

Conceptual Off-Site Mitigation Plan for the
**Coastal Sage Scrub Habitat Impacts to the
Park Drive Slope and Drainage Improvement Project**



JULY 2021

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Conceptual Off-Site Mitigation Plan for Coastal Sage Scrub Habitat Impacts for the Park Drive Slope and Drainage Improvement Project at The Crossings at Carlsbad Golf Course, Carlsbad, California

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
City	City of Carlsbad
project	Park Drive Slope and Drainage Improvement Project
SAR	sodium adsorption ratio
The Crossings	The Crossings at Carlsbad Golf Course

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1 Introduction

1.1 Project Description and History

The City of Carlsbad (City) is planning to repair and stabilize a failing hillside along Park Drive to address public safety and coastal access issues. To help mitigate for coastal sage scrub impacts associated with the Park Drive Slope and Drainage Improvement Project (project), the City is required to provide for 0.66 acres of off-site mitigation creation within the Coastal Zone. The habitat mitigation is also required to include the transplanting of nine California adolphia (*Adolphia californica*) plants that will be impacted by project construction. The off-site mitigation will occur at The Crossings at Carlsbad Golf Course (The Crossings), northwest of the intersection of Palomar Airport Road and College Boulevard, approximately 1.75 miles from the project site (Figure 1, Project Location; Figure 2, Project and Mitigation Area Locations Map; Figure 3, Mitigation Area Map). Both the impact and receptor sites are within the Coastal Zone. The specific language of the mitigation measure (MM-BIO-1) from the Biological Resources Technical Report for the Park Drive Slope and Drainage Improvement Project is provided below (Dudek 2020):

MM-BIO-1 **Habitat Mitigation:** Impacts to 0.33 acres of coastal sage scrub requires mitigation at a 2:1 ratio, totaling 0.66 acres of coastal sage scrub. This habitat mitigation shall be achieved by conserving 0.66 acres of suitable habitat in an off-site mitigation area within the Coastal Zone (see Table 4, Impact and Mitigation Summary [note: table numbering maintained from source]). The habitat mitigation shall include the transplanting of California Adolphia (*Adolphia californica*) to the off-site creation site.

The applicant shall prepare a conceptual mitigation plan and submit to the City of Carlsbad and/or Agencies for review. The final plan shall be submitted at least 30 days prior to initiating Project impacts. The mitigation shall be prepared and implemented consistent with Volume II, Appendix C (Revegetation Guidelines), and Vol. III of the North County Multiple Habitat Conservation Program; pages F-8 to F-11 of the City of Carlsbad Habitat Management Plan; and Section 3.1.5 of the Open Space Management Plan. The mitigation plan shall, at a minimum, include an evaluation of restoration suitability specific to proposed habitat types, soil and plant material salvage/translocation, planting and seeding lists, discussion of irrigation, maintenance and monitoring program, and success criteria. All areas shall be monitored for a minimum of 5 years to ensure establishment of intended plant communities.

Any invasive removal associated with the coastal sage scrub creation site shall be completed using hand equipment and removal shall be completed outside of the nesting bird season. If invasive removal cannot be completed outside of the nesting bird season, pre-work surveys shall be conducted per the nesting bird survey mitigation measure (MM-BIO-4).

Table 4. Impact and Mitigation Summary

Vegetation Community or Land Cover	Existing Acreage	Permanent Impacts (acres)	Required Mitigation Ratio ¹	Required Mitigation Acreage
Native Vegetation Communities				
Occupied Coastal Sage Scrub	3.73	0.28	2:1	0.56

Table 4. Impact and Mitigation Summary

Vegetation Community or Land Cover	Existing Acreage	Permanent Impacts (acres)	Required Mitigation Ratio¹	Required Mitigation Acreage
Disturbed Coastal Sage Scrub	0.05	0.05	2:1	0.10
<i>Subtotal</i>	<i>3.78</i>	<i>0.33</i>	—	<i>0.66</i>
Land Covers				
Disturbed Habitat	0.22	0.15	—	—
Ornamental	1.05	0.13	—	—
Developed	0.24	0.10	—	—
<i>Subtotal</i>	<i>1.51</i>	<i>0.38</i>	—	—
Total	5.29	0.71	—	0.66

¹ Per Table 6 in the Carlsbad Habitat Management Plan (City of Carlsbad 2004).

Construction on The Crossings at Carlsbad Golf Course began in 2005 and was completed in 2007. To construct the golf course, approximately 12.4 acres of native upland vegetation was impacted by the project and mitigated at a 2:1 ratio through the creation of 24.8 acres of coastal sage scrub habitat. Coastal sage scrub mitigation was installed in substantial conformance with the agency-approved Revised Mitigation Plan for the Carlsbad Municipal Golf Course (P&D and HDR 2005). Installation of the coastal sage scrub mitigation was completed and accepted by the City on June 30, 2007, maintained and monitored for 5 years, and accepted by the agencies as successful.

Although only 24.8 acres of created coastal sage scrub vegetation community were necessary to meet the mitigation requirements, approximately 40 acres of coastal sage scrub vegetation community was created. The coastal sage scrub mitigation area was increased to 40 acres to provide added flexibility in achieving performance standards (P&D and HDR 2005). The coastal sage scrub mitigation was created through seeding and the installation of approximately 5,000 container plants. Not all of the 40 acres was included within the City's Habitat Management Plan under the Multiple Habitat Conservation Program.

Diegan coastal sage scrub mitigation at The Crossings consisted of 40.21 non-contiguous acres of coastal sage scrub vegetation community. Of this total mitigation acreage, approximately 30 acres involved active habitat restoration. Active habitat restoration required full monitoring services, including regular qualitative evaluations, yearly quantitative transect assessments, site observation reports, and quarterly and annual reports. The remaining approximately 10 acres of passive mitigation area presently supports native vegetation that received basic weed control and was qualitatively monitored throughout the 5-year monitoring period. The proposed coastal sage scrub mitigation area for the Park Drive Slope and Drainage Improvement Project will be added to the City's Habitat Management Plan area.

