APPENDIX F

Uplands PER

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

September 10, 2025

Presented To

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Acronyms/Abbreviations

Acronym/Abbreviation	Definition
ADA	Americans with Disabilities Act
BCH	beach
bgs	below ground surface
BTR	Biological Technical Report
CADD	computer aided drafting and design
CCC	California Coastal Commission
CDP	Coastal Development Permit
CLT	California least tern
CS	Coastal Strand
CSS	Coastal Sage Scrub
DCSS	Diegan Coastal Sage Scrub
DEV	Developed
DH	Disturbed Habitat
dSCSM	disturbed Southern Coastal Salt Marsh
FE	federally endangered
FP	fully protected
MHPA	Multiple Habitat Planning Area
MLLW	mean lower-low water
MSCP	Multiple Species Conservation Program
NAVD 88	North American Vertical Datum of 1988
NFI	North Fiesta Island
NGVD 29	National Geodetic Vertical Datum of 1929
PEIR	Program Environmental Impact Report
PER	Preliminary Engineering Report
RUD	ruderal
SanGIS	San Diego Geographic Information Source
SAR	sodium adsorption ratio
SCSM	Southern Coastal Salt Marsh
SDBG	San Diego Biology Guidelines
SE	state endangered
SF	Southern Foredune

Acronym/Abbreviation	Definition
SPMF	Salt Pan/Mudflats
USFWS	U.S. Fish and Wildlife Service

1 Introduction

The City of San Diego Public Works Department has engaged a consultant team to assist in the preparation of a Program Environmental Impact Report (PEIR) for multiple prioritized improvement projects within the Mission Bay Park Improvement Zone (Improvement Zone). The Improvement Zone includes "those areas encompassed within the boundaries of Mission Bay Park, Oceanfront Walk from the Mission Bay Jetty to Crystal Pier and the adjoining coastal parks…" It also includes portions of Rose Creek, Tecolote Creek, and the San Diego River. The ultimate goal is to improve the conditions of the Improvement Zone for the enjoyment of residents and visitors. As part of the PEIR, Preliminary Engineering Reports (PERs) are being prepared for the prioritized improvement projects. The prioritized improvement projects include Rose Creek, North Fiesta Island, Tecolote Creek & Fiesta Island Causeway, Leisure Lagoon Marsh (Cudahy Creek), Shoreline Restoration, Habitat Preservation, Bike/Pedestrian Paths, Seawall Restoration, and Deferred Maintenance.

1.1 Project Overview

The Mission Bay Park Master Plan, Draft Fiesta Island Amendment, November 21, 2021 (City of San Diego 2021), identifies five locations (see Appendix A, Preliminary Drawings) on Fiesta Island proposed as upland habitat expansion and preservation areas, one of which is an existing California least tern (CLT) Preserve (Site No. 4) located at the north end of Fiesta Island. The City of San Diego (City) is also considering three other locations (Sites No. 5a and No. 5b) between the San Diego River and Sea World Drive, and one area (Site No. 5c) between Sea World Drive and Mission Bay for consideration as upland habitat expansion. One of those sites is also an existing CLT Preserve site (see Appendix A, Site No. 1a), located near the intersection of Sea World Drive and West Mission Bay Drive. This PER provides an overview of the locations of the proposed upland habitat expansion/preservation areas, a discussion regarding the existing conditions and environmental constraints at each of the sites, as well as an overview of the restoration and revegetation opportunities for upland habitat expansion and preservation within these areas, which are summarized below:

- Site No. 1 – Fiesta Island South
- Site No. 2 – Fiesta Island North Central
- Site No. 3 – Fiesta Island near Youth Camping
- Site No. 4 – Fiesta Island North CLT Preserve Area
- Site No. 5a – Cloverleaf Enhancement Area
- Site No. 5b – Triangle Enhancement Area
- Site No. 5c – South Shores Restoration and Enhancement Area

1.2 Project Location

Mission Bay is located within the City of San Diego, California. This coastal inlet was created over the last 18,000 years, after the last glacial period, as sea level rose to present level and riverine drainage incised the

inlet. As sea level rose, the San Diego River deposited large volumes of alluvial sediment to create the delta that became the landmass for Mission Bay, named False Bay at the time (see Figure 1-1, Aerial View of Mission Beach and False Bay – 1930). During the 1820s, the San Diego River was redirected from False Bay into the San Diego Bay. This left False Bay as a low-flow marshland. False Bay was made up of fluvial and estuarine fine sand, silts, and clays from the surface to approximately 60 feet below ground surface (bgs), which were underlain by Quaternary-age dense clayey sands, hard clays, and gravel/cobble from approximately 50 to 70 feet bgs south of North Mission Bay Drive, and approximately 10–30 feet bgs north of North Mission Bay Drive.

False Bay was historically unnavigable as the channels were narrow and shallow. The City began dredging in 1946 to create Mission Bay Park. Dredging operations, and subsequent land creation with dredged and upland material, occurred between 1946 and 1956, 1959 and 1961, and 1963 to 1964 to create the current configuration of Mission Bay (see Figure 1-1). Landforms such as De Anza were formed with what is geologically described as Artificial Fill. This Artificial Fill consists primarily of loose to medium dense silty sands, with intermittent layers of soft clay.

Fiesta Island was also formed through the placement of on-site dredge material.

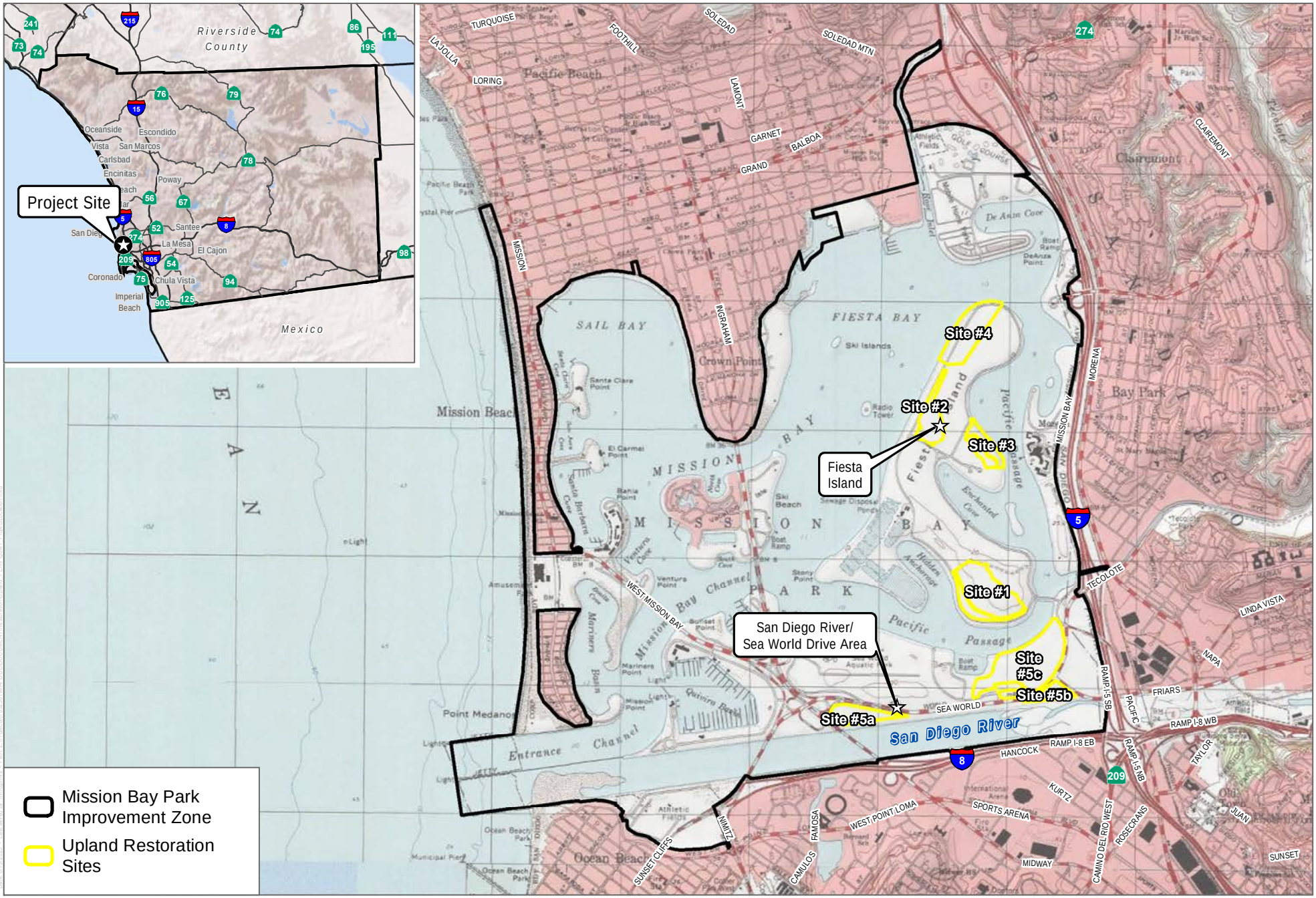
The interior elevations at North Fiesta Island are relatively high with a maximum elevation of 25 feet National Geodetic Vertical Datum of 1929 (NGVD 29) and a mean elevation of 15 feet NGVD 29. By comparison, the exterior elevations of North Fiesta Island range from 0 feet NGVD 29 along the shoreline to 11 feet NGVD 29 along the back beach. An earthen containment dike separates the exterior and low-lying beach areas from the higher interior elevations of the Project area.

Existing sand grain sizes in Mission Bay vary from 0.16 to 0.4 millimeters, with an average grain size of approximately 0.2 millimeters (City of San Diego 1990). Since the redirection of the San Diego River away from Mission Bay, the primary sand sources now originate from occasional Rose Creek and Tecolote Creek stormflow discharges, as well as from erosion of parklands within the Bay.

Figure 1-1. Aerial View of Mission Beach and False Bay – 1930

Source: www.sandiego.gov.

The project location study area includes all of Fiesta Island, as well as locations along the San Diego River and Sea World Drive, from Interstate 5 to West Mission Bay Drive to the west. Figure 1-2, Project Location, shows the project vicinity and an aerial view of the project area.



SOURCE: USGS 7.5-minute La Jolla Quadrangle

FIGURE 1-2

Project Location

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

1.3 Project Goals and Objectives

The goal of the proposed upland habitat expansion/preservation program is to enhance and expand upland habitat biological resources and restore/enhance suitable upland habitat for listed plant and wildlife species known to occupy existing preserves and/or that occur within Mission Bay environs. Species such as the California least tern (*Sternula antillarum browni*) have used preserves that were intended for nesting in the past, however in recent years, nesting at some locations has been sporadic or non-existent due in part to the degradation of suitable habitat for nesting. In addition, Nuttall's lotus (*Acmispon prostratus*) a sensitive plant species, is present within areas of Mission Bay Park where disturbance has left occupied areas in an ecologically unstable condition. The proposed upland habitat expansion/preservation program is intended to stabilize and increase Nuttall's lotus populations through native habitat establishment, enhancement, and improvement of existing habitat that is appropriate for this species.

Upland habitat expansion/preservation includes the following objectives:

- Provide appropriate soil substrate to support wildlife use and vegetation community establishment.
- Provide weed removal and control.
- Establish site access limitations to protect sites from long term adverse modification due to non-native weed population expansion and pedestrian traffic.
- Establish ecologically appropriate native vegetation communities as habitat for sensitive and listed species consistent with the Mission Bay Master Plan.
- Establish self-sustaining native vegetation communities that are adapted to current and future climatic conditions.

The preliminary recommendations outlined herein are based upon a review of existing biological resources information, observations through field reconnaissance and evaluations of current site conditions to identify potential opportunities for upland habitat expansion/preservation. The opportunities were determined while balancing the following constraints:

- Existing CLT Preserve restrictions.
- Existing mitigation/revegetation site restrictions.
- General constructability issues including equipment access and water source availability.
- Adjacency to existing native habitat resources.
- Existing and proposed recreational improvements and other land uses.
- Long-term habitat protection needs.
- Potential for functional habitat improvements that may be recognized by resource agencies

2 Data Collection and Existing Characteristics

Data collection was conducted through a general site reconnaissance and evaluation of current site conditions to assess areas previously identified as potential upland habitat preserves in the Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021; see Appendix A). Fieldwork included an evaluation of native and non-native plant species presence, proximity to other native habitat areas, feasibility for habitat expansion, general soil conditions, as well as an assessment of topographic variation and current site drainage characteristics. To assist with site reference during the field evaluations, the proposed upland habitat expansion/preservation areas from the Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021; see Appendix A) were superimposed over the vegetation and aerial photograph maps (see figure in Section 4, Preliminary Design).

Available reference documents related to Fiesta Island and the San Diego River/Sea World Drive areas, provided by the City, were reviewed and served as background information for the site evaluations. Documents reviewed in preparation of this report included the following:

- The Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021)
- The Mission Bay Park Natural Resource Management Plan, Final (City of San Diego 1980)
- The Status of the California Least Tern at San Diego Unified Port District Properties (Patton 2009)
- Nuttall's Lotus Final Report (San Diego Audubon Society 2018)
- The Mission Bay Park Master Plan (City of San Diego 2002)
- Various maps, figures, and information provided by the City regarding CLT nesting areas, annual counts, monitoring grids, Nuttall's lotus distribution maps, and anecdotal information provided via email
- Mission Bay landfill maps (SCS Engineers 2004)
- Dudek Memorandum, Bay-Wide Assessment of Habitat Restoration Opportunities, prepared by M. Sweesy, October 12, 2018

2.1 Topography

Topographic data was obtained from the U.S. Geological Survey (USGS) 2014 lidar survey. These were incorporated into computer aided drafting and design (CADD) files and compiled with aerial data to provide ground surface elevations of the project. It should be noted that topography data was obtained in the North American Vertical Datum of 1988 (NAVD 88). A conversion between the NAVD 88 and NGVD 29 was performed, ensuring that all analyses have been referenced to the NGVD 29 datum. Additional topographic survey data was collected by Photo Geodetic Corporation in April 2019. The horizontal basis of coordinates for this survey is referenced to the California Coordinate System of 1983 (CCS 83) Zone 6, North American Datum of 1983 (NAD 83), and elevations are referenced to NGVD 29.

2.2 Available GIS Data

The available geographic information system (GIS) data was collected from various sources. San Diego Geographic Information Source (SanGIS) data was reviewed for information regarding parcels and existing utilities in the area (i.e., water and sewer alignments). The parcel data was used for site layout. It should be noted that the location of property lines shown in the preliminary design concept are not exact but provide

an approximation for conceptual design. In some cases, the parcel lines did not align well with the georeferenced 2014 aerial image and contours, therefore, adjustments were made to align specific parcel lines to existing fence lines and road alignments, when applicable. The existing utility data from SanGIS was used for preliminary layout and identification of the wet utilities that may exist in the project area (Table 2-1). Specific items of importance including culvert crossings, existing storm drains, and utility crossings were reviewed further through available as-built plans and/or site visits when necessary. A detailed survey of existing utilities is nonetheless recommended prior to any final engineering design for the project area.

Table 2-1. SanGIS Data Inventory

Data Layer	Version Date	Source (Agency)
LiDAR	2014	SanGIS, SANDAG, NGA, LECC, Regional Public Safety GIS, 18 Incorporated Cities
Aerial Imagery	2017	City of San Diego
Storm Drain Network Files (Drain Conveyance, Drain Structures)	October 17, 2018	City of San Diego, SanGIS, SANDAG
Land Use	January 1, 2017	SanGIS, SANDAG
Hydrologic Soil Groups (SSURGO)	November 11, 2013	National Resources Conservation Service
Parcel Layer	February 15, 2018	SanGIS, SANDAG, Assessor/Recorder/County Clerk
Floodplain Layers	April 7, 2016	Federal Emergency Management Agency
Utility Layers (Sewer Main, Water Main)	March 5, 2018	SanGIS, City of San Diego Public Utilities Department, SANDAG
Census Block District Groups	April 25, 2016	City of San Diego
Municipal Boundaries	July 25, 2011	SanGIS, SANDAG
National Hydrography Dataset Flowline	April 12, 2016	U.S. Geological Survey
Vegetation Mapping	2017 and 2018	SanGIS and City of San Diego, respectively

Additional reference information used for the analysis of the proposed expansion/preservation areas was also obtained from the following sources:

- Vegetation community/land cover mapping was imported into the aerial photograph base, based upon biological survey data collected in 2018, prepared by Dudek & Balk Consulting.
- The polygon areas showing the limits of the previously proposed upland preserve areas was imported from scanned images from the Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021).
- California Natural Diversity Database (CDFW 2019) for information regarding sensitive plant species locations.

- Information regarding the proposed design for the North Fiesta Island wetland mitigation area was provided by Moffatt and Nichol dated June 2025.

2.3 As-Built Drawings

A review of the as-built database at the City of San Diego Development Services Department was conducted, and there were no drawings relevant to the project sites.

3 Existing Conditions

This section presents existing conditions that affect project design.

3.1 Topography

As mentioned previously the landforms and islands within Mission Bay are land features made of artificial fill from bay dredging that occurred in the 1940s, 1950s, and early 1960s. Fiesta Island was formed in this manner. The interior elevations at North Fiesta Island are relatively high with a maximum elevation of 25 feet NGVD 29 and a mean elevation of 15 feet NGVD 29. By comparison, the exterior elevations of North Fiesta Island range from 0 feet NGVD 29 along the shoreline to 11 feet NGVD 29 along the back beach. An earthen containment dike/berm separates the exterior and low-lying beach areas from the higher interior elevations of the project area.

The perimeter access road around Fiesta Island ranges in elevation from 15 to 20 feet NGVD 29. Except for Site No. 3, all the proposed habitat expansion and preservation sites on Fiesta Island are adjacent to the existing earthen containment dike/berm that ranges in height from 18 to 25 feet NGVD 29, which is 3 to 5 feet high relative to the land surface elevation of the perimeter access road. (Note: This topographic information was interpolated from aerial topographic mapping for the Mission Bay Landfill, produced by SCS Engineers [2004]. This mapping shows topography at the very southern tip of Fiesta Island, near Site No. 1, which was used as a general elevation reference point.)

The general topography within the proposed Fiesta Island habitat expansion sites is relatively flat in most locations, with a few topographic depressions where drainage runoff collects and stands for short periods of time. Percolation appears to be rapid in most locations due to the sandy soil conditions. In locations where water ponds, it is suspected that a more impervious soil is present, which interrupts percolation. Those areas also tend to be more compacted than other areas.

Sites located along the San Diego River are generally flat with some localized, low mounding. No distinct landforms are present within the proposed restoration sites. Limited topographic map information was available at the time of the site evaluations along the San Diego River and Sea World Drive, except for the mapping of the Mission Bay Landfill (SCS Engineers 2004), which was based upon a 5-foot contour interval. On that map, the toe of the slope of the San Diego River is shown at an elevation of 5 feet NGVD 29. The top of the slope (i.e. bank) of the river ranges from 15 to 20 feet NGVD 29. The highest elevation within the San Diego River and Sea World Drive sites is 25 feet NGVD 29.

3.2 Hydrology

No specific hydrologic analysis was completed for these site evaluations because all sites are situated within upland areas. Site observations indicate that only on-site drainage within each site is present due to the minor topographic variation and high soil percolation rates. There are several low-lying areas, within Sites No. 1, No. 2, and No. 4, where periodic ponding/standing water occurs during the winter rainy

season, and observed conditions suggest that water retention occurs for brief periods. These low-lying areas are represented by changes in vegetation and the presence of salt pan areas, where salt has accumulated after water evaporates. There are a few patches of wetland species (e.g. willows, mule fat) present in Site No. 4, within the north central portion of Fiesta Island, which suggests that water retention is longer and has less salinity at this location, which allows these species to naturally colonize the area. Drainage retention is more prolonged at this location, resulting from on-site drainage accumulation at this low point. Some groundwater resources may be present to allow these wetland species to persist through dry summer months.

3.3 Soils

Soils throughout Fiesta Island are predominantly sand, identified as "Made Land" on the soils map in the Biological Technical Report for the Mission Bay Park Master Plan Update: Fiesta Island Amendment (BTR; Alden Environmental 2017). In some locations where it appears that water may periodically pond for a short period of time, saline soil conditions have developed resulting from the accumulation of salt from evaporation, and inherent saline conditions of the soil. These areas also tend to be more compacted than at other locations. Where salt pan conditions limit plant growth because of hyper-saline conditions, only plants very tolerant of salt can survive.

Dudek collected soil samples from all proposed Fiesta Island habitat expansion/preservation sites that were evaluated. The samples were analyzed by Wallace Laboratories on May 15, 2019, for agricultural suitability and soils fertility, with recommendations provided for soil amending to support optimal plant growth. All soil samples varied in pH, alkalinity, salinity, sodium adsorption ratio (SAR), and the key soil chemicals (i.e. chloride, nitrate, phosphorus, potassium, sulfur, and zinc).

A summary of the soils analysis results is included in Table 3-1. The detailed results of the soils analysis are included in Appendix B.1.

Table 3-1. Soils Analysis Summary Data

Site	pH	Salinity	Chloride	SAR	Nitrate	Phosphorus	Potassium	Sulfur	Zinc
No. 1 – Fiesta Island South, 12"[a]	7.09	0.13	13	1.0	2	3.7	82	3	0.27
No. 2 – Fiesta Island North Central, 12"[a]	8.67	0.13	9	0.2	1	46.1	16	1	0.33
No. 3 – Fiesta Island Near	8.33	0.69	54	1.2	13	12.1	28	7	1.19

Table 3-1. Soils Analysis Summary Data

Site	pH	Salinity	Chloride	SAR	Nitrate	Phosphorus	Potassium	Sulfur	Zinc
Youth Camping, 12"[a]									
No. 4 – Fiesta Island CLT Preserve Area, 12"[a]	7.88	0.48	26	0.8	17	24.5	144	2	18.12

Notes: SAR = sodium adsorption ratio.

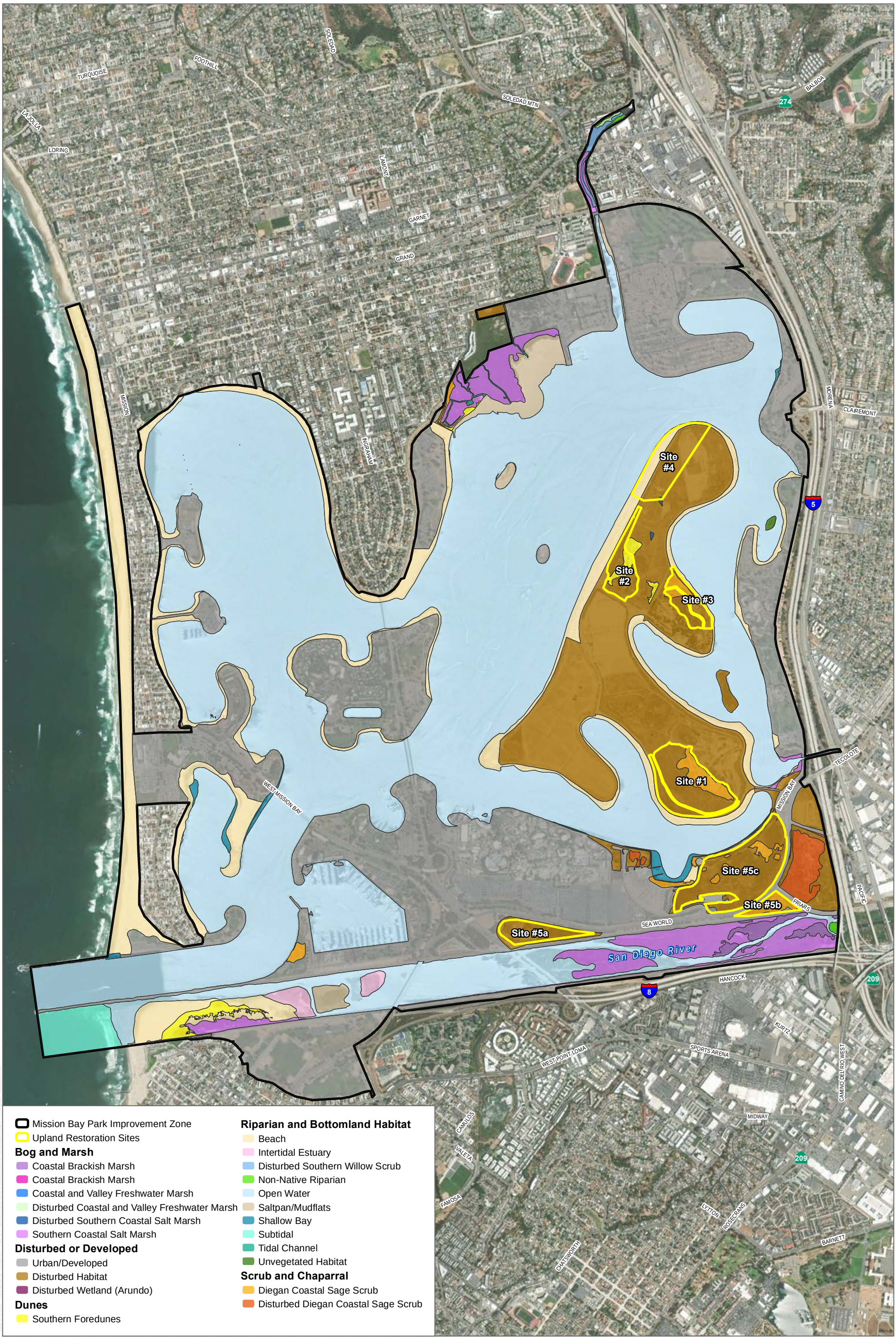
[a] Soil sample depth was typically 12 inches below ground surface.

