Draft

BIG CANYON COASTAL HABITAT RESTORATION AND ADAPTATION PROJECT – PHASE 2A

Habitat Restoration Plan

Prepared for
Newport Bay Conservancy

August 2018

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TABLE OF CONTENTS

Big Canyon Coastal Habitat Restoration and Adaption Project – Phase 2A Habitat Restoration Plan

Page

Figures

Tables

CHAPTER 1
Introduction

This Habitat Restoration Plan (HRP) identifies the goals and objectives and prescribes guidelines and specifications for implementing habitat restoration for the Big Canyon Coastal Habitat Restoration and Adaptation Project – Phase 2A (Project) in the City of Newport Beach (City), California. Restoration efforts within the overall Big Canyon area have been considered for over a decade and phased implementation commenced in 2017 when the City completed initial restoration in Phase 1A. Phase 1 included Installation of water quality improvements, 650 feet of creek restoration, 2 acres of riparian habitat restoration and 1 acre of wetland habitat creation and enhancement. This HRP now describes plans for restoration in Phase 2A, located downstream from Phase 1. Continuing downstream in Big Canyon, toward the Bay, feasibility studies are currently underway to identify practical restoration concepts for future planning, analysis and implementation within Phase 2B and 2C areas. This HRP for Phase 2A involves removing over 6.8 acres of invasive exotic Brazilian pepper trees and other non-native vegetation that has overrun the Phase 2A area and replacing that low quality plant community with a mosaic of native plant communities that are appropriate for the site conditions. Implementation of this HRP will involve temporary effects to waters subject to State and federal regulatory jurisdiction during site preparations for habitat restoration. Despite the short term impacts that result from removing exotic vegetation and from stabilizing Big Canyon Creek to improve hydrology, implementation of this restoration plan will achieve substantial net benefits by enhancing habitat quality and ecological functions and values without reducing the jurisdictional area within the Project site.

This plan and the accompanying design drawings, specifications, and special provisions have been prepared by ESA specialists in the disciplines of civil engineering, fluvial geomorphology, hydrology, landscape architecture, biology and restoration ecology. The final plan and associated specifications also incorporates input from the project sponsor and the Technical Advisory Committee (TAC) created by NBC to oversee planning for the Project. The TAC includes representatives from the California Coastal Conservancy, the City of Newport Beach, California Department of Fish and Wildlife (CDFW), the State Water Resources Control Board (SWRCB), U.S. Fish and Wildlife Service (USFWS), the Orange County Vector Control District, and other individuals affiliated with the California Native Plant Society, and the UC Irvine San Joaquin Freshwater Marsh Reserve.

As described herein, this HRP provides guidelines and specifications for removal of exotic vegetation, improving Big Canyon Creek stability and hydrologic connectivity, and for installing and promoting establishment of site appropriate native vegetation communities. The Project also involves reduction of mosquito breeding habitat and will provide educational opportunities. As such, it is important to recognize that this is not a habitat "mitigation" project. The Project is a

habitat restoration project and thus is self-mitigating; no additional compensatory habitat mitigation is proposed or warranted.

1.1 Responsible Parties

The Newport Bay Conservancy (NBC) directed preparation of this HRP, along with the environmental analysis and permitting efforts for the Project. Planning, environmental analysis and permitting is being funded under a grant program administered by the California State Coastal Conservancy. As noted above, NBC has assembled a TAC to assist with oversight for Project planning and permitting considerations. NBC is also expected to oversee implementation of the HRP and is currently seeking funds to implement the Project.

The Newport Bay Conservancy contact information is provided below:

Name: Newport Bay Conservancy, Attn: Heather Cieslak, MPA, Operations Director
Address: 600 C Shellmaker Road, Newport Beach, CA 92660
Contact: (949) 640-1751; heather.cieslak@gmail.com

The City of Newport Beach is the landowner of the Phase 2A restoration project site and retains oversight authority as the lead agency under CEQA and through its authority to issue a Coastal Development Permit for the Project under the approved Local Coastal Program (LCP).

The City of Newport Beach contact information is provided below:

Name: City of Newport Beach, Attention Bob Stein
Address: 100 Civic Center Drive, Newport Beach, CA 92660
Contact: (949) 644-3322; rstein@newportbeachca.gov

1.2 Project Location / Ownership

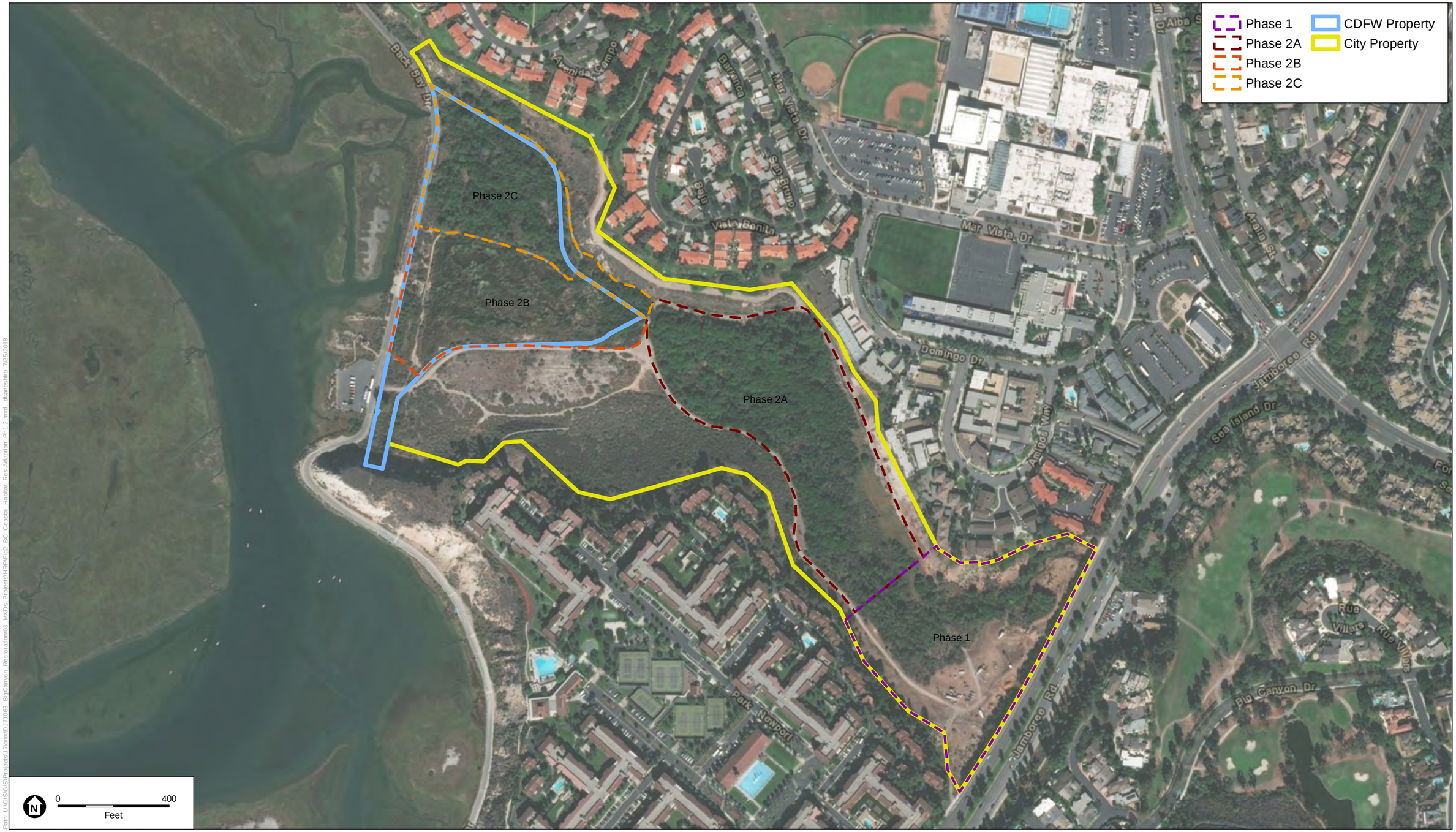
The project site is located in the City of Newport Beach on an 11.32-acre site identified as Phase 2A within the eastern portion of the 60-acre Big Canyon Nature Park (Figure 1, Project Location / Regional Map). The Big Canyon Nature Park is used for passive recreation including hiking on the public trail that traverses the natural open space between Jamboree Road and Back Bay Drive. The Phase 2A site is situated east of Upper Newport Bay and west of Jamboree Road (Figure 2, Big Canyon Restoration - Phases 1 and 2). In the Big Canyon Nature Park, 45 acres is owned by the City of Newport Beach and the Phase 2A site lies entirely within the city-owned parcel. The lower 15-acre portion of the Nature Park is owned by the California Department of Fish and Wildlife (CDFW), which is a part of the Upper Newport Bay State Marine Conservation Area (SMCA) and Ecological Reserve, and is part of Southern California's coastal estuarine environment. Residential and institutional development border Big Canyon to the north and south. The recently completed restoration project in Phase 1 lies just upstream from the Phase 2A Project area, while Phases 2B and 2C areas are just downstream toward Back Bay Drive.

SOURCE: ESRI

Big Canyon Restoration - Phase 2A

Figure 1
Project Location/Regional Map

ESA



SOURCE: ESRI; ESA

Big Canyon Restoration - Phase 2A

Figure 2
Big Canyon Coastal Habitat Restoration and Adaptation - Phases 1 and 2

ESA

Directions to Big Canyon

From Interstate 5 (I-5) or the San Joaquin Hills Toll Road (State Route (SR) – 73), exit Jamboree Road and proceed southwest toward Pacific Coast Highway. After passing Ford Road, turn right at San Joaquin Hills Road and then right on Back Bay Drive. Proceed on Back Bay Drive approximately 0.5 mile to the parking area on the bay side of the road. Phase 2A lies a few hundred yards east of Back Bay Drive along the trail that starts opposite the parking area.

Property Identification and Location Data

Address: 1855 Jamboree Road, Newport Beach, California 92660

Assessor's Parcel Numbers: 440-092-79

Lat./Long.: 33° 37’ 50.21” N / 117° 52’ 49.06” W

U.S. Geological Survey (USGS) Information: Newport Beach 7.5 min. quadrangle map, Township 6 S, Range 10 W, Section 56.

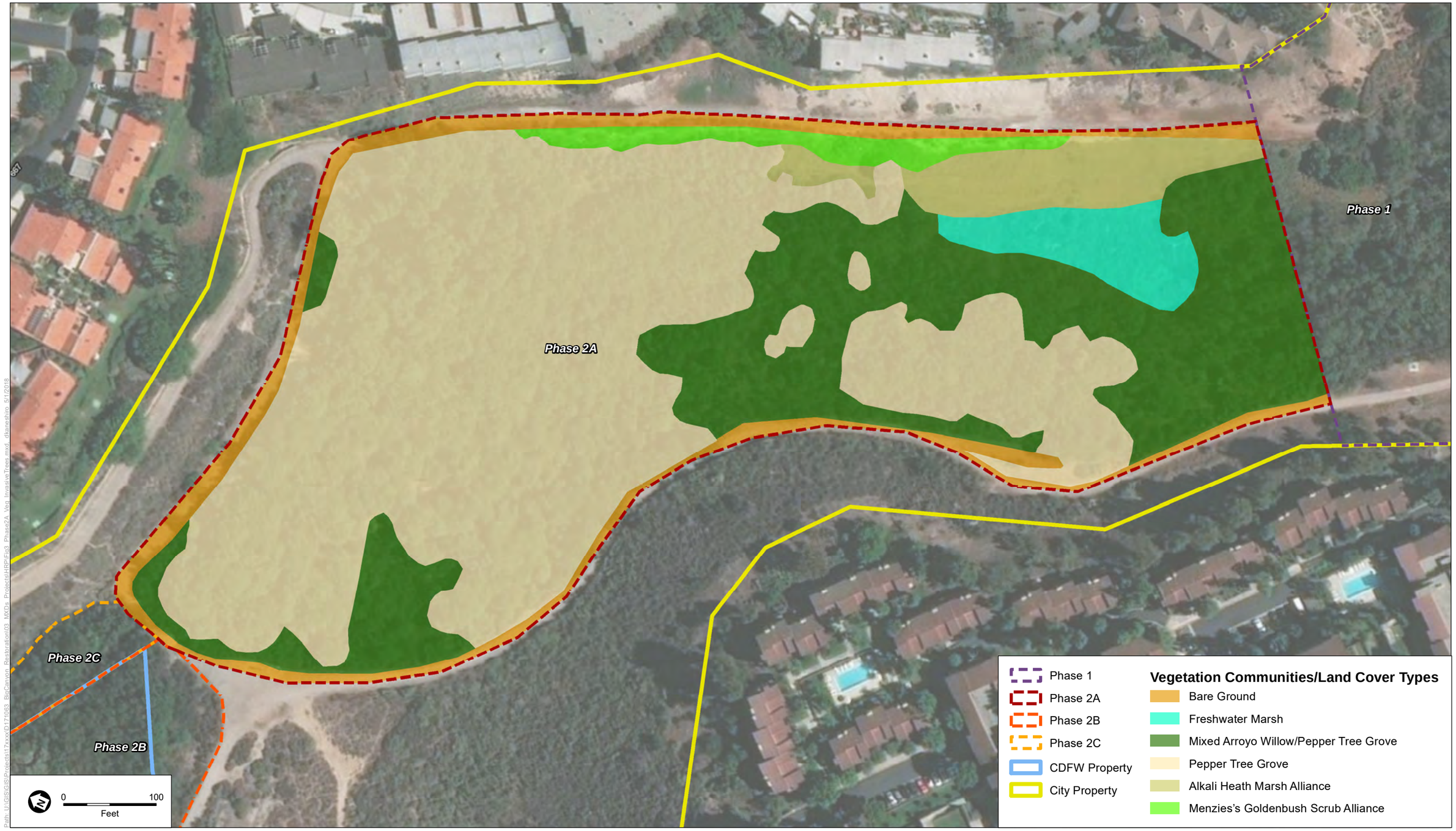
1.3 Restoration Project Description

In this case, the Project is the habitat restoration effort. Whereas habitat restoration requirements are usually imposed on various types of land development or infrastructure projects that result in impacts to jurisdictional areas, in this case this Project is intended to provide substantial benefits within the existing jurisdictional areas by implementing various restoration elements.