1.2 Project Location

The project is centered at approximately 33° 08'40" N, 117° 19'18" W. The Crossings is centered at approximately 33° 07'49" N, 117° 18'00" W. Figures 1–3 show the project site, which is bordered by Faraday Avenue to the north, Palomar Airport Road to the south, The Crossings Road to the west, and McClellan Palomar Airport to the east. Figure 3 shows the proposed enhancement area, which is northwest of the intersection of Palomar Airport Road

and College Boulevard. The nine California adolphia plants will be planted in a suitable location adjacent to the enhancement area.

1.3 Habitat Restoration Biologist

A habitat restoration biologist (restoration biologist) will oversee the habitat enhancement area remedial work and monitoring. The restoration biologist will oversee implementation of this enhancement plan and provide direction to the habitat restoration landscape contractor (contractor) on behalf of the City. The restoration biologist will have the following minimum qualifications:

- Bachelor's degree in biology, ecology, botany, horticulture, or a related field such as landscape architecture.
- 5 years of documented experience implementing and monitoring habitat restoration projects with an emphasis on Diegan coastal sage scrub vegetation in coastal Southern California.
- Although not required, a valid Pest Control Adviser License is highly recommended, as it is required by state law to make specific pest control recommendations.

1.4 Habitat Restoration Landscape Contractor

A contractor with a valid California C-27 Landscape Contracting License will perform the enhancement work and maintenance. To perform this scope of work, the contractor will also possess a valid Pest Control Business License and a Qualified Applicator License (QAL).

The contractor's duties will include site preparation, repair and operation of the irrigation system, remedial planting and seeding, pest management, trash removal, vandalism repairs, and deactivating and removing the irrigation system at the successful conclusion of the enhancement effort. The contractor will work under the direction of the restoration biologist.

1.5 Nursery and Seed Supplier

All container plants will be supplied by a licensed nursery specializing in growing California native plants. Potential nurseries include Tree of Life Nursery in San Juan Capistrano, Moosa Creek Nursery in Valley Center, and Native West Nursery (formerly Recon Native Plants) in San Diego. Seed will come from a seed company specializing in native California species. The contractor may also collect seed from The Crossings golf course. Seed suppliers include S & S Seeds in Camarillo and Native West Nursery in San Diego. All propagules will originate from coastal Southern California sources.

1.6 Existing Conditions of the Enhancement Area – Site Conditions, Soil Test Data, Transect Data

The Crossings project site is quite varied, with eight separate soil series documented on site and 14 different mapping units (Bowman 1973). The soils range from shallow to deep, clays to loams to loamy fine sands, with varying permeability, runoff and erosion potential, different water holding capacities, and varying fertility. The soils

range in pH from acid to neutral to alkaline. In addition, some soils are derived from marine formations and have high salt content. There are relatively flat areas and steep slopes, facing every aspect, north, south, east, and west. This variety of conditions will naturally support different assemblages of plant species at varying densities and vigor.

Diegan coastal sage scrub habitat is quite variable, and varying soil conditions play a large role in that variability. The federally listed threatened coastal California gnatcatcher (*Polioptila californica californica*) is known to use many of the different alliances of plants that make up what is generally referred to as coastal sage scrub habitat, as described in the Manual of California Vegetation (Sawyer et al. 2009).

The soil at the proposed 1.8 acres enhancement area is mapped as Las Flores loamy fine sand, 15%–30% slopes, eroded (LeE2) (Bowman 1973). This soil is moderately steep that is eroded with rills and gullies. Rooting depth is 16 to 26 inches and has a water holding capacity of 2 to 3 inches, with water slowly available from sandy clay subsoil. Runoff is medium to rapid, permeability is very slow, and the erosion potential is moderate to high. Fertility is low to medium. The soil profile pH ranges from medium acid to neutral (5.8 to 7.3) (Bowman 1973). Should there have been any erosion rills and gullies present in the enhancement area prior to construction, they would have been filled in and smoothed out during golf course construction and are no longer present.

Dudek collected composite soil samples from the proposed enhancement area, another potential enhancement area, and a nearby reference site that will also be used to translocate the nine California adolphia plants. The soil samples were sent to Wallace Labs for agricultural suitability analysis. Agricultural suitability analysis consists of tests to determine soil reaction, measured as pH; salinity, measured as ECe; concentrations of soluble salts; fertility measurements for all 15 essential nutrients; sodium; concentrations of 15 non-essential trace metals; sodium adsorption ratio (SAR); moisture content; and soil texture. The soil test results are shown in Appendix A.

Soil test results at the reference site classifies the soil as a sandy loam and shows the soil is moderately acidic in soil reaction with a pH of 5.74. Salinity is low at 0.40 millimho/cm. SAR is acceptable at 2.8. Nitrogen is modest; phosphorus, potassium, zinc, and copper are moderate; and iron, manganese, and magnesium are high. Sulfur is low. Common non-essential heavy metal levels are low. Like the proposed enhancement area, the soil map lists the soil at the reference site as Las Flores loamy fine sand, 15%–30% slopes, eroded (LeE2) (Bowman 1973).

Soil test results from the proposed enhancement area is classified as sandy loam. The soil is mildly alkaline in soil reaction with a pH of 7.53. Salinity is low at 0.48 millimho/cm. SAR is acceptable at 1.5. Nitrogen, phosphorus, and manganese levels are modest; zinc and sulfur are low; copper and boron are moderate; and potassium, iron, and magnesium are high. Common non-essential heavy metal levels are low (Appendix A). Any erosion rills or gullies that may have been present in this area were filled in during golf course construction.

