Encanto Canyons. The Phase II project areas total 14.6 acres, and consisted of the following:[1]

- 6.4 acres of Stage 1 cactus planting areas in Encanto Canyon
- 4.0 acres of Stage 1 cactus planting areas in Radio Canyon
- 4.2 acres of Stage 2 cactus planting areas in Radio Canyon

Bird monitoring included avian surveys focused on coastal cactus wren and California gnatcatcher, and also involved installation of wildlife cameras and artificial nest boxes. Habitat diversification was a crucial goal for Phase II, as many of the areas subject to weed removal and dethatching during Phase I supported very little native cover at the end of Phase I. The goal of diversification was to provide more complete habitat for cactus wren and California gnatcatcher within these areas, and more breeding habitat, provided by cholla patches. The majority of the habitat diversification activities were conducted during two volunteer planting events, which Groundwork organized, as a way of matching the funds provided by SANDAG.

During Year 1 of Phase II, coastal sage scrub/maritime succulent scrub (CSS/MSS) container plants were planted in the Stage 1 cactus planting areas to support habitat diversification in Radio Canyon. CSS/MSS container plants and coast cholla were planted in the Radio Canyon Stage 2 cactus planting areas during a second volunteer planting event in Year 2 of Phase II. During Year 2 of Phase II, cholla cactus that had been planted in the City of San Diego's Brush Management Zone (BMZ) in Encanto and Radio Canyons were removed from the BMZ at the request of the City of San Diego and transplanted to Stage 1 cactus planting areas in Encanto Canyon and Stage 2 cactus planting areas in Radio Canyon. During both volunteer planting days, coast prickly pear (*Opuntia littoralis*), propagated at the EarthLab, were planted in the Radio Canyon Stage 1 and 2 cactus planting areas. A CSS/MSS seed mix was also applied to the majority of the project areas during Year 2.

A full description of Phase II of the project is included in the AECOM and Groundwork report completed in November 2013, titled "Coastal Cactus Wren and California Gnatcatcher Habitat Restoration Project, Phase II, Encanto and Radio Canyons, San Diego, CA, Final Report."

Phase III Introduction

Phase III of the project began on July 15, 2013, and will end on September 1, 2015. This phase is also funded by SANDAG's Transnet EMP to continue the progress made during Phases I and II of the project. This Phase III, Year 1 report discusses activities completed by AECOM between December 1, 2013 and September 1, 2014. Although Phase III funding began on July 15, 2013, project activities conducted by AECOM between July 15, 2013 and November 30, 2013, are considered part of Phase II and are discussed in the Phase II final report.

[1] Phase I and II refer to the first and second grant periods, respectively, and Stage 1 and 2 refer to the two stages of effort in the restoration scheme.

AECOM's work during Year 1 of Phase III focused on maintenance and monitoring of the Stage 1 and 2 cactus planting areas in Radio and Encanto Canyons, a total of 14.6 acres (Figures 3, 4, and 5). Continuing maintenance is critical to the success of the restoration efforts that have been implemented in Radio and Encanto Canyons to date. Weed management removes nonnative competition and allows the native plantings to thrive, increasing the habitat value for cactus wren and providing for the full lifecycle needs of the species (e.g., vegetation appropriate for nesting, fledging, foraging, and dispersal). Vegetation monitoring is implemented to guide the maintenance activities and assess the success of the habitat restoration effort.

MAINTENANCE ACTIVITIES

The AECOM maintenance crew conducted three maintenance visits each in Radio and Encanto Canyons during Year 1 of Phase III. Maintenance consisted primarily of continued weed treatment within the Stage 1 and 2 cactus planting areas (i.e., restoration areas). Weeds represent one of the greatest threats to the successful establishment of native species and the long-term habitat value of the restored habitat. Given the high density of nonnative and invasive species within and surrounding the restoration areas (Photos 2 and 3), diligent weed control efforts are considered crucial to restoration success. Nonnative species targeted for treatment and removal included seedling acacia (*Acacia* sp.), castor bean (*Ricinus communis*), short-pod mustard (*Hirschfeldia incana*), wild radish (*Raphanus sativus*), chrysanthemum (*Glebionis coronaria*), Russian thistle (*Salsola tragus*), fennel (*Foeniculum vulgare*), tree tobacco (*Nicotiana glauca*), and nonnative grasses (*Avena* spp., *Bromus* spp., and others).

Maintenance activities included a combination of manual and mechanical weed removal and herbicide treatments (Round-up®; active ingredient glyphosate). All weed material was removed from the site and properly disposed of. AECOM restoration ecologists monitored weed conditions during the growing season of each year (approximately December through June) so that weeding efforts could be strategically timed to treat the widest possible range of weed species before they began producing seed. Table 1 summarizes the maintenance activities conducted during Year 1 of Phase III.

Table 1
Phase III, Year 1 Maintenance Activities for Encanto and Radio Canyons

Date	Activity Performed
April 2014	Weed treatment of all Radio and Encanto Canyon cactus planting areas
May 2014	Weed treatment of all Radio and Encanto Canyon cactus planting areas
August 2014	Weed treatment of all Radio and Encanto Canyon cactus planting areas

Photo 2: Herbicide spraying of nonnative plants in Encanto Canyon

Photo 3: Treated weeds in Radio Canyon post-herbicide application

MONITORING RESULTS

During Phase II, AECOM restoration ecologists completed qualitative site monitoring visits on an approximately bimonthly basis. Monitoring focused on the Stage 1 and 2 cactus planting areas, as these areas were planted during Phase II and are subject to weed control during Phase III. During each monitoring visit, the restoration ecologist walked the Stage 1 and 2 cactus planting areas in Radio and Encanto Canyons, noting site conditions and areas that required maintenance. The results of the monitoring visits were used to schedule maintenance visits and inform Groundwork of any concerns within the project areas. Qualitative monitoring photos were taken during the site monitoring visits to document areas of concern. These photos were provided to Groundwork, when necessary, and some photos have been incorporated into this report.