Elements are expressed as mg/kg dry soil or mg/L for saturation extract.
pH is measured in a saturation paste extract.
Analytical data determined on soil fraction passing a 2-millimeter sieve.

No soil samples were collected within the potential habitat expansion and enhancement sites along the San Diego River and Sea World Drive. These sites are optional areas that were considered for possible inclusion in the habitat expansion program. Soil within these areas will be evaluated later, once decisions are made regarding which candidate areas will be chosen for habitat expansion/preservation.

3.4 Vegetation

Existing Vegetation within Fiesta Island and the Sea World Drive/San Diego River areas was derived from mapping provided by SanGIS in 2017 and the City of San Diego in 2018. Vegetation communities/land covers are shown in Figure 3-1, Existing Vegetation.



SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 900 1,800 Feet

FIGURE **3-1**

Existing Vegetation

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

3.4.1 Vegetation Communities/Land Cover Descriptions

Native vegetation communities and land covers identified within, or immediately adjacent to, the proposed upland habitat expansion and preservation sites are summarized below. Detailed information regarding these vegetation communities/land covers are included in the BTR (Alden Environmental 2017).

Beach (BCH)

BCH is usually classified as a sandy area basically devoid of vegetation. The upper shoreline within Mission Bay is composed primarily of sand and transitional sandy-silt soils. Portions of the bay shoreline are regularly groomed and maintained by the Mission Bay Park and Recreation maintenance staff. The beach areas are also maintained to remove trash and debris. Most of the sand on Fiesta Island originated from dredged material from Mission Bay. In addition, the city maintains a sand replenishment maintenance area on Fiesta Island, in the location depicted on the figures in Section 4, Preliminary Design, as the "Future Active Recreation (Parking)" area. Within this area imported sand materials are collected from other locations around the bay and stockpiled here for use in repairs on the island.

Developed (DEV)

DEV areas mapped in the study area include parking lots, paved roads, built structures, and associated ornamental landscaping. Ornamental areas include landscape plantings of both ornamental species, as well as native species used for ornamental purposes.

Diegan Coastal Sage Scrub (DCSS)

According to Oberbauer et al. (2008), DCSS is composed of a variety of soft, low, aromatic shrubs, characteristically dominated by drought-deciduous species, such as coastal sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and various sages (*Salvia* spp.), with scattered evergreen shrubs, including lemonadeberry (*Rhus integrifolia*) and laurel sumac (*Malosma laurina*). Specifically, within the Fiesta Island and Sea World Drive/San Diego River locations, dominant species of this community include coastal sagebrush, California buckwheat, bush sunflower (*Encelia californica*), bladderpod (*Peritoma arborea*), and various cactus (*Opuntia* sp.) species. DCSS is considered a Tier II sensitive vegetation community according to the San Diego Biology Guidelines (SDBG) (City of San Diego 2018). DCSS occurs within some isolated locations within Fiesta Island and locations adjacent to the San Diego River and Sea World Drive. In many areas mapped as Disturbed Habitat, there are some remnant native DCSS species present, but in such low numbers that the areas could not be mapped as DCSS.

Disturbed Habitat (DH)

DH are areas that have been physically disturbed through human activity and are no longer recognizable as a native or naturalized vegetation association (Oberbauer et al. 2008). These areas may continue to retain soil substrate. If vegetation is present, it is almost entirely composed of non-native vegetation, such as ornamental

or ruderal exotic species (i.e. weeds). Specifically, within the study area, DH consists mostly of filled soils to be utilized for recreation and development. These areas have recruited non-native plant species including, but not limited to, Russian thistle (*Salsola tragus*), fivehorn smotherweed (*Bassia hyssopifolia*), mustards (*Brassica* sp.), Australian saltbush (*Atriplex semibaccata*), hottentot fig (*Carpobrotus edulis*), various iceplants, fennel (*Foeniculum vulgare*), garland daisy (*Glebionis coronaria*), peppergrass (*Lepidium* sp.), wild radish (*Raphanus* sp.), tree tobacco (*Nicotiana glauca*), and many other herbaceous weeds. Examples of these areas may include graded landscapes or areas, graded firebreaks, graded construction pads, construction staging areas, off-road-vehicle trails, areas repeatedly cleared for fuel management, or areas that are repeatedly used in ways that prevent revegetation (e.g. parking lots, trails that have persisted for years). DH is considered a Tier IV land cover according to the SDBG (City of San Diego 2018).

Southern Coastal Salt Marsh (SCSM) and Disturbed Southern Coastal Salt Marsh (dSCSM)

SCSM is a native plant community comprised of halophytes and persists primarily from tidal influence. In San Diego County this community persists within bays, lagoons, and estuaries where the soils have a broad range of salinities (i.e. saline, freshwater, brackish, hypersaline), based upon the environmental setting, such as tidal estuaries or closed lagoons. Elevation relative to sea level and seasonal conditions also plays a factor, influenced by dry or wet seasonal conditions. SCSM is found on the east side of Fiesta Island, within a few isolated saline basins within the CLT Preserves on Fiesta Island (Site No. 5) and at the old Sea World Drive/Cloverleaf area (Site No. 1a).

California cordgrass (*Spartina foliosa*) dominates the low marsh area and typically occurs from approximately +3.0 feet to +5.0 feet mean lower-low water (MLLW) (see Appendix B.2). Other prevalent species in the low marsh area include salty susan (*Jaumea carnosa*) and saltwort (*Batis maritima*). The mid-elevation salt marsh area as defined typically occurs from approximately +4.0 feet to +5.7 feet MLLW and is dominated by pickleweed (*Salicornia pacifica; S. bigelovii*) and saltwort, also containing cordgrass and western marsh-rosemary (*Limonium californicum*) at lower densities. The high-elevation salt marsh areas are irregularly to intermittently inundated and typically occur from approximately +5.5 feet to +7.5 feet MLLW. The dominant species include woolly sea-blite (*Suaeda taxifolia*), Parish's glasswort (*Arthrocnemum subterminale*), alkali weed (*Cressa truxillensis)*, alkali heath (*Frankenia salina*), salt grass (*Distichlis spicata*), shore grass (*Distichlis littoralis*), and western marsh-rosemary. SCSM is considered a wetlands community according to the SDBG (City of San Diego 2018).

DSCSM is a previously existing SCSM area that has been disturbed by human activities and/or by natural events (e.g. fire, flood). The composition of native species in these disturbed areas is generally lower, less dense, and with a greater number of non-native exotic and weedy species present. Small remnant patches of dSCSM were observed within Site Nos. 1, 3, and 4 on Fiesta Island, and within Site No. 5a (Cloverleaf Enhancement Area) at the Sea World Drive/San Diego River location.

Southern Foredune (SF)

SF is a plant community dominated by succulent perennial herbs and subshrubs, with a higher proportion of suffrutescent plants up to 1 foot tall (Oberbauer et al. 2008). SF is found in areas of sand accumulation along the coast between Point Conception (Santa Barbara) and the U.S./Mexico International border. This habitat is characterized by a drier, warmer, and less strong and persistent onshore wind (Oberbauer et al. 2008). Characterized species include red sand-verbena (*Abronia maritima),* beach sand-verbena (*Abronia umbellata),* beach-bur (*Ambrosia chamissonis*)*,* beach saltbush (*Atriplex leucophylla),* sea rocket (*Cakile maritima),* beach morning glory (*Calystegia soldanella*), beach sun cup (*Camissoniopsis cheiranthifolia*), salt grass, and hottentot-fig (*Carpobrotus edulis*).

Species occurring within SF habitat include beach sun cup, beach-bur, coast goldenbush (*Isocoma menziesii*), and sea rocket. SF is considered a Tier I sensitive vegetation community according to the SDBG (City of San Diego 2018).

Salt Pan/Mudflats (SPMF)

SPMF communities are characterized as coastal wetlands that form when mud is deposited by the tides or rivers (Oberbauer et al. 2008). SPMF occurs in sheltered areas, such as bays and estuaries. Salt pan are expanses of ground covered in salt or other minerals formed from evaporated water. Mudflats are formed when salt pans pool with water when it rains. SPMF communities typically do not support vegetation, however within the study area, glasswort and pickleweed occasionally occurs in higher elevation areas. SPMF occurs in the CLT Preserve on Fiesta Island (Site No. 4) and along Sea World Drive /San Diego River (Site No. 5a). These occurrences in these two locations were visually observed but were small and were not large enough to be mapped as this specific vegetation community.

Non-native Grassland

Non-native grassland consists of dense to sparse cover of annual grasses with flowering culms between 0.5 and 3 feet in height (Oberbauer et al. 2008). In San Diego County the presence of wild oats (*Avena occidentalis*), bromes (Bromus sp.), stork's bill (*Erodium* spp.), and mustard (*Brassica* spp.) are common indicators. In some areas, depending on past disturbance and annual rainfall, annual forbs may be the dominant species; however, it is presumed that grasses will dominate. Non-native grassland is considered a Tier IIIB sensitive vegetation community according to the SDBG (City of San Diego 2018). Non-native grassland occurs in the northern portion of Mission Bay but only occurs in one location within a portion of the CLT Preserve (Site No. 1a) at the Sea World Drive/San Diego River location.

Ruderal (RUD)

RUD is generally land that is supporting little to no native species and is dominated by non-native exotic species and herbaceous weeds. Ruderal land occurs throughout Fiesta Island and specifically within Site No. 3, within the Youth Camping Facility area. It also occurs adjacent to Site No. 1. RUD land and DH are very

similar in that they contain predominantly non-native exotic species; however, DH generally shows more signs of human disturbance and alteration.

3.4.2 Special-Status Species Descriptions

Special-status species, including plants and wildlife, identified within, or immediately adjacent to the proposed upland habitat expansion/preservation sites, are represented in Table 3-2 and in the descriptions that follow (note: detailed information regarding these special-status species is included in the BTR [Alden Environmental 2017]).

Table 3-2. Special-Status Species Site Occurrences

Site	Nuttall's Lotus	Coast Wooly-Heads	Robinson's Pepper-Grass	Oil Neststraw	California Least Tern
No. 1 – Fiesta Island South	X	X	X		
No. 2 – Fiesta Island Central					
No. 3 – Fiesta Island Near Youth Camping	X				
No. 4 – Fiesta Island Central	X (adjacent)	X (adjacent)			
No. 5 – Fiesta Island CLT Preserve Area	X				X
No. 1a – Cloverleaf CLT Preserve Area	X				X
No. 2b – Street Tree Area					
No. 3c – Triangle Restoration Area	X			X (adjacent)	
No. 4d – South Shores East Area	X			X (adjacent)	

Special-Status Plant Species

Special-status plant species detected within the overall Mission Bay park study area during biological resources reconnaissance surveys, conducted for the BTR, included the following: Nuttall's lotus (*Acmispon prostratus*), Palmer's frankenia (*Frankenia palmeri*), Robinson's pepper-grass (*Lepidium virginicum var. robinsonii*), coast woolly-heads (*Nemacaulis denudata* var. *denudata*), San Diego marsh-elder (*Iva hayesiana*),

and woolly sea-blite. (A detailed list of vascular plant species observed during the biological resources surveys and based upon research conducted is included in Appendix B.2).

Special-Status Wildlife Species

Focused wildlife surveys, conducted as part of the BTR surveys, resulted in the detection of the following special-status wildlife species in the overall Mission Bay park study area: Cooper's hawk (*Accipiter cooperii*), redhead (*Aythya americana*), brant (*Branta bernicla*), Costa's hummingbird (*Calypte costae*), black tern (*Chlidonias niger*), white-tailed kite (*Elanus leucurus*), American peregrine falcon (*Falco peregrinus anatum*), common loon (*Gavia immer*), Caspian tern (*Hydroprogne caspia*), California gull (*Larus californicus*), long-billed curlew (*Numenius americanus*), osprey (*Pandion haliaetus*), wandering skipper (*Panoquina errans*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), double-crested cormorant (*Nannopterum auritum*), light-footed Ridgway's rail (*Rallus obsoletus levipes*), black skimmer (*Rynchops niger*), rufous hummingbird (*Selasphorus rufus*), California least tern (*Sternula antillarum browni*), elegant tern (*Thalasseus elegans*), northern harrier (*Circus hudsonius*), reddish egret (*Egretta rufescens*), and southern California legless lizard (*Anniella stebbinsi*). (A detailed list of wildlife species observed during the biological resources surveys and based upon research conducted is included in Appendix B.3).

Information included in the BTR (Alden Environmental 2017) describing California least tern includes the following:

> **California Least tern** (*Sternula antillarum browni*), FE [federally endangered]/SE [state endangered], FP [California fully protected]/MSCP [Multiple Species Conservation Program] Covered
>
> California least tern is a FE, SE, FP, and Multiple Species Conservation Program (MSCP) Covered Species. California least tern breeds in April in southern California and May in northern California (Anderson and Rigney 1980; Massey 1971). The species breeds along marine and estuarine shores, and in abandoned salt ponds (Wilbur 1974). This species is a resident in lacustrine waters near the coast of southern California (Garrett and Dunn 1981). California least terns nest on barren to sparsely vegetated habitat with sandy or gravelly substrate near water (Zeiner et al. 1988–1990).
>
> California least terns were observed in 2016 during a biological reconnaissance survey conducted by AECOM and Nordby Biology Consulting (AECOM 2016).

Special-status species within the City's Multiple Habitat Planning Area (MHPA) boundaries are shown in Figure 3-2, Existing Sensitive Species and MHPA.

SOURCE: ESRI 2024; City of San Diego 2018; CNDDB 2025

DUDEK

0 900 1,800 Feet

FIGURE 3-2

Existing Sensitive Species and MHPA

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

4 Preliminary Design

The Mission Bay Park Master Plan, Fiesta Island Amendment identifies several areas for potential habitat preservation and upland habitat expansion (City of San Diego 2021). The proposed habitat expansion/ preservation areas within Fiesta Island were identified at five locations that are shown on the Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021; see Appendix A). Four sites are discussed herein and are shown in Figure 4-1, Habitat Expansion/Restoration Opportunities Site Reference Map, which provides an overview of the various sites that were evaluated as part of this current PER study.

The City is also considering five other locations adjacent to the San Diego River and Sea World Drive, as additional potential habitat expansion and preservation areas, depending upon the opportunities available in each of those locations.

Appendix A to this PER includes the preliminary drawings/figures for the sites that are being considered on Fiesta Island and those within the San Diego River/Sea World Drive locations. Figures 4-2 through 4-7 show the physical configurations for the proposed restoration and enhancement areas within specific locations on Fiesta Island identified as Site Nos. 1–3, the CLT Nesting Preserve, and three projects located within the San Diego River/Sea World Drive assessment area. Figure 4-8 depicts a species-specific enhancement project at the South Shores site that would be implemented if the City chooses to site recreational activities and features over the larger South Shore restoration site. Appendix A provides graphics for various sites that were considered and rejected within the San Diego River/Sea World Drive expansion area.

A field evaluation was conducted at the potential Upland Habitat Expansion and Preservation areas identified by the Mission Bay Master Plan, within Fiesta Island and the Sea World Drive/San Diego River assessment areas. Discussed below are observations and descriptions of the habitat restoration constraints and opportunities, existing conditions, and proposed habitat restoration within the various proposed preserve areas. Summaries of the habitat restoration recommendations on Fiesta Island and for the Sea World Drive/ San Diego River areas are provided in tables in Sections 4.1 and 4.3, respectively.

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 425 850 Feet

FIGURE 4-1

Habitat Expansion/Restoration Opportunities Site Reference Map

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

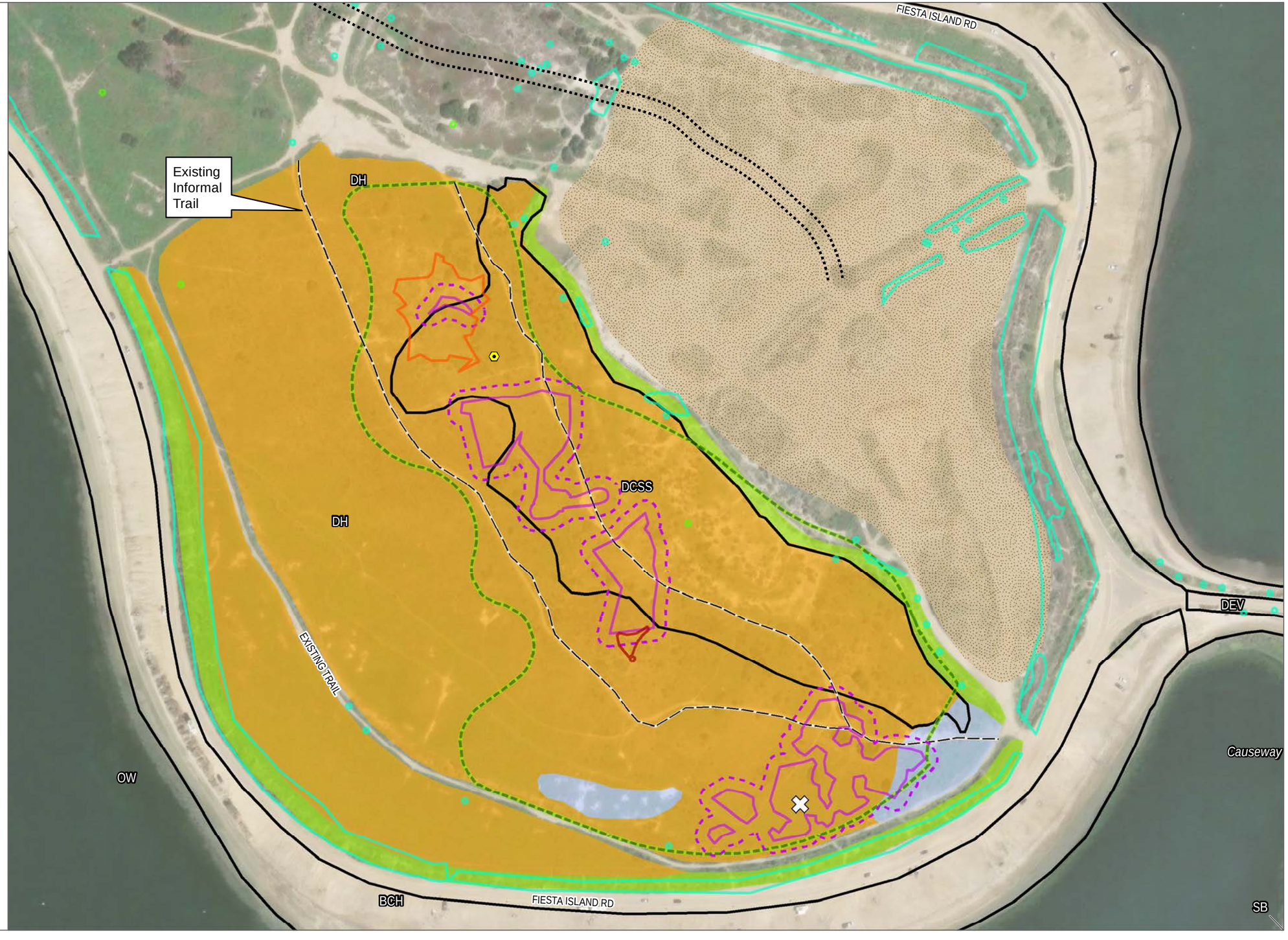
- Soil Sample Location
- Informal Trails
- Potential Haul Route
- Original Proposed Upland Habitat Expansion Preserve Areas (Fiesta Island Concept Plan)
- Existing Sand Replenishment Maintenance Area

Upland Habitat Expansion Restoration Treatments

- Coastal Sage Scrub Restoration and Enhancement
- Coastal Salt Marsh Enhancement
- Coastal Strand Berm Revegetation
- Vegetation Communities/Land Cover
  - BCH, Beach
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH, Disturbed Habitat
  - OW, Open Water
  - SB, Shallow Bay

Special-status Plants

- Lewis' evening-primrose
- Robinson's pepper-grass
- Coast woolly-heads
- Woolly seablite
- Nuttall's acmispon
- Burrowing owl Location



SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 100 200 Feet

FIGURE 4-2

Habitat Expansion/Enhancement Site #1 (Fiesta Island Southeast End)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

North Fiesta Island Stockpile Option 1

North Fiesta Island Wetland Restoration Project

Soil Sample Location

Proposed Grading Contours

Road

Informal Trails

Potential Haul Route

Toe of Berm

Original Proposed Upland Habitat Expansion Preserve Areas (Fiesta Island Concept Plan)

Upland Habitat Expansion Restoration Treatments

Coastal Sage Scrub Restoration and Enhancement

Non-Tidal Coastal Salt Marsh Enhancement and Revegetation

Coastal Salt Marsh/Wetland Revegetation and Enhancement

Sand Import/Coastal Strand Revegetation and Least Tern Enhancement

Southern Foredune Restoration

Vegetation Communities/Land Cover

BCH, Beach

DCSS, Diegan Coastal Sage Scrub

DH, Disturbed Habitat

OW, Open Water

SF, Southern Foredunes

dSCSM, Disturbed Southern Coastal Salt Marsh

Special-status Plants

Lewis' evening-primrose

San Diego Viguiera

Coast woolly-heads

Decumbent goldenbush

Red sand-verbena

Woolly seablite

Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 112.5 225 Feet

FIGURE 4-3

Habitat Expansion/Enhancement Site #2 (Fiesta Island North)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

North Fiesta Island Stockpile Option 1

Soil Sample Location

Proposed Grading Contours

Potential Haul Route

Original Proposed Upland Habitat Expansion Preserve Areas (Fiesta Island Concept Plan)

Upland Habitat Expansion Restoration Treatments

Coastal Sage Scrub Restoration and Enhancement

Non-Tidal Coastal Salt Marsh Enhancement and Revegetation

Sand Import/Coastal Strand Revegetation and Least Tern Enhancement

Vegetation Communities/Land Cover

BCH, Beach

DCSS, Diegan Coastal Sage Scrub

DEV, Urban/Developed

DH, Disturbed Habitat

OW, Open Water

SF, Southern Foredunes

Special-status Plants

Lewis' evening-primrose

Coast woolly-heads

Red sand-verbena

Woolly seablite

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 80 160 Feet

FIGURE 4-4

Habitat Expansion/Enhancement Site #3 (Fiesta Island North End Youth Camping Facility)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

North Fiesta Island Stockpile Option 1

Soil Sample Location

Proposed Grading Contours

Potential Haul Route

Original Proposed Upland Habitat Expansion Preserve Areas (Fiesta Island Concept Plan)

Upland Habitat Expansion Restoration Treatments

Coastal Sage Scrub Restoration and Enhancement

Non-Tidal Coastal Salt Marsh Enhancement and Revegetation

Sand Import/Coastal Strand Revegetation and Least Tern Enhancement

Vegetation Communities/Land Cover

BCH, Beach

DCSS, Diegan Coastal Sage Scrub

DEV, Urban/Developed

DH, Disturbed Habitat

OW, Open Water

SF, Southern Foredunes

Special-status Plants

Lewis' evening-primrose

Coast woolly-heads

Red sand-verbena

Woolly seablite

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 80 160 Feet

FIGURE 4-4

Habitat Expansion/Enhancement Site #3 (Fiesta Island North End Youth Camping Facility)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