Soil test results from the other potential enhancement area is classified as a clay loam. The soil is neutral in soil reaction with a pH of 6.98. Salinity is modestly elevated at 2.35 millimho/cm. SAR is acceptable at 1.4. Nitrogen, phosphorus, and manganese are low. Iron, zinc, and boron are moderate. Potassium, copper, manganese, and sulfur are all high (Appendix A). The soil map lists the soil as loamy alluvial land-Huerhuero complex, 9%–50% slopes, severely eroded (LvF3) (Bowman 1973). Any erosion rills or gullies that may have been present in this area were filled in during golf course construction.

In addition to the soil tests, Dudek collected plant cover data from two 25-meter line transects in the proposed enhancement area on May 14, 2020. The data shows that native species cover was 75%, with 89% weed species cover and 1% bare ground. The native species cover consisted of California sagebrush (*Artemisia californica*) at

37%, California brittlebush (*Encelia californica*) at 25%, California buckwheat (*Eriogonum fasciculatum*) at 12%, and California everlasting (*Psuedognaphalium californicum*) at 1%. Weed species cover consisted of sourclover (*Melilotus indicus*) at 73% cover, tecolote (*Centaurea melitensis*) at 9%, spiny sowthistle (*Sonchus asper*) at 5%, black mustard (*Brassica nigra*) at 1%, and scarlet pimpernel (*Lysmiachia arvensis*) at 1%.

Finally, the proposed enhancement area is adjacent to and within occupied habitat for coastal California gnatcatcher (Figure 3), based on previous monitoring by Dudek (Dudek 2012a, 2012b). Because a portion of the enhancement area was documented to be part of coastal California gnatcatcher territory, controlling weeds and improving habitat quality in this area should directly benefit gnatcatchers.

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2 Proposed Enhancement Measures

All enhancement measures will be overseen and monitored by a restoration biologist and performed by an experienced contractor with coastal sage scrub experience. Any work performed in or adjacent to existing habitat during the bird breeding season from February 1 through September 15 will require a nesting bird survey in accordance with mitigation measure MM-BIO-4, per the Biological Resources Technical Report for the Park Drive Slope and Drainage Improvement Project (Dudek 2020), provided below:

MM-BIO-4 Nesting Bird Survey: For clearing of any other vegetation February 1 through September 15, and clearing of occupied coastal sage scrub February 1 through February 28 and August 16 through September 15, a nesting bird survey shall be conducted within the proposed impact area and a 500-foot buffer within 72 hours prior to construction. This survey is necessary to ensure avoidance of impacts to nesting raptors (e.g., red-tailed hawk [*Buteo jamaicensis*]) and/or birds protected by the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503 and 3513. If any active nests are detected, the area shall be flagged and mapped on the construction plans along with a minimum of a 300-foot buffer and up to a maximum of 500 feet for raptors or listed species, and shall be avoided until the nesting cycle is complete. If construction activities—particularly clearing/grubbing, grading, and other intensive activities—stop for more than 3 days, an additional nesting bird survey shall be conducted within the proposed impact area and a 500-foot buffer before such activities can recommence.

2.1 Soil Amendments

Based on the soil test results (Appendix A), soil amendments will be applied to the soil in the enhancement area to mitigate identified deficiencies and/or excesses and provide a more favorable soil environment for growth of the desired Diegan coastal sage scrub species. Based on the laboratory soil test analysis and recommendations, agricultural gypsum, triple superphosphate, ammonium sulfate, and organic soil amendment in the form of a Biotic Soil Media will be applied to the soil. The Biotic Soil Media contains recycled biodegradable fibers, biostimulants, nutritive additives, and mycorrhizal inoculum to assist with the establishment and growth of any obligate or facultative mycotrophic species. Because the enhancement area already contains significant cover from desirable native vegetation, incorporating the amendments into the soil will be impractical. Instead they will be top dressed either by hand or hydraulically with a hydroseeder. Amendments will be applied as per Table 1.

Table 1. Enhancement Area Soil Amendments

Material	Amount per 1,000 square feet
Ammonium sulfate (21-0-0)	5 pounds
Triple superphosphate (0-45-0)	4 pounds
Agricultural gypsum or Soil Buster pelletized gypsum	20 pounds
ProPlus BioPrime Biotic Soil Media	1 pound
ProPlus JumpStart	4 ounces

The soil test results are also being used to inform the container plant and seed mix for the enhancement area (see Section 2.4, Planting and Seeding). The recommended container stock and seed mix favors species ecologically adapted to the soil conditions and avoids any that are poorly adapted.

2.2 Irrigation System Reactivation

The irrigation system that was installed and used during the original plant establishment period following golf course construction will be used to establish the planting and seeding that will be done in the enhancement area. The irrigation system was deactivated in the enhancement area and the components largely left in place once the vegetation was successfully established. The irrigation system will be rehabilitated and reactivated to provide temporary irrigation for the nine translocated California adolphia plants. The habitat restoration contractor will repair and/or replace pipes and components and rehabilitate and reactivate the still-in-place but abandoned irrigation system. The contractor may prune some existing mature coastal sage scrub plants to facilitate irrigation coverage. The contractor will need to coordinate with the golf course superintendent regarding reactivation of the automatic valves and irrigation scheduling. The irrigation system is anticipated to be operated for 1 to 2 years until the new container plants and seed planted in the enhancement area are established.

2.3 Pre-Planting Weed Control

Prior to applying any soil amendments, planting the container stock, and seeding the enhancement area, the habitat restoration contractor will remove any living or dead annual weeds and perform at least one grow and kill weed control cycle. Any perennial invasive weed species will be treated with the appropriate herbicide, if needed for effective control, and the aboveground biomass removed. Many perennial invasive weed species will require repeated applications of herbicide to kill them.