The Phase 2A habitat restoration project will involve the following major elements:

- clearing and grubbing 6.33 acres of exotic Brazilian pepper tree forest; and 0.50 acres of mixed arroyo willow woodland and pepper trees.
- selectively removing pepper trees and other exotics within 2.41 acres comprised of mixed native riparian and non-native vegetation;
- grading (pulling back upper embankments) and stabilizing segments of Big Canyon Creek to improve the Creek’s hydrologic connectivity to the floodplain;
- establishing a mosaic of native plant communities;
- replacing a small scoured pond that typically holds stagnant water conducive for mosquito breeding with improved energy dissipation and drainage connection to Big Canyon Creek to eliminate standing water.

The proposed Phase 2A restoration project includes the creation of a diverse mosaic of coastal riparian, alkali meadow and upland transitional scrub habitats in areas that are currently dominated by thick groves of non-native Brazilian pepper trees. As shown on Figure 3, Existing Vegetation, there are large continuous patches of non-native Brazilian pepper tree groves (shown in a tan color) covering approximately 6.33 acres of the 11.32-acre subject project area. Brazilian pepper trees also occur intermixed with willows and other native vegetation in patch areas amounting to another 2.91 acres (identified with a green color). Within the dense pepper tree grove areas, the invasive trees, including the root systems, will be removed. These areas will then be re-contoured and fine-graded and the many depressions left behind after root removal will be filled in with earth material from stream stabilization grading or local surface material.



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SOURCE: ESRI; Dudek; ESA

Big Canyon Restoration - Phase 2A

Figure 3
Proposed Project (Phase 2A)
Existing Vegetation and Plant Communities

ESA

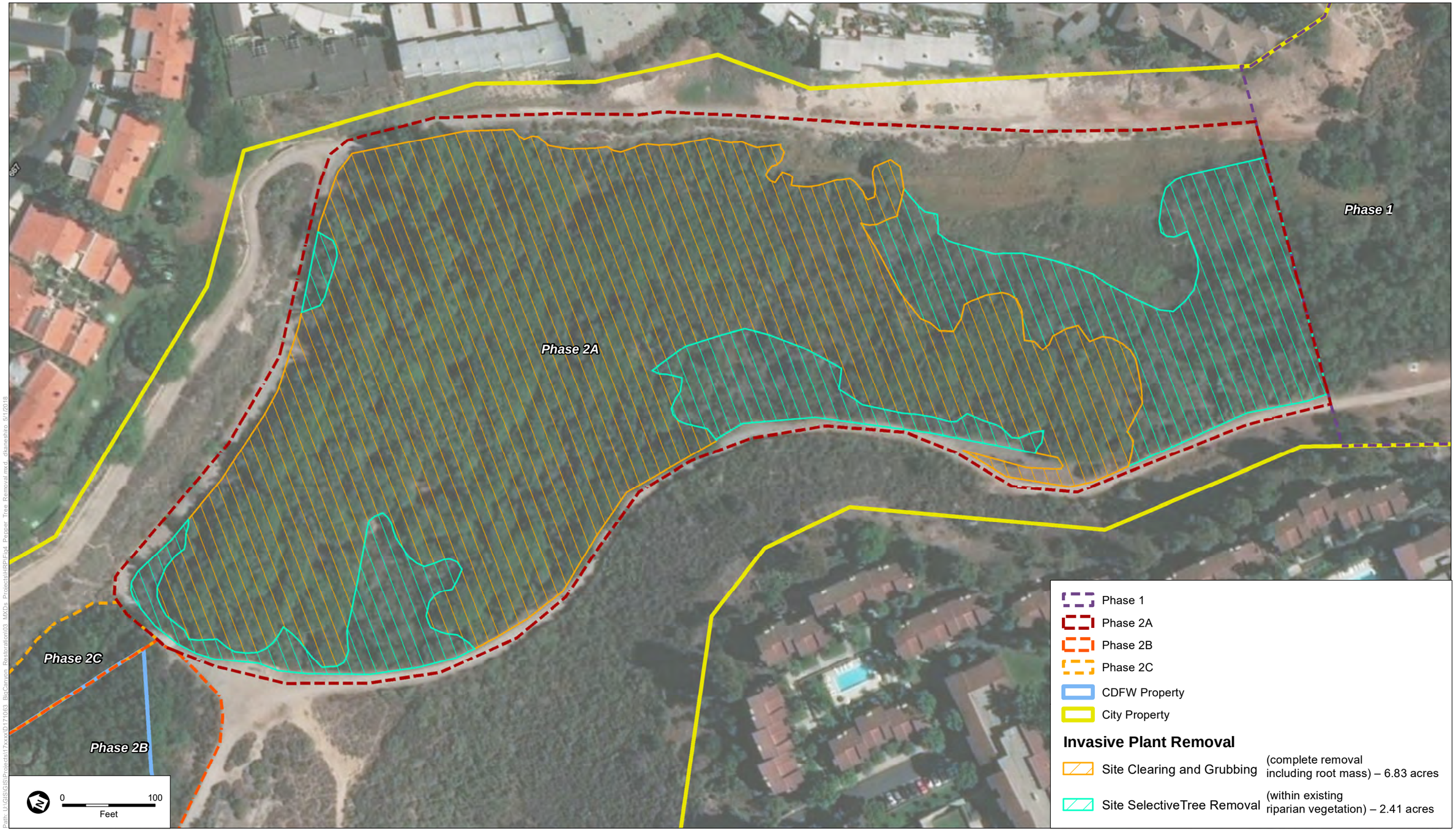
The Project will also stabilize the Big Canyon Creek channel and improve hydrologic connectivity between the channel and floodway by pulling back the upper embankments. Segments of the creek that are locally incised, or too steep to support vegetation, will be graded to create floodplain benches and flatter slopes from the benches to better connect the channel to the floodplain. The removal of the non-native Brazilian pepper trees will include removal of the associated root systems to control re-establishment. Removal of the trees and associated root balls along the stream banks will results in disturbance of the existing banks. Disturbed banks will be graded to connect with the floodplain and/or stabilized using bio-engineering techniques. Specific details describing the stabilization techniques and options to be used in different circumstances are illustrated in the separate construction plans and specifications for the Project.

Replacing the exotic pepper trees will commence subsequent to removing the exotic vegetation, stabilizing the creek and completing the fine-grading and re-contouring within the areas to be treated. Revegetation will involve establishing four native plant communities within the 6.83 acres that were completely cleared and grubbed. That will involve constructing a temporary irrigation system in the grubbed area followed by planting and seed application. The other patch areas, where pepper trees and exotic vegetation are selectively removed, will be seeded following clearing and removal of undesirable plant materials. Any particularly large patch areas may also be irrigated temporarily by extending distribution lines and rotors into such patches from the main system. However, the intent is primarily to allowed small cleared patches within the remaining native willow woodland to revegetate passively, by just seeding and weeding. Following initial planting and seed applications, the revegetated areas will be maintained and monitored for approximately 5 years.

1.4 Replacing Existing Exotic Plant Communities

As indicated on Figure 3, and in Table 1.1, below, the 11.32-acre Phase 2A site contains 9.24 acres of riparian habitat dominated by invasive pepper trees, including 6.33 acres of relatively homogeneous Brazilian pepper tree groves and 2.91 acres of mixed willow / pepper tree woodland. The planned clearing and grubbing and selective removal of exotics will occur entirely within these pepper tree dominated habitat areas as shown on **Figure 4**, depicting the "Extent of Invasive Plant Removal" as compared to Figure 3. The Project will avoid disturbing native habitat types as noted in Table 1.1, which include the freshwater marsh, alkali heath (= alkali meadow) and goldenbush scrub plant communities. The Conceptual Restoration Plan, presented in **Figure 5**, depicts where the mosaic of four proposed native plant communities (riparian, wet alkali meadow, high alkali meadow, and upland transitional) habitats would replace the existing pepper tree dominated areas.

Temporary access ramps may be installed to facilitate access for equipment to remove exotic trees and to grade and stabilize sections of the Creek. Ramps would be installed in up to three locations and would remain in place at least until material removal creek stabilization and site preparations are completed. These ramps are situated within areas designated to be disturbed by grubbing and selective tree removal and also partly overlap existing barren areas (see Figure 5). As noted in Table 1.1, below, the temporary ramps overlay an aggregate area of up to approximately 0.09 acres within the pepper tree groves (0.07 ac.) and mixed arroyo



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SOURCE: ESRI; Dudek; ESA

Big Canyon Restoration - Phase 2A

Figure 4
Proposed Project - Phase 2A
Extent of Invasive Plant Removal

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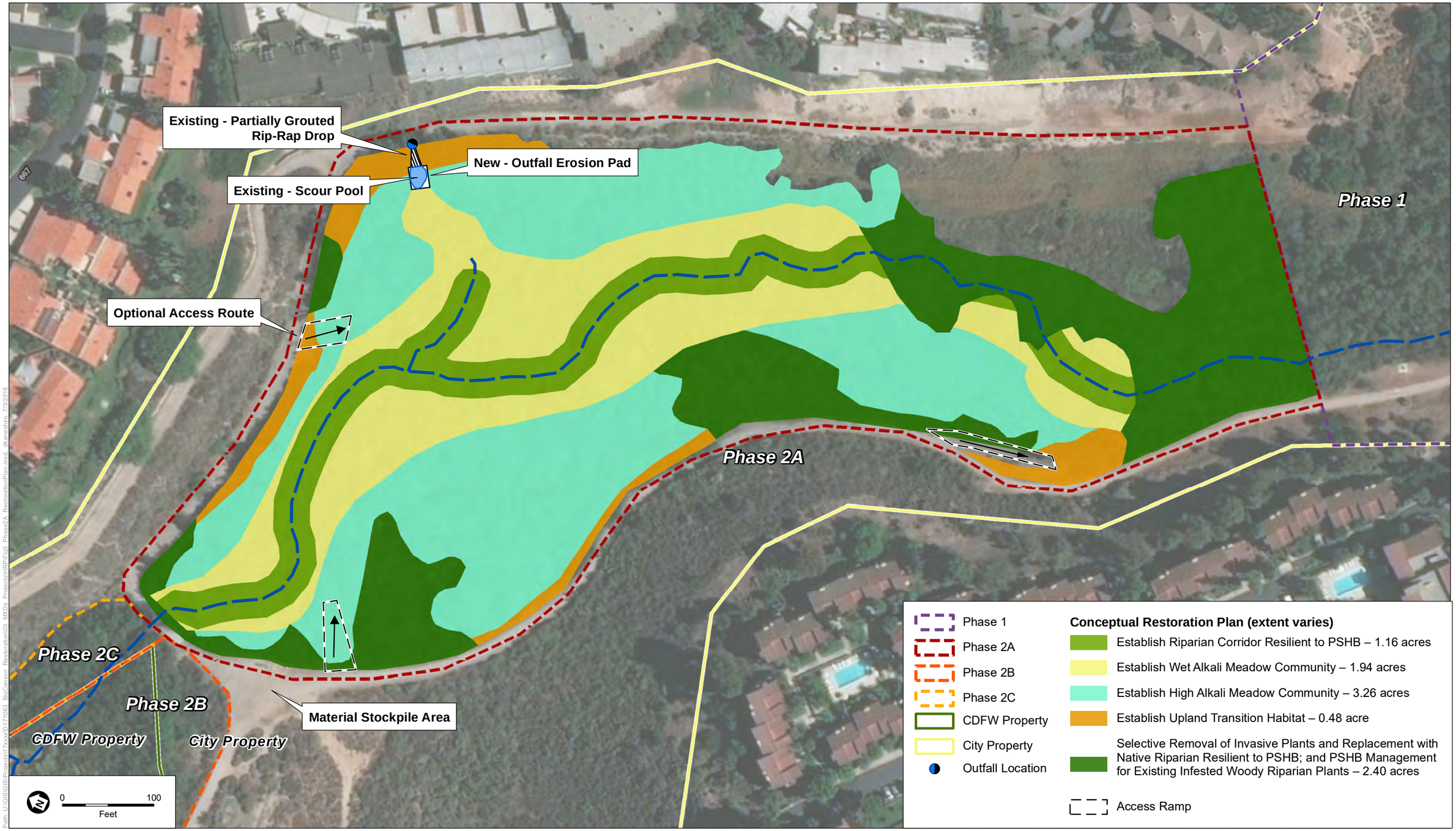

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SOURCE: ESRI; Dudek; ESA

Big Canyon Restoration - Phase 2A

Figure 5
Conceptual Restoration Plan

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woodland/pepper tree grove (0.02 ac.). Ramp placement does not constitute an additional impact but rather a different type of temporary impact within the areas that would be affected by selective removal of pepper trees. One or more of these access ramps may remain in use during the first two years of restoration implementation to facilitate access for maintenance, but would be removed, not later than the fall of the third year after installation is completed. The ramp site(s) would then be de-compacted, revegetated, and maintained for the remainder of the restoration maintenance and monitoring effort.