North Fiesta Island Stockpile Option 1

North Fiesta Island Wetland Restoration Project

Soil Sample Location

Proposed Grading Contours

Temporary Down Slope

Road

CCC Approved Boundary/Temporary Site Protection Fence

Potential Haul Route

Toe of Berm

Coarse Sand with Shell Fragments

Upland Habitat Expansion Restoration Treatments

Southern Foredune Restoration

Vegetation Communities/Land Cover

BCH, Beach

DEV, Urban/Developed

DH, Disturbed Habitat

OW, Open Water

dSCSM, Disturbed Southern Coastal Salt Marsh

Special-status Plants

Lewis' evening-primrose

San Diego Viguiera

Woolly seablite

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 125 250 Feet

FIGURE 4-5

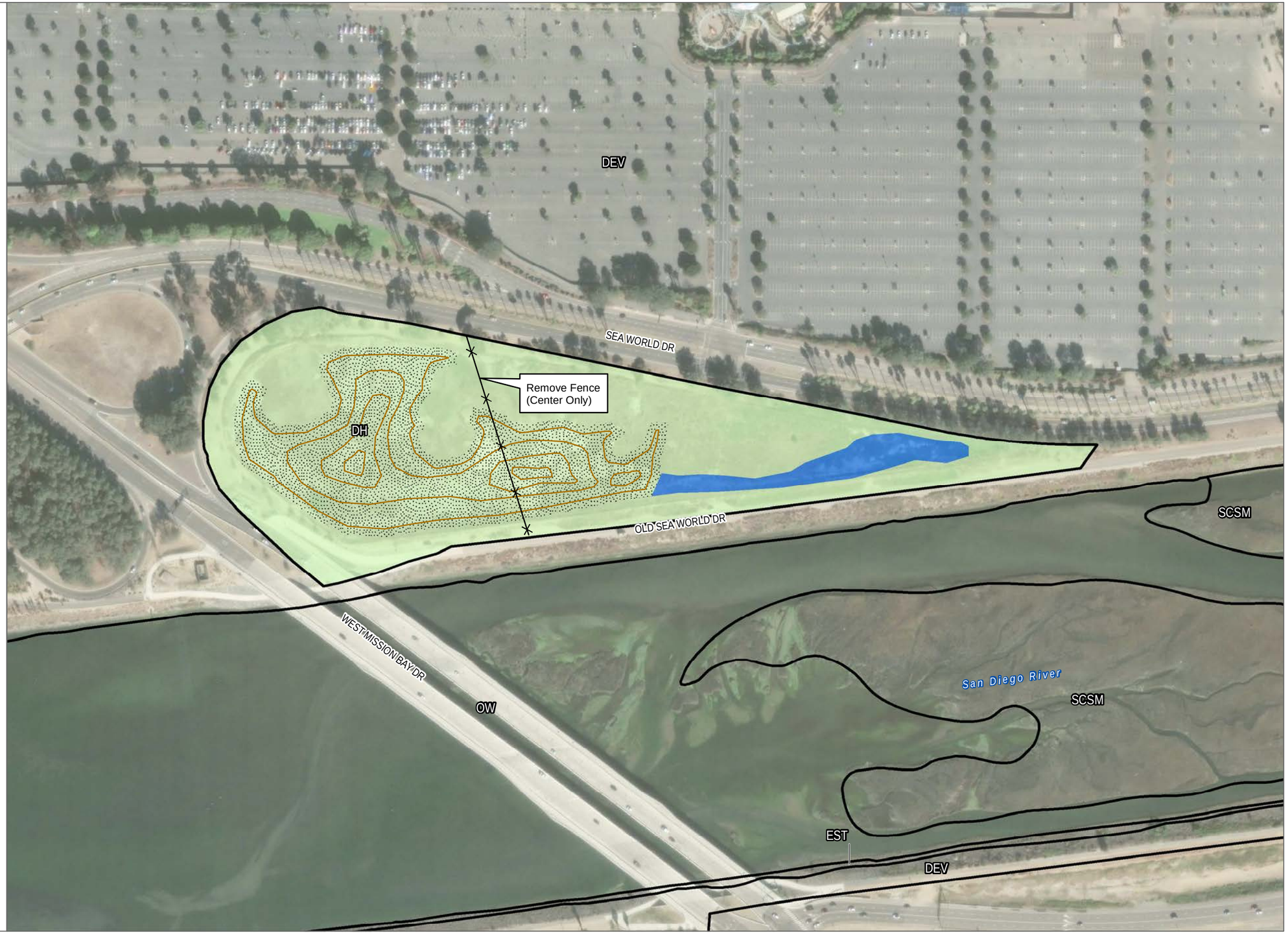
Habitat Expansion/Enhancement Site #4 (Fiesta Island North Central Portion)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

Proposed Grading Contours

Upland Habitat Expansion Restoration Treatments

- Non-Tidal Coastal Salt Marsh Enhancement and Revegetation
- Coastal Strand Revegetation and Enhancement
- Sand Import and Coastal Strand Enhancement Revegetation
- Vegetation Communities/Land Cover
  - DEV, Urban/Developed
  - DH, Disturbed Habitat
  - EST, Intertidal Estuary
  - OW, Open Water
  - SCSM, Southern Coastal Salt Marsh



SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 120 240 Feet

FIGURE 4-6

Habitat Expansion/Enhancement Sites #5a (San Diego River/Sea World Drive)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Soil Sample Location
- Proposed Grading Contours
- Informal Trails
- Original Proposed Upland Habitat Expansion Preserve Areas (Fiesta Island Concept Plan)
- San Diego Audubon Society Revegetation Area (San Diego River/Sea World Dr. Site #3a)

Upland Habitat Expansion Restoration Treatments

- Coastal Sage Scrub Restoration and Enhancement
- Coastal Salt Marsh Enhancement
- Coastal Strand Berm Revegetation
- Sand Import/Coastal Strand Revegetation and Least Tern Enhancement
- Southern Foredune Restoration
- Potential Nuttall's acmispon Expansion Area
- Vegetation Communities/Land Cover
  - BCH, Beach
  - CBM, Coastal Brackish Marsh
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH (Rip-Rap), Disturbed Habitat
  - DH, Disturbed Habitat
  - OW, Open Water
  - SB, Shallow Bay
  - SCSM, Southern Coastal Salt Marsh
  - dDCSS, Disturbed Diegan Coastal Sage Scrub

Special-status Plants

- Lewis' evening-primrose
- Torrey pine
- Coast woolly-heads
- Southwestern spiny rush
- Woolly seablite
- Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 125 250 Feet

FIGURE 4-7

Habitat Expansion/Enhancement Sites #5b and #5c (San Diego River/Sea World Drive)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- Informal Trails
- Potential Nuttall's acmispon Protection Buffer/Restoration Area (100')
- Coastal Sage Scrub Restoration and Enhancement
- Vegetation Communities/Land Cover
  - BCH, Beach
  - CBM, Coastal Brackish Marsh
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH (Rip-Rap), Disturbed Habitat
  - DH, Disturbed Habitat
  - OW, Open Water
  - SB, Shallow Bay
  - SCSM, Southern Coastal Salt Marsh
  - dDCSS, Disturbed Diegan Coastal Sage Scrub

Special-status Plants

- Lewis' evening-primrose
- Torrey pine
- Coast woolly-heads
- Southwestern spiny rush
- Woolly seablite
- Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 125 250 Feet

FIGURE 4-8

Habitat Expansion/Enhancement Site #5c (South Shores Restoration Site) - Nuttall's acmispon Preserve Option Only

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

4.1 Fiesta Island Habitat Expansion/Preservation Areas

Four potential habitat expansion/preservation sites on Fiesta Island were evaluated for this report. Table 4-1 summarizes recommended habitat restoration opportunities. The acreage of proposed habitat restoration reflects the opportunity within each identified area. In some cases, the recommended restoration opportunity exceeds the area shown on the Mission Bay Park Master Plan, Draft Fiesta Island Amendment (City of San Diego 2021; see Appendix A). Larger areas are recommended because the resultant habitat patch will have greater ecological stability and likelihood of becoming self-sustaining with minimal maintenance requirements. In some instances, larger restoration areas are recommended for habitat connectivity within the Fiesta Island Amendment area.

A unifying theme on Fiesta Island involves modification and revegetation of the sand berm that borders each of the proposed restoration sites. Conversion of the berms from non-native vegetation to Coastal Strand and Southern Foredune habitat will help to connect these habitat patches with continuous native vegetation communities. The berms presently support non-native species populations that, if left intact, would provide an ongoing source of non-native weed seed that would invade the proposed habitat restoration areas. Treatment of the berms will reduce long term maintenance and strengthen native vegetation communities within each of the proposed restoration areas.

Table 4-1. Summary of Fiesta Island Upland Habitat Restoration Recommendations

Site	Recommended Habitat Restoration Opportunities Fiesta Island				Import Sand
	Diegan Sage Scrub	*Coastal Strand*	*Southern Foredune*	*Coastal Salt Marsh*	
No. 1 – Fiesta Island South	X	X		X	Yes (berm)
No. 2 – Fiesta Island North Central			X	X	Yes (berm)
No. 3 – Fiesta Island Near Youth Camping	X	X		X	Yes (dune)
No. 4 – Fiesta Island CLT Preserve Area		X	X	X	Yes (preserve cap)

4.1.1 Fiesta Island Site No. 1 – Fiesta Island South

Location and Opportunities

The proposed habitat expansion area, identified herein as Site No. 1 (see Figure 4-2, Habitat Expansion/Enhancement Site No. 1 [Fiesta Island Southeast End]), is situated on the south end of Fiesta Island, and lies between Fiesta Island Road and the existing sand replenishment maintenance area. The area is bordered by a sand berm that parallels the entire length of the Fiesta Island Road and encloses the southern and western boundaries of this restoration site. Another berm runs along the east side of the site separating the potential mitigation site from the sand replenishment maintenance area and proposed soil stockpile area.

Existing Conditions

This potential habitat expansion area is a low-lying area that supports predominantly non-native weeds and exotic species. Exotic/non-native species observed included garland/crown daisy (*Glebionis coronaria*) also known as chrysanthemum, black mustard (*Brassica nigra*), tumbleweed (*Salsola tragus*), thistles, other annual weeds, and non-native grasses. One exotic olive tree (*Olea europaea*) was also observed in this location. Soils appear to contain more fines and fewer sands than other areas observed on Fiesta Island. The perimeter berm is approximately 8 feet tall with steep sides. The berms appear to be made primarily from sand and concrete debris. The berms are vegetated with ice plant and other non-native species that are adapted to sandy soils.

Scattered throughout the center of the site are numerous large mature native laurel sumac shrubs, ranging from 10 to 12 feet in height. The mature condition and large size of these specimens suggests these plants have been present for a long time and their vigorous growth suggests that growing conditions are favorable. There are also sparse occurrences of Diegan coastal sage scrub species including, but not limited to, coastal sagebrush, coast goldenbush, deerweed (*Acmispon glaber*), and coyote brush (*Baccharis pilularis*).

Within the southeast portion of the area there are also sparse occurrences of SCSM species, including woolly sea-blite and beach sun cup. These species occur in the lower portions of the site where water appears to periodically settle and high saline soil conditions have developed from evaporative salt accumulation.

The westerly portion of this site supports a small population of Nuttall's lotus (*Acmispon prostratus)*. This population is not identified on any project maps; however, several pink pin flags were observed in this area which suggests these individuals may have been previously documented. The full extent of this population is not known, and additional surveys and mapping is needed to determine what avoidance measures would be appropriate. An existing trail cuts through the center of this population. Elimination of the trail would help protect and promote species recover and expansion.

A 10-inch municipal water main is present within the Fiesta Island Road right-of-way that can be tapped as a water supply for a temporary irrigation system to support vegetation establishment.

Site Constraints

An informal perimeter trail is located along the inside base of the berm surrounding this site (see Appendix A, Figure 4.1). A secondary trail meanders through the center of the site from the east to the west, near the existing mature laurel sumac shrubs and connects with other trail segments. The area appears to be used for informal dog walking activities and general hiking. A future trail system is planned for the perimeter of this area, on the inside of the berm, as shown on the Fiesta Island Concept Plan. Other uses proposed in the Fiesta Island Concept Plan north of the site include parking lots, active recreational areas, a playground, restrooms, and a connector road cutting through the center of the island. These more intensive recreational uses proposed immediately adjacent to a preserve area could pose access control issues, which may require excluding recreational users and dogs from the restoration area, and/or confining the users to the designated trail system. Some form of fencing or other physical barrier may be required.

Recommendations

Based on disturbed site conditions and the native species observed in this area, Diegan Coastal Sage Scrub, Coastal Strand, and enhancement of the minor occurrence of Southern Coastal Salt Marsh habitat are recommended (Appendix A, Figure 4.1). DCSS would be established on the broad, flat interior area and Coastal Strand vegetation would be established on the existing berm. In addition, based upon the occurrence of Nuttall's lotus, expansion of population size and aerial extent within the site is possible.

To achieve this habitat restoration goal, exotic/non-native species will be eradicated throughout the area, followed by installation of appropriate native species from container plants and seed. Adequate site preparation will be critical to the success of the restoration effort in this location. The perimeter berm topography would be modified to flatten the side slopes through the placement of additional sand. Additional berm grading is recommended to create topographic variation and meandering mounding that more resemble natural dune features.

The existing laurel sumac shrubs would be preserved, and appropriate native DCSS species would be introduced to expand the native habitat area. In addition, the minor occurrences of SCSM species in several locations would be linked together where appropriate with appropriate SCSM species introduced.

A temporary irrigation system is recommended to support young container plants and stimulate seed germination and seedling establishment. Irrigation would continue until plant materials become adequately established and adapted to natural site conditions.

Some form of fencing or barrier would be required along the designated new trail system, between the recreational use area and the preserve, to protect the area from damage, and to allow the native revegetation program to take hold.

The perimeter of this habitat expansion area is identified as a Coastal Landscape (Natural Recreation) Area on the Fiesta Island Concept Plan exhibit. As a result, some level of recreational use is planned within this habitat restoration area. Adjacent recreational uses will require some type of vegetated buffer zone and/or fencing to avoid impacts to this potential preserve area.

4.1.2 Fiesta Island Site No. 2 – Fiesta Island North Central

Location and Opportunities

The proposed habitat preserve area, referred to herein as Site No. 2 (see Figure 4-3), is in the north central portion of Fiesta Island, between the central connector road and the proposed North Fiesta Island Wetlands project area. This site is currently utilized as an informal hiking and dog use area, composed of a network of trails meandering through patches of native and non-native vegetation. The trails are informal and are in soft sandy areas. There is a low elevation access point along the west edge of the site that affords entrance from a widened parking area off Fiesta Island Road. The site is bordered to the south by the section of Fiesta Island Road that bifurcates the island and to the west by the portion of the road that follows the perimeter of Fiesta Island. To the north and east of the site is DH and SF vegetation interspersed with walking trails. The Fiesta Island Master Plan, Fiesta Island Amendment (City of San Diego 2021) indicates that future use of the areas north and east of the site will be used as sand management areas. This area is proposed as a soil stockpile area as source materials to construct the Tecolote Creek Wetlands and Cudahy Wetlands restoration sites.

Existing Conditions

The site is separated from Fiesta Island Road by a sand berm. The site has gentle topography and is mostly flat. Soils are very sandy, and water percolation appears to be rapid. Native species and non-native species are present within the area including large Brewer's salt bush (*Atriplex lentiformis* 'Brewerii'), which are scattered along the northwest edge of the site. A low depression within the southwest portion of the site appears to pond water seasonally for sufficient duration to support a few willows (*Salix lasiolepis*), mulefat (*Baccharis salicifolia*), coast goldenbush, coyote brush, and beach sun cup. Non-native species observed in the area included salt cedar (*Tamarix* sp.), black mustard, garland daisy/chrysanthemum, and other annual weeds.

A 6-inch municipal water main is present approximately 1,600 feet away within San Diego Youth Aquatic Center. The water source may be tapped as a water supply for a temporary irrigation system to support vegetation establishment.

Site Constraints

The area is heavily used by the public and currently has numerous informal hiking and dog walking trails meandering through the area. Scattered native species, interspersed with non-native exotic/weed species are present. The site is very windy, being on the west side of the island. Some homeless activities were observed in the area.

Recommendations

SF habitat is recommended for establishment on this site. Soils are too sandy to support DCSS. The natural windy location on the island would provide some benefit to the establishment of the dune habitat. To restore the site, the network of trails will need to be eliminated and/or condensed to one main trail navigating the perimeter of the restoration area. A more formalized trail is proposed on the Fiesta Island Concept Plan

around the perimeter of the restoration area. Fencing and signage will need to be incorporated into the trail system to keep trail users and pets out of the restoration area.

Further establishment of SF habitat is possible on the existing berm following a similar treatment as described for Site No. 1. Berm modification and establishment of foredune vegetation should extend north along the berm that parallels Fiesta Island Drive to the North Fiesta Island Wetlands project to create habitat connectivity between these resource areas. Additional foredune establishment is recommended outside the berm on a disturbed area located between Fiesta Island Drive and the berm. Habitat establishment on the berm and adjacent areas will create a larger block of habitat that is more easily maintained and protected.

According to the Fiesta Island Concept Plan, the sand replenishment maintenance areas will be relocated to the southeast and north ends of this project site, which would include a maintenance road connecting the two areas to the Fiesta Island connector road. It will be important to maintain a buffer zone between the sand management/soil stockpile area and the restoration area.

There is also a small low-lying wetland area composed of willows, mule fat, and some coastal salt marsh species near the south-central portion of this site that should be preserved. There are opportunities in this location to expand upon and enhance the habitat through the removal of invasive/exotic species and weeds, and a combination of planting and seeding with appropriate native species.

4.1.3 Fiesta Island Site No. 3 – Fiesta Island Near Youth Camping

Location and Opportunities

Access to this potential preserve expansion was hindered due to locked gates and fencing, however a visual reconnaissance was conducted from the northerly perimeter of the site from the fence line. This proposed habitat preservation area, identified herein as Site No. 3 (see Figure 4-4), is located at the northeast end of the Youth Camping facility. The Fiesta Island Concept Plan shows a portion of this youth camping area, along the northeast edge of the site up to the bay edge, as designated habitat preserve. An existing maintenance access road/trail crosses through the area. The easterly edge of this restoration area extends to the edge of the beach along the bay.

Existing Conditions

There is a paved maintenance access road and paved trail system that crosses through the proposed restoration area. A perimeter chain link fence parallels Fiesta Island Road with a maintenance access road gated entry point located at the north edge of the site. The access gate and maintenance road leads directly into the area identified as the restoration site. It is currently unknown if these existing paved road improvements need to remain, or if they could be relocated to alternative locations.

The proposed restoration area extends from the camping facility in the west to the beach edge in the east. The area has varying topography sloping from higher elevations in the west to lower elevations in the east.

Most of the site is currently disturbed habitat composed of a mixture of non-native weeds and ornamental/exotic species. Patches of disturbed DCSS also exist within the site.

A municipal water main is present approximately 1,300 feet away within San Diego Youth Aquatic Center. The water source may be tapped as a water supply for a temporary irrigation system to support vegetation establishment.

Site Constraints

The paved access road and paved trails pose a potential constraint for the proposed restoration because roads and trails invite recreational activities that could cause impacts to the preserved and restored native vegetation area. Fencing and/or barriers would need to be installed at the perimeter of roads and trails to keep users from entering the area.

Recommendations

The paved access road and gate and paved trails crossing through this restoration should be evaluated for abandonment or realignment to move user activities away from the restored and expanded habitat. Removal/relocation of the roads will help create a larger, contiguous habitat area that will have less edge effects and greater ecological resilience. If the existing paving and gate are to remain, it is recommended that the size of the proposed restoration area would need to be reduced or expanded elsewhere to the southeast, and the restoration terminated at the westerly edge of the access road/trail.

To support the establishment of dune communities, import sand is recommended to create low-profile dune features that are 2 to 4 feet tall relative to existing adjacent landscape elevations. Due to the existing topography, the dune will appear taller along the bay shoreline and shorter when viewed from camping areas to the west. Approximately 21,175 cubic yards of coarse beach sand are needed to create dune landforms and features. All dune areas will be stabilized with native dune vegetation to protect the landform from wind modification and the need to replenish sand to the area.

Native vegetation communities that are recommended for this area include DCSS, Coastal Strand, and enhancement of existing non-tidal coastal salt marsh vegetation. The future limits of the youth camping facility, and the proposed limits of the beach use area along the easterly margin of the site will need to be identified to determine the extent of the restoration area. This area has good habitat potential that would transition directly from the beach and open bay water. Although the area is not intended to function as CLT nesting habitat, there is potential for CLT to nest on the dune feature if birds are attracted to the site. This area offers educational interpretive opportunities for young people at the camping facility. Interpretive elements could be incorporated along the margins of the existing roads, trails, and habitat preserve areas.

4.2 Fiesta Island North California Least Tern Preserve

Location and Opportunities

The existing CLT Preserve is located at the northeast end of Fiesta Island (see Figure 4-5). The site is bordered by Fiesta Island Road and a sand berm. A chain link fence demarcates the perimeter of the preserve boundary.

The following describes existing conditions, habitat requirements, design considerations, and recommendations for the restoration of the Fiesta Island North CLT Preserve. Background research and more detail is included in the CLT Restoration Design Concepts Memorandum (Appendix C). The CLT preserve design recommendations are consistent with the Mission Bay Park Master Plan (City of San Diego 1994) and recommendations provided by the City of San Diego, California Coastal Commission (CCC), and the U.S. Fish and Wildlife Service (USFWS) (CCC 2021).

4.2.1 Goals and Objectives

The main goal of the CLT Preserve design is to demolish the old preserve that no longer functions as intended (Jackson 2022, 2024) and construct a new preserve that is designed and maintained to provide resources that are attractive to CLT. The goal is to build a reconfigured CLT preserve that takes lessons learned from the existing nesting preserve and improves the habitat quality to attract CLT and provide suitable and sustainable CLT nesting habitat. The adopted CLT nesting preserve design incorporates the best available science and is consistent with Section 55.2 of Article V of the City of San Diego City Charter, Mission Bay Park Master Plan, and the Fiesta Island Master Plan Amendment (City of San Diego 2021). Specifically, the CLT Preserve design intends to "expand endangered or threatened species preserves and upland habitats in areas identified in the Mission Bay Park Master Plan, including on North Fiesta Island." It was determined by USFWS and confirmed by CCC staff that the existing CLT nesting site has failed to attract CLT and support nest success for years since its peak in 2003, and that without substantial modification, the preserve would not function as a viable nesting site for these endangered birds. Therefore, new recommendations are identified for the CLT Preserve that are consistent with the Mission Bay Master Plan Amendment direction:

> The Island's north subarea is a controlled habitat preserve area for the California least tern. In addition to sandy areas, this area includes mudflats, lower, mid and upper salt marsh and expanded wetland habitat. The existing mile-long paved roadway located around the perimeter of the subarea will be removed except for an approximately 1,320-foot long segment on the east side, which shall be converted to solely pedestrian and bicycle use. The shortened roadway (to be regraded to drain inward, away from the coast, to promote wetland formation) shall be for bicycles and pedestrians, allowing the public to access the beach areas on the east side of the peninsula outside of the California least tern breeding season. Gates provided at both the western and eastern entry points to the northern area. Maintain visibly permeable, fences with anti-perching features and interpretive signage around the CLT and salt marsh sites, with the interior space to be accessed only by authorized individuals. Public access shall be maintained to the roadway and eastern beach

areas outside of the CLT breeding season, and the remainder of the north subarea shall be closed to public access year-round to protect the CLT and salt marsh sites. Dredge a channel across the Island along with bridges at the western and eastern roadway points to create new habitat areas and improve water circulation. The habitat improvements to the CLT nesting site and new wetlands shall be prioritized in the overall redevelopment of Fiesta Island and shall be completed prior to full redevelopment of the Southeast Subarea.

4.2.2 History of CLT Preserve

Mission Bay is an artificial saltwater bay that was created from a natural estuary, originally called "False Bay." The original marshland was fed by the San Diego River, which subsequently became confined by levees as the area was developed for recreation. The San Diego River terminus historically shifted between San Diego Bay and False Bay before dredging activities in 1946. This periodic shifting changed where the river carried silt and sand and had the potential to transform a small bay into an estuary and then into a shallow water tidal marsh over time (UCSD 2019). Fiesta Island was originally a sandbar within this estuary. In the late 1940s 25 million cubic yards of sand and silt were dredged to create the varied landforms of Mission Bay Park, including Fiesta Island, which encompasses 610 acres. Despite its man-made origins, the isolation of the island and surrounding food sources enticed the federally endangered California least tern to build their nests in several sandy areas on the island.