2.4 Planting and Seeding

Container plants and seed will be planted in the enhancement area to increase native species cover and diversity. Container plant installation will be done in accordance with standard horticultural practice within a hole at least twice the diameter as the container and at the same depth. One Best-Pak 20-10-5 controlled release fertilizer packet with micronutrients, or approved equal, will be placed with each container plant following the manufacturer's label directions.

Ideally, planting and seeding will occur late in the year, September through December, to allow the maximum time to become established during the winter rainy season. Planting and seeding can occur during the spring months, if necessary, but should not occur during the summer months. The restoration biologist will work with the contractor to spot locations to plant the container stock in the enhancement area. Tables 2 and 3 show the container plant and seed lists.

Table 2. Enhancement Area Container Plant List

Scientific Name	Common Name	Container Size	Quantity per Acre	Quantity per 1.8 Acres
<i>Artemisia californica</i>	California sagebrush	1-gallon	218	392
<i>Eriogonum fasciculatum</i>	California buckwheat	1-gallon	68	122
<i>Malosma laurina</i>	laurel sumac	1-gallon	6	11
<i>Mimulus aurantiacus</i>	bush monkey-flower	1-gallon	54	97
<i>Opuntia littoralis</i>	coast prickly-pear	1-gallon	82	148
<i>Rhus integrifolia</i>	lemonadeberry	1-gallon	9	16
Total			437	786

Table 3. Enhancement Area Seed List

Scientific Name	Common Name	Percent Pure Live Seed	Pounds per Acre	Pounds per 1.8 Acres
<i>Acmispon glaber</i>	deerweed	85	4	7.2
<i>Artemisia californica</i>	California sagebrush	10	4	7.2
<i>Camissonia strigulosa</i>	sandysoil suncup	TBD	0.1	0.2
<i>Croton setiger</i>	dove weed	50	0.5	0.9
<i>Deinandra fasciculata</i>	fascicled tarweed	20	1	1.8
<i>Encelia californica</i>	California brittlebush	25	2	3.6
<i>Eriogonum fasciculatum</i>	California buckwheat	10	6	10.8
<i>Eriophyllum confertiflorum</i>	golden-yarrow	25	0.5	0.9
<i>Eschscholzia californica</i>	California poppy	85	1	1.8
<i>Hazardia squarrosa</i>	saw-toothed goldenbush	3	1	1.8
<i>Isocoma menziesii</i>	Menzies' goldenbush	15	2	3.6
<i>Lasthenia californica</i>	goldfields	50	0.5	0.9
<i>Lupinus bicolor</i>	miniature lupine	90	3	5.4
<i>Lupinus truncatus</i>	collared annual lupine	56	2	3.6
<i>Malocothamnus fasciculatus</i>	Mendocino bushmallow	10	1	1.8
<i>Mimulus aurantiacus</i>	bush monkey-flower	2	0.5	0.9
<i>Pseudognaphalium californicum</i>	California everlasting	2	0.5	0.9
<i>Salvia columbrae</i>	chia	65	1	1.8
<i>Salvia mellifera</i>	black sage	40	1	1.8
<i>Stipa lepida</i>	foothill needlegrass	65	2	3.6
<i>Stipa pulchra</i>	purple needlegrass	75	5	9.0
Total			38.6	69.5

TBD = to be determined

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3 Success Standards

Performance criteria have been established that will be used to determine success of the enhancement area. These criteria modify the previously approved performance criteria that were approved for The Crossings prior to project implementation. The modified performance criteria herein are derived from data collected at The Crossings golf course after successful implementation of the Revised Mitigation Plan for the Carlsbad Municipal Golf Course (P&D and HDR 2005). In essence, the existing coastal sage scrub mitigation area serves as a reference site for additional enhancement areas. Although the coastal sage scrub mitigation did not meet the precise performance goals established in the 2005 mitigation plan, implementing the mitigation plan resulted in 24.8 acres of high-quality habitat being established at the project site that is occupied by coastal California gnatcatcher and was accepted as successful. Occupation of this self-perpetuating gnatcatcher habitat serves as a better indicator of habitat success than somewhat arbitrary numerical criteria in the mitigation plan. Environmental conditions within The Crossings site are variable with regards to soil type, depth, fertility, reaction (pH), water-holding capacity, slope orientation, and steepness. All these variables influence the plant species and vegetative cover these soils will support, which logically lends itself to more flexible performance criteria than the “one size fits all” performance criteria in the original 2005 mitigation plan.

The performance criteria were developed based on previous and similar coastal sage scrub habitat restoration projects in the area, as well as by collected reference data from the gnatcatcher-occupied coastal sage scrub habitat at The Crossings. The proposed performance criteria to determine success of the enhancement area are as follows (where they differ from the original mitigation plan, standards are shown in brackets):

- 75% cover; the shrub layer should compromise 40% [native trees and shrubs of at least 60% cover].
- Total vegetative ground cover of at least 75%.
- Native shrubs with a cover of at least 60%, with at least 40% cover provided from any combination of the following shrub species: California sagebrush, California brittlebush, California buckwheat, Menzies' goldenbush, San Diego bush monkey-flower, black sage (*Salvia mellifera*). [California sagebrush cover at least 40%, native shrubs in general (not just 1 species) at least 40%].
- Weeds with a cover of no more than 10%.
- 0% weed cover for perennial species listed as invasive on the California Invasive Plant Council Inventory [proposed new standard not in the original mitigation plan].
- At least 4 native species present [at least 10 native species present].
- Native shrub species will show evidence of recruitment [of at least 5 species].

Monitoring to measure the performance criteria is provided in Section 5, Monitoring.

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4 Maintenance

The enhancement area will be maintained by the contractor for up to 5 years to control invasive weed species and establish the container stock and seed planted to improve native species cover and diversity. Landscape maintenance is anticipated to be more intensive in the first 1–3 years and then reduced in Years 4–5 after the container plants and seed become established and irrigation is discontinued. Maintenance in Years 4–5 is expected to be limited to controlling invasive weed species and removing trash and debris, if any. The restoration biologist will oversee and work with the contractor providing the maintenance, and make recommendations, as necessary.