In addition, during the July 2014 monitoring visit, the restoration ecologist took photos at permanent photo-documentation points established throughout the Stage 1 and 2 cactus planting areas in Radio and Encanto Canyons. The locations of the permanent photo points are shown in Figures 4 and 5, and the photos taken from these points are included in Appendix 1. Photos will continue to be taken at these points to document the progress of the restoration areas.

Also during the July 2014 site visit, the restoration ecologist recorded the flora and fauna observed within the restoration areas, and made ocular estimates of native and nonnative vegetative cover. The floral and faunal inventories are presented in Tables 2 and 3, respectively. A description of the vegetative cover within the project areas is provided below.

Table 2
Plant Species Observed in the Radio and Encanto Canyon Restoration Areas

Scientific Name	Common Name
Native Species	
Acmispon glaber	deerweed
*Adolphia californica**	California adolphia
Ambrosia psilostachya	western ragweed
Artemisia californica	California sagebrush
Astragalus sp.	locoweed
Baccharis salicifolia	mule fat
Baccharis sarothroides	broom baccharis
*Bahiopsis lacinata**	San Diego viguiera
Chamaesyce polycarpa	small seed sandmat
Conyza coulteri	Coulter's fleabane
Croton setigerus	doveweed

Scientific Name	Common Name
Cylindropuntia prolifera	coast cholla
Dienandra fasciculata	fascicled tarweed
Eriogonum fasciculatum var. *fasciculatum*	California buckwheat
Hazardia squarrosa var. *squarrosa*	southern sawtooth goldenbush
Heteromeles arbutifolia	toyon
Lycium andersonii	desert thorn
Malacothamnus fasciculatus	chaparral bushmallow
Malosma laurina	laurel sumac
Opuntia littoralis	coast prickly pear
Peritoma arborea	bladderpod
Populus freemontii ssp. *fremontii*	western cottonwood
Quercus agrifolia	coast live oak
Rhus integrifolia	lemonadeberry
Salix goodingii	black willow
Salix lasiolepis	arroyo willow
Salvia apiana	white sage
Salvia mellifera	black sage
Sambucus nigra ssp. *caerulea*	Mexican elderberry
Simmondsia chinensis	jojoba
Sisyrinchium bellum	blue-eyed grass
Solanum sp.	nightshade
Yucca schidigera	Mojave yucca
Nonnative Species	
Acacia melanoxylon	Tazmanian blackwood
Acacia redolens	desert carpet
Anagallis arvensis	scarlet pimpernel
Bromus spp.	bromes
Carpobrodus edulis	hottentot fig
Centaurea melitensis	tocalote
Cynodon dactylon	Bermuda grass
Erodium cicutarium	red-stem filaree
Erodium botrys	long-beaked filaree
Foeniculum vulgare	fennel
Fraxinus sp.	ash
Glebionis coronaria	chrysanthemum
Hirschfeldia incana	short-pod mustard
Marrubium vulgare	horehound
Opuntia ficus-indica	mission prickly pear
Phoenix canariensis	Canary Island date palm
Ricinus communis	castor bean

Scientific Name	Common Name
Salsola tragus	tumbleweed
Shinus molle	Peruvian pepper tree
Schinus terebinthifolius	Brazilian pepper tree
Washingtonia robusta	Mexican fan palm

* Special-status species

Table 3
Wildlife Species Observed in the Radio and Encanto Canyon Restoration Areas

Scientific Name	Common Name
Reptiles	
*Aspidoscelis hyperthya beldingi**	orange-throated whiptail
Sceloporus occidentalis	western fence lizard
Uta stansburiana	side-blotched lizard
Birds	
Aphelocoma californica	western scrub jay
Buteo jamaicensis	red-tailed hawk
Calypte anna	Anna's hummingbird
Carpodacus mexicanus	house finch
Chamaea fasciata	wrentit
Corvus corax	common raven
Falco sparverius	American kestrel
Mimus polyglottos	northern mockingbird
Pipilo crissalis	California towhee
*Polioptila californica californica**	coastal California gnatcatcher
Sayornis nigricans	black phoebe
Spinus psaltria	lesser goldfinch
Tyrannus verticalis	western kingbird
Zenaida macroura	mourning dove
Mammals	
Canis latrans	coyote
Spermophilus beecheyi	California ground squirrel
Sylvilagus audubonii	Audobon's cottontail

* Special-status species

Native vegetative cover was visually estimated to be approximately 60% within the main portion of the Radio Canyon Stage 1 cactus planting area. All other cactus planting areas in Radio Canyon were estimated to support 5–10% native vegetative cover. The Stage 1 cactus planting areas in Encanto Canyon were estimated to support 15–20% native vegetative cover, consisting primarily of coast cholla. Nonnative cover was visually estimated to be approximately 1%

(excluding established perennial nonnatives, such as acacia [*Acacia* spp.] shrubs and nonnative trees) in all of the restoration areas.

Comparison to Success Standards

Although the project has only completed the first year of Phase III, a comparison to the final Phase III success standards is provided below as a metric of the progress of the restoration areas. The Phase III success standards for the restoration areas, per Groundwork's Phase III EMP grant application, include the following:

1. Less than 10% weed cover in the Radio and Encanto Canyon restoration areas by the end of the project.

2. Successful eradication of 3 acres of perennial invasives, primarily acacia, from the Radio and Encanto Canyon restoration areas by the end of the project.

3. Significant increase in cover of cholla cactus and CSS/MSS species in the Radio and Encanto Canyon restoration areas by the end of the project.