The existing fenced 30-acre CLT nesting site on NFI is managed by the City of San Diego in coordination with the USFWS; the Preserve is surrounded by a berm and a mile-long segment of Fiesta Island Road. The first monitoring data for the NFI CLT colony were reported in 1997 (Unitt 2004). However, the CLT nesting sites on Fiesta Island have been failing for years since its peak in 2003 (CCC 2021) mainly due to dense and tall vegetation cover and predator pressures (Jackson 2022). To recover the NFI CLT nesting site, the CCC and USFWS directed closure of the entire NFI to public access year-round and demolish Fiesta Island Road to create a direct connection between the nesting site and open bay waters. A modified plan was devised by CCC staff to address the deficiencies at the nesting preserve while maintaining limited, seasonal public access (CCC 2021).

4.2.3 Existing CLT Preserve Lessons Learned

The reasons for the low CLT productivity and nest failures are many. Research thorough a literature review and communications with preserve managers and staff revealed important lessons learned that inform the proposed design of a new CLT Preserve.

Maintenance Challenges

The CLT Preserve is surrounded by steep berms and is the most difficult of all San Diego CLT nesting sites to maintain in terms of vegetation cover, which attracts a diverse assortment of predators (Jackson 2022). The underlying cause of vegetation recruitment is the soil texture composition. Soils are characterized as silty sand. Sieve tests results show that the soil is composed of 75%–80% silt particles and only 25%–30% sand

fractions. Furthermore, the sand grain size is at the smaller end of the grain size range that is characterized as sand. The high fraction of silt particles and small sand grain size creates a soil surface that is supportive of seedling recruitment of non-native plant species and vegetation in general. Fine soil particles tend to retain moisture for longer and bind nutrients including organic compounds that support seed germination, seedling recruitment, and general plant growth. The rapid growth of vegetation in spring coincides with the CLT breeding season. Therefore, rapid vegetation growth occurs at a time when CLT are visually scanning the landscape to identify potential nest sites.

The CLT Preserve is occupied by bare ground and coastal salt marsh vegetation that are subject to non-native species invasion. This vegetation growth and the lack of coarse sand grains on the soil surface reduce sandy nesting opportunities. The berms surrounding the CLT Preserve also support non-native species populations that provide an ongoing source of non-native weed seed. Intense non-native vegetation recruitment necessitates annual vegetation maintenance via mechanical mowing to clear areas for CLT nesting. The maintenance needs are more excessive than the City of San Diego can provide. Therefore, teams of volunteers organized by the San Diego Audubon Society and USFWS have assisted with the control of invasive vegetation that would otherwise dominate the island. However, it appears these mowing and invasive species removal activities may compact the soil, making it less desirable for nesting (Jackson 2024).

The maintenance challenge is to exclude vegetation that is higher than the incubating California least terns on the nesting site. Any vegetation such as the invasive cocklebur (*Xanthium strumarium*), annual grasses, or other non-native vegetation impedes the visual surveillance of terns for predators. The vegetation also attracts snakes and other ground predators, further attracting avian predators. Species such as sand-verbena (*Abronia villosa*) and coast woolly-heads should also be completely removed or thinned to avoid trapping chicks (Jackson 2022).

Nesting Outcomes Based on Long-Term Data

The NFI CLT Preserve functioned for about 5 years (from 1997 to 2003) (Unitt 2004; CCC 2021). However, the site started declining in 2003 and has not recovered to date. In 2022, Jackson concludes that no nests were found at the NFI and Stony Point CLT Preserves, although terns were observed site selecting for a brief period at NFI. This is likely due to presence of tall vegetation and predation (Jackson 2022). In 2024, two chicks (one nest) hatched from a total of six nests (totaling 12 eggs) on the NFI CLT Preserve, which is still significantly below any success threshold; 10 CLT were depredated by predators (Jackson 2024). For all CLT nesting sites in the San Diego area, the most predator activity in 2022 occurred at NFI (Jackson 2022).

CTL habitat selection reflects the need to balance its own survival with reproductive efforts. It is highly likely that CLT assesses the vegetation cover and predator abundance at the potential nesting site prior to nesting to maximize reproduction while ensuring their own survival. The NFI site lacks internal elevated areas for terns to more easily view incoming avian predators. Open vistas allow for a full view of incoming predators for colony defense. Jackson (2024) recommends less vegetation cover to lower the mortality for chicks and fledglings that sometimes get entangled, and at the same time, be less attractive to terrestrial predators. The tall vegetation at NFI prevents terns from viewing incoming predators and attracts terrestrial animals along

with avian predators. This is the likely reason that NFI CLT Preserve productivity has been declining and demonstrates that the lack of nesting at NFI is due to habitat choice by CLT (Jackson 2022).

Based on the long-term data collected at NFI, it is suggested that the habitat does not function mainly due to the following constraints:

- CLT Preserve surrounded by land instead of water, which limits access to foraging and mating habitat
- Inadequate substrate
  - Too many fines that may compact soils and prevent nest establishment
  - Compaction from maintenance activities
  - Organic materials that prevent camouflaging the birds and produce higher ground temperature
- Density and height of vegetation (particularly non-native species) limiting nesting habitat
- Predators (vicinity to, and access and habitat for predators)
- Human disturbance (human presence, unauthorized access and noise disturbance)

The consistent low number of nests and survivor rates at NFI is attributable to habitat choice by CLT, which reflects the needs of the species to balance its own survival against reproductive efforts. CLT in Mission Bay may be assessing the vegetation cover and the predator situation prior to nesting to maximize reproduction while ensuring their own survival. The frequent occurrence of great blue herons may deter CLT from nesting. The tall vegetation on NFI may have discouraged nesting and attracted terrestrial predators along with more avian predators (Jackson 2024).

4.2.4 Existing Conditions

Presently, the fenced CLT nesting preserve is approximately 28 acres consisting of 14 acres of maintained nesting habitat and 14 acres of unmaintained nesting habitat. The unmaintained portion of the preserve is composed of patchy non-tidal coastal salt marsh vegetation, interspersed with non-native species. The sandy strip along the western portion of the CLT Preserve includes fine silt particles that provide an opportunity for non-native species to recruit. The sand berm between the road and the fence is constructed from soil and concrete debris and supports primarily non-native exotic species, with some interspersed native species. Inside the berm, the elevation of the land is 8 to 16 feet higher than the adjacent roadway at the north end of the project site.

Fiesta Island Drive is a paved asphalt road that runs the perimeter of the North Island recreation zone. Importantly, the road is situated between the CLT preserve and the open water habitat creating a barrier between nesting and foraging habitat. The North Island zone outside of the fenced CLT preserve is devoted to recreational activities that are typical of Mission Bay Park and NFI including use of Fiesta Island Road for vehicular circulation and beach access, cycling, jogging, and other sports related activities. The interior of the

island area outside the fenced CLT preserve is used for sand processing and remote-controlled model off-road vehicle racing.

Topography and Soils

The CLT Preserve is flat, with little to no topographic variation. About half of the Preserve is composed of maintained barren soil and the rest is disturbed coastal salt marsh vegetation. Generally, the soil throughout the area are sandy, but contain fine silt particles and organic materials that provide an opportunity for non-native species to recruit. The western portion of the CLT nesting area is classified as beach habitat, however small portions of the site exhibit salt pan characteristics in the low-lying areas where water periodically ponds and evaporates.

Vegetation

As discussed above, half of the CLT Preserve consists of unmaintained disturbed non-tidal coastal salt marsh habitat that is interspersed with non-native species. The balance of the relatively flat site supports disturbed alkali vegetation with patches of alkali scalds that are barren. The non-native species present on NFI include ice plant (*Mesembryanthemum crystallinum*), and tall-growing plants such as mustard (*Brassica* sp., *Hirschfeldia* sp.), cocklebur, and annual grasses.

4.2.5 Habitat Design and Management

The dominant non-native vegetation on the CLT Preserve necessitates annual vegetation maintenance via mechanical mowing to clear areas for CLT nesting. Maintenance includes mowing and disking to remove weed cover. It appears this mowing activity may compact the soil, making it less desirable for nesting. Management of the preserve includes routine predator control, access control, and CLT nest monitoring.

California Least Tern Habitat Preferences

It is imperative to understand habitat preferences, feeding, mating, and nesting behavior, and predator threats to design functional CLT habitat. CLT prefer to nest in larger groups in coastal areas adjacent to open water, on beaches, mudflats, and shallow sand dunes, usually near shallow estuaries and lagoons (88 FR 49310–49355). The nests are simple scrapes in sand or small-grained gravel in relatively barren substrate above the tidal inundation zone to avoid flooding. Access to open water is necessary for mating; the male flies around with a small fish in his beak, often pursued by a female looking for a fishing mate. Terns hunt for food in shallow water bodies and take turns feeding their young. While CLT prefers open habitat for nesting, sparse vegetation in the vicinity provides cover from predation of juveniles.

Landscape Context, Size and Shape

Landscape context, such as adjacency to shallow water, and habitat size, shape, and edges are important factors to consider when designing functional CLT habitat. California least terns migrate, roost, and nest in colonies and are ground nesters. Colonies consist of 15 to 300 pairs (88 FR 49310–49355). Therefore, a

successful nesting area should be large enough to provide enough space for a small colony, which in San Diego is a minimum of 3 to 4 acres in size and should provide appropriate spacing between nests (between 0.5 meters and 7 meters).

CLT require access to shallow and calm open water for hunting, mating, and raising their young, but also needs to be close to sparsely vegetated dune habitat for cover. They prefer to be surrounded by shallow water on three sides and favor peninsulas over islands. CLT prefers nesting close to a lagoon or estuary with a dependable food supply (e.g., anchovies, silversides, surf perch, and topsmelt), and adjacency to shorelines appears to be desirable for foraging and roosting with fledglings (USFWS 1980).

Topography and Soils

Micro-topography, substrate, ground temperature, and other surface features contribute to successful CLT nesting habitat with the appropriate sand substrate being one of the most important factors. CLT do not nest in dunes or areas with diverse topography, although shallow dunes and low growing dune vegetation is used for cover, specifically for chicks to escape predators. The highest nest success rates have been documented in relatively flat terrain at elevations above the high tide to prevent flooding of the habitat (88 FR 49310–49355).

Loose, coarse sand and shell fragments that prohibit non-native vegetation establishment provide more successful nesting habitat than finer substrates and dense or tall vegetation (Stucker et al. 2013). Light-colored sand-shell substrate that is softer and relatively richer in shell content than other sandy locations are conducive to higher nesting success (Patton 2009). It has also been shown that lighter color sand provides better camouflage and cooling features than darker color sand that provided higher contract and, therefore, higher visibility for predators (Jackson 2024). California least terns make shallow depressions in the ground to lay their eggs; therefore, the substrate should not be compacted. They occasionally decorate their nests with pebbles, shells or debris, and shells are a preferable nesting substrate (Sherfy et al. 2011; Stucker et al. 2013; 88 FR 49310–49355). Heavy cover and large debris (i.e. driftwood) seem to compromise the tern's ability to detect nest predators by obstructing their viewshed. A heterogeneous landscape with open sandy areas interrupted by areas with sparse vegetation may produce the best results (Swaisgood et al. 2018). Measurements of soil temperatures of the various substrates compared to the ambient air temperature (20.4°C) were recorded in five different test plots on FAA Island in Mission Bay in 2024. The substrate with the highest mean temperature was the soil (37.4°C), followed by silt (35.1°C), then native shell (32.6°C), oyster shell (32.7°C), and sand (32.4°C) (Jackson 2024). This underlines the importance of choosing the appropriate substrate (i.e., native shell and sand) to increase nesting success when restoring CLT nesting sites.

Vegetation

California least terns seem to prefer sparsely vegetated areas; the nest-site selection has been shown as optimal at less than 5% cover but could be as high as a 15% cover (Swaisgood et al. 2018). CLT select for open areas but nest in the vicinity of sparse vegetation to provide cover for juveniles. CLT appear to avoid vegetation (specifically grass, salt bush, and beach-bur), silt and leaf litter preferring sand and gravel features (Sherfy et

al. 2011). Placement of shallow and sparse vegetation at the fringes of dunes has shown to be used as cover as well as shading for chicks and indicated higher fledgling success.

4.2.6 Threats and Stressors

California least terns are affected by many stressors including predation, lack of sightlines due to vegetation, lack of access to forage and fledgling resources, and human disturbance. This section explores environmental and anthropogenic stressors and how design can alleviate some stressors.

Predator Stressors

Prepared sites that are not utilized have the most intense predator pressure and the CLT decline at NFI (and Stony Point on Fiesta Island) reflect these types of predator pressures (Jackson 2022). At NFI, the main predators are peregrine falcons (*Falco peregrinus*), and corvids such as common ravens (*Corvus corax*) and American crows (*Corvus brachyrhynchos*) who prey on CLT chicks (USDA 2022). Furthermore, gull-billed terns (*Gelochelidon nilotica*) and snakes also prey on eggs and juveniles (Jackson 2022); mammalian predators include voles (*Microtus obscurus*), skunks (*Mephitis* sp.), opossums (*Didelphis virginiana*), and feral cats that either use the land bridge to NFI or that are being released. The Mission Bay CLT population is also subject to predation by the blue heron (*Ardea herodias*) from a rookery across the bay at Sea World. Herons are not a typical predator on CLT, but the proximity of the rookery at Sea World, paucity of food sources surrounding the rookery, and the proximity of the North Fiesta Island tern colony create an unusual predator-prey relationship significantly affecting the North Fiesta Island tern colony. Although herons affect CLT at the Stony Point and Mariner's Point nesting sites in Mission Bay disproportionately, NFI is also affected by heron predation, albeit to a lesser degree. Nest abandonment can be attributed to multiple factors such as stress related to predator avoidance, food shortages, or anthropogenic disturbances (Jackson 2022). U.S. Department of Agriculture Predator Control have been conducting daily predator surveys and control efforts from March through August (USDA 2022). In 2024, almost all eggs at NFI succumbed to predator(s), most notable a striped skunk (*Mephitis mephitis*); gulls were also a problem due to a trash container outside the Preserve that attracted a significant number of gulls (Jackson 2024).

Anthropogenic Stressors

The CLT colonies in Mission Bay are in the middle of a large urban park setting with multiple predators and anthropomorphic stressors that can disturb incubating terns. The bay is surrounded by tall trees and buildings that provide excellent habitat for multiple predator species, and Mission Bay Park has limited open space for these foraging predators. Encroaching development near beaches and estuaries increases access of predators like dogs, cats, crows, skunks, foxes, and raccoons to tern nests. Recreational pressures include human presence trespassing/harassment, and trash that attracts predators (Jackson 2024).

Human activity has been shown to create disruptions that scare off CLT during nesting site selection and during nesting (Jackson 2022; USFWS 2023; Gullatta 2023; Aquarium of the Pacific 2025). Noise, movement, physical presence, and visual and auditory disturbance may create direct and indirect impacts to preserve

viability. Human-associated trash attracts predators. In addition, trespassing and vandalism have been an ongoing issue at Mission Bay's CLT preserves. Human disturbances around the colony can lead to egg and chick abandonment directly, or indirectly by preventing adults from incubating and/or brooding. Anthropogenic stress may increase predator perturbation and lead to nest abandonment or may even lead to direct depredation of eggs or chicks (Jackson 2022). In Mission Bay, a factor that may likely have contributed to the failing of nest colonies is the proximity of various events that have resulted in trespass and nest abandonment (Gullatta and Turman 2023).

4.2.7 CLT Nesting Habitat Design Recommendations

CLT nesting success has significantly dropped on NFI CLT Preserve due to inferior siting and habitat conditions (Jackson 2022, Jackson in progress 2024). Current habitat conditions on North Fiesta Island (NFI) are not conducive to successful breeding and foraging for CLT for the following reasons: (1) the nesting area is not directly connected to open water; (2) soils include fine silts that foster and promote undesirable non-native vegetation recruitment and cover; (3) the site is occupied by dense vegetation (native and non-native); and (4) the preserve is accessible to predators and subject to event noise and trespassing. The underlying habitat requirements discussed in Section 2.0 provide the baseline for the design of the CLT Preserve.

Based on available science on the CLT biology, nesting preferences, mating behavior, and predator and anthropogenic threats, the following design criteria for the CLT Preserve restoration and design were developed (see Appendix C for a more in-depth description of the available science and the design criteria rationale). Informed by the science-based design criteria described above and recommendations by the CCC, USFWS, and City of San Diego, the existing CLT Preserve would be divided into the CLT Preserve on the west side of NFI, and a coastal estuary/salt marsh on the east side (Figure 4-7). The design of the estuary/salt marsh is described in the NFI Wetlands Restoration Preliminary Engineering Report and Habitat Restoration Plan.

Landscape Context and Size

As indicated in the data summary above, CLT prefers to be surrounded by water to increase hunting and mating opportunities. The current CLT preserve is surrounded by land. Therefore, the proposed CLT Preserve will be shifted to the western half of the NFI Subarea in a position that maximizes the perimeter interface between the beach and water connection to approximately 2,363 linear feet. The ultimate size of the CLT nesting site is anticipated to be 28.8 acres, which will provide sufficient nest spacing area and exceed the 4-acre minimum of functional nesting sites.

The following are design criteria that were considered to design the landscape context, size, and shape:

- Large perimeter surface area adjacent to shallow open water for hunting and mating
- Surrounded on three sides by water
- Proximity to shallow estuaries to provide diverse food sources
- Sighted above the tidal inundation zone to avoid tidal flooding of nests

- Adjacent shallow dune habitat to protect from wind, deposit sand, and provide visual deterrents for predators and humans.
- Minimal size to provide colonial habitat suitability for at least 15 pairs (minimum 4 acres)
- Enough area to provide appropriate nest spacing to sustain a nesting colony.

Nesting Habitat

In conjunction with demolition of most of Fiesta Island Road within the North Subarea, the CLT nesting site would be re-graded to form a continuous, sandy slope down to the western beach and water, granting a direct connection between the upland nests and water foraging areas. A similar gentle slope will be graded along the eastern boundary of the CLT nesting site (western boundary of the salt marsh restoration site) to provide a direct connection to the NFI wetlands restoration site. The adjacent marsh will also provide calm waters supporting fish nursery habitat with small fish on which CLT fledglings may practice their foraging techniques. A small dune feature is located on the southern trip of the preserve, directly adjacent to the public beach south of the preserve. The southern dune is designed as a noise barrier from the adjacent RV parking and public beach that is planned to occur south of the created channel. The dune feature will be sparsely vegetated with low growing native dune vegetation to provide cover for juveniles.

The nesting habitat would be designed to be relatively flat with shallow western and eastern slopes toward the water and wetlands restoration project, respectively. The current substrate shall be tested and all unsuitable fine and organic materials exported. Light-colored, coarse (beach quality) sand (sand which contains less than 5% silt and clay) augmented with crushed shells, shell fragments, and small pieces of driftwood (large pieces could be used as predator perches) shall be imported, placed to 24-inch depth, and compacted to less than 75% to provide a loose sandy substrate in which CLT scrape their nests. Roof tiles shall be distributed across the entire nesting site to provide cover for juveniles. While the dune vegetation will provide cover for juveniles, NFI is subject to intense predator pressure and the roof tiles will be important to provide additional refuge in closer proximity to nests. The following design features were considered to design for the highest functionality of nesting habitat:

- Shallow, flat area void of topographic diversity
- Sandy (not compacted) to enable the creation of shallow depressions
- Coarse-grained loose sand and abundance of shells and/or fine debris
- Barren or sparsely vegetated (around 5%) at habitat edges for cover
- Presence of small, undulated dune habitat for cover

Protection from Predators and Human Encroachment

An approximately 1,320-foot segment of Fiesta Island Road would be retained on the east side to serve the beach and picnic area that would remain open to public access year-round. A tidal channel from the salt marsh restoration area is designed to connect to bay waters and cut access from the public beach and picnic area to

the salt marsh restoration and the CLT Preserve. However, public access to the vicinity of the CLT Preserve may be used by mammalian predators and will potentially create a disturbance conflict for the CLT nesting areas. Because Fiesta Island is a heavily visited park that allows off-leash dog activity, it will be necessary to maintain fencing around the nesting area. The proposed design includes a tall east–west fence with anti-perching materials across NFI that extends into bay waters on both sides and will be erected south of the new subtidal channel. The intent of this fence is to protect the CLT Preserve from recreational trespass during the avian nesting season. In addition, a similar fence along the southern access to the nest site north of the subtidal channel would prevent recreational trespass and human encroachment to avoid disturbance to roosting migratory birds. Initially, a temporary fence will be installed around the CLT Preserve that will be replaced by a permanent fence along the southern boundary of the wetlands crossover channel when the wetlands are built. Anti-perching materials should also be installed on all gates. In addition, the perimeter fence should be designed to minimize access by mammalian predators such as skunks, opossums, and feral cats.

To prevent water-based human encroachment to NFI adjacent to the nest site and the restored wetlands, a protective buffer zone of 50 feet would be installed and the buffer perimeter fitted with buoys. The buffer shall be regulatory maintained and enforced to preclude boat access and human disturbance in nesting habitat. Fencing along the channel and the installation of a dune north of the channel would further provide noise and visual barriers and minimize trespassing. Recreational uses/facilities should be planned as far away from the CLT Preserve as feasible to avoid noise disturbance and the attraction of predators (e.g., trash cans). The following design features are recommended:

- Physical and visual barriers from predators (i.e., vegetated back dunes) to interrupt direct lines of sight for predators
- Cover for protection of juveniles
    - Distributing roof tiles within the nesting habitat
    - Providing low-growing sparse (5-15% cover) vegetation at the habitat edges (i.e. at the undulated dune extensions)
- Measures to avoid creating the following:
    - Contrasting colors (i.e., substrate, vegetation, debris) that make CLT stand out to predators
    - Predator perches (i.e., large woody debris, driftwood, and perching structures, including power lines and lamp posts)
    - CLT decoys to attract predators (i.e., remove decoys once nesting has started)
    - Obstructions to provide optimal visibility to spot predators
- No public access to the nesting preserve
- Seasonal access restrictions surrounding the preserve
- Physical deterrence and visual/noise barriers to prevent or minimize human disturbance (e.g., fencing, dunes, estuary channels)

4.2.8 Access for Maintenance and Management

Maintenance Access

Habitat management, monitoring and predator control would be provided through restricted access to authorized management personnel only. Maintenance of the CLT Preserve includes vegetation management, including removal of invasive species, and trash removal, which requires vehicular access in addition to pedestrian access. A gated bridge crossing the new intertidal channel is proposed to provide access to the southern portion of the CLT Preserve; this access path would also provide access to both northwest to the CLT nesting area via a permanently gated path and east to the pedestrian/non-motorized bike path which would be seasonally gated. The maintenance path across the CLT Preserve would run along the eastern perimeter of the nesting site and be constructed with light-colored surface treatment (such as GraniteCrete) to provide camouflage for the nesting CLT and prevent an increase in surface temperature. The maintenance access path will be designed as narrow as feasible (not to exceed 12 feet in width) and terminate in a hammerhead or circular turnaround. No road edge delineation shall be installed to prevent perches for avian predators. The following shall be used during maintenance:

- Site-controlled access road restricted to maintenance
- Camouflaged surface treatment

Monitoring and Management

The current CLT Preserve is being managed by the City of San Diego, USFWS, and the San Diego Bird Alliance. In addition to weed removal, existing management includes monitoring and predator control. To prevent future failure of the redesigned CLT Preserve and in response to heightened predator pressure and human disturbance on NFI, additional monitoring and management has been suggested. The City of San Diego , would either update the MBNRMP or include a Long Term Habitat Management Plan (LTHMP) as a component of PER implementation which will specify additional monitoring and management of the CLT Preserve. Proposed monitoring and management would include the following:

- Increase security patrols and install a locked chain or pipe gait across the access road.
- Increase monitoring frequency and monitor predators by installing cameras and monitoring camera footage.
- Increase signage to deter human encroachment.
- Conduct periodic (e.g. once every 7 years) replenishment/capping of the nest site with 2 feet of appropriate substrate in coordination with the USFWS. This will aid in weed control and maintain substrate conditions for nesting terns.
- Conduct annual management of vegetative cover along the dunes and on the nest site to limit cover to less than 20% and vegetative height to less than 16 inches tall. This cover and height of vegetation

allows for unfettered chick movement and protects chicks from exposure to sun and predation but does not provide cover or convenient perches for predators.

- Remove all placed decoys to attract CLT once nesting has been started.