4.1 Pest Management

Weeds are expected to be the primary pest problem in the Diegan coastal sage scrub enhancement area. Weeds will be controlled so they do not prevent establishment of the intended native species. Weeds will be controlled when they are small and before they can bloom and set seed. The contractor will be required to apply seed again if weeds are not controlled in a timely manner and the native species do not become established. A timely manner is understood to be within 1 month of written direction by the restoration biologist. More frequent weed control will be performed, as necessary, to keep weeds at manageable levels.

Invasive perennial exotic species, such as fennel (*Foeniculum vulgare*), tree tobacco (*Nicotiana glauca*), castor bean (*Ricinus communis*), saltcedar (*Tamarix* species), pampas grass (*Cortaderia* species), artichoke thistle (*Cynara cardunculus*), hotentot fig (*Carpobrotus* species), and fountain grass (*Pennisetum setaceum*), will be controlled. The restoration biologist may add additional species to this list if other species are observed invading the enhancement area. A combination of physical removal and herbicide treatment will likely be required to control these species. Properly timed, repeat herbicide applications are usually required for complete control of most of these hardy perennials. The contractor will refer to the herbicide label for information on proper timing and application rates for treatment.

Annual weed species present in the enhancement area prior to implementation or in the region that will likely require control include mustards (*Brassica nigra*, *Hirschfeldia incana*), garland daisy (*Glebionis coronaria*), stinkwort (*Dittrichia graveolens*), sweetclover (*Melilotus* species), stinknet (*Oncosiphon piluliferum*), wild radish (*Raphanus sativus*), annual sowthistles (*Sonchus asper*, *S. oleraceus*), prickly lettuce (*Lactuca serriola*), and various non-native annual grasses. Other weed species may invade the enhancement area and could also require control. Annual weeds and grasses will be kept under control so they are not a competitive threat to establishment of the desired native species. The restoration biologist will advise the contractor as to which species to control.

All applicable laws, regulations, safety precautions, and label directions must be followed when performing pest control. The contractor performing the work should consult a licensed Pest Control Adviser if specific pest control recommendations are required. All weed debris will be removed from the enhancement area and disposed of in a legal manner.

The enhancement area will be kept free of the invasive exotic weed species listed in this section, and other weed species will be controlled if the restoration biologist believes they are a competitive problem interfering with the establishment of desirable species. Pampas grass, artichoke thistle, saltcedar, and other perennial invasive exotic species will be controlled throughout the 5-year monitoring period in the enhancement area.

Invertebrate pests and diseases are not expected to be a problem in the enhancement area. Snails could become a problem and will be controlled if necessary. Vertebrate pests such as gophers, ground squirrels, rabbits, rats, and voles could become a problem and will be addressed by the City or contractor if necessary. Should control measures become necessary, the City or contractor will follow all applicable laws, regulations, safety precautions, and label directions when performing pest control. Vertebrate pests classified as non-game mammals by the California Department of Fish and Wildlife may be taken at any time and in any manner, but game mammals have certain restrictions that must be met before they can be controlled, and a hunting license may be required. The contractor will consult a licensed Pest Control Adviser if specific pest control recommendations are required.

4.2 Irrigation

The reactivated irrigation system will be operated to help establish the remedial planting and seeding within the enhancement area and for the nine salvaged California adolphia plants. An irrigation system was installed and used during the original plant establishment period following golf course construction, and then decommissioned. The system will be repaired, rehabilitated, and reactivated to establish the container plants and seed that will be planted in the enhancement area.

Once the container plants and seeds planted in the enhancement area have become successfully established, the irrigation system will be decommissioned and abandoned. The irrigation system is anticipated to be used for 2–3 years, depending on how quickly the container plants, salvaged California adolphia plants, and seedlings become established and are able to survive on natural conditions. All aboveground irrigation components will be removed and either reused or disposed of in a legal manner once they are no longer needed.

5 Monitoring

The restoration biologist will provide monitoring and prepare reports in accordance with the enhancement plan requirements. Monitoring will incorporate both qualitative and quantitative methods. The restoration biologist will also provide maintenance recommendations to the contractor and City, as necessary, to help meet the performance criteria.

5.1 Qualitative Monitoring

Qualitative monitoring will consist of making periodic site visits to assess plant health and development and maintenance needs, and make recommendations to the contractor and the City. Qualitative monitoring site visits will occur monthly in Year 1, every other month in Years 2 and 3, and quarterly in Years 4 and 5, if necessary. Qualitative monitoring will be done for both the enhancement area and the nine salvaged California adolphia plants that will be planted nearby.

5.2 Quantitative Monitoring

Quantitative monitoring will consist of collecting cover data from line transects, preparing a floral species list for the enhancement area, and counting container plant mortality. Photo documentation will also be used to document vegetation development (see current photos in Figure 4, Photo Views of the Mitigation Area). Quantitative monitoring visits will occur annually in spring when the most plants are blooming and are easier to identify.

Transect monitoring will be collected from four permanent 25-meter line intercept transects established within the enhancement area. Each transect will be marked with a T-post and mapped with a GPS device. Line intercept data will be collected every 0.5 meters. Cover will be calculated by native species, non-native species, and total plant cover. Species richness data will also be collected by counting all plant species growing within a 5-meter-wide belt along each transect. Photos will be taken of each transect to photo-document vegetation development.

Quantitative monitoring for the nine salvaged California adolphia plants will consist of counting and photographing the live plants to determine their quantity.

5.3 Annual Reports

An annual report will be prepared each year to describe progress toward meeting the success standards for the enhancement area.

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6 Contingency Measures

Contingency measures are not expected to be required based on previous experience establishing functioning coastal sage scrub at The Crossings. Should contingency measures be required, the City will work with the resource agencies to determine an appropriate remedial action program or actions.