The restoration areas are already meeting success standard #1, as they currently support approximately 1% weed cover (excluding established perennial nonnative species). Several patches of preexisting acacia shrubs and mature palm trees are present within the Radio Canyon planting areas, and a patch of nonnative trees, including Brazilian peppertree (*Schinus terebinthifolius*), is present in Encanto Canyon, although not within the cactus planting areas. However, all seedlings of these perennial exotic species are treated by the AECOM maintenance crew when observed, thereby preventing their spread within the restoration areas. In addition, future volunteer events within the canyons will include the removal of at least 3 acres of these perennial nonnative species (per success standard #2). Groundwork has already begun to remove the patch of Brazilian peppertree from Encanto Canyon, and the AECOM maintenance crew will treat any re-sprouts with herbicide for the duration of Phase III.

Many of the cactus planting areas have experienced increases in cholla cactus and CSS/MSS species cover since the beginning of Phase III. In January 2014, Groundwork conducted a volunteer planting day in portions of the Radio Canyon Stage 2 cactus planting areas that had low native cover. Many of the CSS/MSS species planted during that event are thriving and contributing to the native cover within the planting areas. In addition, Groundwork volunteers applied seed to the Radio Canyon planting areas during Phase II, and native seedlings, including San Diego viguiera (*Bahiopsis lacinata*), California buckwheat (*Eriogonum fasciculatum* var*. fasciculatum*), and jojoba (*Simmondsia chinensis*), are sprouting within the planting areas. In addition, many of the cholla planted during the Phase II volunteer planting events have put on new growth (Photo 4).

Photo 4: New growth on planted cholla in Radio Canyon

The 2013/2014 rainy season was exceptionally dry in Southern California, and the drought has likely affected the condition of the restoration areas, leading to lower native and nonnative annual cover, reducing the recruitment of native perennial species, and leading to higher mortality of container stock planted during the volunteer planting day. The restoration areas will likely exhibit greater increases in native cover (and more weed issues) during subsequent years that receive higher rainfall.

Additional success standards for Phase lll per Groundwork's Phase lll EMP grant application are as follows:

1. Observed presence of cactus wrens in Radio Canyon. This objective may not be achievable within the grant period due to the inherently slow maturation rate of the habitats being installed by the project.

2. Observed successful nesting of cactus wrens in Radio Canyon. This is also a long-term objective that may not be achieved within the grant period.

3. New institutionalized and sustainable relationships with the surrounding property owners and residents, and education of students and residents on conservation issues, evidenced in part by generating at least 400 student volunteer hours and 600 adult volunteer hours annually.

Funding for continuation of bird monitoring was not authorized in the Phase III grant; therefore, presence and nesting bird data will need to be obtained from regional cactus wren monitoring efforts or other sources.

COMMUNITY-DRIVEN RESTORATION AND MONITORING

Groundwork's outreach to canyon-adjacent schools and communities continues with a goal of long-term volunteer canyon stewardship. The three-canyon Urban Greening grant to be led by Urban Corps in partnership with Groundwork has received a Notice to Proceed, and the EarthLab Propagation Center, established in Phase I of the Coastal Cactus Wren & California Gnatcatcher Habitat Restoration Project, is gearing up to propagate the 15,000 plants to be installed through Urban Greening. A community planning process is being developed for stakeholder vetting of the trail improvements to be accomplished through Urban Greening, and a January 31 2014 Radio Canyon Day will engage 150 residents in the installation of 500 plants in the Phase III area to adjust for lost plants. Additionally, in conjunction with the Mayor's commitment to Brush Management in high-fire areas such as District 4, Groundwork is developing an information campaign for canyon residents to deal with backyard landscapes.

Using GPS data collection and GIS mapping, Groundwork has established a base map/inventory of Phase I-III plants. This data collection will be conducted on a regular basis by Groundwork, and will be used to support success rates/coverage for the 15,000 plants to be installed through the Urban Greening grant.

CONCLUSIONS

Particularly in light of the recent drought conditions, the habitat restoration and enhancement efforts during Year 1 of Phase III should be considered very successful. Although not all of the container stock planted during the volunteer planting day has survived, the additional CSS/MSS species, both from container plants and seeding, have improved the quality of the canyon environments and increased potential habitat for coastal cactus wren, California gnatcatcher, and other native plant and animal species. Native plant cover in the restoration areas has increased and nonnative cover has decreased, thereby expanding food sources and providing more complete ecosystem services for native wildlife. Site maintenance activities have been successful in controlling weeds within the planting areas and improving the potential for native species to continue to occupy these areas. In addition, improving the quality of habitat in these canyons helps to address the goals of the City of San Diego's Multiple Species Conservation Program by contributing to the native habitat and habitat connectivity in the region. Although it is likely still too early in the restoration program for coastal cactus wren and California gnatcatcher to occupy the restored habitat, many ecological benefits have already been provided by the project.

RECOMMENDATIONS AND FUTURE PLANS

Priorities for the canyons should be protecting and improving the Stage 1 and 2 cactus planting areas, continuing avian and restoration monitoring, and creating a detailed long-term management plan for the entirety of the two canyons.

Phase III

Phase III includes the eradication of 3 acres of perennial invasives from the restoration areas, which will be completed by volunteers in partnership with Groundwork. AECOM recommends that any areas that are subject to perennial exotics removal be planted and/or seeded with patches of cholla and native CSS/MSS species to prevent these areas from being reclaimed by exotics. This additional restoration will continue to build on the progress made during Phases I and II, and will add to the habitat for coastal cactus wren, California gnatcatcher, and other native species in the canyons. If possible, it is also recommended that portions of the Stage 1 and 2 cactus planting areas that have low native cover be subject to enhancement activities, including additional planting and/or seeding with native CSS/MSS species. The areas recommended for supplemental planting/seeding are shown in Figure 6, and a list of recommended species that are appropriate for the canyons is provided in Table 4.