TABLE 1.1
MODIFICATIONS TO VEGETATION COMMUNITIES IN PHASE 2A PROJECT AREA

		Permanent Effects			
Vegetation Community	**Existing**	**Clearing and Grubbing**	**Selective Removal**	**Total Permanent Effects**	**Access Ramp Effects**
Mixed Arroyo Willow/Pepper Tree Grove	2.91	0.50	2.41	2.91	0.02
Pepper Tree Grove	6.33	6.33	-	6.33	0.07
Freshwater Marsh	0.40	-	-	-	-
Alkali Heath Marsh Alliance	0.58	-	-	-	-
Menzies' Goldenbush Scrub Alliance	0.28	-	-	-	-
Bare Ground	0.82	-	-	-	0.04
Grand Total	**11.32**	**6.83**	**2.41**	**9.24**	**0.13**

As previously noted, clearing and grubbing is planned to completely strip all exotic vegetation within 6.33 acres of pepper tree groves and 0.50 acre of mixed arroyo willow / pepper tree groves. Selective removal of exotic pepper trees and enhancement would occur within some fraction of the remaining 2.41 acres of mixed arroyo willow/pepper tree groves. The selective removal work would involve pepper tree removal and may also include substantial pruning or removal of native willow trees, if they are badly infested with Polyphagous Shot Hole Borer (PSHB) or Kuroshio Shot Hole Borer. Some incidental damage to native vegetation is also anticipated to occur in order to access, prune and remove the individual exotic specimens and infested willows.

To minimize adverse effects to native vegetation within mixed native and non-native community, selective removal work would be done manually or using small, lightweight machines to the extent feasible. However, as a conservative estimate of potential disturbance to the existing mixed arroyo willow/pepper tree grove community on-site, it is assumed that a number of patch areas amounting to from 30% to 60% of the 2.41 acres (i.e., 0.80 to 1.60 acres) in the aggregate, may be temporarily disturbed during selective removal effort. Subsequent to the selective removals and pruning, these areas would be enhanced passively as native vegetation recolonizes these areas via natural recruitment and also actively by re-seeding areas with appropriate native plants, all of which would improve the quality and health of this community, resulting in a net ecological benefit. Therefore, temporary disturbances to conduct the enhancement work would be "self-mitigating."

1.5 Temporary Effects in Jurisdictional Areas

The project has been designed to avoid permanent impacts to native riparian habitat, including federally protected wetlands, and non-wetland jurisdictional waters and no fill material will be placed within these regulated areas. However, there will be a substantial amount of clearing and grubbing to remove pepper trees and other exotic plants. Clearing and grubbing will occur mainly within the pepper tree forest (6.33 acre) but will also clear 0.50 acre of mixed arroyo willow /pepper tree, for a total of 6.83 acres. In addition, selective removal of invasive pepper trees and other exotic vegetation will also disturb surface soils over some fraction of the remaining 2.41-acres of mixed arroyo woodland / pepper tree community. Although much of the native vegetation is expected to remain intact in that area, for the purpose of identifying potential areas subject to temporary disturbance, the entire 2.41 acres of the mixed plant community is considered potentially affected. It should be noted that the jurisdictional areas, as delineated (see separate Jurisdictional Delineation Report for details), are slightly smaller than the total area subject to disturbance. For example, the total area of waters of the U.S. within the 6.83-acre area to be cleared and grubbed amounts to 6.22 acre, and the area subject to CDFW/CCC jurisdiction occupies 6.79 acres, as indicated in Table 1, below. Likewise, there is just 2.01 acres delineated as federal jurisdictional waters within the 2.41-acre area potentially subject to selective removal of exotics, while almost all the designated selective removal is considered to be within CDFW/CCC jurisdiction.

Jurisdictional areas were identified and delineated based on criteria for federal wetland and non-wetland waters of the U.S. and were also determined for CDFW which coincides with the area that meets the definition of "wetlands" applied by the California Coastal Commission (CCC). **Table 1.2**, below provides the acreage of existing jurisdictional areas within the Phase 2A site and then lists the maximum acreages of the three different jurisdictional areas that occur within the limits of proposed clearing and grubbing and where selective removal may occur. The acreages identified as potentially affected by selective removal of invasive species represent an extremely conservative estimate of potential disturbance because this estimate assumes that the entire area designated for selective removal would be affected. In reality, selective removal of pepper trees and other exotic specimens would affect only a fraction of the 2.41-acre area designated for this treatment; likely on the order of 1/3 up to as much as 2/3 of the area.

TABLE 1.2
TEMPORARY EFFECTS IN JURISDICTIONAL AREAS

	Acres[a]			
Jurisdiction Types	**Existing**	**Areas to be Cleared and Grubbed**	**Maximum Area Affected by Selective Removal**	**Total Effects**
USACE/RWQCB Wetlands	6.13	4.04	1.26	5.30
USACE/RWQCB Non-Wetland Waters	2.93	2.18	0.75	2.93
CDFW / CCC Wetland/Riparian	10.47	6.79	2.40	9.19

[a] Minor differences in the total acreage effects in jurisdictional areas compared to the total acreages of plant communities shown below in Table 10 are due to differences in the configuration of vegetation types (which sometimes extend beyond jurisdictional limits) as compared with how jurisdictional areas are delineated. However, the total areas are closely matched.

SOURCE: ESA, 2018

Also, the project proposes to restore segments of Big Canyon Creek where it is eroded and incised, and thus now partly isolated from the floodplain. Project implementation proposes to pull back the upper part of the incised banks which will allow the Creek to overflow a much shallower streambed and thus improve hydrologic connectively with the floodplain. Anticipated excavation would occur along some 660 linear feet and extend to an average of about 30 feet on each side of the channel with an average depth of 1.5 feet. Following grading and removal of pepper tree root masses in the upper 2 to 3 feet of soil, various measures would also be implemented to stabilize and then revegetate the channel and adjacent areas. For example, in some segments, Vertical Soil Lifts (VSLs), consisting of coir fabric wrapped around 1-foot thick layers of native soil material, will be stacked with live cuttings in between each VSL to stabilize discrete sections of the Creek where tree removal may leave voids large enough to compromise stream bank integrity (please see Project Design Plans, Sheets C-3, C-4, and C-5 for details). This bio-engineering technique would not "add" fill but simply replace and re-contour stream bank sections with native soil and organic materials. Pulling back and stabilizing the Creek embankments will not "fill" or raise the ground surface level but will result in a shallower yet more stable channel.

The process of clearing and grubbing the undesirable exotic vegetation and re-contouring the channel and floodplain areas to improve hydrological connectivity will also involve temporary diversion of flows during the work, but once completed, the hydrologic functions are intended to be much improved over the existing incised condition of the channel where infiltration is much more limited, particularly in areas lateral to the streambed. Thus, temporary effects to waters, wetlands, and associated riparian habitat as a result of restoration implementation are unavoidable. However, the resulting restored habitat will provide superior ecological benefits and would not result in placement of fill or any loss of federally protected jurisdictional areas.

It is important to emphasize that the proposed disturbance effects will not result in permanent fill or displace any jurisdictional wetland or non-wetland waters area. Surface soils will be disturbed during removal of invasive plants and to contour and stabilize the Creek embankments but will not increase the elevation or place permanent structures within jurisdictional limits.

1.6 CRAM Assessment

ESA conducted a Riverine CRAM assessment to evaluate the pre-project condition of Big Canyon Creek within the project site. The Assessment Area (AA) was a 25-meter wide strip within the pepper tree canopy along Big Canyon Creek.

The following attributes were assessed: Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure. A rating of A, B, C, or D was determined for each metric pursuant to the Riverine Wetlands Field Book, and then converted to a numeric value (A=12, B=9, C=6, and D=3). These numeric values were then used to calculate attribute scores and overall CRAM scores.

Table 1.3 provides a summary of the CRAM results for the project site assessment areas (AAs). The overall CRAM score for the pre-construction AA was low (64), mainly due to a very low score for the Biotic Structure attribute. Other low-scoring metrics, such as buffer width and water source, are reflective of the highly urbanized environment of the project area and cannot be changed. However, the project is expected to significantly improve the scores for all Biotic Structure metrics by greatly reducing the presence of invasive species and allowing for increased plant community diversity and structural variation in vegetation. It is recommended that a CRAM assessment be conducted after the project is complete, especially after the restoration has resulted in self-sustaining habitat conditions, to measure the functional improvement of the habitat within the project site.

TABLE 1.3
SUMMARY OF CRAM SCORES

Attributes and Metrics	Score1
Buffer and Landscape Context	**79.7**
Stream Corridor Continuity	A
Buffer Submetrics	
% of AA with Buffer	A
Average Buffer Width	C
Buffer Condition	C
Hydrology	**83.3**
Water Source	C
Channel Stability	A
Hydrologic Connectivity	A
Physical Structure	**75.0**
Structural Patch Richness	B
Topographic Complexity	B
Biotic Structure	**25**
Plant Community Submetrics	D
No. of Plant Layers	D
No. of Co-dominants	D
Percent Invasion	D
Horizontal Interspersion	D
Vertical Biotic Structure	D
Overall AA Score	**65.7**

[1] Metrics (i.e. stream corridor continuity, water source, etc.) are scored A through D with A representing the highest/best score and D representing the lowest. The metrics scores are given weighted values and used to calculate the scores for each attribute (i.e. buffer and landscape context, hydrology, etc.). Attributes are scored as a percentage out of 100.

CHAPTER 2
Goals and Benefits of the Restoration Project

The project restoration efforts will benefit the Big Canyon Nature Park through:

- Removal of Exotic and Invasive Plants and Replanting with Native Vegetation to Create a Mosaic of Coastal Habitats
- Restoration, Enhancement and Improvement in the Resiliency of Riparian Habitat
- Creation of Wet and High Alkali Meadow Habitat to Improve Resiliency of Restored Habitats
- Reduction of Creek Channel Erosion and Restoration of Connectivity between the Creek Channel and Floodplain
- Reduction of Mosquito Breeding Habitat
- Improvement in the Big Canyon Creek Water Quality and Benthic Habitat
- Encouragement in Public Access and Improvement in Educational and Recreational Opportunities

The following sections describe the types of habitat and functions and values that will be restored, enhanced and/or preserved.

2.1 Restoration Overview

Restoration in Big Canyon Phase 2A continues the process of improving the ecological functions and values in Big Canyon that began with commencement of the Phase 1 restoration in 2016/2017. The Phase 2A project involves removing invasive exotic vegetation further downstream along Big Canyon Creek, and replacing the existing pepper tree forest with appropriate native plant communities. The project will also correct the incised condition of Big Canyon Creek, stabilize the creek banks, and improve hydrology by connecting the Creek to the adjacent floodplain. The Phase 2A site will then be planted and maintained for several years to establish a mosaic of native and resilient habitats that promote biodiversity and healthy ecosystems.

2.2 Habitat Types to be Created, Restored, or Enhanced

As with Phase 1, hydrology is a primary consideration in determining appropriate replacement plant communities. High soil salinity is also an important factor. The condition of this area has been gradually modified as the result of local and regional development. Prior to development, a narrow riparian corridor occurred within the canyon that would have received ephemeral flows during and for short periods after rainfall. Due to the urban and golf course development in the watershed, Big Canyon Creek now receives perennial nuisance flow as well as high flow events during storms.

The native plant communities proposed to be established reflect consideration of the existing conditions at the site and recognition of endemic plant species and the composition of native vegetation types in natural areas around Upper Newport Bay. This plan intends to establish several habitat types along a hydrologic gradient from most mesic (wet) nearest Big Canyon Creek, consisting of riparian woodland and scrub vegetation. Progressing away from the Creek, in near adjacent areas that will frequently be wet at or near the surface, the vegetation would mimic a wet alkali meadow plant community, including highly salt tolerant species (halophytes). As elevations increase slightly, the wet alkali meadow would transition to a similar "high" alkali meadow, which will be similar in composition to the wet meadow, but will favor more drought tolerant species. Finally, the exterior of the site, which includes the slopes around the central basin, would be vegetated with a transitional upland scrub mix, similar to the existing goldenbush scrub.

2.3 Specific Functions and Values of Habitat Type(s) to be Established, Restored, Enhanced, and/or Preserved

The project proposes to restore habitat by removing invasive exotics and replanting native species, and will stabilize the creek and improve hydrology by pulling back incised steep banks and implementing erosion control measure. Removing the pepper tree forest and establishing a dense cover of native vegetation in the Phase 2A site will also reduce or eliminate the ongoing undesirable pedestrian traffic within the basin which is currently hidden from view by the exotic forest canopy. Restoration of the site will also promote and enhance educational opportunities in Big Canyon. Implementation of this HRP will result in improved flood flow attenuation, improved nutrient sequestration, and improved habitat value for wildlife.