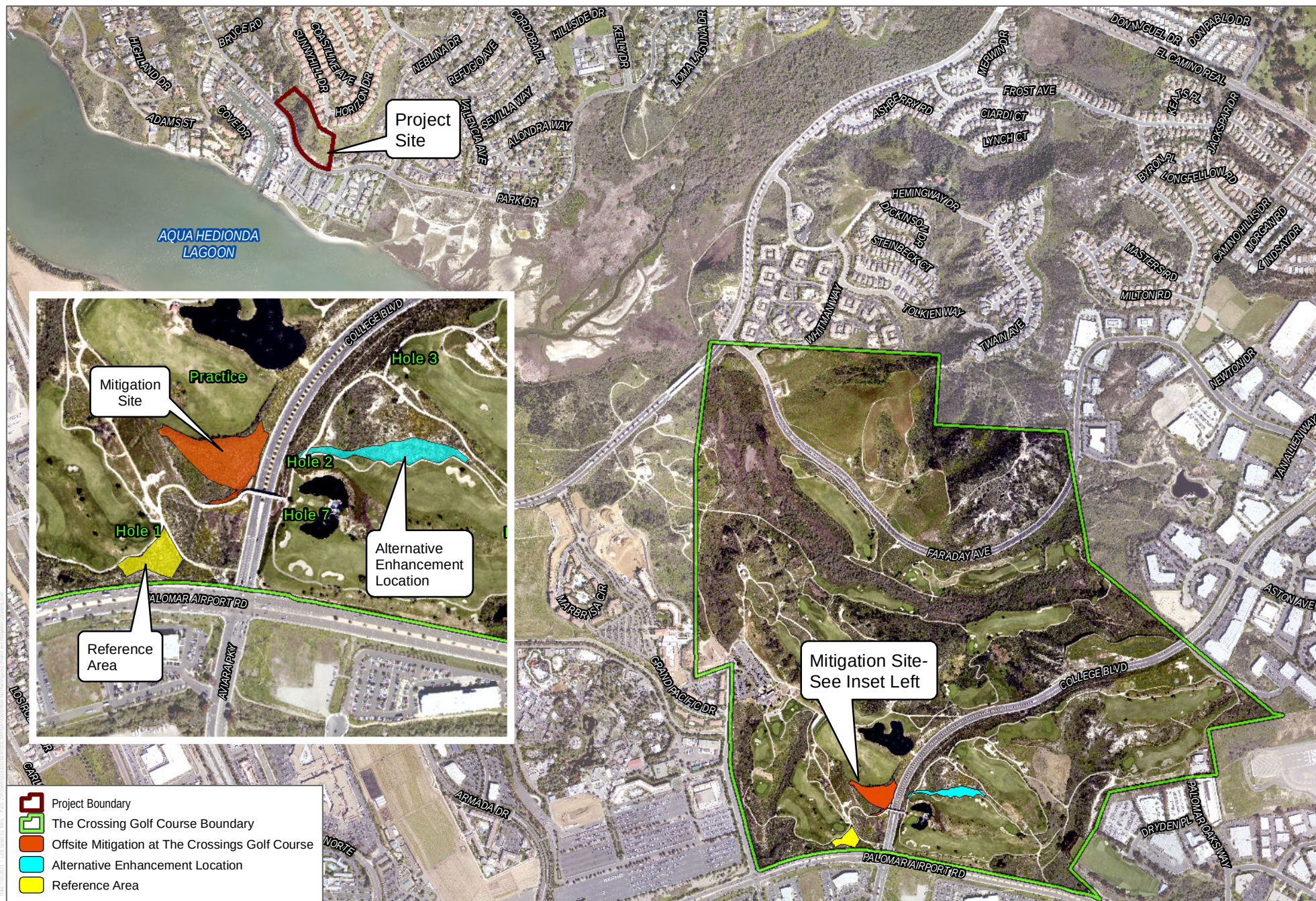
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7 References

- Bowman, R.H. 1973. *Soil Survey, San Diego Area, California, Part 1*. United States Department of the Agriculture. 104 pp. + appendices.
- City of Carlsbad. 2004. *City of Carlsbad Habitat Management Plan for Natural Communities in the City of Carlsbad*. December 1999; final approval November 2004. <https://carlsbadca.prod.govaccess.org/home/showdocument?id=1600>.
- Dudek. 2012a. *Fifth Annual Coastal Sage Scrub Mitigation Monitoring Report for the Crossing at Carlsbad Golf Course, City of Carlsbad, California*. May. 122.pp.
- Dudek. 2012b. *2012 Post-Construction California Gnatcatcher Monitoring Report for The Crossings at Carlsbad, City of Carlsbad, San Diego County, California, Permit #'s TE051248-4 and TE139634-1*. May. 60 pp.
- Dudek. 2020. *Draft Biological Resources Technical Report, Park Drive Slope and Drainage Improvement Project*. December. 100 pp.
- P&D and HDR (P&D Environmental and HDR Engineering). 2005. *Mitigation Plan Carlsbad Municipal Golf Course*. February 2005. 35 pp.
- Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation, Second Edition*. California Native Plant Society, Sacramento, California. 1300 pp.

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SOURCE: SANGIS 2017, 2020

DUDEK



0 1,000 2,000 Feet

FIGURE 2

Project and Mitigation Area Locations Map

Conceptual Off-Site Mitigation Plan for Coastal Sage Scrub Habitat Impacts to the Park Drive Slope and Drainage Improvement Project

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SOURCE: AERIAL-SANGIS 2017

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Photo 1: View looking south. (Photo Date: 5/14/2020)



Photo 2: View looking northwest. (Photo Date: 5/14/2020)



Photo 3: View looking northeast. (Photo Date: 5/14/2020)



Photo 4: View looking southeast. (Photo Date: 5/14/2020)

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Appendix A

Soil Test Results

WALLACE LABORATORIES

**365 Coral Circle
El Segundo, CA 90245
phone (310) 615-0116 fax (310) 640-6863**

January 22, 2021

Doug Gettinger, DGettinger@dudek.com
Dudek & Associates, Inc.
605 Third Street
Encinitas, CA 92024

RE: The Crossings Golf Course, Job No. 11632-04-02
Received January 20, 2021, Coastal Sage Scrub Revegetation, Our ID No. 21-21-22

Dear Doug,

The pH is moderately alkaline at 7.53. Salinity is modest at 0.48 millimho/cm.