Table 4
Species Appropriate for Planting/Seeding On-site

Scientific Name	Common Name
Acmispon glaber[1]	deerweed
*Adolphia californica**	California adolphia
Artemesia californica[1, 2]	California sagebrush
*Bahiopsis laciniata**[, 1]	San Diego viguiera
*Calandrinia maritima**	seaside calandrinia
Cylindropuntia californica var. *californica**	snake cholla
Cylindropuntia prolifera	coast cholla
Encelia californica[2]	California encelia
Eriogonum fasciculatum var. *fasciculatum*	California buckwheat
*Euphorbia misera**	cliff spurge
Ferocactus viridescens var. *viridescens**	coast barrel cactus
Isomeris arborea	bladderpod
Lycium californicum	desert thorn
Mimulus auranticus	monkeyflower
Optunia littoralis	coast prickly-pear
Salvia apiana	white sage
Salvia mellifera	black sage

Sambucus nigra ssp. *caerulea*	Mexican elderberry
Simmondsia chinensis[1]	jojoba
Sisyrinchium bellum	blue-eyed grass

* Special-status species

[1] Included in original CSS/MSS seed mix for the canyons.

[2] Plant in low densities to avoid species becoming too abundant.

Additional Recommendations

In addition to the restoration being undertaken as part of Phase III of the project, AECOM recommends that the following activities be considered for future funding.

Bird Monitoring

The continuation of the coastal cactus wren and California gnatcatcher monitoring begun in Phase I of the project is critical for monitoring the performance and effectiveness of habitat restoration in relation to project goals. For this project, the key monitoring question is to determine whether and at what point coastal cactus wrens and coastal California gnatcatchers begin foraging and/or nesting in the restored habitat. In the absence of continued avian monitoring, the actual effects of habitat restoration on these species will not be known, and this information will not be available for future restoration efforts.

Although not currently included in Phase III of the project, AECOM highly recommends that Groundwork seek additional funding and/or professional volunteers to continue the avian monitoring program through the end of Phase III. Ideally, a robust monitoring program would be implemented that documents coastal cactus wren and California gnatcatcher use of the project areas for a minimum of 5 years.

Avian monitoring methods should be coordinated with regional coastal cactus wren monitoring programs to ensure consistency of data and efficiency of effort. Potential methods for monitoring could include banding, global positioning system/telemetry tracking, or motion-activated remote cameras aimed at active nests. Banding methods are generally the easiest to implement, but are most effective when monitoring of banded birds occurs over an area broader than the immediate project area. Broader monitoring for banded birds allows the monitoring program greater probability of capturing regional dispersal patterns of birds beyond Encanto and Radio Canyons. Avian monitoring must be performed by qualified biologists in possession of the appropriate permits.

Natural Resource Plan

San Diego's urban canyons experience a complex mix of pressures and support. They are expected to support biological values and public access/recreation values. A holistic conceptual plan has been submitted by Groundwork to the City of San Diego that provides a

comprehensive view of the issues and opportunities and long-term goals for an entire canyon and will provide multiple benefits for future native habitat and coastal cactus wren restoration efforts. It lays out the most ecologically beneficial pattern of habitat; identifies reasonable public access plan that is informed by ecological sensitivities; and establishes an organized implementation strategy that addresses inter-stakeholder coordination, phasing strategies, cost estimates, regulatory needs, and potential funding sources. It allows community and nonprofit groups to efficiently and effectively apply volunteer efforts to long-term goals. It will provide a high level of confidence to funding agencies that their contributions will be effectively applied to targeted goals. The plan would outline the intended goals for the canyons and would provide an implementation roadmap that could be followed by contractors, community stewards, and students.

Future Habitat Restoration

As restoration success is achieved in the Stage 1 and 2 cactus planting areas, restoration of disturbed habitats in the northern portion of Radio Canyon should be considered as a tool to facilitate safe movement of coastal cactus wrens between populations elsewhere in the region. It is recommended that additional restoration implemented in the canyons be guided by the master plan discussed above to ensure that appropriate habitats are planned and that the restoration design will provide for the ecological needs of coastal cactus wren and California gnatcatcher.

Given the poor baseline condition of the planting areas and their surroundings, weed issues will certainly remain a significant threat to restoration success for several years until the restored habitat fully matures. Therefore, any additional areas of the canyons that are subject to restoration should also be maintained for a minimum of 2 years (ideally 5 years) following planting. Continued maintenance and weed control will ensure that restoration efforts are not lost to weeds and/or urban pressures. Weed abatement programs for large restoration areas are typically most effective when they focus primarily on chemical methods. All chemical use must be performed under the supervision of a person who holds a Qualified Applicator License and is highly knowledgeable in native plant identification and weed eradication programs. It is also recommended that the City of San Diego target the portions of the BMZ adjacent to the restoration areas for weed control efforts, if possible, to prevent the spread of nonnative species from these areas into the restoration areas.

Generally, additional restoration in the canyons should address the following:

- Coastal cactus wren habitat, specifically MSS patches dominated by cholla cactus, should be further expanded by increasing the size of the current patches and/or creating new patches. Coastal cactus wren habitat should be carefully located to maximize benefit to the species and facilitate safe movement throughout the two canyons.

- Coastal sage scrub habitat should be restored to support California gnatcatcher. This habitat should ideally become the background matrix habitat in Radio Canyon, with MSS habitat emerging in the hot, dry slopes most suited to that habitat.

- The ephemeral drainages defining the spine of each canyon should be restored, including the removal of arundo (*Arundo donax*) and other invasive exotics, and the establishment of riparian scrub habitats where hydrology will support them. Existing storm drain and street runoff problems currently causing erosion should be addressed as well. Riparian habitat restoration should avoid establishing large tree species that could facilitate raptor predation on coastal cactus wren and California gnatcatcher populations.