4.2.9 Recommendations

It is recommended that additional sand with shell fragments be imported throughout the existing preserve and undulating/mounding topography be established to provide a more natural condition and improve the CLT nesting functionality. In addition, areas to the northeast and southeast, where non-native vegetation is present should be modified and converted to sand areas to provide expanded CLT nesting opportunities.

A perimeter buffer zone extending from the preserve fence to Fiesta Island Road should be restored to upland coastal strand vegetation. These upland areas would mainly involve restoration of the sand berm around the south, east and north boundaries of the site. This will provide a native vegetation buffer zone around the CLT Preserve and more diversity of biological resources. The removal of non-native vegetation will reduce future non-native weed invasion into the preserve.

When the North Fiesta Island Wetland project is implemented, the fence between the Wetland and the CLT Preserve should be relocated or removed to provide a better connection and access for CLT foraging within the proposed wetland areas to the west. Public access control into the preserve would still need to be ensured and could be accomplished by fencing the combined wetlands project and preserve area.

Grading Design

The grading design for the CLT Preserve incorporates all the features and lessons learned as described in the sections above. In addition, the design conforms to the requirements of USFWS. Figure 4-5 depicts the nesting preserve concept in context with the NFI wetlands restoration project. A 30% grading design with planting layout and cross sections is provided in Appendix A.

The grading design provides for 20-foot (horizontal):1-foot (vertical) beach slopes from the water shoreline up to a large level nesting area. The slope into the NFI wetland restoration area is also set at a 20:1 slope. The nesting area elevation is set at a 12-foot elevation, above the currently predicted year 2100 sea level to avoid inundation in perpetuity. The nesting area will be level or nearly so, allowing for potential small undulations. A small dune feature is located at the windward edge of the nesting area to create a visual barrier from the public beach located south of the preserve. The top of the dune feature will be 4-foot higher than the adjacent nesting area with a broad top, steep windward slopes, and shallow leeward slopes. Total beach 20:1 slope area is 18 acres, flat nesting area is 9.6 acres, and the dune feature is approximately 1.2 acres.

Critical to the success of the nesting preserve is the surface substrate. Existing unsuitable soils that contain too many silt and clay particles will be excavated and exported from the preserve area and stockpiled at one of three designated stockpile areas (Figure 4-1). The grading design recommends 2-foot over-excavation to

allow for 2 feet of suitable import coarse beach sand mixed with shell fragments and potentially driftwood fragments. The total range of estimated soil export is 242,760 cubic yards – 291,312 cubic yards of unsuitable material to be stockpiled at one or more designated stockpile areas on Fiesta Island. Soil would be stored at these areas until the Tecolote Creek and/or Cudahy Creek wetland restoration projects are constructed. Approximately 67,760 cubic yards of import sand, as described above, will be imported and spread over the CLT nesting preserve to achieve final designed finish grade elevations. A depth of 2 feet of clean, coarse beach sand is recommended to cap the remaining underlying unsuitable soil to reduce or eliminate recruitment of non-native vegetation that has rendered the existing CLT nesting preserve nonviable. The sand cap material will reduce ongoing maintenance activities and provide nest substrate that is preferable and attractive to CLT.

Section 4.7.1, Project Sequence, describes a sequence of project implementation for the Mission Bay Park Upland Habitat Expansion and Preservation that anticipates the need to implement the CLT nesting preserve prior to other habitat restoration projects. Construction of this preserve will provide nesting resources for CLT concurrent with impacts to the existing CLT nesting preserve. In addition, the export soil generated from the preserve grading will serve as fill material for the Tecolote Creek and Cudahy Creek projects that require large earthwork volumes to fill area of Mission Bay to create the target tidal wetlands elevations A temporary downslope into the CLT nesting preserve will be created at the interface with the future NFI wetland restoration site. Site access will be via an overland route until the wetlands restoration is constructed, thereafter, access to the CLT nesting preserve will be via a vehicular bridge over the wetland subtidal channel.

Planting Design

Planting within the CLT nesting preserve is limited to the 1.2-acre dune area and along the fringe of the NFI wetlands restoration project area. Native dune vegetation will be planted and established on the dune feature to stabilize the soil surface and minimize sand movement. The Coastal Strand plant palette (see Section 4.4, Proposed Plant Palettes for Revegetation Treatment Areas) will be applied to the dune feature, but only low-growing species will be established within the CLT nesting preserve.

Subsequent grading of the NFI wetlands project will daylight at the toe of the downslope into the CLT Preserve. Final elevations with the wetlands restoration area will be approximately 10 to 12 feet lower than the nesting preserve top elevation. As stated, the connecting slope will be a 20:1 slope gradient into the tidal wetland. Those portions of the CLT Preserve that occupy the transitional slope will be revegetated with transitional upland species and, potentially coastal strand plant species. Please refer to the NFI Wetland Restoration Preliminary Engineering Report for added details.

Irrigation

No temporary irrigation system is contemplated for the limited planting within the CLT nesting preserve. All installed container plants will be hand watered until the plants are established enough to be self sufficient.

Maintenance Access and Site Security

Initial CLT nesting preserve security will be provided by a temporary 6-foot-tall chain-link fence with anti-perching features that will be installed at the top of the temporary slope until the NFI wetlands restoration project is built. The fence will be located along the CCC line demarcating the boundary between the CLT nesting preserve and NFI wetlands restoration project. The fence will extend out into the open bay water to a depth of 6 feet of water as a barrier to public entry. Buoys will be placed at each end of the fence to alert boaters to the navigational hazard. A normally locked walk-in gate will be provided for authorized personnel to enter the site to perform maintenance activities. Once NFI wetlands are constructed, site security will be afforded by a deep, subtidal channel that will provide tidal exchange between the west and east sides of NFI. A vehicular bridge over the tidal channel will be installed as part of the NFI wetlands project to provide authorized entry to the CLT nesting preserve by maintenance staff. The temporary fence is recommended to be removed from upland areas to reduce the potential for perching opportunities for birds that may prey on CLT chicks and adults and to allow free access to open bay water and the NFI wetlands restoration project by adult CLT and fledges. The bayward fence extension into the water may be retained as an additional deterrent to public access,

4.3 Sea World Drive/San Diego River Habitat Expansion/Preservation Areas

Several potential habitat restoration sites were identified for evaluation along the southern edge of the Mission Bay Park Improvement Zone in association with Sea World Drive and the San Diego River. The following information below addresses four potential sites that were evaluated. Additional restoration sites are included in the Bay-Wide Assessment of Habitat Restoration Opportunities memorandum (Dudek 2018). A summary of potential upland habitat restoration opportunities outlined in the PER is provided in Table 4-2. Detailed analysis of each potential restoration site is provided in this section.

Table 4-2. Summary of Sea World Drive/San Diego River Upland Habitat Restoration Recommendations

Site	Recommended Habitat Restoration Opportunities				Import Sand
	Diegan Sage Scrub	*Coastal Strand*	*Southern Foredune*	*Coastal Salt Marsh*	
No. 5a – Cloverleaf Least Tern Preserve Area	None	X	None	X	Yes
No. 5b – Triangle Restoration Area	Enhancement only	None	None	None	No
No. 5c – South Shores Area	X	X	X	None	Yes

4.3.1 Sea World Drive/San Diego River Site No. 5a – Cloverleaf

Location and Opportunities

The potential restoration area, referred to herein as Site No. 5a (see Figure 4-6), is located at the west end of the San Diego River access road (old Sea World Drive), adjacent to the current Sea World Drive and West Mission Bay Drive. The area is bordered by an existing chain link fence surrounding the preserve area. Torrey Pine street trees line Sea World Drive to the north. The area contains disturbed areas composed of non-native vegetation could be eradicated to promote native vegetation communities. Exotic species removal and control, expansion of CS would enhance the habitat value of this area.

A portion of this site to the east was previously restored as a SCSM mitigation site, and as such may not be able to be modified, other than being enhanced through exotics species removal and control. The status and current restrictions on this mitigation area need to be researched further with the City to determine what constraints may exist regarding site modifications. The condition of the vegetation has degraded because of non-native species invasion since the site was originally restored. Removal of non-native species and enhancement through native vegetation establishment is warranted. Whether enhancement of this area could be counted as mitigation credit is currently unknown and needs to be researched through City and resource agency records.

There are currently no direct habitat connections to the San Diego River wetlands habitat to the south because the river channel is significantly lower and the rock armored riverbank and paved access road separate the area from the river habitat.

A 12-inch municipal water main is present within the right-of-way of Sea World Drive. The location of existing fire hydrants is not known, but either the mainline or a fire hydrant may be tapped to gain access to the municipal water supply for temporary irrigation of restriction plantings.

Site Constraints

The site is isolated from other native habitat areas and is bound by roadways on three sides. The existing salt marsh mitigation area has no connection to the San Diego River and the proposed restoration area would be non-tidal. The only water influence is from direct rainfall and runoff from adjacent areas. A low point in the northeastern portion of the site appears to pond water periodically. The seasonal ponding and evaporation have created hypersaline soil conditions which appear to support limited SCSM species.

Recommendations

It is recommended that non-native species, including weeds, be removed and eradicated from the site. Working around and protecting existing native habitat areas, the native habitat areas should be expanded into the adjacent non–native treatment areas to create conditions for CS habitat restoration. Buffer areas within and outside the existing fence should be revegetated to CS. Portions of the site may be suitable as habitat to create a new population of Nuttall's lotus.

In locations where hard compacted soil is present, these areas should have additional sand placed over areas that pond to provide suitable substrate for coastal strand vegetation. Additional sand placement will require 1 to 2 feet of import sand (approximately 52,982 cubic yards) from Fiesta Island. Minor topographic variation and mounding should be created to create microtopographic variation. Sand depth should consider the depth of water accumulation at low points to avoid water ponding within the sand area.

Cloverleaf California Least Tern Designated Breeding Habitat Relocation

The Cloverleaf Upland Habitat Expansion Site 5a includes redesignation of California Least Tern (CLT) Preserve, in accordance with the 2021 Mission Bay Park Master Plan (MBPMP), from the Cloverleaf Uplands Restoration Site to an alternative site. In lieu of continued management at the Cloverleaf site as outlined in the Mission Bay Natural Resources Management Plan (NRMP), protection of least tern breeding habitat is proposed at the San Diego River Mouth Estuary including the western portion of Southern Wildlife Preserve.

As discussed in the MBPMP, the 1990 Mission Bay Natural Resources Management Plan (NRMP) identifies four of the Least Tern preserves to remain: on the north shore of the San Diego River Channel near Sea World Drive, by the Ingraham Street "cloverleaf", the tip of Mariner's Point, FAA Island in Fiesta Bay, and the northern peninsula of Fiesta Island also known as Fiesta Island North. The MBPMP proposes that Stony Point in Fiesta Island be preserved to provide CLT habitat but that the Cloverleaf site at the intersection of Sea World Drive and Ingraham Street should be abandoned and replaced at other locations.

Redesignation of the CLT designated breeding site to the San Diego River Estuary including the western portion of the Southern Wildlife Preserve would be implemented as part of the future project-specific permit application for the Cloverleaf Upland Habitat Expansion and Preservation PER Site 5a or completion of the update to the Mission Bay NRMP, whichever occurs first.

4.3.2 Sea World Drive/San Diego River Site No. 5b – Triangle Enhancement Area

Location and Opportunities

This area, referred to herein as Site No. 5b (see Figure 4-7), is an existing disturbed DCSS area known as the "triangle area." Informal habitat restoration and enhancement activities were previously implemented in this area by the San Diego Audubon Society. The site is bordered to the north by Sea World Drive, to the east by Friars Road, and to the south by the Old Sea World Drive access road/trail and the rock-armored San Diego River bank. Existing DCSS vegetation is in moderately good condition and was originally mapped by Merkel & Associates as a combination of small patches of DCSS, with a higher density of SF and disturbed SF vegetation (Merkel & Associates 2004). Various sensitive species have been observed on site including Nuttall's lotus in association with the SF vegetation. More recent biological mapping by Dudek (Dudek 2025) generalized the whole area as DCSS habitat. This area provides some habitat value due to the diversity of the native species present and the density of the vegetation. The area could benefit from enhancement through the removal and treatment of non-native/exotic species and revegetation using container planting and seeds of DCSS

species. Whether mitigation credit could be achieved from the enhancement efforts being implemented at this site is unknown and would need to be researched further with the resource agencies.

Site Constraints

The area is well vegetated with DCSS vegetation and has been the location of previous revegetation efforts by volunteers from the San Diego Audubon Society. The revegetation effort was successful; however, non-native weeds and exotic species have re-invaded portions of the site since that effort was completed. An unauthorized foot trail also cuts through the easterly end of the site and there is some trash and debris present. As indicated by the City, it appears that Nuttall's lotus has not persisted in this location despite previous revegetation efforts.

The site is small and bordered on three sides by roads. Vehicular noise and human intrusion are constraints to functioning native habitat. This area has no opportunity for expansion because all areas are already vegetated, and the site is confined on all sides. The site is not connected to any adjacent native vegetation. The closest native habitat area is northeast of Friars Road.

Recommendations

It is recommended that this area be targeted for non-native species eradication and enhancement. Once eradication is complete, native species should be installed through container planting and seeding to enhance the existing habitat area. This site presents an opportunity for the City to partner with the Audubon Society to complete the non-native species eradication and enhancement planting.

4.3.3 Sea World Drive/San Diego River Site No. 5c – South Shores Restoration Area

Location and Opportunities

This restoration area, east of the South Shores Park, referred to herein as Site No. 5c (see Figure 4-7), is an existing DH and disturbed DCSS area, that is bordered by Sea World Drive to the south and east and Mission Bay to the north and west. The site is the main gateway entrance to Mission Bay Park from Sea World Drive including road access to Fiesta Island, parklands along west Mission Bay Drive, and to Sea World, and major arterial connections to Mission Beach, Ocean Beach, and Pacific Beach.

Two scenarios are presented for this site. One scenario presents the maximum extent of potential native vegetation community restoration (Figure 4-7) while protecting the existing large population of Nuttall's lotus. The second scenario assumes that most of the site will be utilized for recreational purposes and only the Nuttall's lotus population area will be preserved and potentially enhanced (Figure 4-8).

Portions of this site are part of the former Mission Bay Landfill, which dates to late 1958, as shown on the Landfill Phases Map, City of San Diego, Mission Bay Landfill (SCS Engineers 2004). The southerly portion of the site falls within the limits of the old landfill, however the northerly portion of the site appears to have been

outside of the landfill footprint. The site was previously mapped by Merkel & Associates as a combination of non-native vegetation, DCSS, and disturbed SF (Merkel & Associates 2004). Various sensitive species, including the largest population of Nuttall's lotus in Mission Bay Park, are in the central portion of the site. More recent biological mapping by Dudek (Dudek 2025) generalized the whole area as disturbed DCSS habitat.

This area has patches of DCSS species interspersed with patches of non-native exotic/invasive species. An existing formal trail runs along the northern boundary that is part of the South Shore improvement area. A few informal trails are interspersed through the northwestern portion of the site.

This site offers an opportunity for upland DCSS restoration and enhancement because the site is large and has non-native species present that can be removed for habitat enhancement. The site also offers opportunities to import sand to provide appropriate soils that will support the target dune topography and CS vegetation community. In consideration of the former landfill cap, filling over the landfill will protect buried materials and provide for additional topographic variation to create habitat diversity and microclimates that support species diversity.

Site Constraints

The presence of Nuttall's lotus within the site could afford additional enhancement opportunities; however, the existing population would limit grade modifications within the center of the site.

The existing Model Airplane Park and associated activities provide some localized constraints. However, restoration of the broader area would not overly constrain model airplane flights in the airspace above the restoration site. Future improvements for recreational opportunities along the northern boundary with Mission Bay could introduce recreational impacts to the site.

The presence of the old landfill site prohibits any ability to excavate below existing surface elevations except to install container plantings.

Recommendations

The area is suitable for restoration of Coastal Sage Scrub (CSS) and Coastal Strand (CS) vegetation communities. The project would create a large block of native habitat within the Mission Bay Improvement Zone. Non-native species should be targeted for eradication. Once eradication is complete, appropriate sand substrates should be imported into designated areas for Coastal Strand vegetation community to support establishment of self-sustaining biological resources. Site grading should be designed to provide topographic variation. Imported sand from Fiesta Island is recommended to cap the area where coastal strand habitat is the target vegetation community. Approximately 95,477 cubic yards of sand will be needed to create a dune feature that is 2 to 4 feet above the existing site elevation. A low-profile dune feature is recommended to maintain views of the bay from Sea World Drive and to minimize wind-blown sand. Once grading is complete, native species should be installed through container planting and seeding.

Nuttall's lotus population within the center of the site should be protected from disturbance. Only eradication of non-native species should occur in those areas. Opportunities to expand the population should be examined and incorporated into the final project design.

Use of Coastal Strand and CSS plant palettes and seed mixes will provide the necessary propagules to establish target vegetation communities. A temporary drip irrigation system will be installed to support container plant establishment. Native seed mixes will be unirrigated and dependent on winter rainfall for germination and establishment.

A lower-cost alternative targeting CSS habitat throughout the site may be adopted. This option eliminates the cost of sand hauling and placement at the restoration site. In addition, should the City Park and recreation Department chose to located active recreational facilities within the open space area at South Shores, only the extent of the existing occupied Nuttall's lotus would be preserved with a minimum 50-foot buffet that would be restored to coastal sage scrub habitat.

4.4 Proposed Plant Palettes for Revegetation Treatment Areas

The proposed plant palettes listed in Tables 4-3 through 4-6 present the native species intended to be sourced from container plant materials and/or seed mix for the habitat treatments at the various habitat restoration/enhancement areas within the project.

Table 4-3. Coastal Strand Restoration Plant Palette

Container Plants					
Scientific Name	*Common Name*	*Container Size*	*Spacing (feet on center)*	*Percent Composition*	*Plants/Acre*
Abronia maritima[1]	red sand-verbena	1 gallon	6	30	363
Abronia umbellata[1]	beach sand-verbena	1 gallon	6	30	363
Ambrosia chamissonis	beach-bur	1 gallon	6	20	242
Atriplex leucophylla	beach saltbush	1 gallon	8	5[2]	34
Camissoniopsis cheiranthifolia	beach sun cup	1 gallon	4	2	54
Peritoma arborea	bladderpod	1 gallon	6	5[2]	60
Oenothera californica ssp. *californica*	California evening-primrose	1 gallon	4	2	54
Limonium californicum	western marsh-rosemary	1 gallon	4	2	54
				Total	**1,224**

Table 4-3. Coastal Strand Restoration Plant Palette

Hydroseed Mix "A"			
Scientific Name	*Common Name*	*% Pure Live Seed (PLS)*	*Bulk Pounds per Acre*
Abronia maritima	red sand-verbena	13	TBD/final design
Abronia umbellata	beach sand-verbena	15	TBD/final design
Acmispon prostrates	Nuttall's lotus	(TBD/per collection)	TBD/final design
Ambrosia chamissonis	beach-bur	50	TBD/final design
Camissoniopsis cheiranthifolia	beach sun cup	86	TBD/final design
Nemacaulis denudata var. *denudata*	coast woolly-heads	(TBD/per collection)	TBD/final design
		Total Pounds per Acre	**TBD**

Notes:
[1] Only species to be planted in CLT Preserve.
[2] Species to be included only on berms with all other species.

Table 4-1. Southern Coastal Salt Marsh Restoration Plant Palette (Non-Tidal)

Container Plants					
Scientific Name	*Common Name*	*Container Size*	*Spacing (feet on center)*	*Percent Composition*	*Plants/Acre*
Cressa truxillensis	alkali weed	1 gallon	4	10	272
Distichlis spicata spicata	coastal salt grass	4-inch pots	3	5	242
Frankenia salina	alkali heath	1 gallon	6	15	181
Jaumea carnosa	salty susan	1 gallon	4	10	272
Suaeda californica	woolly sea-blite	1 gallon	6	20	242
				Total	**1,209**

Hydroseed Mix "B"			
Scientific Name	*Common Name*	*% Pure Live Seed (PLS)*	*Bulk Pounds per Acre*
Cressa truxillensis	alkali weed	6	TBD/final design
Frankenia salina	alkali heath	31	TBD/final design
Suaeda californica	woolly sea-blite	10	TBD/final design

Table 4-1. Southern Coastal Salt Marsh Restoration Plant Palette (Non-Tidal)

Total Pounds per Acre	**TBD**

Table 4-5. Southern Foredune Restoration Plant Palette

Container Plants					
Scientific Name	*Common Name*	*Container Size*	*Spacing (feet on center)*	*Percent Composition*	*Plants/Acre*
Abronia maritima	red sand-verbena	1 gallon	6	20	242
Abronia umbellatum	beach sand-verbena	1 gallon	6	20	242
Ambrosia chamissonis	beach-bur	1 gallon	10	10	44
				Total	**528**

Hydroseed Mix "C"			
Scientific Name	*Common Name*	*% Pure Live Seed (PLS)*	*Bulk Pounds per Acre*
Abronia maritima	red sand-verbena	13	TBD/final design
Abronia umbellatum	beach sand-verbena	15	TBD/final design
Ambrosia chamissonis	beach-bur	50	TBD/final design
Camissoniopsis cheiranthifolia	beach sun cup	86	TBD/final design
Nemacaulis denudata var. *denudata*	coast woolly-heads	(TBD/per collection)	TBD/final design
	Total Pounds per Acre		**TBD**

Note: TBD = to be determined.

Table 4-6. Diegan Coastal Sage Scrub Restoration Plant Palette

Container Plants					
Scientific Name	*Common Name*	*Container Size*	*Spacing (feet on center)*	*Percent Composition*	*Plants/Acre*
Artemisia californica	coastal sagebush	1 gallon	6	20	242
Cneoridium dumosum	bush-rue/spice bush	1 gallon	6	5	60
Encelia californica	coastal sunflower	1 gallon	6	15	181
Eriogonum parvifolium	seacliff buckwheat	1 gallon	6	20	242
Rhus integrifolia	lemonadeberry	Deep 1 gallon	15	10	19

Table 4-6. Diegan Coastal Sage Scrub Restoration Plant Palette

Salvia mellifera	black sage	1 gallon	8	15	102
				Total	**846**
Hydroseed Mix "D"					
Scientific Name	*Common Name*			*% Pure Live Seed (PLS)*	*Bulk Pounds per Acre*
Artemisia californica	coastal sagebrush			18	TBD/final design
Bromus carinatus	California brome			86	TBD/final design
Encelia californica	coastal sunflower			14	TBD/final design
Eriogonum parvifolium	seacliff buckwheat			18	TBD/final design
Eriophyllum confertiflorum	golden yarrow			22	TBD/final design
Eschscholzia californica	California poppy			78	TBD/final design
Isocoma menziesii	coast goldenbush			7	TBD/final design
Lupinus succulentus	arroyo lupine			83	TBD/final design
Phacelia parryi	Parry's phacelia			76	TBD/final design
Salvia mellifera	black sage			43	TBD/final design
Stipa (Nassella) lepida (deawned)	foothill needle grass			64	TBD/final design
				Total Pounds per Acre	**TBD**

All seed mixes applied via hydroseed shall incorporate the following slurry mix components:

- Seed mix at rates indicated per each seed mix above
- Virgin wood cellulose fiber mulch @ 2,200 pounds per acre
- Az-Tac binder-tackifier @ 100 pounds per acre (or approved equal), for installation between November and February of any given year
- Fertilizer 11-52-0 (diammonium phosphate) @ 250 pounds per acre
- Green slurry marker dye

4.5 Preliminary Drawings

Preliminary drawings for each of the proposed upland habitat expansion areas within Fiesta Island (Site Nos. 1–5), and the optional upland habitat expansion areas within the Sea World Drive/San Diego River location (Site Nos. 1a–4d), are included in Appendix A, Preliminary Drawings. Drawings are currently in draft phase and are not for construction.

4.6 Preliminary Opinion of Probable Construction Cost

The preliminary opinion of probable construction cost estimates for the preliminary design components outlined at the various Fiesta Island and Sea World Drive habitat expansion/preservation sites are presented in Table 4-7, Tables 4-7a through 4-7g, Table 4-8, and Table 4-9. The quantities provided represent the total area for all chosen upland habitat expansion/preservation areas.

The probable construction cost estimates provided herein are based upon the following acreage and revegetation habitat types, assumptions anticipated at each site, and as presented below. These high-level estimates were developed to convey the order of magnitude cost for the program element. More detailed cost estimates will be required for City budgeting purposes.