Implementation of this HMMP will replace and improve those functions and values that were damaged or impaired by the grubbing activity by replacing native riparian vegetation, eradicating non-native species, and establishing native riparian and wetland habitat area in this sub-watershed.

The prescribed efforts will improve habitat quality by substantially reducing noxious weed cover in favor of increased cover and diversity by native vegetation. In turn, restoring dense native vegetation will restore and may improve nutrient cycling and also may improve subsurface water storage by restoring the site's natural flow retention. Establishing substantially higher percentages of native vegetative cover throughout the drainage feature as compared with the currently disturbed and overgrown condition will provide substantially higher value to wildlife in terms of forage and potential for nesting. Other intended benefits will include restored water quality levels by reestablishing natural bio-filtration effects, stabilized soils by restoring vegetation, and dissipating of energy from storm flows in the revegetated channel, increased flood storage capacity due and nutrient cycling from expanding the wetland area. In general, establishing native vegetation in the subject area is intended to:

- Provide reasonably effective erosion control to deter channel and habitat degradation;
- Enhance Beneficial Uses for this tributary to Upper Newport Bay;
- Enhance biological values (e.g., species diversity, forage and cover for wildlife), as compared with existing disturbed conditions;
- Substantially deter the further establishment and spread of noxious invasive species

2.6 Preliminary Cost Estimate

Rough estimates indicate costs could range between $1.3 and $1.8 million. However, that range is little more than a "thumbnail" estimate and does not reflect actual bids. A more accurate estimate will be prepared for the final HRP.

2.7 Project Schedule – Site Preparations and Planting

The efforts to complete all site preparations and finish initial plant installation is expected to last 5 months, beginning in fall 2019. These efforts will include exotic vegetation removal, creek restoration, irrigation installation, scour pond construction, container planting and seed application. Initial implementation will be substantially complete by March 31, 2020 to avoid working in the area during the nesting season. Planting of all restoration areas will take place once grading has been completed as identified in **Table 2.1**.

Project activities would commence with the installation of construction stormwater pollution prevention BMPs in accordance with the project Stormwater Pollution Prevention Plan (SWPPP). Following the installation of stormwater BMPs, project construction work would occur in phases for approximately five months. The following schedule presents the project phases, the activities to be completed under each phase, and the duration of the activities. Several activities will run concurrently to achieve the overall project schedule of approximately five months.

TABLE 2.1
PRELIMINARY RESTORATION SCHEDULE

Phase	Activity	Duration	Month 1				Month 2				Month 3				Month 4				Month 5			
Mobilization & Invasive Plant Removal	Site preparation – Erosion and Sediment Control	1-2 weeks																				
	Clearing and Grubbing	6-8 weeks																				
Creek Restoration	Bank and Floodplain Grading	4-6 weeks																				
	Stream Stabilization	2-3 weeks																				
	Fine Site Contouring	2-3 weeks																				
Site Replanting for Restoration and Enhancement	Soil Amendments	1-2 weeks																				
	Install Temporary Irrigation System	1-3 weeks																				
	Plantings for Riparian, Alkaline Meadow & Upland Habitats	4-6 weeks																				
Trail Enhancements	Raise viewing area and trail upgrades	2-3 weeks																				
PSHB Control Measures	Pruning, Soil Amendments, other measures	6-7 weeks																				

CHAPTER 3
Description of Proposed Restoration Site

This section describes the existing conditions in Phase 2A site and Project area.

3.1 Ownership Status

The City of Newport Beach owns the 11.32-acre Phase 2A project site planned for restoration.

3.2 Existing Functions and Values of the Revegetation Site

The project area is highly impaired by exotic and invasive plants. More than half of the project area is dominated by invasive Brazilian pepper trees, which have a negative impact on the quality of the riparian corridor and adjacent habitat zones. The remaining project area consists primarily of species that are invasive and have degraded the riparian habitat. Although wildlife may utilize these non-native invasive species, they do not offer ideal nesting or foraging opportunities for fauna that utilize riparian habitats, thus the habitat is considered biologically impaired. The stream corridor outside of the pepper trees groves is dominated by native willows that exhibit evidence of infestation by PSHB. Urbanization in the Big Canyon watershed has resulted in increased peak and sustained storm flows that have resulted in hydraulic modification of the Big Canyon Creek, and mosquito breeding habitat is present after wet weather when storm flows collect in the small scour pond at the base of the northern slope from an inflowing storm drain channel. The creek is also impacted from selenium concentrations in dry weather flows.

3.3 Existing Conditions

Focused plant and wildlife surveys were conducted within the Phase 2A project site and buffer (i.e., study area) in 2015 (Dudek 2015), as well as follow-up reconnaissance surveys and soil testing in March 2018 (ESA 2018). In addition to surveys to establish baseline conditions, studies have been conducted to assess the feasibility to restore riparian habitat, and provide information to support this conceptual design. A brief summary of the results of these surveys and studies is provided below.

3.3.1 Soils

The study area is generally quite disturbed and the quality of soils throughout the study area is generally poor and exhibits relatively high salinity as described below, based on soil testing conducted in 2018. The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) soils maps identified three soil types within the Phase 2Aarea: Cieneba sandy loam along the northeast side, tidal flats through most of the middle section, and Anaheim clay

loam along some of the southwest side and intruding a bit north into the site. The USDA mapping of the tidal flats appears to reflect remnant map units from before the time that the hydrology of the system was altered or may just not be accurate, since the area is not subject to tidal influence, and may not have been at any time in recent history. Placement of the grade structure along the northwest end of the site, where the trail passes between Phase 2A and Phases 2B and 2C downstream, established the current outflow elevation for Phase 2A (about 22' to 23' above mean sea level (amsl), according to current topographic mapping). It appears that locally derived sediment has been deposited as alluvium within the shallow, flat area behind the grade break within Phase 2A. The vegetation in Phase 2A is not (and has not been) subject to tidal influence but still exhibits high salt content in the soil. Despite being altered, the soil exhibited hydric characteristics throughout much of the relatively flat area on both sides of Big Canyon Creek.

Soil Sample Data

Soil samples were collected from surface (0" to 12") and subsurface (12" to 24") materials in Phase 2A at two locations under the Brazilian pepper tree canopy, which will be restored, and at one location at the edge of the freshwater marsh and the existing alkali heath habitat in Phase 2A which will not be disturbed by the Project. Samples under the pepper tree canopy are useful to compare to conditions in existing native marsh and alkali meadow habitat which is considered to be a local reference site since it supports existing habitat.

Soil test results showed:

- Organic matter is sufficient as compared to the reference site. However, if too much surface material is removed, organic matter inputs may be required to restore soil's nutrient cycling capacity.

- Sodium Adsorption Ratio (SAR), and sodium (Na) levels are high in all restoration and reference samples but are still suitable for salt-tolerant species. It would likely be difficult to reduce these levels to a great extent although some reduction can be achieved.

- Chloride (Cl-, sulfur (S) and iron (Fe) levels are indicative of anaerobic conditions. Soils had redoximorphic features, indicating prolonged saturation, leading to anaerobic conditions when oxygen is depleted.

- Samples contained manganese (Mn), zinc (Zn), lead (Pb), and magnesium (Mg) at levels above what is widely tolerated by most plants. Although selenium (Se) in one sample appeared relatively high, it is not known whether that may be a potentially toxic level for plants. It is recommended to amend soils to encourage adsorption of these metals through application of organic and inorganic inputs as noted below and in the Project Specifications.

- Potassium (K), as found on cation exchange sites is lower than is desired and may indicate a potassium deficiency. This is likely a result of high Mg levels (divalent cation). Additional potassium inputs are anticipated to be appropriate.

3.3.2 Vegetation

Throughout much of the proposed project, the vegetation reflects the extensive historical site disturbance from cattle grazing, agricultural activities and introduction of perennial dry weather flows in a historically intermittent coastal creek. The invasion and establishment of invasive trees and understory vegetation has heavily impacted the southern riparian forest habitat. A total of 194 species of invasive and non-native grasses, forbs, and trees have been identified within the Big Canyon Nature Park (Dudek 2015). The non-native Brazilian pepper tree (*Schinus terebinthifolius*) dominates the majority of the project area, while other portions are comprised of native vegetation or intermixed communities with both native and non-native species. As a result, portions of the project are comprised of a mosaic of different types, and are characterized by varying levels of disturbance, and status of succession, rather than distinct, well-defined habitat types.

Current vegetation communities are shown on **Figure 3** based on surveys conducted in March 2018. Acreages of each vegetation community in the study area are listed earlier in this plan on **Table 1.1.** The site is dominated by extensive pepper tree groves with dense canopies with little or no understory.

Big Canyon Creek flows through these pepper tree groves and the roots of these trees extend along the creek banks that provide stabilization where the channel is more incised and the top of the bank is greater than two feet from the bed. In the upper portion of the project, the existing conditions include a mixture of riparian arroyo willow habitat mixed with pepper trees and other invasive plants. The project area also includes freshwater marsh and alkali heath community and coastal sage scrub habitat containing Menzies's goldenbush as a dominant element. More detailed descriptions of these vegetation communities are presented in the Biological Technical Report (ESA, 2018).

Two special-status plant species, southern tarplant and California boxthorn, were observed in the study area during surveys conducted by Dudek (2015) and confirmed by ESA during the March 26, 2018 site visit. Neither of these species was identified within the Phase 2A project area although several specimens of California boxthorn occur along the pedestrian trail just north of the restoration site where they appear to have been intentionally planted.

3.3.3 Wildlife (including Sensitive Species)

Although much of the study area is composed of non-native pepper tree forest, a variety of wildlife species were observed within the larger study area. Coastal California gnatcatcher (Federally Threatened [FT], California Species of Special Concern [SC]) was observed within the study area (outside of the project site to the west) during ESA's March 2018 site visit. In addition, during 2015 focused surveys, Dudek biologists observed one pair of coastal California gnatcatchers and potentially one separate individual coastal California gnatcatcher within the southwestern portion of the study area (also outside of the project site to the west) in the same vicinity as the location detected during the 2018 site visit (Dudek 2015). Cooper's hawk (CDFW Watch List [WL]) and yellow warbler (SC, Bird of Conservation Concern [BCC]) were detected in the riparian habitat within the study area by ESA during the 2015 biological surveys. Yellow

warbler, yellow-breasted chat (SC), and white-tailed kite (State Fully Protected [FP]) were also observed within the study area by Dudek during their 2015 surveys, of which one yellow warbler observed at the southern boundary of the project site within the study area.

3.4 Present and Proposed Uses of the Restoration Area

The 11.32-acre Phase 2A habitat restoration site is part of the 60-acre Big Canyon Nature Park. This area is recognized and zoned as natural open space and no future land use change is anticipated.

3.5 Present and Proposed Use of Adjacent Areas

The project is situated within a wide canyon that flows to Newport Bay Ecological Area. The surrounding hillsides to the north and south contain residential development. To the east, on the opposite side of Jamboree, is a private golf course. No land use changes to adjacent areas are anticipated.

3.6 Reference Sites

Vegetation communities anticipated to flourish within the restoration sites, including species composition and density of planting/seeding, were selected for restoration based on an awareness of the site's hydrology and high soil salinity, and some familiarity with native riparian habitat in the vicinity, and in the adjacent Phase 1 site. It is also important to recognize that the condition of this area has been gradually modified as the result of local and regional development. For example, whereas Big Canyon Creek was historically an ephemeral stream, it now receives perennial nuisance flow from the developed areas and the golf course upstream as well as high flow events during storms. The native plant communities proposed to be established reflect consideration of the existing conditions at the site and recognition of endemic plant species and the composition of native vegetation types in natural areas around Upper Newport Bay.

One potentially appropriate natural reference site was located along and adjacent to a small creek located just northwest of the terminus of Galaxy Drive, and east from the intersection of Santiago Drive and Irvine Avenue on the northwest side of Upper Newport Bay. The small creek supports a willow riparian thicket with an alkali meadow community adjacent. Just northwest of the Creek are patches of alkali meadow dominated by salt grass and spiny rush along with several other native species common to alkali meadow habitats. This area is easily accessible from and existing trail leading down from the end of Galaxy Drive. Although this natural area does not contain as many species as are proposed for the riparian corridor and alkali meadow plant communities in Phase 2A, it provides a good reference for total native cover and health of existing vegetation.

CHAPTER 4
Implementation Plan

This section addresses the implementation of habitat restoration activities to: (1) restore riparian habitat (2) restore and create a mosaic of native and sustainable habitats, 3) stabilize the creek and floodplain, and (4) enhance public access and education within the Big Canyon Nature Park. Implementation of habitat revegetation activities will involve removal of invasive, fine-grading and soil redistribution, temporary irrigation, active seeding and planting, monitoring, and short- and long-term maintenance.