Nitrogen, phosphorus and manganese are modest. Zinc and sulfur are low. Copper and boron are moderate. Potassium, iron and magnesium are high. Sodium is moderate. SAR (sodium adsorption ratio) is 1.5. The concentrations of common non-essential heavy metals are low.

Frequently in California, topsoils have modest amounts of magnesium and subsoils contain high levels of magnesium. High magnesium is undesirable. Magnesium limits the uptake of potassium and calcium. It acts like sodium and disperses soil crumbs. Periodic additions of gypsum can be made to reduce the effects of high magnesium.

Recommendations

General soil preparation on a square foot basis. Broadcast the following uniformly; rates are per 1,000 square feet for a 6-inch lift. Incorporate them homogeneously 6" deep.

Ammonium sulfate (21-0-0) – 5 pounds
Triple superphosphate (0-45-0) – 4 pounds
Agricultural gypsum - 20 pounds
Organic soil amendment - about 4 cubic yards, sufficient for 3% to 5% soil organic matter on a dry weight basis

For the preparation on a volume basis, homogeneously blend the following materials into the soil. Rates are expressed per cubic yard:

Ammonium sulfate (21-0-0) – 1/4 pound
Triple superphosphate (0-45-0) – 1/4 pound
Agricultural gypsum – 1 pound
Organic soil amendment - about 20% by volume, sufficient for 3% to 5% soil organic matter on a dry weight basis

Organic soil amendment:

1. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. Organic matter shall be at least 50% on a dry weight basis.
2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 millimho/cm @ 25° C. on a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 part per million.
5. Silicon content (acid-insoluble ash) shall be less than 50%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.

Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

arsenic	12	copper	100	selenium	20
cadmium	15	lead	200	silver	10
chromium	150	mercury	10	vanadium	50
cobalt	30	molybdenum	20	zinc	200
		nickel	100		

Higher amounts of salinity or boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

For site maintenance, apply ammonium sulfate (21-0-0) at 5 pounds per 1,000 square feet about once per quarter. Monitor the site with periodic soil and leaf tissue testing. Adjust the maintenance program as needed.

Sincerely,

Garn A. Wallace, Ph. D.
GAW:n

WALLACE LABS 365 Coral Circle El Segundo, CA 90245 (310) 615-0116		SOILS REPORT Location Requester graphic interpretation: * very low, ** low, *** moderate	Print Date Jan. 21, 2021 Receive Date 1/20/21
ammonium bicarbonate/DTPA extractable - mg/kg soil Interpretation of data low medium high 0 - 7 8-15 over 15 0-60 60 -120 121-180 0 - 4 4 - 10 over 10 0- 0.5 0.6- 1 over 1 0 - 1 1 - 1.5 over 1.5 0- 0.2 0.3- 0.5 over 0.5 0- 0.2 0.2- 0.5 over 1		Sample ID Number Sample Description elements phosphorus potassium iron manganese zinc copper boron calcium magnesium sodium sulfur molybdenum nickel aluminum arsenic barium cadmium chromium cobalt lead lithium mercury selenium silver strontium tin vanadium	**** high, ***** very high 21-21-22 Coastal Sage Scrub Revegetation graphic 3.61 ** 140.08 ***** 12.36 ***** 0.57 ** 0.23 * 0.41 *** 0.26 *** 334.53 *** 1,077.93 ***** 102.77 *** 13.52 * 0.05 *** 0.19 * 0.05 * 0.11 * 0.28 * 0.06 * n d * n d * 0.10 * 0.05 * n d * 0.04 * n d * 1.56 * 0.02 * 0.14 *
The following trace elements may be toxic The degree of toxicity depends upon the pH of the soil, soil texture, organic matter, and the concentrations of the individual elements as well as to their interactions. The pH optimum depends upon soil organic matter and clay content- for clay and loam soils: under 5.2 is too acidic 6.5 to 7 is ideal over 8.0 is too alkaline The ECe is a measure of the soil salinity: 1-2 affects a few plants 2-4 affects some plants, > 4 affects many plants.		Saturation Extract pH value ECe (milli-mho/cm) calcium magnesium sodium potassium cation sum chloride nitrate as N phosphorus as P sulfate as S anion sum boron as B SAR est. gypsum requirement-lbs./1000 sq. ft.	7.53 ***** 0.48 ** millieq/l 46.4 2.3 13.2 1.1 45.7 2.0 5.3 0.1 5.5 41 1.2 8 0.6 0.5 0.0 28.4 1.8 3.5 0.21 ** 1.5 ** 291 fair sandy loam low low 8.6% 26.0%
problems over 150 ppm good 20 - 30 ppm toxic over 800 toxic over 1 for many plants increasing problems start at 3 est. gypsum requirement-lbs./1000 sq. ft.			
relative infiltration rate estimated soil texture lime (calcium carbonate) organic matter moisture content of soil half saturation percentage			

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
 pH and ECe are measured in a saturation paste extract. nd means not detected.
 Analytical data determined on soil fraction passing a 2 mm sieve.