Table 4-7. Site Numbers, Restoration Habitat Type, and Acreages

Site Nos. Revegetation Types	Acreage
Fiesta Island Sites	
Site 1 (DCSS, CS and SCSM Revegetation & Enhancement)	
Coastal Sage Scrub Restoration & Enhancement	34.22
Coastal Salt Marsh Enhancement	1.12
Coastal Strand Berm Revegetation & Enhancement	3.49
Site 1 Subtotal	*38.83*
Site 2 (SCSM, SF Revegetation & Enhancement)	
Coastal Salt Marsh/Wetland Revegetation & Enhancement	1.4
Southern Foredune Restoration & Enhancement	13.54
Site 2 Subtotal	14.94
Site 3 (DCSS, SCSM and CS Revegetation, Soil Import and Grading)	
Coastal Sage Scrub Restoration & Enhancement	8.42
Coastal Salt Marsh Revegetation & Enhancement (non-tidal)	0.44
Sand Import and Coastal Strand Revegetation & CLT Enhancement	3.57
Site 3 Subtotal	12.43
CLT Preserve (Fence, Sand Import and Grading, Planting)	
Sand Import	25.3
Coastal Strand Revegetation	1.2
Wetland Transition Revegetation	1.5
CLT Preserve Subtotal	*28.8*
Sub-Total Fiesta Island Area	**102.25**
Sea World Drive/San Diego River Sites	
Site 5a (SF & SCSM Enhancement, Soil Import and Grading)	
Coastal Salt Marsh Revegetation & Enhancement (non-tidal)	0.96
Coastal Strand Revegetation & Enhancement	10.09
Sand Import and Coastal Strand Enhancement	6.33
Site 5a Subtotal	*17.38*
Site 5b (DCSS Enhancement, Seeding Only)	
Coastal Sage Scrub Restoration & Enhancement	6.29
Site 5b Subtotal	*6.29*
Site 5c (DCSS, SF and CS Revegetation, Soil Import and Grading)	
Coastal Sage Scrub Restoration & Enhancement	10.96
Southern Foredune Restoration & Enhancement	11.02
Sand Import and Coastal Strand Enhancement	29.59
Site 5c Subtotal	*51.57*
Subtotal Sea World Drive/San Diego River Area	**75.24**
Total Area	**177.49**

Notes: CS = Coastal Strand; DCSS = Diegan Coastal Sage Scrub; SF = Southern Foredune; SCSM = Southern Coastal Salt Marsh.

To determine the probable cost of construction for this preliminary design, unit costs were derived from similar project cost estimates. The probable cost of construction estimates for each site are shown

separately in Tables 4-7a through 4-7g. Additionally, summaries of the total cost of the Upland Habitat Expansion and Preservation projects are also shown in Tables 4-8 and 4-9.

Table 4-7a. Site No. 1 Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	38.83	$6,500	$252,395
Planting Coastal Strand Habitat (berms)	Acres	3.49	$40,000	$139,600
Planting Southern Coastal Salt Marsh Habitat	Acres	1.12	$30,000	$33,600
Planting Diegan Coastal Sage Scrub	Acres	34.22	$22,000	$752,840
Temporary Drip Irrigation	Acres	38.83	$60,000	$2,329,800
Temporary Fence	LF	5,338	$3.5	$18,683
Signage	EA	4	$250	$1,000
120-Day Plant Establishment Maintenance Period	Acres	38.83	$13,000	$504,790
5-Year Maintenance Period	Acres/ Year	38.83	$54,000	$2,096,820
Contingency (10% of Total Construction Cost)				$350,824
			Total Construction Cost	**$6,460,669**

Notes: LF = linear feet; EA = estimated amount.

Table 4-7b. Site No. 2 Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	14.94	$6,500	$97,110
Planting Southern Coastal Salt Marsh Habitat	Acres	1.40	$30,000	$42,000
Planting Southern Foredunes Habitat	Acres	13.54	$13,200	$178,728
Temporary Drip Irrigation System	Acres	14.94	$48000	$717,120
120-Day Plant Establishment Maintenance Period	Acres	14.94	$13,000	$194,220
5-Year Maintenance Period	Acres/ Year	14.94	$54,000	$806,760
Contingency (10% of Total Construction Cost)				$103,496
			Total Construction Cost	**$2,035,938**

Table 4-7c. Site No. 3 Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	12.43	$6,500	$80,795
Sand Import/Placement	CY	21,175	$13.40	$283,745
Planting Coastal Strand Habitat	Acres	3.57	$40,000	$142,800
Planting Southern Coastal Salt Marsh Habitat	Acres	0.44	$30,000	$13,200
Planting Upland Diegan Coastal Sage Scrub	Acres	8.42	$22,000	$185,240
Temporary Drip Irrigation System	Acres	12.43	$60,000	$745,800
120-Day Plant Establishment Maintenance Period	Acres	12.43	$13,000	$161,590
5-Year Maintenance Period	Acres	12.43	$54,000	$671,220
Contingency (10% of Total Construction Cost)				$145,158
			Total Construction Cost	**$2,429,548**
			Total Cost – CSS only Option	**$2,042,870**

Notes: CY = cubic yards; CSS = Coastal Sage Scrub.

Table 4-7d. CLT Preserve Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	28.8	$6,500	$187,200
Site Grading	CY	143,000	$13.40	$1,916,200
Sand Import/Placement	CY	81,635	$36	$2,040,875
Planting Coastal Strand Habitat	Acres	1.2	$40,000	$48,000
Chain-Link Fence with Anti-perching – 6 feet tall	LF	2,560	$35	$89,600
1 Walk-In Gate, 1 Vehicular Gate	EA	2	$3,000	$6,000
Signage	EA	4	$250	$1,000
Temporary Watering via Water Truck for 9 Months	Acres/ Month	1.2	$4,800	$51,840
120-Day Plant Establishment Maintenance Period	Acres	1.2	$13,000	$15,600
5-Year Maintenance Period	Acres	1.2	$54,000	$64,800
Contingency (10% of Total Construction Cost)				$442,112
			Total Construction Cost	**$4,863,227**

Notes: CY = cubic yards; LF = linear feet; EA = estimated amount.

Table 4-7e. Site No. 5a Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	16.42	$6,500	$106,730
Sand Import/Placement	CY	52,982	$13.40	$709,959
Planting Coastal Strand Habitat	Acres	16.42	$40,000	$656,800
Planting Southern Coastal Salt Marsh Habitat	Acres	0.96	$30,000	$28,800
Temporary Drip Irrigation	Acres	17.38	$60,000	$1,042,800
120-Day Plant Establishment Maintenance Period	Acres	17.38	$13,000	$225,940
5-Year Maintenance Period	Acres	17.38	$54,000	$938,520
Contingency (10% of Total Construction Cost)				$370,955
			Total Construction Cost	**$4,080,504**

Note: CY = cubic yards.

Table 4-7f. Site No. 5b Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	6.29	$6,500	$40,885
Seeding Diegan Coastal Sage Scrub	Acres	6.29	$10,000	$62,900
5-Year Maintenance Period	Acres	6.29	$40,000	$251,600
Contingency (30% of Total Construction Cost)				$31,136
			Total Construction Cost	**$386,521**

Table 4-7g. Site No. 5c Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
Clearing and Grubbing/Non-native Eradication	Acres	51.57	$6,500	$335,205
Sand Import/Placement	CY	95,477	$13.40	$1,279,392
Planting Southern Foredunes Habitat	Acres	11.02	$30,000	$360,600
Planting Upland Diegan Coastal Sage Scrub	Acres	10.96	$22,000	$241,120
Planting Coastal Strand Habitat	Acres	29.59	$40,000	$1,183,600
Temporary Drip Irrigation System	Acres	51.57	$60,000	$3,094,200
120-Day Plant Establishment Maintenance Period	Acres	51.57	$13,000	$670,410

Table 4-7g. Site No. 5c Preliminary Opinion of Probable Construction Cost

Item	Unit	Quantity Total	Unit Price	Cost
5-Year Maintenance Period	Acres	51.57	$54,000	$2,784,780
Contingency (10% of Total Construction Cost)				$649,412
			Total Construction Cost	**$10,598,719**
			Total Cost – CSS only Option	**$8,844,149**

Notes: CY = cubic yards; CSS = Coastal Sage Scrub.

Table 4-8. Summary of Probable Cost for Mission Bay Upland Habitat Expansion Projects

Location	Cost
Site No. 1	$6,460,669
Site No. 2	$2,035,938
Site No. 3	$2,429,548*
CLT Nesting Preserve	$4,863,277
Site No. 5a	$4,640,108
Site No. 5b	$386,521
Site No. 5c	$10,598,719*
Total Cost	**$31,414,780**

*See Tables 4-7c and 4-7g for CSS-only restoration option.

The construction cost estimate assumes the following conditions apply:

- Surplus excavated soils can be stored on site and will not require off-site disposal. Offsite disposal is not included in this estimate.
- Soils excavated from North Fiesta Island may be reused to construct upland restoration Sites No. 2, 5a, and 5c.
- Appropriate coarse sand with shell fragments to be used as a cap for the CLT Preserve will be imported from a source to be identified at the time of construction.
- Construction is done under dry conditions with typical earthmoving equipment such as scrapers, loaders, excavators, and off-road trucks.
- A water source will be provided by the City and water costs will be covered by the City.

The planning and design cost estimate is based on 15% of the total construction costs. Additionally, the environmental permitting cost is based on 5% of the total construction costs. The total preliminary opinion of probable cost of the Upland Habitat Expansion and Preservation preliminary design is shown in Table 4-9.

Table 4-9. Preliminary Opinion of Probable Cost Entire Project (includes construction, planning, design and permitting)

Item	Cost
Total Construction Cost (Site Nos. 1–5 and Alternative Site Nos. 1a– 4d)	$31,414,780
Planning and Design (15% of Construction Cost)	$4,712,217
Environmental Permitting (5% of Construction Cost)	$1,570,739
Total Cost	**$37,697,736**

4.7 Preliminary Project Schedule

A preliminary project schedule is not included currently. Once decisions have been reached regarding which habitat expansion and enhancement sites the City wishes to pursue, then a schedule for implementation will be developed and will be included in Appendix D.

4.7.1 Project Sequence

Implementation of the Upland Habitat Expansion and Preservation projects will require appropriate sequencing to optimize materials to build each project and in consideration of the ecological benefits that accrue from different projects. These interrelationships are critical to implement specific project components.

The order of projects below should be considered in the overall implementation program to optimize material costs to build the identified wetlands restoration projects. These recommendations assume there are no alternative sources of appropriate soil materials that may be available before implementation of these Upland Habitat Expansion and Preservation projects.

North Fiesta Island California Least Tern Preserve

Construction of the CLT Preserve is recommended as the first project to be implemented under the Upland Habitat Expansion and Preservation for the following reasons:

- Construction of the CLT Preserve will impact a portion of the existing CLT Preserve and the balance of the existing preserve would be impacted by the NFI wetlands restoration project.
- Construction of the CLT nesting preserve will generate 144,000 cubic yards of soil from the nesting site that is needed to build other restoration projects potentially including fill material for the Cudahy Creek or Tecolote Creek wetland restoration projects or to construct either of the Upland Restoration Sites No.3, 5a or 5c.
- Construction of the CLT Preserve prior to the NFI wetlands site will allow grading to occur on dry land without the future sub-tidal channel that is part of the NFI wetlands restoration site. If built after the

wetlands project, the sub-tidal channel will create significant construction access problems for the nest preserve construction and would substantially increase the grading cost of the nesting preserve.

North Fiesta Island Wetlands Restoration Project

Construction of the NFI wetlands restoration project after the Califronia least tern nesting preserve is completed is recommended for the following reasons:

- Construction of this project will generate 900,000 cubic yards of soil material from the project excavation site that may serve as fill material to build the Cudahy Creek and/or Tecolote Creek wetland restoration projects. Without this source fill material, alternative appropriate off-site import soils would have to be trucked to these restoration sites at great cost as compared to the short haul route from NFI stockpile areas to either restoration site.

Implementation of the project will create a new tidal connection to the east side of Fiesta Island where water quality is chronically poor. Eelgrass mitigation has been identified within the NFI wetlands restoration site that is sufficient to mitigate most of the impacts of all other restoration sites. By implementing eelgrass mitigation in an early restoration project, the city may avoid additional mitigation elsewhere in Mission Bay.

Fiesta Island Causeway

Early construction of the causeway tidal exchange culvert will start the process to improve water quality on the east side of Fiesta Island. These water quality benefits may require several years to make a significant difference in the water quality of the area. Successful eelgrass mitigation potential east of Fiesta Island will be dependent upon the increased water quality that will occur with this project and after construction of the NFI wetlands restoration project.

5 Other Considerations as Appropriate

5.1 Feasibility Analysis of Constructability

The feasibility for the construction of the proposed upland habitat expansion improvements would involve consideration of the factors explored in Subsections 5.1.1 through 5.1.6.

5.1.1 Construction Condition

The weed eradication, fencing, grading, and revegetation recommendations provided herein would ideally be implemented during the fall and winter months to take advantage of seasonal rainfall, as well as to avoid work disturbance during the migratory bird nesting period, which is from February 15 through September 15.

5.1.2 Equipment Needs

Equipment needed for the grading work and import of soil would include dump trucks, scrapers, earthmoving equipment, a front-end loader, water trucks, and backhoe. Access points for equipment would need to be provided as well as staging areas for the storage of equipment and supplies.

5.1.3 Construction Access Points

Access points for equipment would need to be provided at each site where grading and soil placement is proposed. A traffic control plan is likely not required, as the quantity of equipment entering and leaving the site would be minimal.

Within the Fiesta Island project area, Fiesta Island Road, a paved access road, navigates the perimeter of the island to provide public access and parking. Parking areas are unpaved and unimproved. At the approximate center of the island, at the head of Enchanted Cove (see Figure 4-1), and west of the Youth Camping area, Fiesta Island Road branches off to the northeast and west, bifurcating the island and providing a cut-through for vehicular access to the west side of the island. All Fiesta Island sites can be accessed by the Fiesta Island Road.

Within the San Diego River/Sea World Drive study area, vehicular access to potential restoration sites is provided from East Mission Bay Drive and Sea World Drive. South Shores Parkway provides vehicular access to Old Sea World Drive, which parallels the San Diego River. Informal parking is afforded off the shoulder of Old Sea World Drive; no formal parking areas exist. This road is now used primarily for recreational purposes (e.g., walking, biking, birding, and resource interpretation access).

5.1.4 Soil Material Sources, Stockpile and Staging Areas

The import of sand and shell fragment material is recommended for the Site No. 4, CLT Preserve. Additionally, import of sand is recommended for NFI Site No. 3 and import of sand and fertile soil for the

San Diego River/Sea World Site No. 5c. The source of the material would be preferred from Fiesta Island sand stockpile sources; however, sand could come from elsewhere as long as it satisfies sand grain size and/or shell requirements.

Long-term soil stockpile sites are identified on Figure 4-2. The order of sites is based on the desirability of the site for stockpiling, recreational uses, and proximity to the excavation area and future placement at wetlands restoration sites. A two-way haul route is proposed down the middle of Fiesta Island to avoid conflicts with public circulation routes. However, one haul route crossing of Fiesta Island Drive west of the Youth Center is unavoidable. The crossing will require traffic control during all hauling operations.

All material sources should be reviewed and approved by the habitat restoration specialist as appropriate for the intended revegetation efforts. It is assumed that this material would be imported to the sand management/soil stockpile sites on Fiesta Island and then transferred from those locations to the sites via smaller vehicles when needed. Other materials, including irrigation equipment, soil amendments, plant materials and seed would likely be brought to the site on an as needed basis and stored as necessary based upon construction scheduling.

Staging areas for the storage of equipment and supplies would also need to be provided in strategic locations near each site. Two staging areas are recommended, one on Fiesta Island and the other in the Sea World Drive Site No. 4d location.

5.1.5 Maintenance Requirements

The revegetation areas would be maintained and monitored for an initial 120-day period (i.e., 4 months). Subsequent to that, a 5-year maintenance and monitoring period would likely be required by the resource agencies, where appropriate. The 120-day maintenance would be done by the installation contractor. The long-term maintenance could be done by the installation contractor, or by a different contractor per City direction and contracting coordination. Maintenance vehicles and the size of the maintenance crews will vary depending on the location being maintained. Crews are expected to be small, with likely no more than two trucks and a crew of from four to eight laborers and one to two supervisors.

Maintenance and control of non-native exotic species will be an ongoing effort, based on seasonal conditions, and should target the most aggressive and invasive species first. A combination of hand pulling, vegetation thinning, and herbicide treatment should be implemented. Weed control should be done in the least environmentally impactive methods. Integrated pest management techniques should be utilized in the maintenance program.

5.1.6 Land Ownership

All the land under consideration is owned and maintained by the City of San Diego. As such, there are no known landownership conflicts that may present risks to this project.

5.2 Risk Assessment

Various risks are prevalent when undertaking the habitat expansion and preservation design process. This section explores the variety of risks to help shed light on the potential future challenges that may be encountered. By documenting the risks, and developing an understanding of common challenges, future pitfalls may be avoided or minimized to achieve the best possible outcome.

A risk assessment was performed based on three criteria: probability of each risk occurring, the potential impacts to cost, and the potential impacts to time until project completion. Each risk was given a value from very low, low, moderate, and high for each of the three risk assessment criteria. Additionally, a strategy and response action for each risk was determined.

A Risk Assessment Table containing all the information from the risk assessment is provided in Appendix E.

5.2.1 Utilities

Utilities present within the Fiesta Island area and along the Sea World Drive location have been mapped based upon available information. Prior to the initiation of detailed design for all areas, a more thorough evaluation and mapping of existing utilities will be conducted to ensure that no utilities are impacted by the proposed work.

5.2.2 Existing Soil Data

Soils that have been compromised due to human activities, such as site disturbance, compaction, placement of unauthorized fills, and placement of trash and debris should be evaluated for each specific site as part of the final design. No significant physical soil problems were noted during site visits. Soil tests were conducted at all of the five Fiesta Island sites (see Section 3.3, Soils), and did identify high salinity levels in the soils, and one site (Site No. 2) had the highest variation of tested constituents, as well as high compaction. Due to the unfavorable soil conditions, and other factors, Site No. 2 is not recommended for habitat expansion.

5.2.3 Proximity to Neighbors

All of the habitat expansion and preservations sites are adjacent to public open space, or areas owned by the City of San Diego, which currently have passive recreational use, except during periods when tournaments are conducted within Fiesta Island. Impacts to recreational users resulting from the habitat expansion construction operations would be minimal and limited in duration and would be scheduled around major events to avoid conflicts with users. There would be minimal to no noise impacts, except for grading operations at five of the nine sites, which would occur for short durations. Traffic impacts are also minimal, with an increase in vehicles to the sites. Construction timing of the project may be scheduled to avoid peak visitor use which spans approximately from Memorial Day (May) through Labor Day (September).

5.2.4 Environmental Windows

All restoration/revegetation work would be avoided during the migratory bird nesting season, which is from February 15 through September 15 of any given year. Work in association with populations of Nuttall's lotus would be initiated after mapping of the species and field flagging is completed, during the spring growing season when the species can best be detected. All areas of Nuttall's lotus will be protected in place.

5.2.5 Water Quality Concerns

Water quality control protection would be determined and implemented per each site and would be specified during final design. In areas where site drainage runs off from the revegetation sites could occur, that would affect adjacent marine or freshwater resources, storm drain facilities, existing site improvements, paving, etc., appropriate stormwater best management practices and water pollution control measures would be implemented during construction to protect these resources and improvements.

5.2.6 Competing Interests

City Charter Section 55.2 proposes that the Mission Bay Park Improvements project includes efforts to restore wetlands, wildlife habitat, and other environmental assets; preserve beneficial uses of the Improvement Zone by maintaining navigable water and eliminating navigational hazards; restore embankments and erosion control features; and to improve the conditions of the Improvement Zone for the benefit and enjoyment of residents and visitors.

The Upland Habitat Expansion and Preservation projects are some of the projects of the wider Mission Bay Park Improvements. As such, the projects are focused on certain aspects of the larger City Charter, Section 55.2. The projects are designed to restore wildlife habitat and other environmental assets; and to improve the conditions of the Improvement Zone for the benefit and enjoyment of residents and visitors.

As a result of this project being in a public park near an urban setting, the possibility of local resistance to the improvements may occur, which would lead to the need to provide mitigation or additional project alternatives. Specifically informal dog use areas and informal recreational trail use may conflict with the proposed upland expansion program. Temporary disturbances and conflicts could arise during the construction period, so adequate fencing, barriers and informational signage would be required while the work is occurring. Restrictions on use of and intrusion into the preserve areas should be posted in visible locations at completion of the work.

5.2.7 Sensitive Habitat

Known existing sensitive habitat includes jurisdictional wetlands, locations where Nuttall's lotus occurs and where there is the potential for other sensitive species to occur. These locations would be further evaluated during final design, with appropriate protective/mitigation measures implemented to protect or translocate these resources. In addition, the existing CLT Preserve area is considered sensitive habitat, due to the potential seasonal use of these areas by CLT for nesting purposes. Planning and protection measures will be

included in the final project design and scheduling to avoid disturbance during the nesting period. As a result of earthwork activities, the potential presence of archaeological and/or paleontological resources, additional rare plant species, and/or additional rare or endangered wildlife may be encountered requiring that avoidance or mitigation measures be implemented. The project team will work with the applicable resource agencies to ensure that all sensitive habitat and other sensitive resources are protected, and that protective measures are implemented in a timely manner to protect all sensitive habitat and resources.

5.2.8 Permitting

As a result of the need to receive approval from multiple resource permitting agencies, the possibility of project delays during the environmental review approval process with each agency could occur which would result in increased project schedules or require new mitigations (see Section 5.4, Environmental Considerations and Permits).

5.3 Project Conflict Coordination and Evaluation

Potential conflict coordination issues are outlined below. Design and construction of the Upland Habitat Expansion and Preservation projects should coordinate with the following major development projects nearby within Mission Bay Park:

- North Fiesta Island Wetland Restoration
- Tecolote Creek Wetland Restoration & Fiesta Island Causeway Tidal Culvert
- Bike/Pedestrian Project
- Shoreline Restoration projects
- Deferred Maintenance projects

Recreational conflicts include decreased access to the project sites to preserve the existing vegetation and the proposed revegetation areas. Formal trails will be further demarcated to allow use of the space in a way that safeguards the habitat and protects sensitive resources. Informal trails currently located within the proposed revegetation areas will be eliminated to allow for the restoration/revegetation of the disturbed/ unauthorized access areas.

Vehicular conflicts could occur because of construction equipment and materials being imported into the sites. Work should be avoided during peak recreational use periods, holidays, and special events.

Potential opportunities to combine with other projects:

- The work in Site No. 5b, along Sea World Drive, could afford opportunities for the City to team with the Audubon Society to improve and enhance that site.

5.4 Environmental Considerations and Permits

Environmental permits required to construct the Upland Habitat Expansion and Preservation projects are summarized in the matrix below. As a part of the Mission Bay Park PEIR, the City is seeking to streamline state and federal resource agency approval for all future projects, including Upland Habitat Expansion and Preservation. These projects trigger the need for multiple environmental considerations and permits. Since recommendations propose development in the coastal zone, a Coastal Development Permit (CDP) from the CCC is likely required. The City of San Diego may also issue a CDP for aspects of the project. While no wetland permits are required from the U.S. Army Corps of Engineers for work in uplands, informal consultation with USFWS would still need to occur for endangered and threatened species involved. Informal consultation with the California Department of Fish and Wildlife (CDFW) is also recommended to discuss potential impacts to state-protected species. Furthermore, wetland impacts below the high tide line and potentially within the jurisdiction of the U.S. Army Corps of Engineers (e.g. Fiesta Island Site No. 3 Near Youth Camping and Fiesta Island Site No. 4 CLT Preserve) may require permits pursuant to the Clean Water Act and the Rivers and Harbors Act. Anticipated regulatory permits and subsequent environmental review needed for implementation is further detailed and summarized in the Mission Bay Park Improvements Program Implementation Framework.