Future Activities

AECOM restoration ecologists will visit the site on a bimonthly basis during Year 2 of Phase III. These visits will be used to schedule the three site maintenance visits that will be conducted by the AECOM maintenance crew. The final annual report for Phase III will be prepared at the end of Year 2 and will be submitted to Groundwork by the end of the grant period (September 1, 2015).

FIGURES

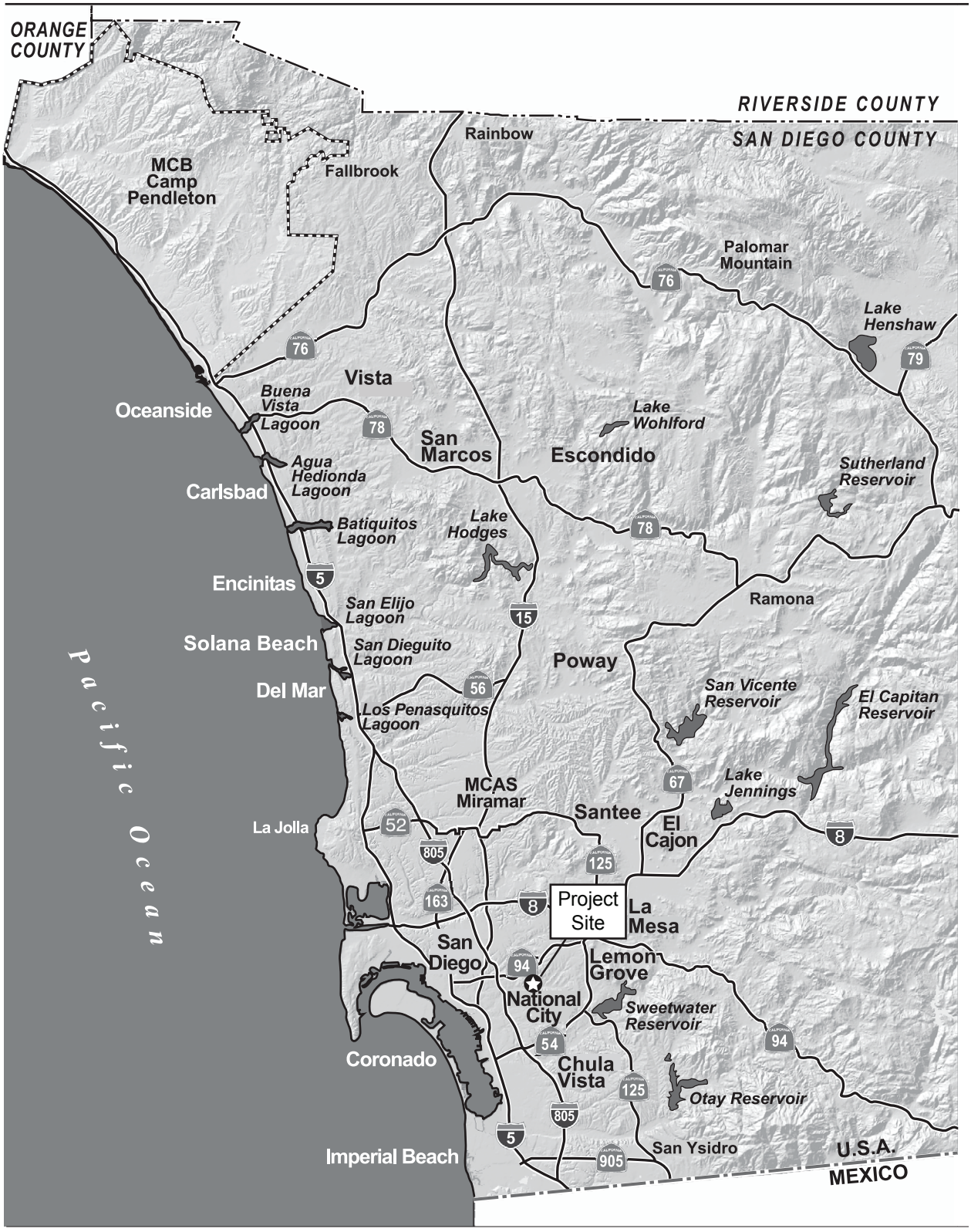
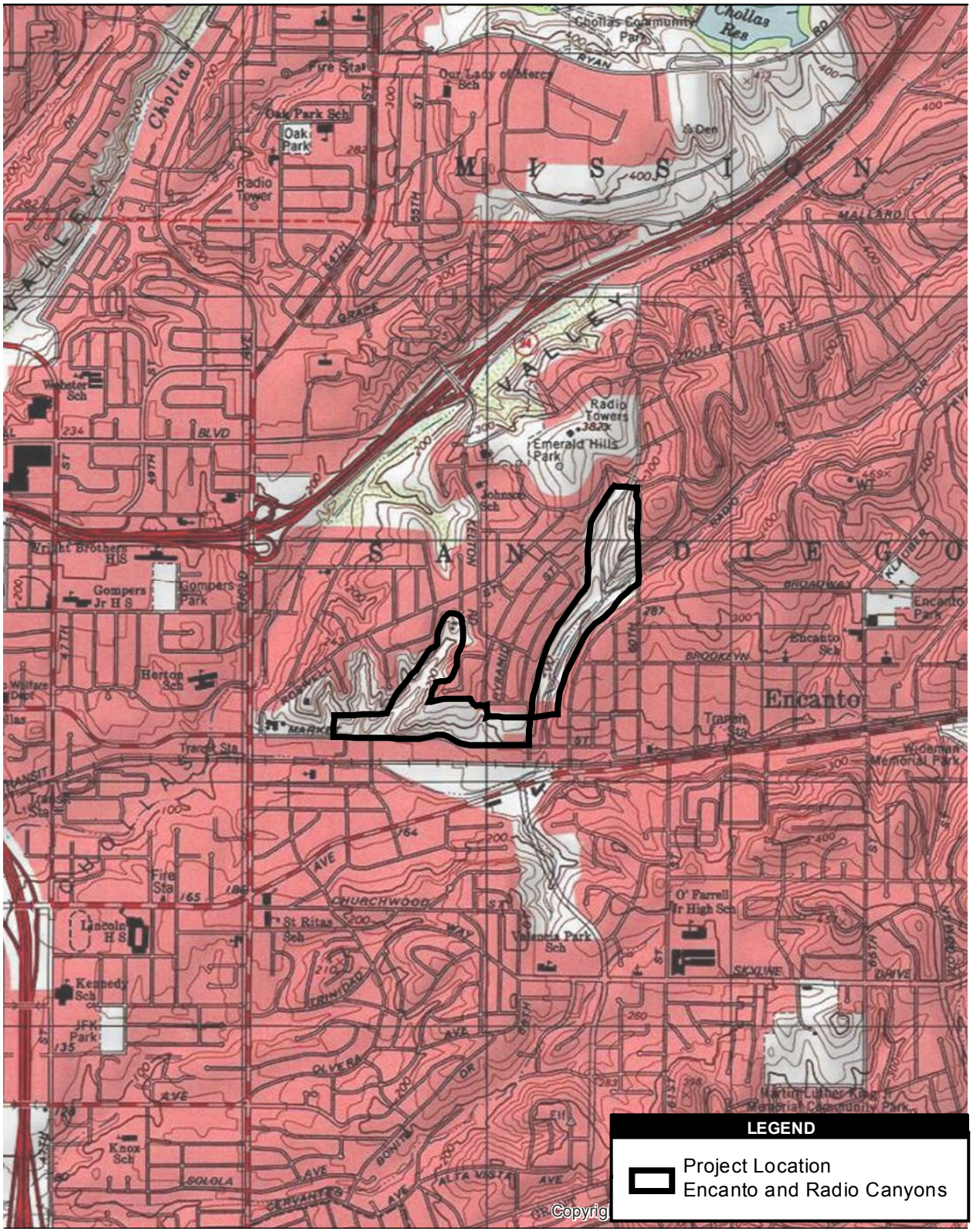