4.1 Rationale for Expecting Implementation Success

Hydrology is generally considered the most important variable driving riparian habitat development. The stream stabilization and floodplain restoration area has been considered and designed using a hydrology/hydraulic model. Modeling indicated that the majority of the Phase 2A site would be inundated by a 2-year storm event. Existing perennial nuisance flows are substantial and plans to better connect the Creek to the floodplain will improve lateral saturation across much of the site. Also, after the pepper tree root masses are removed and the floodplain is fine graded to fill in depressions and smooth out the pockmarked surface left after root removal, the final elevations in the area where riparian and alkali meadow habitat are proposed will roughly match the existing riparian area. The ultimate floodplain will be relatively flat although it will exhibit a natural gradient from upstream to downstream to the existing grade control where the outlet leads under the trail crossing between Phase 2A and Phases 2B and 2C. Although the roots of seedlings and young plants may not immediately contact the zone of saturation below the soil surface the first year or so, supplemental irrigation will be provided to help establish plant root systems so that they can eventually reach the zone where soils are frequently saturated, particularly during the wet season.

The habitat restoration areas are expected to succeed in terms of providing improved value to wildlife due to the elimination of the above and below-ground invasive plant biomass as well as invasive plant seed source, and active establishment of a diverse assemblage of native plants in the site. Plants species were selected with consideration of the existing high soil salinity and soil amendments were selected to help ameliorate potentially toxic conditions. Also, use of a variety of native woody and non-woody riparian plants as well as implementation of soil amendments and adaptive management is intended to promote resilience to exotic pests, particularly PSHB.

4.2 Contractor Requirements

4.2.1 Restoration Ecologist

Overall supervision of the installation, maintenance, and monitoring of this restoration project shall be the responsibility of a qualified Restoration Ecologist. The Restoration Ecologist must have a degree in biology or related field and possess a minimum of five years of documented habitat restoration experience in Southern California and documented restoration success.

The Restoration Ecologist shall educate all participants with regard to restoration goals and requirements and directly oversee grading, soil amendments, soil contouring, planting and seeding, irrigation and BMP installation, and maintenance during the project. In addition, the Restoration Ecologist shall regularly monitor the site, evaluate progress, provide recommendations for maintenance, and prepare annual progress monitoring reports. The Restoration Ecologist shall notify the Contractor, the City and NBC of any significant issues that may require attention.

4.2.2 Floodplain Grading Contractor

A qualified grading contractor, with experience in fine grading, will be retained to perform both mass and fine grading of the Big Canyon Creek banks and adjacent floodplain as part of the restoration effort. This grading contractor must be able to read and implement grading plans, establish natural contours, provide an on-site survey to establish and confirm elevations, and be able to work under the direction of the Restoration Ecologist to address any changes on-site approved by the City and Restoration Ecologist that may be required.

4.2.3 Installation/Maintenance Restoration Contractor

The habitat installation and maintenance Contractor (Contractor) must have documented native habitat restoration experience, work effectively in coordination with the Restoration Ecologist, be responsible for completion of all soil amendments, planting and seeding, BMP installation, invasive plant control, temporary irrigation, and maintenance of restoration and habitat mitigation areas. A bond or line of credit may be required to insure that the project is completed successfully. The restoration installation and post-restoration maintenance may be conducted by the same, or by a different Contractor; however, the Contractor must have the qualifications described herein.

The Contractor shall be experienced with the installation and maintenance of native plant habitat, specifically riparian habitat, and be knowledgeable of the identification of native plants versus invasive plants. The maintenance Contractor shall be responsible for site preparation and soil testing, soil amendment application, planting and seeding, installation of an irrigation system and operation (determining watering schedules in coordination with the Restoration Ecologist), invasive plant control, trash removal, watering, signage and access control maintenance, dead plant replacement and re-seeding and other potential remedial measures. If significant trespassing and vandalism occurs that damages portions of the mitigation areas at no fault to the Contractor, the affected areas shall be restored through funding provided by the Responsible Party or its successors and/or assigns. All activities conducted by the Contractor shall be seasonally

appropriate and conducted in coordination with the Restoration Ecologist. The Contractor shall meet the Restoration Ecologist at the site when requested, and perform all checklist items in a timely manner, as directed by the Restoration Ecologist to accomplish the required activities.

4.3 Financial Assurances

As this restoration project is primarily dependent on grant funding, financial assurances may not be provided as with a for-profit mitigation project. If funding is not sufficient to match reasonable bids by contractors to perform the prescribed services, this plan may be refined or the plans may be phased and a subsequent proposal for restoration would be prepared and submitted describing the modified project plan.

4.4 Site Preparation

4.4.1 Contractor Education

All grading and landscape contractors participating in the habitat mitigation will meet at the site with the Restoration Ecologist to review plans, site information, and contractor responsibilities before beginning work in the area. Specifically, the Restoration Ecologist will review requirements of the plan that concern the Contractor, including site grading, soil amendments, site protection, inspections, landscape procedures and guarantees. The Restoration Ecologist will have final supervisory control over field installation and will have the authority to make changes in the field as deemed necessary to meet project goals and requirements.

4.4.2 Site Protection

Biologically sensitive areas will be marked off prior to project implementation and periodically monitored during periods of intensive activity (e.g., exotic removal, earthwork, soil amendment). Water quality protection during construction will be monitored based on a pre-construction Water Quality Management Plan (WQMP), developed prior to construction.

Native vegetation not intended to be impacted by implementation activities will be fenced or flagged during implementation of exotic removals, earthwork, and other site preparations.

If at any time workers or machinery damage native vegetation or streambed/wetland habitat outside the limits of work, the Contractor will bear the full cost of restoring damage beyond the designated limits of work, as well as the costs for monitoring the success of the supplemental revegetation and other required measures.

4.4.3 Site Grading

Approximately 6.83 acres would be disturbed for clearing/grubbing, grading, and re-planting activities. An additional 2.41 acres will be subject to selective removal of exotic trees and non-native vegetation and large patches cleared in this area would also be seeded. Earthwork is anticipated to pull back the creek channel banks that have been incised to achieve improved connectivity between the channel and floodplain. Materials pulled back from the banks will be used to fill in depressions within the floodplain created by the removal of root systems from the

extensive pepper tree groves. Fine-grading of the floodplain will be conducted to fill in depressions and create a gentle continuous slope that connects the channel to the floodplain. These fine-grading activities will be limited to the channel segments within the pepper tree removal areas and where the channel bottom of Big Canyon Creek is more than two feet below the top of bank. The total earthwork cut volume is anticipated to be approximately 2,500-5,500 cubic yards. If the excavated material cannot be fully used to fill in depressions and fine-contouring, a limited amount of less than 500-1,000 cubic yards may be used in upland areas around the perimeter of Phase 2A. A limited amount (<250 cubic yards) of suitable material may also be used on foot-traffic only trails. Please see separate plans and specifications for details regarding grading and creek bank stabilization activities.

There are up to three potential excavations and grading equipment access points as shown on **Figure 5**. Temporary stockpiling of soils will be within the pepper tree removal areas close to the upland areas (away from potential flooding and migration of sediment into the creek) that will receive earthwork materials for filling in depressions and fine-contouring on both the southern and northern sides of this area. Temporary stockpile areas will include sediment and erosion control measures per the SWPPP.

Construction activities will be coordinated with erosion control and surface water diversion to prevent soils loss, channel instability, discontinuity of water supply during dry weather season, and flood damages during major wet season events. A Water Quality Management Plan (WQMP) will be developed as part of the Construction SWPPP to be implemented from the onset of the construction to post construction.

4.4.5 Removal and Processing Exotic or Infested Trees

A primary focus of the restoration process will be removal of large Brazilian pepper trees. 6.33 acres on site consisting of nearly pure stands of pepper trees will be entirely cleared and grubbed of pepper trees. Another 0.5 acres containing some elements of an arroyo willow woodland community along with the dominant pepper trees will also be completely cleared to provide access between the two largest clearing areas and for access to the Creek to pull back the upper banks and stabilize the Creek. Finally, pepper trees and other exotic vegetation will be selectively removed within patches amounting to a total of 2.41 acres. Although pepper trees are common to dominant in the selective removal areas, efforts will be made to preserve native vegetation intact and only remove the exotic specimens.

In the selective removal areas, willow trees exhibiting significant infestation by PSHB will also be cut and removed. Infested branches and limbs may be set aside and solarized (according to specifications provide by UC Riverside) to destroy PSHB and Fusarium fungus), on site for later use as mulch, provided the solarization is demonstrated to be effective.

In general, the tree removal will involve cutting the pepper trees (and other exotic tree specimens) down and processing materials progressively, working from patch to patch until all pepper trees and other exotic trees are cut and all branches, foliage, trunks and root masses are removed and/or processed. The lower trunks and root masses can be chipped and the resultant material may be suitable as mulch for use on site. However, foliage and upper branches of the pepper trees must

be removed from the site including flowers, fruit, and seeds due to the potentially detrimental effects of the oils associated with the foliage.

It is recommended that the upper branches and foliage be processed through a shredder for ease of hauling and to save space. As each patch is cleared of trees, all seed materials and foliar debris must be raked up and removed for disposal to reduce re-seeding and minimize the detrimental effects of the oils. All this material should be removed from the site and must not be used as on-site compost.

Since Brazilian pepper trees readily re-sprout from the cut roots, both the aboveground biomass as well as the upper mass of each tree's root structure will be physically removed to the extent practical, generally down to about 3 feet below the surface. It will not be necessary to "chase" long roots that extend more than 10 to 15 feet laterally into the soil since subsequent maintenance will remove or treat "runners" that emerge from any roots left in place. The objective will be to remove the entire above ground portion of each tree and pull out the bulk of each central root mass while avoiding removing large amounts of soil or exacerbating erosion and over-excavating material beyond 3 feet below the ground surface.

Since the lower trunks and roots don't produce much oil, trunks and root masses may be chipped in a stump grinder or tub grinder for use on site as wood chip mulch for top dressing over the site after plants are installed and seed is applied.

Brazilian pepper trees are not known to be a reproductive host for PSHB but may still be subject to infestation. Therefore, prior to tree removal the trees shall be inspected for the PSHB presence including signs of entry into the trunk. This invasive beetle carries three pathogenic fungi: *Fusarium euwallaceae*, *Graphium euwallacea*, and *Paracremonium pembeum* that may cause die-back and can result in death of the tree. If the tree is free of the PSHB, as noted above, the trunks and roots may be chipped and stored for spreading over the site after planting is completed and spread in place. Infested trees shall be disposed of at an approved landfill offsite.

Several other exotic tree species are present in small numbers and will also be removed, including Mexican fan palm (*Washington robusta*), and shamel ash (*Fraxinus uhdei*). In addition, other exotic trees would also be removed, if present, including any specimens of eucalyptus (*Eucalyptus* spp.), Canary Island palm (*Phoenix canariensis*), Fig (*Ficus carica*), or goldenrain tree (*Koelreuteria paniculata*).

4.4.6 Soil Preparation and Amendments

De-compaction

Following exotic removals, demobilization of equipment and completion of off-site hauling activities, and subsequent to or concurrent with fine grading activities, areas indicating or suspected of exhibiting compaction shall be de-compacted to a minimum depth of 18 inches. Decompaction should occur prior to application of soil amendments as the amendments are to be incorporated into the top 6 inches of soil rather than to greater depths.

Humic Acid with Silicon Amendment

Soil shall be amended with humic acid with silicon derived from mined Leonardite, and processed utilizing either cold extraction or potassium hydroxide. Sodium hydroxide extracted humic acid or coal, peat based or synthetic humic acid are not acceptable. Non-plant food ingredients shall include a minimum 50% humic acid and 10% silicic acid. BioAg's Humisolve-ION14™ or equivalent shall be utilized.

Humic acid with silicon product shall be applied and incorporated into the top 6 inches of soil at a rate of 50 pounds per acre on the revegetated areas following completion of exotic removals, bank stabilization, and fine grading.

Chitin/Chitosan Application

Chitin and Chitosan (C&C) shall be directly applied to the soil concurrent with the humic acid with silicon amendment and mycorrhizal inoculum, and incorporated into the top 6 inches of soil at a rate of 250 pounds per acre. This includes all areas where exotic removal has occurred, including broadcast application.

For application in small patch areas where selective removal of exotics is completed, C&C shall be broadcasted and raked into the surface along with the Humic Acid with Silicon and Mycorrhizal Inoculum.

Compost Amendment

An 80/20 compost/vermicompost blend will be spread over the restoration surface area per the application rates provided below. This application will provide some additional humic acid that will help tie up excess salt and metals in the soil and add microbial activity necessary for successful plant establishment and growth. Compost blend should be applied on top of the humic acid with silicon and Chitin and Chitosan amendment application, then all materials mixed into the top 6 inches of the surface layer prior to planting and hydroseeding.

Compost / vermicompost application rates shall be as follows:

- Riparian Corridor areas - 35 cubic yards/acre
- Wet and High Alkali Meadow - 35 cubic yards per acre
- Upland Transition areas - 10 cubic yards per acre.

The compost shall be processed or completed to reduce non-native plant seeds and deleterious material; and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plants or animals. Other deleterious materials such as plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.

Mycorrhizal Inoculum

Site grading will expose underlying soils that likely do not have an established mycorrhizal colony; the extensive disturbance of surface materials during site preparations will also disrupt

any mycorrhizal activity already present. Mycorrhizae in the root zone of native plants contribute to the ability of these plants to fix nitrogen, facilitate uptake of phosphorous from the soil, and increase absorption of soil moisture. Therefore, mycorrhizal inoculum shall be applied to all restoration areas to amend soils. Mycorrhizal inoculum shall be broadcast applied to the soil concurrent with the humic acid with silicon amendment and C&C, and incorporated into the top 6 inches of soil at a rate of 60 pounds per acre.