Resource agency-imposed restrictions play a strong role in construction costs and duration. During discussions with resource agencies, permit restrictions will be negotiated, including but not limited to:

- Hours of operations
- Noise control
- Light control
- Dust control
- Fueling
- Site access
- Storage and staging
- Impacts to habitat and sensitive species

Regarding the above topics, the City should strive for the following to maintain flexibility of construction methods:

- 6-day work weeks
- Hours of operation from 7 a.m. to 6 p.m. with occasional night work, as necessary
- Fueling and equipment maintenance permitted on site
- Flexible construction access and staging areas

- Multiple construction access and staging areas allow various approaches to be conceived by contractors to increase competition during bidding.
- Staging areas within or close in proximity to the construction area reduces construction duration and cost

Table 5-1. Potential Environmental Permit Requirements

Agency	Permit
Federal	
U.S. Army Corps of Engineers (USACE)	• Potential permits include Nationwide, Regional General, Individual Permit/Letter of Permission pursuant to the Clean Water Act Section 404 and Section 10 of the Rivers and Harbors Act
U.S. Fish and Wildlife Service (USFWS)	• Endangered Species Act, Informal Consultation
State	
California Coastal Commission (CCC)	• Coastal Development Permit • Consistency Certification, Section 30600(a) of the California Coastal Act, or Waiver of Federal Consistency Provisions
California Department of Fish and Wildlife (CDFW)	• Informal consultation to confirm no permit required under the California Endangered Species Act Section 2081
Regional Water Quality Control Board (RWQCB)	• 401 Certification pursuant to the Clean Water Act and Porter-Cologne Water Quality Control Act • Notice of Intent to utilize Construction General Permit
Local	
City of San Diego	• Site Development Permit

5.5 City Professional Standards and Mission Bay Master Plan Consistency

Concept development, design, and permitting of Upland Habitat Expansion and Preservation projects must comply with City standards and the Mission Bay Park Masterplan (City of San Diego 2002). An inventory of relevant standards, potential conflicts, and potential resolutions to such conflicts, is provided in Table 5-2.

Table 5-2. Inventory of Relevant Standards

Source	Standards and Recommendations	Compliance/ Potential Conflict	Implementation/ Solution
Mission Bay Park Master Plan	The turf and beach areas along the Park's shorelines support the most intensive public recreational activity in Mission Bay. These areas draw users from throughout the San Diego region. With the County's population	Upland Habitat Expansion and Preservation projects preliminary design is developed with the general goal of improving or	**Improvements** • Natural Recreation

Table 5-2. Inventory of Relevant Standards

Source	Standards and Recommendations	Compliance/ Potential Conflict	Implementation/ Solution
	on the rise, the capacity of the park to accommodate this activity must be commensurately increased.	maintaining public recreational activity.	
	The rise of environmental awareness in recent decades has been paralleled by an increase in the desire for more natural recreation venues. The telephone survey conducted as part of the Master Plan Update revealed that most San Diego residents would like to experience parts of Mission Bay in a more natural condition.	Upland Habitat Expansion and Preservation projects preliminary design is developed with the general goal of improving or maintaining the natural condition of Mission Bay.	**Improvements** • Upland Habitat • Endangered Habitat Expansion and Preservation • Natural Recreation
	In response to an extraordinary level of public demand for preservation and enhancement of natural resources, this Plan includes a number of proposals aimed at improving the Park's wildlife habitats.	Upland Habitat Expansion and Preservation projects preliminary design is developed with the general goal of improving or maintaining the natural condition of Mission Bay.	**Improvements** • Upland Habitat • Endangered Habitat Expansion and Preservation
	Pg. 82 – Mission Bay Park should be planned, designed, and managed for long-term environmental health. The highest water quality; sustained biodiversity; ongoing education and research; and the reduction of traffic noise, and air pollution should all be priorities. The Park's natural resources should be conserved and enhanced not only to reflect environmental values, but also for aesthetic and recreation benefits.	Upland Habitat Expansion and Preservation projects preliminary design is developed with the goal of improving environmental conditions for Mission Bay Park.	**Improvements** • Upland Habitat • Endangered Habitat Expansion and Preservation • Natural Recreation
2018 City CADD Standards	The City uses Bentley MicroStation as its basic CADD graphics engine, for engineering design and drawing production, if approved by the City, Design Consultants may use other industry standard CADD systems, such as AutoCAD, to produce hard copy or PDF files which can be transmitted appropriately to the Project Managers as submittals. However, for compatibility reasons, all electronic CADD file submittals must	Submit final electronic CADD files in MicroStation.	No conflict.

Table 5-2. Inventory of Relevant Standards

Source	Standards and Recommendations	Compliance/ Potential Conflict	Implementation/ Solution
	be created in MicroStation or approved CADD system using City specified seed files that will be uploaded into the City's CADD file management system and shall conform to the requirements set forth in these standards (https://www.sandiego.gov/publicworks/edocref/drawings).		

5.6 ADA and Title 24

The Americans with Disabilities Act (ADA) of 1990 is a civil rights law prohibiting discrimination against individuals with disabilities. With respect to Upland Habitat Expansion and Preservation projects, ADA requirements pertain to the proposed trails and paths through and around the project sites. All facilities will be designed to current ADA standards.

Title 24 is a California Building Standards Code establishing requirements for "energy conservation, green design, construction and maintenance, fire and life safety, and accessibility" of a building's "structural, mechanical, electrical, and plumbing systems." No buildings are proposed as a part of the Upland Habitat Expansion and Preservation projects and, therefore, Title 24 requirements are not applicable.

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A Preliminary Drawings

SOURCE: ESRI 2024; City of San Diego 2018

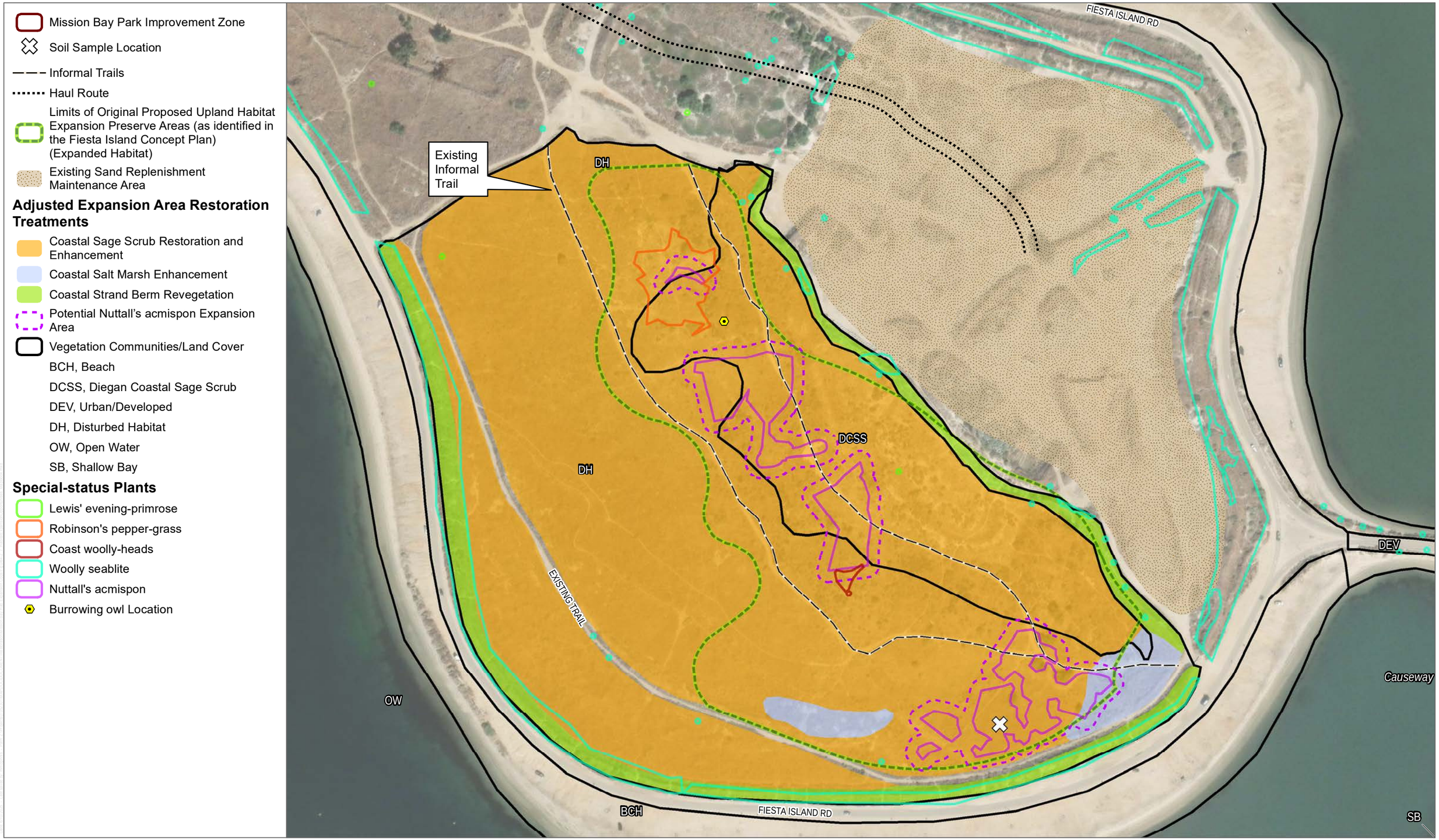
DUDEK

0 425 850 Feet

FIGURE 4-1

Habitat Expansion/Restoration Opportunities Site Reference Map

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation



SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 100 200 Feet

FIGURE 4-2

Habitat Expansion/Enhancement Site No. 1 (Fiesta Island Southeast End)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- North Fiesta Island Wetland Restoration Project
- Soil Sample Location
- Grading Contours
- Informal Trails
- Haul Route
- Toe of Berm
- Limits of Original Proposed Upland Habitat Expansion Preserve Areas (as identified in the Fiesta Island Concept Plan) (Expanded Habitat)

Adjusted Expansion Area Restoration Treatments

- Coastal Sage Scrub Restoration and Enhancement
- Non-Tidal Coastal Salt Marsh Enhancement and Revegetation
- Coastal Salt Marsh/Wetland Revegetation and Enhancement
- Sand Import/Coastal Strand Revegetation and Least Tern Enhancement
- Southern Foredune Restoration and Enhancement
- Vegetation Communities/Land Cover
  - BCH, Beach
  - DCSS, Diegan Coastal Sage Scrub
  - DH, Disturbed Habitat
  - OW, Open Water
  - SF, Southern Foredunes
  - dSCSM, Disturbed Southern Coastal Salt Marsh

Special-status Plants

- Lewis' evening-primrose
- San Diego Viguiera
- Coast woolly-heads
- Decumbent goldenbush
- Red sand-verbena
- Woolly seablite
- Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 112.5 225 Feet

FIGURE 4-3

Habitat Expansion/Enhancement Site No. 2 (Fiesta Island North)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- Soil Sample Location
- Grading Contours
- Haul Route
- Limits of Original Proposed Upland Habitat Expansion Preserve Areas (as identified in the Fiesta Island Concept Plan) (Expanded Habitat)

Adjusted Expansion Area Restoration Treatments

- Coastal Sage Scrub Restoration and Enhancement
- Non-Tidal Coastal Salt Marsh Enhancement and Revegetation
- Sand Import/Coastal Strand Revegetation and Least Tern Enhancement
- Vegetation Communities/Land Cover
  - BCH, Beach
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH, Disturbed Habitat
  - OW, Open Water
  - SF, Southern Foredunes

Special-status Plants

- Lewis' evening-primrose
- Coast woolly-heads
- Red sand-verbena
- Woolly seablite

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 80 160 Feet

FIGURE 4-4

Habitat Expansion/Enhancement Site No. 3 (Fiesta Island North End Youth Camping Facility)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- North Fiesta Island Wetland Restoration Project
- Soil Sample Location
- CCC Approved Boundary
- Haul Route
- Toe of Berm
- Low Marsh
- Mid Marsh
- High Marsh
- Mudflat
- Transitional
- Subtidal
- Upland

Adjusted Expansion Area Restoration Treatments

- Southern Foredune Restoration and Enhancement
- Vegetation Communities/Land Cover
  - BCH, Beach
  - DEV, Urban/Developed
  - DH, Disturbed Habitat
  - OW, Open Water
  - dSCSM, Disturbed Southern Coastal Salt Marsh

Special-status Plants

- Lewis' evening-primrose
- San Diego Viguiera
- Woolly seablite

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 125 250 Feet

FIGURE 4-5

Habitat Expansion/Enhancement Site No. 4 (Fiesta Island North Central Portion)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

Mission Bay Park Improvement Zone

Existing Fence to Remain

Adjusted Expansion Area Restoration Treatments

Non-Tidal Coastal Salt Marsh Enhancement and Revegetation

Coastal Strand Revegetation and Enhancement

Sand Import and Coastal Strand Enhancement Revegetation

Vegetation Communities/Land Cover

DEV, Urban/Developed

DH, Disturbed Habitat

EST, Intertidal Estuary

OW, Open Water

SCSM, Southern Coastal Salt Marsh

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK

0 120 240 Feet

FIGURE 4-6

Habitat Expansion/Enhancement Site No. 5a (San Diego River/Sea World Drive)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- Soil Sample Location
- Grading Contours
- Informal Trails
- Limits of Original Proposed Upland Habitat Expansion Preserve Areas (as identified in the Fiesta Island Concept Plan) (Expanded Habitat)
- San Diego Audubon Society Revegetation Area (San Diego River/Sea World Dr. Site #3a)

Adjusted Expansion Area Restoration Treatments

- Coastal Sage Scrub Restoration and Enhancement
- Coastal Salt Marsh Enhancement
- Coastal Strand Berm Revegetation
- Sand Import/Coastal Strand Revegetation and Least Tern Enhancement
- Southern Foredune Restoration and Enhancement
- Potential Nuttall's acmispon Expansion Area
- Potential Nuttall's acmispon Expansion Area
- Vegetation Communities/Land Cover
  - BCH, Beach
  - CBM, Coastal Brackish Marsh
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH (Rip-Rap), Disturbed Habitat
  - DH, Disturbed Habitat
  - OW, Open Water
  - SB, Shallow Bay
  - SCSM, Southern Coastal Salt Marsh
  - dDCSS, Disturbed Diegan Coastal Sage Scrub

Special-status Plants

- Lewis' evening-primrose
- Torrey pine
- Coast woolly-heads
- Southwestern spiny rush
- Woolly seablite
- Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 125 250 Feet

FIGURE 4-7

Habitat Expansion/Enhancement Site Nos. 5b and 5c (San Diego River/Sea World Drive)

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

- Mission Bay Park Improvement Zone
- Informal Trails
- Potential Nuttall's acmispon Protection Buffer/Restoration Area (100')
- Coastal Sage Scrub Restoration and Enhancement
- Vegetation Communities/Land Cover
  - BCH, Beach
  - CBM, Coastal Brackish Marsh
  - DCSS, Diegan Coastal Sage Scrub
  - DEV, Urban/Developed
  - DH (Rip-Rap), Disturbed Habitat
  - DH, Disturbed Habitat
  - OW, Open Water
  - SB, Shallow Bay
  - SCSM, Southern Coastal Salt Marsh
  - dDCSS, Disturbed Diegan Coastal Sage Scrub

Special-status Plants

- Lewis' evening-primrose
- Torrey pine
- Coast woolly-heads
- Southwestern spiny rush
- Woolly seablite
- Nuttall's acmispon

SOURCE: ESRI 2024; City of San Diego 2018

DUDEK 0 125 250 Feet

FIGURE 4-8

Habitat Expansion/Enhancement Site Nos. 3c and 4d (San Diego River/Sea World Drive) - Nuttall's Acmispon Preserve Option Only

Preliminary Engineering Report Mission Bay Park Upland Habitat Expansion and Preservation

B Technical Support Documents

B.1 Soils Analysis, Mission Bay Park Upland Habitat Expansion, Wallace Laboratories

Appendix B-1
Soils Analysis
Mission Bay Park Upland Habitat Expansion

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

May 16, 2019

John Minchin, jminchin@dudek.com
Dudek & Associates, Inc.
605 Third Street
Encinitas, CA 92024

RE: Mission Bay Pier Habitat Expansion, City of San Diego, job 10523
Received May 14, 2019

Dear John,

Summary Data

description	pH	salinity	chloride	SAR	nitrate	phosphorus	potassium	sulfur	zinc
1) Fiesta Island South End, 12"	7.09	0.13	13	1.0	2	3.7	82	3	0.27
2) Fiesta Island Central, 12"	6.79	28.80	7,305	16.1	843	82.9	415	4439	39.95
3) Fiesta Island Near Youth Camping Facility, 12"	8.33	0.69	54	1.2	13	12.1	28	7	1.19
4) Fiesta Island North Central Area, West of Youth Camping, 12"	8.67	0.13	9	0.2	1	46.1	16	1	0.33
5) Least Tern Preserve Area, 12"	7.88	0.48	26	0.8	17	24.5	144	2	18.12

Samples 3 and 4 have high alkalinity with pH values of 8.33 and 8.67, respectively. Sample 1 is pH neutral. Sample 2 is slightly acidic. Sample 5 has moderate alkalinity.

Salinity is modest for samples 3 and 5 at 0.69 and 0.48 millimho/cm, respectively. Salinity is low for samples 1 and 4 at 0.13 millimho/cm. Salinity is high at 28.8 millimho/cm for sample 2. This is about three-quarter the salinity of seawater. Chloride is high is 7,305 parts per million in the saturation extract.

Nitrogen is low for samples 1 and 4. Nitrogen is modest for samples 3 and 5. Nitrogen is high for sample 2.

Phosphorus is low for sample 1. Potassium is for samples 3 and 4. Sulfur is low for samples 1, 3, 4 and 5. Zinc is low for samples 1 and 4. Zinc is excessively high for sample 2 for zinc-sensitive plants. Manganese is low for samples 1, 3 and 4. Copper is low for sample 4. Magnesium is low for samples 3 and 4.

The optimal level of zinc is several parts per million. It is essential but is toxic if it is too high. Sensitive plants such as woody plants frequently need plant available zinc below about 30 parts per million. Herbaceous plants generally need zinc below about 50 parts per million. Grasses are fairly tolerant of high zinc. Excessive zinc causes stunting, dieback and discoloration. Trees and shrubs do not fail immediately after installation but several years without rooting they fail. High zinc restricts the uptake of potassium and other micronutrients. Since heavy metals do not normally migrate through the soil profile, deeper soil is expected to be more suitable. Initial growth may be slow but may improve over time if rooting moves into better soil.

Sodium is high for sample 2. SAR (sodium adsorption ratio) is 16.1.

High sodium and high SAR values have adverse effects on soil physical properties including reduced water percolation, decreased soil aggregate stability, increased clay dispersion, increased swelling of expandable clays, increased surface crusting and reduced soil tilth. High sodium also restricts the uptake of competitive ions such as potassium. Normally the SAR should be less than 3. Soils are defined as being sodic if the SAR is over 13. Gypsum can be applied followed with leaching to lower the concentration of sodium and SAR.

A modest amount of plant available lead is present for sample 2. The concentrations of other common non-essential heavy metals are low.

Sample 2 is hydrophobic. It is difficult to wet. Water beads up on the soil surface initially and then slowly moves into the soil.

Recommendations if the soils are to be amended

Use zinc-tolerant plants for sample 2.

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

Urea formaldehyde (39-0-0) – 8 pounds for 1, 3, 4 and 5
Potassium sulfate (0-0-50) – 8 pounds for 3 and 4
Triple superphosphate (0-45-0) – 4 pounds for 1
agricultural gypsum - 10 pounds except 2
Organic soil amendment - about 3 cubic yards, sufficient for 2% to 3% soil organic matter

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

Urea formaldehyde (39-0-0) – 1/3 pound for 1, 3, 4 and 5
Potassium sulfate (0-0-50) – 1/3 pound for 3 and 4
Triple superphosphate (0-45-0) – 1/4 pound for 1
agricultural gypsum – 1/2 pound except 2
good quality soil amendment - about 15% by volume, sufficient for 2% to 3% on a dry weight basis

Organic soil amendment:

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

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

arsenic	12	copper	100	selenium	10
cadmium	15	lead	150	silver	10
chromium	200	mercury	10	vanadium	50
cobalt	50	molybdenum	20	zinc	250
		nickel	100		

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

Leach if lower salinity is needed for sample 2.

For maintenance fertilization, apply urea formaldehyde (39-0-0) at 8 pounds per 1,000 square feet as needed.

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

Sincerely,

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

WALLACE LABS
365 Coral Circle
El Segundo, CA 90245
(310) 615-0116

SOILS REPORT

Print Date May. 15, 2019 Receive Date 5/14/19

Location Mission Bay Pier Habitat Expansion, City of San Diego

Requester John Minchin, Dudek

graphic interpretation: * very low, ** low, *** moderate, **** high, ***** very high

ammonium bicarbonate/DTPA

extractable - mg/kg soil

Interpretation of data
low medium high

Sample ID Number	19-135-15		19-135-16		19-135-17		19-135-18		19-135-19	
Sample Description	1) Fiesta Island South End, 12"		2) Fiesta Island Central, 12"		3) Fiesta Island Near Youth Camping Facility, 12"		4) Fiesta Island North Central Area, West of Youth Camping, 12"		5) Least Tern Preserve Area, 12"	
elements		graphic		graphic		graphic		graphic		graphic
0 - 7 8-15 over 15 **phosphorus**	3.71	**	82.95	*****	12.12	****	46.09	*****	24.45	*****
0-60 60 -120 121-180 **potassium**	81.55	***	414.92	*****	27.52	*	16.43	*	143.67	****
0 - 4 4 - 10 over 10 **iron**	17.16	*****	78.53	*****	8.48	***	27.18	*****	18.05	*****
0- 0.5 0.6- 1 over 1 **manganese**	0.11	*	4.62	****	0.42	**	0.09	*	0.51	**
0 - 1 1 - 1.5 over 1.5 **zinc**	0.27	*	39.95	*****	1.19	***	0.33	*	18.12	*****
0- 0.2 0.3- 0.5 over 0.5 **copper**	0.43	***	41.61	*****	0.24	**	0.09	*	0.55	****
0- 0.2 0.2- 0.5 over 1 **boron**	0.11	**	1.00	*****	0.21	***	0.18	**	0.47	***
calcium	330.73	***	280.51	***	369.61	***	374.70	***	372.33	***
magnesium	80.11	***	658.23	*****	25.53	*	17.44	*	66.42	***
sodium	12.49	*	2,069.21	*****	9.74	*	2.89	*	12.42	*
sulfur	2.70	*	4,599.85	*****	7.30	*	1.30	*	2.40	*
molybdenum	0.06	***	0.75	****	0.03	***	0.05	***	0.08	***
nickel	0.08	*	2.32	**	0.01	*	n d	*	0.08	*
The following trace elements may be toxic The degree of toxicity depends upon the pH of the soil, soil texture, organic matter, and the concentrations of the individual elements as well as to their interactions **aluminum**	n d	*	3.24	****	0.86	***	0.61	***	n d	*
arsenic	0.06	*	0.22	*	0.05	*	0.13	*	0.13	*
barium	3.59	**	n d	*	0.37	*	1.14	*	0.21	*
cadmium	n d	*	0.35	*	n d	*	n d	*	0.02	*
chromium	n d	*	n d	*	n d	*	n d	*	n d	*
cobalt	0.03	*	0.04	*	0.01	*	0.01	*	n d	*
lead	0.12	*	6.67	***	0.38	*	0.32	*	0.70	*
lithium	0.17	*	0.03	*	0.15	*	0.15	*	0.20	*
mercury	n d	*	n d	*	n d	*	n d	*	n d	*
selenium	n d	*	n d	*	n d	*	n d	*	n d	*
The pH optimum depends upon soil organic matter and clay content- for clay and loam soils: under 5.2 is too acidic 6.5 to 7 is ideal over 8.0 is too alkaline **silver**	n d	*	0.01	*	n d	*	n d	*	n d	*
strontium	2.94	*	0.51	*	3.99	*	9.01	**	3.74	*
tin	n d	*	n d	*	n d	*	n d	*	n d	*
vanadium	0.12	*	0.30	*	0.08	*	0.12	*	0.11	*
Saturation Extract										
pH value	7.09	***	6.79	***	8.33	****	8.67	****	7.88	****
The ECe is a measure of the soil salinity: **ECe (milli-mho/cm)**	0.13	*	28.80	*****	0.69	**	0.13	*	0.48	**
	millieq/l		millieq/l		millieq/l		millieq/l		millieq/l	
1-2 affects a few plants **calcium**	7.3	0.4	1,039.7	52.0	48.3	2.4	10.9	0.5	29.2	1.5
2-4 affects some plants, **magnesium**	5.8	0.5	1,344.6	111.1	18.4	1.5	3.3	0.3	9.4	0.8
> 4 affects many plants. **sodium**	14.7	0.6	3,339.5	145.2	39.6	1.7	3.5	0.2	18.7	0.8
potassium	9.3	0.2	225.0	5.8	16.7	0.4	3.5	0.1	40.1	1.0
cation sum		1.7		314.1		6.1		1.1		4.1
problems over 150 ppm **chloride**	13	0.4	7,305	205.8	54	1.5	9	0.3	26	0.7
good 20 - 30 ppm **nitrate as N**	2	0.1	843	60.2	13	0.9	1	0.1	17	1.2
phosphorus as P	0.5	0.0	4.0	0.1	1.3	0.0	2.2	0.1	2.2	0.1
toxic over 800 **sulfate as S**	8.7	0.5	1,111.5	69.5	44.9	2.8	2.8	0.2	17.9	1.1
anion sum		1.0		335.6		5.3		0.6		3.1
toxic over 1 for many plants **boron as B**	0.10	*	1.54	*****	0.30	**	0.17	*	0.61	***
increasing problems start at 3 **SAR**	1.0	*	16.1	*****	1.2	*	0.2	*	0.8	*
est. gypsum requirement-lbs./1000 sq. ft.	2		486		2		0		2	
relative infiltration rate	slow/fair		fair/slow		fair		fair		slow/fair	
estimated soil texture	loamy sand		sandy loam		sand		sand		sand	
lime (calcium carbonate)	no		yes		no		no		no	
organic matter	low/fair		low/fair	hydrophobic	fair/low		low/fair		fair/low	
moisture content of soil	2.7%		7.8%		1.4%		2.9%		3.9%	
half saturation percentage	17.4%		18.8%		17.3%		20.0%		15.6%	

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.

pH and ECe are measured in a saturation paste extract. nd means not detected.