Figure 1
Regional Map



Source: USGS 7.5' Quadrangle National City, Calif. 1975

2,000 1,000 0 2,000 Feet

Scale: 1:24,000; 1 inch = 2,000 feet

Figure 2
Project Location

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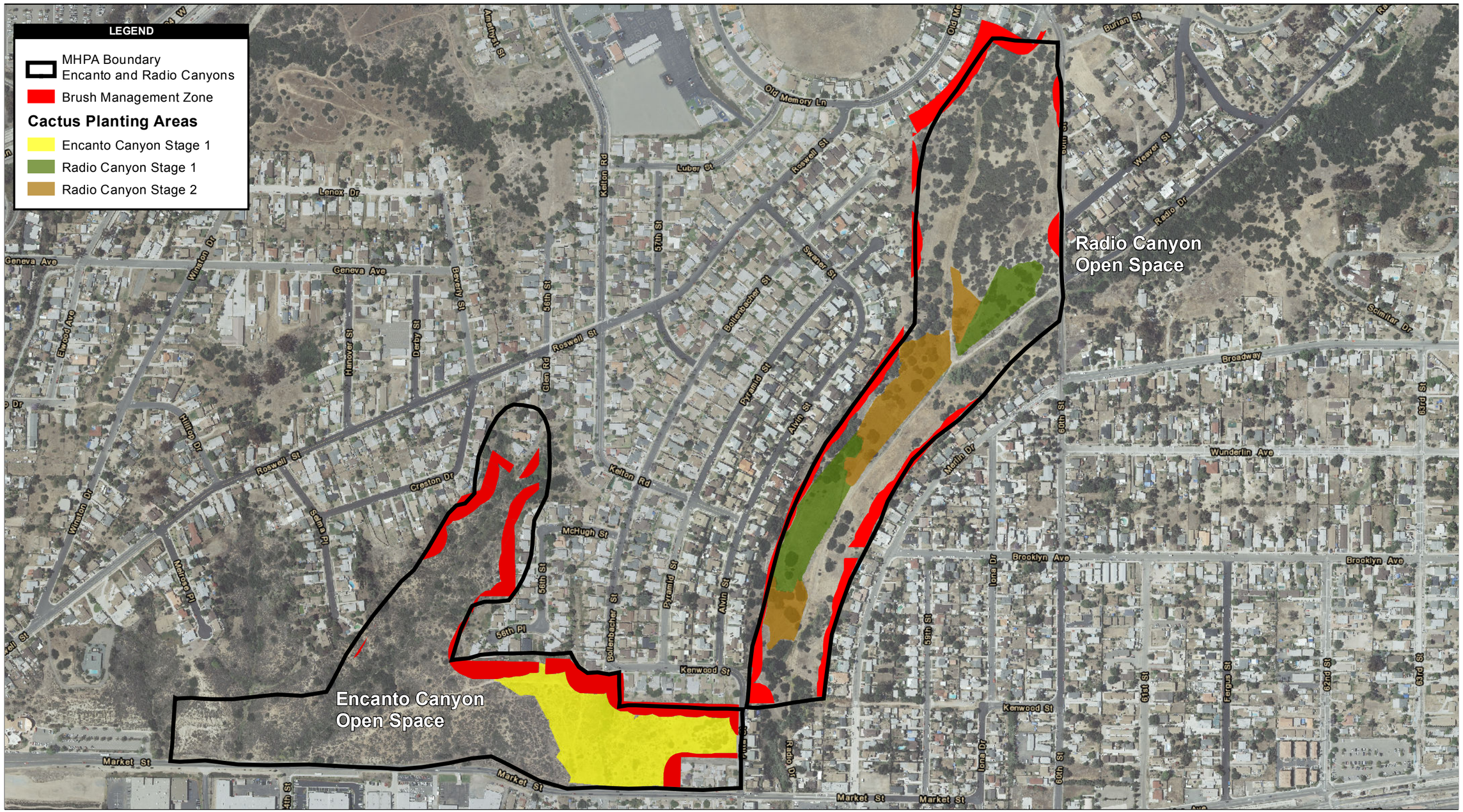