Mycorrhizal Inoculum shall be and ecto-endomycorrhizal mycorrhizal inoculum. FungiPerfecti's MycoGrow Endo-Eco Soluble Mix or approved equivalents are prescribed. Mycorrhizae shall not be stored in direct sun or at temperatures greater than 90°F or less than 32°F. Mycorrhizae that have become wet, moldy, or exposed to extreme temperatures shall be rejected or discarded.

4.5 Planting Plan and Specifications

The habitat restoration planned for this Project will incorporate a combination of active seeding and planting. All restoration areas will be seeded using standard horticultural practices, as outlined below. Target species were chosen based on species that are early successional species and are known to readily germinate under disturbed conditions. Substitutions to the seed list (adjustments in quantities and/or species) may be allowed with the approval of the Project Restoration Ecologist.

The landscape contractor is expected to secure seeds in advance of the anticipated seeding dates. If the landscape contractor is unable to obtain the specified species at the time of seeding, substitute species will be considered at the discretion of the Restoration Ecologist, who may make necessary substitutions to the seed list depending on availability, biological appropriateness, and/or variability of the site conditions.

4.5.1 Landscape Installation Contractor Responsibilities

The landscape contractor will be responsible for implementing this Plan and performing landscape maintenance for 120 days after installation and until the mitigation areas meet their performance criteria. Maintenance tasks will include re-seeding areas that have not germinated adequately, and irrigation and weeding to support successful plant establishment.

4.5.2 Seed and Plant Mixes

Revegetation will be performed using species found within the immediate project vicinity to mimic natural habitat compositions and conditions. The proposed seed lists for the revegetation and mitigation areas are presented in **Tables 4.1 through 4.8**.

TABLE 4.1
RIPARIAN CORRIDOR CONTAINER PLANTS / LIVE STAKES - SOUTHERN WILLOW SCRUB

Scientific Name	Common Name	Size	Life Form	Spacing and Coverage	Plants/Acre
Baccharis salicifolia	mule fat	live stake	Shrub	6' o. c. (8%)	120
Baccharis salicina	willow baccharis	1 gal.	Shrub	6' o. c. (8%)	120
Ribes speciosum	fuchsia-flowering gooseberry	1 gal.	Shrub	4' o. c. (4%)	140
Rosa californica	California rose	4" pots	Herb	3' o. c. (4%)	240
Salix exigua	sandbar willow	1 gal.	Shrub	6' o. c. (8%)	120
Salix lasiolepis	arroyo willow	live stakes	Tree	8' o. c. (12%)	100
Sambucus nigra ssp. *caerulaea*	blue elderberry	1 gal.	Tall shrub	8' o. c. (10%)	84
Platanus racemosa	western sycamore	5 gal.	Tree	12' o. c. (6%)	24
Populus fremontii	Fremont's cottonwood	5 gal.	Tree	12' o. c. (6%)	24
Salix gooddiingii	black willow	live stakes	Tree	12' o. c. (6%)	24
			Totals	**(72%)**	**1,245**

TABLE 4.2
RIPARIAN CORRIDOR SEED MIX – SOUTHERN WILLOW SCRUB

Species	Common Name	Life Form	Application Rate Bulk Lbs / Acre	Purity/Germination
Ambrosia psilostachya	western ragweed	Herb	3.0	TBD
Anemopsis californica	yerba mansa	Herb	3.0	TBD
Artemisia douglasiana	Mugwort	Forb	3.0	TBD
Artemisia dracunculus	Tarragon	Shrub	3.0	TBD
Baccharis salicifolia	mule fat	Shrub	2.0	TBD
Bromus carinatus	Cal. brome grass	Grass	4.0	TBD
Eleocharis palustris	common spikerush	Grass-like	1.0	TBD
Elymus triticoides	beardless wild rye	Grass	4.0	TBD
Muhlenbergia rigens	Deergrass	Grass	2.0	TBD
Plantago erecta	Cal. plantain	Herb	8.0	TBD
Pluchea odorata	salt marsh fleabane	Herb	2.0	TBD
		Total	**35.0**	

TABLE 4.3
WET ALKALI MEADOW HABITAT CONTAINER PLANTS

Scientific Name	Common Name	Size	Life Form	Spacing and Coverage	Plants/Acre
Anemopsis californica	yerba mansa	1 gal.	Herb	2' o. c. (5%)	700
Anthrocnemum subterminale	Parish's glasswort	liners	Succulent	2' o. c. (4%)	550
Baccharis salina	willow baccharis	1 gal.	Shrub	6' o. c. (6%)	90
Distichlis spicata	saltgrass	liners	Grass	2' o. c. (10%)	1,400
Frankenia salina	alkali heath	liners	Herb	2' o. c. (8%)	1,100
Jaumea carnosa	fleshy jaumea	D-40	Succulent	2' o. c. (5%)	700
Juncus acutus ssp. *leopoldii*	spiny rush	1 gal.	Large herb	6' o. c. (15%)	230
Monanthochloe littoralis	shoregrass	liners	Grass	2' o. c. (6%)	830
Salicornia pacifica	pickleweed	liners	Succulent	2' o. c. (14%)	1,940
Suaeda taxifolia	Woolly sea blite	1 gal.	Succulent	3' o. c. (3%)	180
			Totals	73%	**7,720**

TABLE 4.4

WET ALKALI MEADOW SEED MIX

Species	Common Name	Life Form	Application Rate Bulk Lbs / Acre	Purity/Germination*
Amblyopappus pusillus	dwarf coastweed	Herb	TBD	TBD
Anemopsis californica	yerba mansa	Herb	2.0	TBD
Artemisia douglasiana	mugwort	Herb	2.0	TBD
Cressa truxillensis	alkali weed	Herb	4.0	TBD
Distichlis spicata	saltgrass	Grass	3.0	TBD
Eleocharis palustris	common spikerush1	Grass	1.0	TBD
Elymus triticoides	beardless wild rye	Grass	3.0	TBD
Frankenia salina	alkali heath	Herb	4.0	TBD
Heliotropium curassavicum	salt heliotrope	Herb	3.0	TBD
Lasthenia glabrata	goldfields	Herb	2.0	TBD
Plantago erecta	California plantain	Herb	10.0	TBD
Pluchea odorata	salt marsh fleabane	Herb	2.0	TBD
		Total	**> 36.0**	

TABLE 4.5
HIGH ALKALI MEADOW HABITAT CONTAINER PLANTS

Scientific Name	Common Name	Size	Life Form	Spacing and Coverage	Plants/Acre
Baccharis pilularis	coyote brush	1 gal.	Shrub	4’ o. c. (6%)	210
Camissoniopsis cheiranthifolia	beach evening primrose	1 gal.	Shrub	4’ o. c. (8%)	280
Distichlis spicata	saltgrass	liners	Grass	2’ o. c. (12%)	1,660
Frankenia salina	alkali heath	liners	Herb	2’ o. c. (16%)	2,220
Juncus acutus ssp. leopoldii	spiny rush	1 gal.	Large herb	6’ o. c. (6%)	90
Limonium californicum	sea lavendar	1 gal.	Herb	3’ o. c. (3%)	190
Sambucus nigra ssp. *caerulaea*	blue elderberry	1 gal.	Tall shrub	6’ o. c. (6%)	90
Sesuvium veruccosum	western sea-purslane	liners	Succulent	2’ o. c. (4%)	550
Suaeda taxifolia	woolly sea blite	1 gal.	Succulent	3’ o. c. (3%)	180
			Totals	64%	**5,470**

TABLE 4.6
HIGH ALKALI MEADOW SEED MIX

Species	Common Name	Life Form	Application Rate Bulk Lbs / Acre	Purity/Germination
Ambrosia psilostachya	western ragweed	Forb	3.0	TBD
Amsinckia menziesii	small-flowered fiddleneck	Herb	2.0	TBD
Artemisia douglasiana	mugwort	Shrub	2.0	TBD
Cressa truxillensis	alkali weed	Herb	4.0	TBD
Distichlis spicata	saltgrass	Grass	3.0	TBD
Elymus triticoides	beardless wild rye	Grass	3.0	TBD
Festuca microstachys	small fescue	Grass	3.0	TBd
Frankenia salina	alkali heath	Herb	4.0	TBD
Heliotropium curassavicum	salt heliotrope	Herb	4.0	TBD
Lasthenia glabrata	goldfields	Herb	2.0	TBD
Limonium californicum	sea lavendar	Herb	2.0	TBD
Malvella leprosa	alkali mallow	Herb	5.0	TBD
Plantago erecta	California plantain	Herb	8.0	TBD
		Total	**45.0**	

TABLE 4.7
UPLAND TRANSITION HABITAT CONTAINER PLANTS

Scientific Name	Common Name	Size	Life Form	Spacing and Coverage	Plants/Acre
Atriplex lentiformis	quailbush	1 gal.	shrub	6′ o. c. (6%)	84
Atriplex canescens	four-winged saltbush	1 gal.	shrub	6′ o. c. (6%)	84
Baccharis pilularis	coyote brush	1 gal.	shrub	4′ o. c. (14%)	480
Heteromeles arbutifolia	toyon	1 gal.	large shrub	8′ o. c. (10%)	88
Malosma laurina	laurel sumac	1 gal.	large shrub	8′ o. c. (10%)	88
Peritoma arborea	bladderpod	1 gal.	shrub	6′ o. c. (8%)	128
Rhus integrifolia	lemonadeberry	1 gal.	large shrub	8′ o. c. (8%)	72
			Totals	62 %	**1,024**

TABLE 4.8
UPLAND TRANSITION HABITAT SEED MIX

Species	Common Name	Life Form	Application Rate Bulk Lbs / Acre	Purity/Germination
Acmispon glaber	deerweed	Shrub	2.5	TBD
Artemisia californica	California sagebrush	Shrub	3	TBD
Encelia californica	California encelia	Shrub	2	TBD
Eriogonum fasciculatum	California buckwheat	Shrub	3	TBD
Eriophyllum confertiflorum	golden yarrow	Herb	2	TBD
Isocoma menziesii var. *vernonioides*	coast goldenbush	Shrub	2.5	TBD
Lasthenia glabrata	goldfields	Herb	2	TBD
Lupinus bicolor	miniature lupine	Herb	3	TBD
Plantago erecta	Cal. plantain	Herb	8	TBD
Stipa pulchra	purple needlegrass	Bunchgrass	6	TBD
Festuca microstachys	small fescue	Grass	4	TBD
	Total		**38.0**	

4.5.3 Seed Material Sources

Seeds will be procured from a native seed-supply company and shall originate from coastal areas of Orange, Los Angeles, or San Diego Counties, with the exception of the more common species that are regionally ubiquitous (e.g., plantain, goldfields, purple needlegrass). Special collections may be required for several species that are not otherwise available from seed suppliers. Assistance with locating healthy source populations for special collections is available from the Newport Bay Conservancy and Irvine Ranch Conservancy staff. Also, Dr. Peter Bowler (University of California, Irvine) and Ron Vanderhoff, a local botanical expert, who both serve on the Technical Advisory Committee for the Phase 2A project, may assist with locating seed sources for certain species that are not available from the commercial seed supplier or for directing custom collections by seed suppliers to obtain appropriate material.

As noted above, herbaceous species and grasses that have a widespread distribution are more likely to be genetically homogeneous from region to region. Therefore, seed derived from local origin are not an important consideration for such species. Therefore, seed for native grass and most wildflower species that occur in Southern California may be procured from commercial sources, unless local sources are readily available. If seed for certain species is unavailable in the local area, the Restoration Ecologist will consider whether other available sources in the region are appropriate or whether more distant sources may be acceptable.

If the Contractor is unable to obtain the specified species at the time of seeding, substitute species will be considered at the discretion of the Restoration Ecologist, who will determine if species substitutions are ecologically appropriate.

4.5.5 Timing of Site Preparation and Installation

Site preparation and hydroseeding shall be seasonally timed to capture winter/spring rainfall to the extent practical. Seeding of material is recommended to occur just prior to the rainy season (October – November) and no later than mid-February. Establishment maintenance will begin immediately following seeding and planting.

4.5.6 Seed Installation Specifications

The success of the overall habitat restoration areas hinges on proper implementation of this plan, including completion of Contractor responsibilities, proper site preparation, soil amendments, timing of seeding, site protection, general seeding specifications, substitutions, sources, and guarantees.

Seeding & Hydromulching Application

Specified native seed mixes are recommended to be applied using the following hydroseed techniques in the various plant community areas. Seeds shall be supplied on the basis of bulk weight, percent purity, and percent germination from a qualified Southern California native seed supplier. The native seed mix, together with liquid humic acid, compost tea, mycorrhizal inoculum, and mulch shall be hydroseeded using a two-step technique as follows:

Step One

- 2 gallons per acre liquid humic acid – applied directly in water and mixed before addition of all other materials
- 30 gallons/acre compost tea
- Specified seed mix per habitat type

Step Two

- 1 gallon per acre liquid humic acid – applied directly in water and mixed before addition of all other materials
- 2,000 lb./ac of virgin cellulose wood fiber
- 160 lb./ac organic soil stabilizer (Ecology Control or equivalent product)

Humic acid shall be applied to the water in the tank and mixed well prior to the addition of all other ingredients. Compost tea consists of liquefied worm casting concentrate. "Worm Juice Plus" from Earthworm Soil Factory in Chico, CA, or equivalent shall be used for the compost tea. Once the seed, compost tea, and compost are added to the mixing tank, application must be made within 1 hour. If the temperatures will exceed 90°Fahrenheit, step two must be applied within 3 hours of the first step.