WALLACE LABORATORIES

365 Coral Circle
El Segundo, CA 90245
phone (310) 615-0116 fax (310) 640-6863

March 11, 2021

Doug Gettinger, DGettinger@dudek.com
Dudek & Associates, Inc.
605 Third Street
Encinitas, CA 92024

RE: The Crossings Golf Course, Job No. 11632-04-02
Two samples received March 8, 2021

Dear Doug,

Reference Site - The pH is acidic at 5.74. Salinity is modest at 0.40 millimho/cm.

Nitrogen and boron are modest. Sulfur is low. Phosphorus, potassium, zinc and copper are moderate. Iron, manganese and magnesium are high. Sodium is moderate. SAR (sodium adsorption ratio) is 2.8. The concentrations of common non-essential heavy metals are low.

Frequently in California, topsoils have modest amounts of magnesium and subsoils contain high levels of magnesium. High magnesium is undesirable. Magnesium limits the uptake of potassium and calcium. It acts like sodium and disperses soil crumbs. Periodic additions of gypsum can be made to reduce the effects of high magnesium.

Revegetation Site – The pH is neutral. Salinity is modestly elevated at 2.35 millimho/cm. Soluble sulfur is high.

Nitrogen, phosphorus and manganese are low. Iron, zinc and boron are moderate. Potassium, copper, magnesium and sulfur are high. Gypsum is present. Magnesium is higher than for the Reference Site.

Recommendations for Revegetation Site

General soil preparation on a square foot basis. Broadcast the following uniformly; rates are per 1,000 square feet for a 6-inch lift. Incorporate them homogeneously 6" deep.

Calcium ammonium nitrate (27-0-0) – 4 pounds

Triple superphosphate (0-45-0) – 4 pounds

Organic soil amendment - about 4 cubic yards, sufficient for 3% to 6% soil organic matter on a dry weight basis

For the preparation on a volume basis, homogeneously blend the following materials into the soil. Rates are expressed per cubic yard:

Calcium ammonium nitrate (27-0-0) – 1/4 pound

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Organic soil amendment - about 20% by volume, sufficient for 3% to 6% soil organic matter on a dry weight basis

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2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 millimho/cm @ 25° C. on a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 part per million.
5. Silicon content (acid-insoluble ash) shall be less than 50%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.

Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

arsenic	12	copper	100	selenium	20
cadmium	15	lead	200	silver	10
chromium	150	mercury	10	vanadium	50
cobalt	30	molybdenum	20	zinc	200
		nickel	100		

Higher amounts of salinity or boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

For site maintenance, apply calcium ammonium nitrate (27-0-0) at 4 pounds per 1,000 square feet several times a year.

Monitor the site with periodic soil and leaf tissue testing. Adjust the maintenance program as needed.

Sincerely,

Garn A. Wallace, Ph. D.
GAW:n

WALLACE LABS 365 Coral Circle El Segundo, CA 90245 (310) 615-0116		SOILS REPORT Location Requester graphic interpretation: * very low, ** low, *** moderate **** high, ***** very high	Print Date Mar. 10, 2021	Receive Date 3/8/21
ammonium bicarbonate/DTPA extractable - mg/kg soil Interpretation of data low medium high 0 - 7 8-15 over 15 0-60 60 -120 121-180 0 - 4 4 - 10 over 10 0- 0.5 0.6- 1 over 1 0 - 1 1 - 1.5 over 1.5 0- 0.2 0.3- 0.5 over 0.5 0- 0.2 0.2- 0.5 over 1		Sample ID Number Sample Description elements phosphorus potassium iron manganese zinc copper boron calcium magnesium sodium sulfur molybdenum nickel aluminum arsenic barium cadmium chromium cobalt lead lithium mercury selenium silver strontium tin vanadium	21-69-57 Reference Site graphic 9.26 *** 100.82 *** 22.78 ***** 4.71 ***** 1.14 *** 0.47 *** 0.17 ** 538.31 ***** 743.93 ***** 173.93 *** 12.06 * 0.04 *** 0.42 * n d * 0.28 * 1.74 * 0.04 * n d * 0.11 * 2.12 ** 0.47 * n d * n d * n d * 4.50 * n d * 0.25 *	21-69-58 Revegetation Site graphic 6.45 ** 165.37 ***** 9.19 *** 0.36 ** 1.03 *** 0.92 ***** 0.26 *** 476.74 ***** 1,109.89 ***** 220.59 ***** 1,001.94 ***** 0.04 *** 0.15 * n d * 0.06 * 0.09 * 0.03 * n d * 0.05 * 0.31 * 0.56 * n d * n d * n d * 1.25 * n d * 0.03 *
The following trace elements may be toxic The degree of toxicity depends upon the pH of the soil, soil texture, organic matter, and the concentrations of the individual elements as well as to their interactions The pH optimum depends upon soil organic matter and clay content- for clay and loam soils: under 5.2 is too acidic 6.5 to 7 is ideal over 8.0 is too alkaline The ECe is a measure of the soil salinity: 1-2 affects a few plants 2-4 affects some plants, > 4 affects many plants.		Saturation Extract pH value ECe (milli-mho/cm) calcium magnesium sodium potassium cation sum chloride nitrate as N phosphorus as P sulfate as S anion sum boron as B SAR est. gypsum requirement-lbs./1000 sq. ft.	5.74 ** 0.40 ** millieq/l 12.7 0.6 7.0 0.6 51.0 2.2 2.6 0.1 3.5 28 0.8 11 0.8 1.4 0.0 22.3 1.4 3.0 0.28 ** 2.8 ** 193 slow sandy loam no low/fair 7.0% 21.3%	6.98 *** 2.35 ***** millieq/l 314.9 15.7 94.1 7.8 109.9 4.8 9.5 0.2 28.5 15 0.4 1 0.0 0.3 0.0 461.2 28.8 29.3 0.31 ** 1.4 * 321 fair clay loam no low 16.5% 33.7%

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
 pH and ECe are measured in a saturation paste extract. nd means not detected.
 Analytical data determined on soil fraction passing a 2 mm sieve.