Source: Copyright:© 2013 Esri, DeLorme, NAVTEQ, TomTom; SanGIS 2009; SANDAG 2012; AECOM 2014

450 225 0 450 Feet

Scale: 1 = 5,400; 1 inch = 450 feet

Figure 3
Project Areas and Restoration Site Boundaries

Coastal Cactus Wren & California Gnatcatcher Habitat Restoration Project – Phase III, Year 1

Path: P:\2009\09080138 Cactus Wren\6.0 GIS\6.3 Layout\Fig3_preserves_EncantoCanyon_RadioCanyon-1.mxd, 06/24/09, RolD

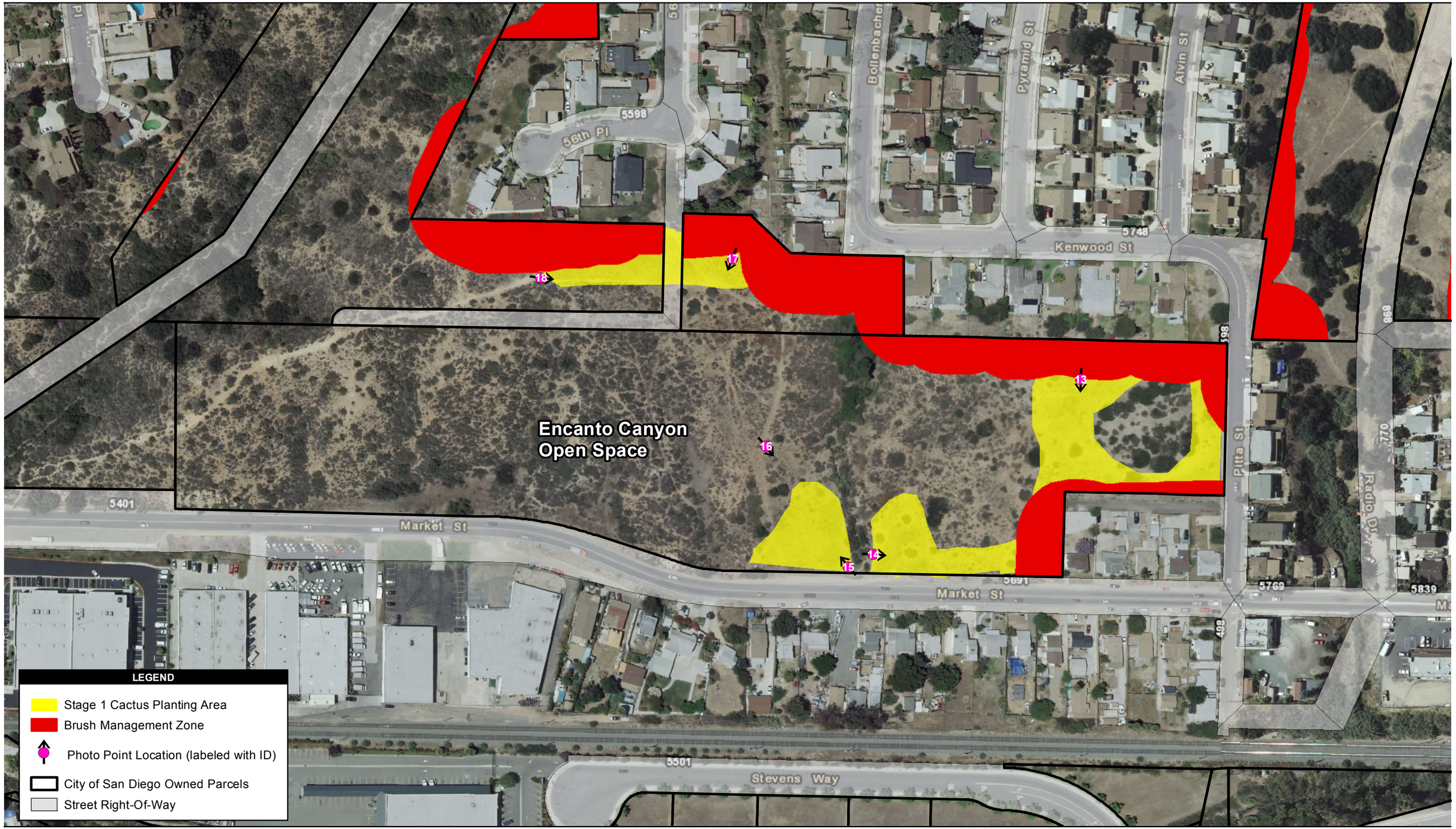
Source: Copyright:© 2013 Esri, DeLorme, NAVTEQ, TomTom; SanGIS; SANDAG; AECOM 2013

150 75 0 150 Feet

Scale: 1:1,800; 1 inch = 150 feet

Figure 4
Radio Canyon Project Areas Detail

Path: P:\2009\09080138 Cactus Wren\6.0 GIS\6.3 Layout\Figures\PhaseIII_Y1\Fig4_RadioCyn_RestoDetail.mxd, 7/29/2014, steinb