Containerized & Live Staking Plant Inspection

Prior to delivery to the site, the Restoration Ecologist shall inspect container plants at the nursery and live stake materials (to be used as cuttings) at the harvest site for PSHB. Plant materials exhibiting signs of infestation will not be used.

Planting Technique

The lay-out of container plants will consist of groups of plants distributed in natural groupings. Spacing of slope plants within the groups will follow the specifications presented in the prepared landscape plan for containerized plants. Planting sites will be marked on the site using different colored pin flags under the supervision of the Restoration Ecologist. Groups of container plants will be arranged in randomized patterns within the designated habitat type areas.

All container plants shall be planted to the following specifications:

- Planting holes shall be at a minimum twice the depth and width of the containerized plant, or a minimum of twice the width containerized plants.
- Prior to planting, the planting hole shall be mixed 1/3rd with compost and filled with water and allowed to drain.
- Plants shall be set in the planting hole so that the crown of the root ball is approximately 1 inch above finish grade. Under no circumstance should the plant crown be buried.
- A watering basin shall be provided around each plant from 18 - 24 inches in diameter.
- Watering basins shall be filled with compost tea after planting.
- Plant basins shall be mulched with approximately 1.5 to 2 inches of approved wood chip mulch after planting.

All live stake cuttings are to be planted to the following specifications:

Willow and mule fat cuttings shall be acquired from near the project site. Collection of cuttings shall be conducted such that donor stands will not be substantially affected, as follows:

- Four to five-foot-long cuttings shall be obtained when plants are dormant (leafless, with winter buds).
- The basal end shall be cut at a 45-degree angle to identify the end to be planted, and immediately immersed in water treated with 1 drop of liquid humic acid per gallon for

storage as necessary for transport, and for a minimum of 24 hours (ideally 7 to 10 days) to encourage root growth.

- Cuttings shall be planted in holes 50% deeper than the length of the cutting and 1.5 feet wide, backfilled with 1/3rd specified compost. A long pry bar may be used to create the narrow holes required.

- Just prior to installation, the lower end of cuttings shall be dipped in compost tea and immediately planted vertically in the holes.

- Planting holes shall then be filled with compost tea and backfilled to proper compaction.

- Wood chip mulch shall be placed around cuttings 2 to 4 inches deep, not placed directly against the main stem of the plants, and maintained during the initial 120-day establishment period.

- Each cutting shall be irrigated immediately following installation to saturate surrounding soil.

4.6 Irrigation Plan

Once seed and containerized or live staked material is in place, the Contractor will be responsible for supplying sufficient water to adequately germinate and establish the seed and support survival and growth of the containerized and live staked material.

The frequency of irrigation will depend on plant health/vigor, soil moisture and the rate of evapotranspiration occurring between irrigation events. The irrigation schedule will be based on planting zones and related water needs of the plants. The following management scheme is recommended:

- Irrigate soil to full field capacity to the desired depth (approximately 18 inches during germination and seedling establishment and 18 to 24 inches during containerized and live stake plant establishment).

- Initially keep hydroseeded areas moist, until seeded material has germinated.

- Allow soil to dry down to approximately 50 to 60 percent of field capacity (in the top 6 to 10 inches after germination and during seedling establishment and 8 to 12 inches during plant establishment) before the next irrigation cycle.

Wetting of the full root zone and drying of the soil between irrigation events is essential to the maintenance of the plants and the promotion of a deep root structure that will support the vegetation after establishment. A soil probe or shovel is useful to directly examine soil moisture and rooting depth.

It is anticipated that an aboveground temporary irrigation line will be installed. In hard to reach areas, other methods of watering that can successfully support plant establishment, health and growth may be considered for use if deemed necessary by the project biologist.

4.7 As-Built Conditions

The contractor will prepare an As-Built report within 90 days from the date of completion of planting and seeding for review by NBC and the City. It is assumed that all grading is completed and all stream bank stabilization elements are installed, and that other site preparations, including application of soil amendments and construction of the temporary irrigation are necessarily completed prior to installing plant materials and applying seed. Once NBC has determined that the As-Built report is complete, it will be submitted to the regulatory agencies with the notification that installation is complete. The As-Built report will include will identify and confirm the site preparation methods used, species and quantities of seed and container stock installed, seeding methods, and planting locations. Documentation of the finished installation will include a graphic exhibit depicting each area as planted or seeded and whether treatments varied from the methods provided in this HRP. Any significant deviations from this plan or the associated plans and specifications must be reported, particularly with respect to changes in the grading limits or final elevations, as well as modifications to prescribed site preparations. The report will specify and list all soil amendments and plant materials actually installed, and describe the irrigation system and coverage provided. The As-Built report will include one or more exhibits showing the stream segments that were graded and stabilized, the configuration of each of the four plant community types that were planted, and the outlines of the patch areas where exotic vegetation was selectively removed for comparison with plans provided herein.

CHAPTER 5
Maintenance Activities during Monitoring Period

Maintenance activities planned during the monitoring period will focus on maintaining conditions favorable to the establishment of native plants to a self-sufficient state. Maintenance activities expected to be necessary during the maintenance program include non-native plant (weed) control, pest management, re-planting and re-seeding as needed, erosion control, trash removal, and temporary irrigation.

5.1 Responsible Parties

The responsible parties for the maintenance program are the same as described in Section 1.1 of this Plan.

5.1.1 Responsible Party's Restoration Ecologist

Overall supervision of the landscape maintenance contractor will be the responsibility of the project Restoration Ecologist. The project Restoration Ecologist will ensure the proper landscape maintenance procedures are followed, and will coordinate with the maintenance contractor to help identify priority maintenance activities.

5.2 Maintenance Schedule

The start of the short-term maintenance period begins when the installation has been certified as substantially complete by the Restoration Ecologist and the City.

5.2.1 120-Day Maintenance

The plant establishment period (PEP) will start after planting and seeding installation has been completed, which is the final step of the installation phase, and will have a duration of 120 calendar days. The 120-day PEP will be considered part of the Year 1 post-installation period. During the 120-day PEP is the warrantee period, during which the installation contractor is responsible for ensuring that plants become properly established and that installation has been properly executed. During this period, irrigation use (i.e., frequency and quantity of water) will be scheduled to support sufficient seed germination and container plant and live stake root development and establishment. Water for as needed temporary irrigation will be provided by a metered point of connection (POC), water truck, temporary tank on-site. The installation contractor will have the responsibility and discretion (means and methods) for conducting temporary irrigation to meet success criteria during the 120-day PEP. In addition, potential

problems and issues associated with installation that could adversely affect the overall success of the revegetation and mitigation efforts are likely to be detected during this period, and the installation contractor is provided an opportunity during this period to address and fix them. As a part of this period, the installation contractor is contractually obligated to guarantee their workmanship and perform remedial measures (e.g., re-seeding and/or re-planting, etc.) if necessary.

5.2.2 Long-Term Maintenance

Maintenance activities include those activities that will occur after the 120-day PEP for the remaining 5-Year period to meet success criteria. Long-term maintenance of the revegetation and mitigation areas will be performed by the City or an assigned maintenance contractor.

5.3 Maintenance Activities

5.3.1 Contractor Education

The Restoration Ecologist will meet with the maintenance contractor prior to the start of the 5-Year long-term maintenance period to ensure that the Contractor understands the maintenance provisions required relative to meeting Project goals and success criteria This will include education regarding restoration area limits to avoid potential incursions or impacts to adjacent sensitive habitat and wildlife species.

5.3.2 Contractor Guarantees

The maintenance contractor will be responsible for re-seeding and/or re-planting and other potential remedial measures to meet success criteria. If determined to be beneficial and appropriate for the Project, potential species substitutions (compared to the prescribed plant palettes and seed mixes in this plan) may be used, if approved by the Restoration Ecologist.

5.3.3 Irrigation Maintenance

The maintenance contractor will be responsible for providing temporary irrigation for the restoration areas to meet Project goals and success criteria. The automated irrigation system will be maintained and repaired as needed. The maintenance contractor will also coordinate with the Restoration Ecologist to determine appropriate irrigation application schedules during different times of the long-term maintenance period. As a confirmation that self-sustaining habitats have been established, it is intended that temporary irrigation use be phased out by Year 3 (or earlier) so that the native plant communities will not need supplemental irrigation for at least 2 years during the 5-Year maintenance and monitoring period.

5.3.4 Weed Control

Invasion of exotic weeds is one of the greatest threats to the success of a restoration project. Propagules (i.e., seed and rhizomes) of non-native species within a site and from outside sources can aggressively colonize newly graded or barren areas and can out-compete native species if the non-native species are not controlled. Once established, the competitive exclusion of light, water, and nutrients by exotic plants adversely affects or can completely prevent native species from

being able to re-establish and grow. A comprehensive weed control and eradication program shall be implemented to minimize the adverse effects of weed invasion.

Weed densities and control demands will depend on the seasonal rains and temperatures each year of project implementation. The timing of weed control may be different for each of the different target exotic species. It should be anticipated that frequent (twice-monthly to monthly) monitoring of the restoration areas will be required for weed management in the first one to three years. Monitoring will be effective for early identification of seedling and re-sprouting weed species and to scheduling control methods according to the phenology of each weed species.

For efficient control of exotic species, specified weeds must be controlled before they produce viable seed. Methods of control will depend on the species, the density of weeds, the area of infestation, and the ecological sensitivity of the habitat (including the density of native species intermixed with weed species). Hand or mechanical means are preferred methods for control of weed species. Some species may be controlled by a combination of cutting and removal, followed by spot foliar herbicide spray application on re-growth. Herbicide use shall be minimized due to the sensitive nature of the habitat, and be conducted in accordance with County of Orange, State and federal rules and regulations and in accordance with product specifications. Applications shall be conducted under supervision of persons possessing a Qualified Applicator License (QAL) issued by the California Department of Pesticide Regulation. All exotic plant debris that has aggressive rhizomes or seeds shall be removed and legally disposed of off-site.

5.3.5 Pest and Disease Management

An Integrated Pest Management (IPM) approach will be taken toward pest control, with natural measures and prevention playing primary roles in suppressing or reducing pest species populations. Active pest control measures will be implemented if a pest species poses a competitive threat to native species establishment. Insect plant pests, vertebrate pests, and plant diseases will be monitored by the landscape maintenance contractor and Restoration Ecologist. Badly damaged plants will be pruned to prevent pestilence spreading, or replaced if directed by the Restoration Ecologist. Species substitutions may be required for plants infected with soil-borne pathogens. Common chronic plant diseases will generally be ignored unless the infections are severe during the establishment phase. Any signs of the PSHB will be reported to the UC Riverside Eskalen Lab and appropriate remedial measure taken immediately, including but not limited to removal of the diseased branch and/or tree, chipping <1” or heat treatment to 160 F and disposal offsite at an approved landfill.

Excessive foraging by herbivorous animals may necessitate protective screening around plants or other methods determined to be suitable to address pest activities.

5.3.6 Protection from Herbivory

Herbivory of new planting can be a problem at restoration sites. Rodents and various mammalian species may be responsible for damage to newly established plants. Following initial planting, the site shall be monitored for signs of herbivory. Wire cages, enclosure fences, or other plant sheltering devices will be used on an as-needed basis. Tubex® or equivalent tree shelters are

effective at curtailing herbivory and would be installed if substantial herbivory occurs. Evidence of herbivory will be noted in the monitoring reports.

5.3.7 Trash Removal

Trash will be removed by the landscape contractor on an as-needed basis. Care will be taken that trash removal activities minimize or avoid impacts to plants in the revegetation areas. Dead limbs, tree fall, and natural plant litter will be left in place. Weed debris will be removed from the project area and disposed of legally off-site.

5.4 Schedule

The project schedule for the habitat mitigation, from planting through the post-installation monitoring and maintenance, is shown in **Table 4.9**. The schedule is subject to change pending timing of permit approvals, acceptance of this plan and seasonality (since planting and seeding should occur during the winter months to take advantage of the rainy season). The maintenance and biological monitoring period will begin once as-built conditions are reported and mitigation installation is accepted by the agencies.

TABLE 5.1

PROPOSED IMPLEMENTATION AND MONITORING SCHEDULE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Implementation*								G, I,	G, I	G, I, P	S, P, PEP, Q, L	PEP, Q, L
Year 1	PEP, Q, L	PEP, Q, L	L	Q, L	L	A, L	Q, L	L	Q,L	RM, L	QL	R, L
Year 2			Q, L			Q, A, L			Q, L	RM		R, Q, L
Year 3			Q, L			Q, A, L			Q, L	RM		R, Q, L
Year 4			Q, L			Q, A			Q, L	RM		R, Q
Year 5			L						Q, L	RM		FR

*NOTES: Timeframe subject to change.
SP= Site preparation
G = Grading
I = Irrigation installation
P = Planting
PEP = 120-Day Plant Establishment Period
RM = Remedial measures
Q = Qualitative monitoring
L = Landscape maintenance
S = Scheduled completion of planting & start of YR 1
A = Annual monitoring (quantitative)
R = Report due
FR = Final Report Due

CHAPTER 6
Monitoring Plan for the Restoration Areas

6.1 Performance Standards for Target Dates and Success Criteria

The success of the restoration project will be measured using criteria based on general site characteristics (habitat-based success metrics) and on the functional condition of the restoration areas (CRAM metrics). The habitat condition of the restoration project will be assessed using the standard performance criteria described in Tables 6.1 and 6.2 which serve as restoration planting success indicators. The functional evaluation (Table 6.2) is based on the anticipated CRAM scored following project implementation. Success goals are as follows:

- Achieve the final Year 5 performance standards listed in Table 15.
- Provide a comparable (equivalent or superior) CRAM scores compared to the baseline CRAM for all functions except for Buffer/Landscape Context and Hydrology as these functions cannot be changed or improved upon.
- The restored habitat must be self-sustaining. Self-sustaining is defined as the site requiring no supplemental irrigation for two consecutive years and the site resists invasion by non-native species - no significant weeding being necessary for two consecutive years.