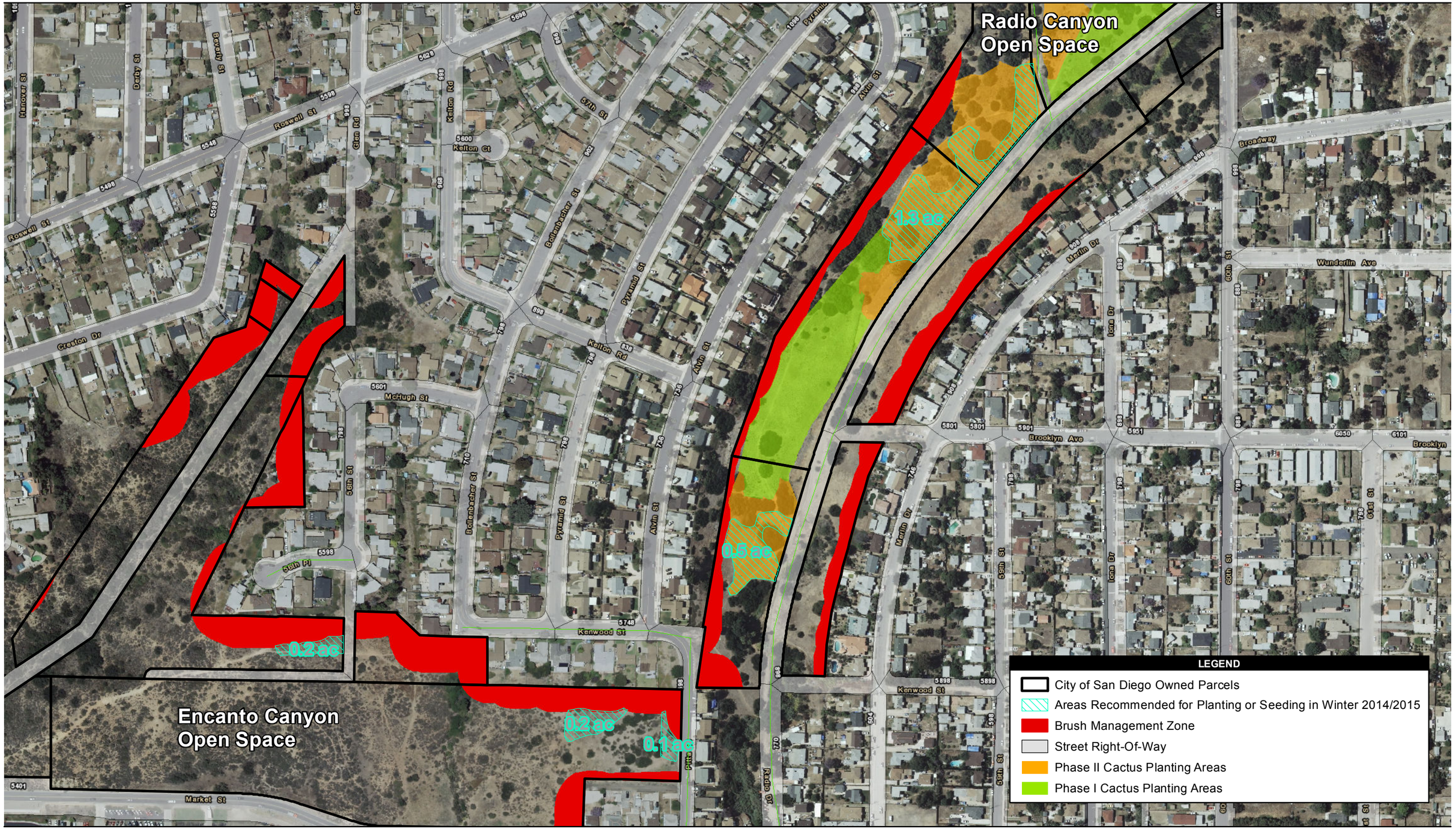
Source: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors; SanGIS; SANDAG; AECOM 2013

150 75 0 150 Feet

Scale: 1:1,800; 1 inch = 150 feet

Figure 5
Encanto Canyon Project Areas Detail

Path: P:\2009\09080138 Cactus Wren\6.0 GIS\6.3 Layout\Figures\PhaseIII_Y1\Fig5_EncantoCyn_RestoDetail.mxd, 10/1/2014, steinb



Source: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors; SanGIS; SANDAG; AECOM 2013

150 75 0 150 300 Feet

Scale: 1:1,800; 1 inch = 150 feet

Figure 6
Project Areas Recommended for Supplemental Planting or Seeding

Path: P:\2009\09080138 Cactus Wren\6.0 GIS\6.3 Layout\Figures\PhaseIII_Y1\Fig6_RecomendedSupplemental.mxd, 10/1/2014, steinb

APPENDIX 1

PHOTO DOCUMENTATION

JULY 2014

Photo Point 1. Stage 1 cactus planting area in Radio Canyon.

Photo Point 2. Stage 2 cactus planting area in Radio Canyon.

Photo Point 3. Stage 1 cactus planting area in Radio Canyon.

Photo Point 4. Stage 2 cactus planting area in Radio Canyon.

Photo Point 5. Stage 2 cactus planting area in Radio Canyon.

Photo Point 6. Stage 1 cactus planting area in Radio Canyon.

Photo Point 7. Stage 1 cactus planting area in Radio Canyon.

Photo Point 8. Stage 1 cactus planting area in Radio Canyon.

Photo Point 9. Stage 2 cactus planting area in Radio Canyon.

Photo Point 10. Stage 2 cactus planting area in Radio Canyon.

Photo Point 11. Stage 2 cactus planting area in Radio Canyon.

Photo Point 12. Stage 2 cactus planting area in Radio Canyon.

Photo Point 13. Stage 1 cactus planting area in Encanto Canyon.

Photo Point 14. Stage 1 cactus planting area in Encanto Canyon.

Photo Point 15. Stage 1 cactus planting area in Encanto Canyon.

Photo Point 16. Stage 1 cactus planting areas in Encanto Canyon.

Photo Point 17. Stage 1 cactus planting area in Encanto Canyon.

Photo Point 18. Stage 1 cactus planting area in Encanto Canyon.