The restoration success criteria and the goals reflect the expected functional improvement of the habitat parameters. This condition is reflected in the success criteria interim and final goals for the restoration areas. Progress toward achieving the interim success criteria will be the basis for recommendations for remedial actions and adaptive management. The ultimate success criteria will be used as the basis for certification of restoration success and/or the need for remedial measures. Monitoring (and maintenance) will continue until the revegetated areas have achieved the final success criteria or until the resource agencies determine that monitoring is no longer necessary.

TABLE 6.1
GENERAL PERFORMANCE STANDARDS FOR HABITAT RESTORATION

Milestones	Assessment Criteria	Maintenance Actions
Year 1*	All native plants (seeded, container plants) to achieve 40% absolute cover with 90% survivorship of containerized/live stake material. Weed cover < 15%	If targeted plant materials experience mortality and do not meet the 1st Year success criteria, plants will be replaced to bring densities up to 100% of original plant density. Soil samples will be collected in order to determine the efficacy of the soil amendment program as needed.
Year 2	All native plants (seeded, container plants) to achieve 50% absolute cover with 80% survivorship of containerized/ live stake material. Weed cover < 12%	If plants do not meet coverage criteria, additional seeding and planting will be conducted. Dead or severely distressed containerized/transplanted plant material will be replaced to bring densities up to 100% of the original planting density. . Soil samples will be collected in order to determine the efficacy of the soil amendment program as needed.
Year 3	All native plants (seeded, container plants) to achieve 60% absolute cover with 80% survivorship of containerized/ live stake material. Weed cover < 10%	If plants do not meet coverage criteria, additional seeding and planting will be conducted. Dead or severely distressed containerized/transplanted plant material will be replaced to bring densities up to 80% of the original planting density. . Soil samples will be collected in order to determine the efficacy of the soil amendment program as needed.
Year 4	All native plants (seeded, container plants) to achieve 65% absolute cover with 100% survivorship of containerized/ live stake material. Weed cover < 5%	If plants do not meet coverage criteria, additional seeding and planting will be conducted. Dead or severely distressed containerized/transplanted plant material will be replaced to bring densities up to 80% of the original planting density.
Year 5	All native plants (seeded, container plants) to achieve 70% absolute cover with 100% survivorship of containerized/ live stake material. Weed cover < 5%	If plants do not meet coverage criteria, additional seeding and planting will be completed. Dead or severely distressed containerized/transplanted plant material will be replaced to bring densities up to 80% of the original planting density.

*Yr 1 includes the 120 establishment period

TABLE 6.2
TARGET CRAM SCORES FOR RIPARIAN / WETLAND RESTORATION AREAS

Attributes and Metrics	Habitat Creation Area Alfa Rating	Habitat Enhancement Area Alfa Rating
Buffer and Landscape Context		
Stream Corridor Continuity	A	D
Buffer Submetrics		
% of AA with Buffer	B	A
Average Buffer Width	D	C
Buffer Condition	B	B
Hydrology		
Water Source	D	D
Channel Stability	C	B
Hydrologic Connectivity*	C	C
Physical Structure		
Structural Patch Richness	D	D
Topographic Complexity	C	C
Biotic Structure		
Plant Community Submetrics		
No. of Plant Layers	C	C
No. of Co-dominants	C	C
Percent Invasion	A	A
Horizontal Interspersion	C	C
Vertical Biotic Structure	B	B

*Assumes habitat creation area a confined hydrologic connectivity and enhancement areas as non-confined

For the habitat restoration areas, target goals will be in accordance with the standards in Table 6.1 above. However, the habitat restoration areas will not be formally contingent on meeting the standards in Table 6.1 or 6.2 since compensatory mitigation is not required for pure habitat restoration.

6.2 Monitoring Methods

Monitoring for purposes of documenting progress toward meeting success criteria will be conducted by the Restoration Ecologist. Continuity with the personnel and methodology of monitoring will be maintained as much as possible to ensure comparable assessments throughout the duration of the monitoring. Monitoring will commence with the completion of the installation of plantings, continuing through the post-installation period until the success criteria have been met. The monitoring program will emphasize qualitative and quantitative assessments of the status of the habitat mitigation program. Records of mortality and other problems such as insect damage, herbivory, weed infestation and erosion (soil loss), will be identified and documented by the Restoration Ecologist.

Monitoring will assess attainment of annual and final success criteria and identify the need to implement remedial and adaptive measures to assure ultimate success, or contingency measures in event of failure. Qualitative monitoring results will be used in conjunction with quantitative

monitoring results to document the progress of the restoration areas relative to success criteria standards.

6.3 Qualitative Assessment

Qualitative assessments will be conducted to assess the overall condition of the habitat restoration areas, and to determine the effectiveness of the maintenance program (e.g., weed control, native plant care, and erosion control, etc.), maintenance contractor performance, and general development of the habitat relative to the performance criteria. Qualitative monitoring will also assess plant health, including signs of the PSHB, and the potential need for supplemental soil amendments.

Qualitative assessments will be conducted monthly during the spring (March through June) and bi-monthly otherwise during the first and second year. Qualitative monitoring will occur at least quarterly during the third and fourth years; and semi-annually during year five (or beyond) until the project has met its success criteria. Qualitative surveys will be completed during each monitoring visit, and will consist of a site walkover, general habitat characterization, and taking representative photographs. General observations, such as fitness and health of the planted species, pest problems, herbivory, weed establishment, mortality, and plant stress, will be noted during each site walkover. The Restoration Ecologist will also note observations of wildlife use and native plant recruitment. Records will be kept of plant mortality, significant insect damage, weed infestation, and other potential problems. The Restoration Ecologist will determine remedial measures necessary to facilitate compliance with performance standards and relay these findings to the maintenance contractor (and copied to NBC and the City) after each visit, as necessary, to address and correct problems in a timely manner. Remedial measures undertaken will be summarized in the annual monitoring reports.

6.4 Quantitative Sampling

The routine monitoring will include evaluation of site hydrology, plant establishment and vigor, indications of faunal utilization, indications of biogeochemical processes, and collection of site photographs.

The following quantitative surveys will be performed for habitat mitigation areas:

1. CRAM - A post-restoration CRAM will be conducted for the riparian habitat mitigation areas following the same methods as the baseline CRAM. A total of two post-restoration CRAM studies will be conducted in the spring; one during the spring of the third monitoring year, and one during the spring of the last (fifth) monitoring year.

2. Biological Botanical Monitoring - One quantitative habitat survey per year will be conducted in the spring throughout the five-year monitoring period. The restoration ecologist will set up a minimum of one 50-meter point-intercept transect perpendicular to the flowline within the riparian habitat creation area, two within the riparian enhancement areas, and two within the coastal sage scrub mitigation areas. Plant monitoring will be performed along transects using the point or line intercept method (Bonham, 1989). Data on the biological composition of the restoration areas will be collected at one-foot intervals along each transect; cover data will be

collected within 1-meter quadrats that will be placed every 3 feet alternately on the right or left of the transect. The following plant data will be collected and calculated for mitigation areas to assess plant and habitat development relative to the success criteria and also to help identify the need for potential remedial actions:

- Relative cover of both native and exotic species (percent of the ground surface covered by the crown area of a species); because plant crowns overlap relative cover can exceed 100 percent
- Species richness - number of species in the sample area
- Structural diversity - number of vegetative strata present
- General health, growth rate, and mortality of plant species along each transect.

3. Photo-documentation - Photographs will be taken to document the progress of the mitigation areas throughout the monitoring period. Photo-documentation locations will be established prior to commencement of the habitat mitigation and geo-referenced. Photographs will be taken from the same angles and locations so that comparisons can be made through time. Photo-documentation will occur annually in the spring for the monitoring period.

6.5 Monitoring Schedule

See Table 5.1 provided in the previous section.

6.6 Annual Monitoring Reports

Annual monitoring reports will be provided to NBC and the City (Responsible Party), Corps, RWQCB, CCC and CDFW. Annual technical reports describing the results of the qualitative monitoring and quantitative data collection will be submitted annually within two months following the yearly monitoring periods. The first report will be submitted after the first 12-month monitoring period ends as defined by the completion of installation date established in the As-Built Report. Each annual report will contain the following information:

1. A list of names, titles, and companies who prepared the annual report and participated in monitoring activities for that year.
2. An analysis with discussion of all quantitative monitoring data (plant survival, percent cover, etc.), prepared in graph and table formats to present project progress relative to success criteria
3. A description of CRAM analysis and results in the Year 3 and 5 Year reports.
4. Prints or color photo copies of monitoring photographs.
5. Details of necessary replacement plantings and other remedial actions.
6. Logs of all maintenance activities.
7. Maps or photos identifying monitoring areas, transects, planting zones, areas requiring remedial measures.
8. The final (Year 5) monitoring report shall summarize the results of all five monitoring years and provide an overall quantitative assessment of the project's success.

CHAPTER 7
Completion of Restoration

7.1 Notification of Completion

The City of Newport Beach will notify the Corps, RWQCB, and CDFW in writing upon completion of the habitat restoration effort through the submittal of the final Year 5 monitoring report. This report will include a summary of the monitoring and maintenance period and an analysis of quantitative and comparative sampling data that will show that the performance criteria standards have been met.

7.2 Agency Confirmation

Following the submission of the final annual report and notification letter of successful completion, representatives from the City, Corps, RWQCB, and CDFW may require a site visit to verify that the restoration project is successful as specified in permit terms and conditions. Once the success criteria have been met, the Responsible Party will be free of further obligation and the long-term management period will commence.

7.3 Adaptive Management

An integral part of a successful restoration program is the ability to detect problems early in the process, determine the cause of the problem, and attempt to modify the restoration program to accommodate emerging issues. Minor problems, such as trash, limited vandalism, isolated instances of plant mortality, or small-scale weed or pest infestations will be rectified by the maintenance contractor as they are identified during routine site monitoring.

Major remedial actions or contingency measures will be triggered if there are large-scale instances of plant mortality, weed infestation or disease (i.e., more than 10 percent of the site is affected), or if the site is not making progress toward attainment of the interim success criteria after the end of the second year. Under these circumstances, the cause of the mitigation area not making progress toward meeting success criteria will be evaluated and potential courses of action and/or corrective measures determined. The Restoration Ecologist will recommend appropriate contingency measures for consideration by the City and NBC. All remedial actions or modifications will be first presented to the Responsible Party and may be subject to approval of the regulatory agencies. After the implementation of remedial or contingency measures, the maintenance and monitoring period may be extended until the site meets mitigation success criteria as confirmed by the agencies.

7.4 Force Majeure

The City of Newport Beach shall be responsible to maintain and remediate the restoration areas, except in case of certain Catastrophic Events or Unlawful Acts, as defined below.

A "Catastrophic Event" is defined as an event, such as a spill of hazardous or toxic substance, the impact of a vehicle or failing aircraft, or a fire, which has a material and detrimental impact on the quality of native vegetation, soils, or wildlife of the mitigation areas and over which the property owner and Responsible Party had no reasonable control.

An "Unlawful Act" is defined as the unlawful act of another and shall include, an event or series of events, such as the intentional dumping within the mitigation area or its watershed of a hazardous or toxic substance, or the discharge of such a substance by any person or entity other than the property owner in violation of a statute, ordinance, regulation or permit, which event or series of events has a material and detrimental impact on the water quality, native vegetation, soils or wildlife of the mitigation area, and which event or series of events could not reasonably have been prevented by property owner.

CHAPTER 8
Literature Cited

Bonham, C. D., 1989. *Measurements for Terrestrial Vegetation.* John Wiley & Sons, New York, New York.

California Invasive Plant Council. 2018. The Cal-IPC Inventory. https://www.cal-ipc.org/plants/inventory/

Collins, J.N., E.D. Stein, M. Sutula, R. Clark, A.E. Fetscher, L. Grenier, C. Grosso, and A. Wiskind. 2013. California Rapid Assessment Method for Wetlands, Riverine Wetlands Field Book, v. 6.1, January 2013.

Mitsch, W.J., and J.G. Gosselink. 2000. *Wetlands*, 3rd edition, Van Nostrant Reinhold Company, New York, NY.

Society for Ecological Restoration International Science & Policy Working Group. 2014. The SER Primer on Ecological Revegetation. www.ser.org.

U.S. Army Corps of Engineers. 2014. *Special Public Notice: Final Revegetation Guidelines and Monitoring Requirements.*