Analytical data determined on soil fraction passing a 2 mm sieve.

B.2 Vascular Plant Species Observed and/or Known to Occur Within Fiesta Island

Appendix B-2

Vascular Plant Species Observed and/or known to occur in within Fiesta Island

(Reference: Taken from the Biological Resources Technical Report for the Mission Bay Park Master Plan Update, Fiesta Island Amendment, Oct. 2017 Alden Environmental, Inc.)

PLANT SPECIES OBSERVED
MISSION BAY PARK MASTER PLAN UPDATE:
FIESTA ISLAND AMENDMENT

SCIENTIFIC NAME	COMMON NAME
LYCOPODS	
SELAGINELLACEAE SPIKE-MOSS FAMILY	
Selaginella cinerascens	ashy spike-moss
GYMNOSPERMS	
PINACEAE—PINE FAMILY	
Pinus torreyana ssp. *torreyana*	Torrey pine (not naturally occurring; planted)
ANGIOSPERMS: DICOTS	
AIZOACEAE—FIG-MARIGOLD FAMILY	
Carpobrotus chilensis	sea fig*
Carpobrotus edulis	hottentot fig*
Malephora crocea	coppery mesembryanthemum*
Mesembryanthemum crystallinum	crystalline ice plant*
Mesembryanthemum nodiflorum	slender-leaved ice plant*
Tetragonia tetragonioides	New Zealand spinach*
AMARANTHACEAE—AMARANTH FAMILY	
Amaranthus blitoides	pigweed, amaranth*
Atriplex suberecta	Peregrine saltbush*
Atriplex lentiformis ssp. *lentiformis*	big saltbush
Atriplex semibaccata	Australian saltbush*
Bassia hyssopifolia	bassia*
Salicornia pacifica	pickleweed
Salicornia virginica	pickleweed
Salsola tragus	Russian thistle, tumbleweed*
Suaeda calceoliformis	horned sea-blite
Suaeda esteroa	estuary sea-blite+
Suaeda taxifolia	woolly sea-blite+
ANACARDIACEAE—SUMAC OR CASHEW FAMILY	
Malosma laurina	laurel sumac

APIACEAE (UMBELLIFERAE)─CARROT FAMILY

Cyclospermum leptophyllum	marsh parsley*
Foeniculum vulgare fennel*	

ASTERACEAE─SUNFLOWER FAMILY

Amblyopappus pusillus	pineapple weed
Ambrosia acanthicarpa	annual bursage
Ambrosia chamissonis	beach-bur
Ambrosia dumosa	burro-weed
Artemisia californica	California sagebrush
Baccharis pilularis	coyote brush
Baccharis salicifolia	mule fat, seep-willow
Baccharis sarothroides	broom baccharis
Centaurea melitensis	tocalote, star-thistle*
Cotula australis	Australian brass buttons*
Cotula coronopifolia	brass buttons*
Dittrichia graveolens	stinkwort*
Encelia californica	common encelia
Encelia farinose	brittlebush, incienso
Erigeron bonariensis	asthmaweed*
Erigeron canadensis	horseweed
Gazania sp.	African daisy*
Glebionis coronaria	garland, crown daisy*
Hedypnois cretica	Crete weed*
Helminthotheca echioides	bristly ox-tongue*
Heterotheca grandiflora	telegraph weed
Hypochaeris glabra	smooth cat's-ear*
Isocoma menziesii	coast goldenbush
Jaumea carnosa	marsh jaumea
Lactuca serriola	prickly lettuce*
Laennecia coulteri	Coulter's horseweed
Lasthenia californica	goldfields
Logfia gallica	narrow-leaf herba impia*
Matricaria discoidea	pineapple weed
Pseudognaphalium microcephalum	white everlasting
Sonchus asper ssp. *asper*	prickly sow thistle*
Sonchus oleraceus	common sow thistle*
Stephanomeria diegensis	wreathplant
Xanthium strumarium	cocklebur

BATACEAE FAMILY─BATIS FAMILY

Batis maritima	saltwort

BORAGINACEAE─BORAGE FAMILY

Amsinckia menziesii	rancher's fireweed

Heliotropium curassavicum	Chinese parsley
Pectocarya linearis ssp. *ferocula*	comb-bur

BRASSICACEAE (CRUCIFERAE)—MUSTARD FAMILY

Brassica nigra	black mustard*
Cakile maritima	European sea rocket*
Hirschfeldia incana	short-pod mustard*
Lepidium didymum	lesser swine cress*
Lepidium nitidum var. *nitidum*	shining peppergrass
Lepidium oblongum	wayside peppergrass*
Raphanus raphanistrum	wild radish*
Raphanus sativus	wild radish*
Sisymbrium irio	London rocket*

CARYOPHYLLACEAE—PINK FAMILY

Cardionema ramosissimum	tread lightly
Spergularia bocconi	sand spurrey*
Spergularia marina	salt marsh sand spurrey

CHENOPODIACEAE—GOOSEFOOT FAMILY

Arthrocnemum subterminale	Parish's glasswort
Chenopodium album	lamb's quarters*
Chenopodium murale	nettle leaf goosefoot*

CONVOLVULACEAE—MORNING-GLORY FAMILY

Cressa truxillensis	alkali weed
Cuscuta pacifica	goldenthread

CRASSULACEAE—STONECROP FAMILY

Crassula connata	pygmy-weed

EUPHORBIACEAE—SPURGE FAMILY

Euphorbia maculata	spotted spurge*

FABACEAE (LEGUMINOSAE)—LEGUME FAMILY

Acacia longifolia	golden wattle*
Acmispon glaber	deerweed
Acmispon heermannii var. *heermannii*	Heermann's lotus
Acmispon prostratus	Nuttall's lotus+
Acmispon strigosus	Bishop's lotus
Lupinus bicolor	miniature lupine
Medicago polymorpha	bur clover*
Melilotus albus	white sweet clover*
Melilotus indicus	sourclover*

FAGACEAE—OAK FAMILY

Quercus agrifolia	coast live oak, encina

FRANKENIACEAE—FRANKENIA FAMILY

Frankenia salina	alkali heath

GERANIACEAE—GERANIUM FAMILY

Erodium botrys	long-beak filaree*
Erodium cicutarium	red stemmed filaree*
Erodium moschatum	white stemmed filaree*

LAMIACEAE—MINT FAMILY

Salvia mellifera	black sage

LYTHRACEAE—LOOSESTRIFE FAMILY

Lythrum hyssopifolium	Hyssop loosestrife*

MALVACEAE—MALLOW FAMILY

Malacothamnus fasciculatus	chaparral mallow
Malva parviflora	cheeseweed, little mallow*
Malva pseudolavatera	Cretan mallow*

MORACEAE—MULBERRY FAMILY

Ficus carica	edible fig*

MYRTACEAE—MYRTLE FAMILY

Eucalyptus globulus	blue gum*

MYRSINACEAE—MYRSINE FAMILY

Anagallis arvensis	scarlet pimpernel*

NYCTAGINACEAE—FOUR O'CLOCK FAMILY

Abronia maritima	red sand-verbena+
Abronia umbellata var. *umbellata*	beach sand-verbena

ONAGRACEAE—EVENING-PRIMROSE FAMILY

Camissoniopsis cheiranthifolia ssp. *suffruticosa*	beach suncup
Camissoniopsis lewisii	Lewis' evening primrose+
Oenothera elata ssp. *hirsutissima*	great marsh evening-primrose

OXALIDACEAE—WOOD-SORREL FAMILY

Oxalis pes-caprae	Bermuda buttercup*

PLUMBAGINACEAE—LEADWORT FAMILY

Limonium californicum	western marsh-rosemary
Limonium perezii	sea-lavender*

Limonium sinuatum	sea-lavender*
POLYGONACEAE—BUCKWHEAT FAMILY	
Emex spinosa	Devil's thorn*
Eriogonum fasciculatum var. *fasciculatum*	coast California buckwheat
Lastarriaea coriacea	leather spineflower
Nemacaulis denudata var. *denudata*	coast woolly-heads+
Polygonum aviculare	prostrate knotweed*
Rumex crispus	curly dock*
RANUNCULACEAE—CROWFOOT FAMILY	
Consolida ajacis	doubtful knight's spur*
SALICACEAE—WILLOW FAMILY	
Salix gooddingii	Goodding's black willow
Salix laevigata	red willow
SOLANACEAE—NIGHTSHADE FAMILY	
Datura wrightii	Jimson weed, thorn-apple, tolguacha
Nicotiana glauca	tree tobacco*
Solanum americanum	American black nightshade
TAMARICACEAE—TAMARISK FAMILY	
Tamarix ramosissima	saltcedar*
URTICACEAE—NETTLE FAMILY	
Urtica urens	dwarf nettle*
ZYGOPHYLLACEAE—CALTROP FAMILY	
Tribulus terrestris	puncture vine*

ANGIOSPERMS: MONOCOTS

ARECACEAE—PALM FAMILY	
Phoenix canariensis	Canary Island date palm*
Washingtonia robusta	Washington fan palm*
CYPERACEAE—SEDGE FAMILY	
Cyperus eragrostis	tall flatsedge
Cyperus involucratus	umbrella plant*
POACEAE (GRAMINEAE)—GRASS FAMILY	
Avena barbata	slender wild oat*
Avena fatua	wild oat*
Brachypodium distachyon	false brome*

Bromus arizonicus	Arizona brome
Bromus catharticus	rescue grass*
Bromus diandrus	ripgut grass*
Bromus hordeaceus	soft chess*
Bromus madritensis ssp. *rubens*	red brome*
Cortaderia selloana	pampas grass*
Cynodon dactylon	Bermuda grass*
Distichlis spicata	saltgrass
Distichlis littoralis	shoregrass
Festuca perennis	Italian rye grass*
Hordeum murinum ssp. *glaucum*	glaucous barley*
Hordeum murinum ssp. *leporinum*	foxtail barley*
Lamarckia aurea	goldentop*
Monanthochloe littoralis	shoregrass
Nassella sp.	needlegrass
Parapholis incurve	curved sicklegrass*
Phalaris minor	Mediterranean canary grass*
Piptatherum miliaceum	smilo grass*
Poa annua	annual bluegrass*
Polypogon monspeliensis	annual beard grass*
Schismus barbatus	Mediterranean schismus*
Sorghum bicolor	sorghum*
Spartina foliosa	California cordgrass
Vulpia microstachys var. *microstachys*	desert fescue
Vulpia myuros var. *hirsuta*	hairy rattail fescue*

THEMIDACEAE─BRODIAEA FAMILY

Dichelostemma capitatum	blue dicks

*Non-native species
+Sensitive species

B.3 Animal Species Observed or Detected Mission Bay Park Master Plan Update: Fiesta Island Amendment

Appendix B-3

Animal Species Observed or Detected Within Fiesta Island

(Reference: Taken from the Biological Resources Technical Report for the Mission Bay Park Master Plan Update, Fiesta Island Amendment, Oct. 2017 Alden Environmental, Inc.)

ANIMAL SPECIES OBSERVED OR DETECTED MISSION BAY PARK MASTER PLAN UPDATE: FIESTA ISLAND AMENDMENT

SCIENTIFIC NAME	COMMON NAME
INVERTEBRATES	
HESPERIIDAE—SKIPPERS	
Erynnis funeralis	funereal duskywing
LYCAENIDAE—BLUES, COPPERS & HAIRSTREAKS	
Brephidium exile	western pygmy blue
NYMPHALIDAE—BRUSH-FOOTED BUTTERFLIES	
Coenonympha tullia california	California ringlet
Vanessa annabella	west coast lady
VERTEBRATES	
REPTILES	
IGUANIDAE—IGUANID LIZARDS	
Sceloporus occidentalis	western fence lizard
Uta stansburiana	common side-blotched lizard
COLUBRIDAE—COLUBRID SNAKES	
Lampropeltis getula californiae	California kingsnake
BIRDS	
ANATIDAE—DUCKS, GEESE & SWANS	
Anas americana	American wigeon
Anas platyrhynchos platyrhynchos	mallard
Aythya affinis	lesser scaup
Bucephala albeola	bufflehead
GAVIIDAE—LOONS	
Gavia immer	common loon+
PODICIPEDIDAE—GREBES	

Aechmophorus occidentalis	western grebe
PELECANIDAE—PELICANS	
Pelecanus occidentalis californicus	California brown pelican+
PHALACROCORACIDAE—CORMORANTS	
Phalacrocorax auritus albociliatus	double-crested cormorant+
ARDEIDAE—HERONS & BITTERNS	
Ardea alba	great egret
Egretta thula thula	snowy egret
ACCIPITRIDAE—HAWKS, KITES & EAGLES	
Circus cyaneus hudsonius	northern harrier+
Elanus leucurus	white-tailed kite+
FALCONIDAE—FALCONS & CARACARAS	
Falco sparverius sparverius	American kestrel
RALLIDAE—RAILS, GALLINULES & COOTS	
Fulica americana americana	American coot
CHARADRIIDAE—LAPWINGS & PLOVERS	
Charadrius semipalmatus	semipalmated plover
Charadrius vociferus vociferus	killdeer
SCOLOPACIDAE—SANDPIPERS & PHALAROPES	
Limosa fedoa	marbled godwit
Numenius phaeopus hudsonicus	whimbrel
Tringa semipalmata	willet
LARIDAE—GULLS, TERNS & SKIMMERS	
Hydroprogne caspia	Caspian tern+
Larus argentatus smithsonianus	herring gull
Larus delawarensis	ring-billed gull
Larus heermanni	Heermann's gull
Larus occidentalis wymani	western gull
**Sternula antillarum browni*	California least tern
COLUMBIDAE—PIGEONS & DOVES	
Columba livia	rock pigeon
TROCHILIDAE—HUMMINGBIRDS	
Calypte anna	Anna's hummingbird

TYRANNIDAE—TYRANT FLYCATCHERS

Sayornis saya	Say's phoebe

LANIIDAE—SHRIKES

Lanius ludovicianus	loggerhead shrike+

CORVIDAE—CROWS, JAYS & MAGPIES

Corvus corax	common raven

ALAUDIDAE—LARKS

Eremophila alpestris actia	California horned lark+

HIRUNDINIDAE—SWALLOWS

Hirundo rustica erythrogaster	barn swallow
Petrochelidon pyrrhonota tachina	cliff swallow
Stelgidopteryx serripennis	northern rough-winged swallow

EMBERIZIDAE—EMBERIZIDS

Melospiza melodia	song sparrow
Zonotrichia leucophrys	white-crowned sparrow

ICTERIDAE—BLACKBIRDS & NEW WORLD ORIOLES

Agelaius phoeniceus	red-winged blackbird
Sturnella neglecta	western meadowlark

FRINGILLIDAE—FINCHES

Haemorhous mexicanus	house finch

MAMMALS

LEPORIDAE—RABBITS & HARES

Lepus californicus bennettii	San Diego black-tailed jackrabbit+
Sylvilagus audubonii	desert cottontail

SCIURIDAE—SQUIRRELS & CHIPMUNKS

Otospermophilus beecheyi	California ground squirrel

+Sensitive Species

*California least tern added to the species list by Dudek, July 2019. This species was described within the Alden Environmental biological technical report, but appears to have not been directly observed or detected during their surveys, and thus was not included in their species list.

C NFI CLT Restoration Design Concepts Memorandum

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MEMORANDUM

To:	Nicholas Ferracone
From:	Christina Schaefer (Schaefer Ecological Solutions), Michael Sweesy (Dudek)
Subject:	North Fiesta Island Subarea Least Tern Preserve Design Alternatives
Date:	November 21, 2024
cc:	Matt Valerio, Emily Seklecki, Dudek; Chris Webb, Craig Frampton, Moffatt & Nichol
Attachment(s):	Figures 1-4

The North Fiesta Island Subarea (NFI) habitat restoration projects is divided into two distinct, but interrelated, habitat types: the creation of coastal salt marsh/estuary consisting of mudflats, lower, mid and upper salt marsh, and California least tern (*Sternula antillarum browni;* CLT) nesting habitat. Fiesta Island is an artificial island used primarily for recreation, which creates constraints that have been considered in the approach to the habitat restoration design. Furthermore, habitat for the federally endangered CLT already exists at NFI, but design flaws and location significantly constrain the overall nesting success.

This memo presents design concepts for the CLT preserve and saltmarsh restoration project in two alternatives. Each alternative presents a combination of design components that depicts design options for both projects. The interrelated nature of the projects requires the design to address both resources as an integrated ecological unit. The main distinction between the two alternatives presented here is adherence to the division of the two project areas. Alternative 1 presents a design scenario that respects the dividing line depicted in the NFI Amendment to the Mission Bay Park Master Plan (Figure 1) between the CLT and marsh project sites. Alternative 2 modifies the dividing line to explore more ecologically meaningful design opportunities. Alternative 2 would adhere to the Master Plan intent to devote the entire north end of NFI to natural systems that support self-sustaining habitat and resilient, dynamic ecological systems in support of water quality improvements and sensitive wildlife within Mission Bay Park.

The Mission Bay Master Plan - Fiesta Island Amendment (City of San Diego, 2021) and California Coastal Commission (CCC) - approved Master Plan map bisects the North Island zone into two restoration areas and designates these areas for a reconfigured CLT nesting preserve and a new coastal salt marsh wetlands restoration project (Figure 1). Based on the conceptual master plan graphic, approximately 28 acres of NFI will be devoted to the creation of a new CLT nesting preserve and approximately 34 acres will be devoted to a tidal salt marsh restoration project that is a component of the Mission Bay Water Quality Improvement Project. The size of the designated CLT preserve matches the acreage of the existing CLT preserve area. The NFI Amendment directs the closure of Fiesta Island Road around the northern portion of the island to protect the natural resources being created and to isolate the CLT nesting preserve from recreationists who have enjoyed vehicular and pedestrian circulation through this portion of NFI since the construction of Mission Bay Park. The plan maintains seasonal pedestrian and bicycle access along the eastern shoreline of NFI but restricting this access to periods outside the CLT breeding season.

Fiesta Island Amendment Consistency Analysis

Overall consistency of the proposed and recommended design alternatives with the Fiesta Island Amendment to the Mission Bay Master Plan is described below as well as summarized query that is the focus of this memo.

Amendment Description	Design Alternatives Consistency
The existing mile-long paved roadway located around the perimeter of the subarea will be removed except for an approximately 1,600-foot long segment on the east side, which shall be converted to solely pedestrian and bicycle use.	Both design alternatives adopt the 1,600-foot long maximum length of the seasonal pedestrian and bicycle path access. The 1600-foot path will terminate at a marsh/bay overlook feature that serves as a defined terminus to public access in the form of a destination point that may include picnic amenities and educational signage. The terminus amenity will be fenced to reinforce the terminus of the path. The access path will be paved and regraded to drain inward toward the salt marsh restoration site to allow for biological pre-treatment of runoff prior to entering bay waters. The paved path will be of sufficient width to allow the passage of emergency and maintenance vehicles to access the terminus feature for health emergencies, trash removal, fence and signage repair, and access to the CLT preserve. A locked gate at the terminus allow for maintenance access by authorized city staff. The remainder of the former Fiesta Island Road will be removed and restored to appropriate native habitat. An unpaved footpath or narrow vehicular maintenance access path from the terminus feature may be provided into the CLT preserve.
The shortened roadway (to be regraded to drain inward, away from the coast, to promote wetland formation) shall be for bicycles and pedestrians, allowing the public to access the beach areas on the east side of the peninsula outside of the Least Tern breeding season.	As described above, the remaining pedestrian/bicycle path will be paved. The road will be regraded to drain away from the beach and into the adjacent salt marsh. Given the high sand content and overall permeability of the soil, large amounts of runoff during rain events are unlikely. A low perimeter fence and a short slope from the path down to the adjacent salt marsh habitat will be present to reduce human access to the marsh. The back dune features proposed within the CLT preserve are intended to reduce line-of-sight from the path into the nesting preserve.
Gates provided at both the western and eastern entry points to the northern area.	The proposed site design provides only one eastern access point across the sub-tidal exchange channel that separates the wetlands restoration/CLT nest site from public use areas to the south. Seasonal public access will be controlled by a locked gate at the entrance to the bridge crossing over the sub-tidal channel. Park Rangers will restrict or allow access through operation of the locked gate on a seasonal basis. Educational and prohibited access signage may be considered at the entry control point to explain why access is limited to specific times of the year and may alert public to consequences related to unauthorized entry.
Maintain visibly permeable, fences with anti-perching features and interpretive	Although not shown, the conceptual design can incorporate environmental educational signage along the pedestrian route and at the terminus feature. Signage would address site specific topics such as CLT life cycle, population

Amendment Description	Design Alternatives Consistency
signage around the Least Tern and salt marsh sites, with the interior space to be accessed only by authorized individuals.	status, salt marsh ecological topics, and water quality topics related to Mission Bay Park. A low perimeter fence is proposed on the inland side of the seasonal path to deter public entry into the salt marsh restoration site. The terminus feature would also be fenced and gated to restrict year-round public access to the CLT preserve and allow for appropriate maintenance access into the CLT preserve. The salt marsh restoration area provides a buffer between seasonal public access areas and the CLT preserve. The low fence would not pose a perch resource for CLT predators because of the visual protection provided by the proposed back dune features and the relative difference in elevation between the salt marsh and CLT preserve site. Signage would be designed as low-profile features that would not provide perches for predators with sightlines into the preserve area.
Public access shall be maintained to the roadway and eastern beach areas outside of the Least Tern breeding season, and the remainder of the north subarea shall be closed to public access year-round to protect the Least Tern and salt marsh sites.	As previously described, the proposed alternatives address seasonal access restrictions to the eastern side of NFI as required in the Fiesta Island Amendment. The design anticipates human behavior by creating a destination feature at the end of the 1,660-foot seasonal access route. The feature provides a clear indication to users that they have reached the end of the route, and the only way back is along the route used to access the site. Without a terminus feature, human nature is to continue along the route until a perceived end is encountered or the route becomes impassable. Lack of structure and clear messaging at the terminus may also result in pioneered trails going many different directions. Signage may also be used at the terminal feature to reinforce appropriate and desired behavior.
Dredge a channel across the Island along with bridges at the western and eastern roadway points to create new habitat areas and improve water circulation.	The design alternatives both contain the prescribed cross-island tidal exchange channel that is intended to provide for greater mixing of seawater on the east side of NFI to improve water quality. Only one access bridge on the east seems necessary to provide both public and maintenance access to the northern zone of Fiesta Island. A western gate was considered and rejected because such a bridge would create an opportunity to directly access the CLT preserve. In addition, the design contemplates screening public beach activity on the west shoreline from the CLT preserve using vegetated foredune features. The limited line-of-sight into the preserve is desirable to minimize public attention. In addition, the presence of a deep sub-tidal channel as a blocking feature and potential strategically located signage that directs public access to the east is intended to eliminate public access to the preserve area.
Preserve Configuration shown as a straight line split at the north end of Fiesta Island (shown in Figure 1).	Alternative 1 (Figure 2) presents a design scenario that matches the straight dividing line depicted in the Amendment to the Mission Bay Park Master Plan (Figure 1) between the CLT and marsh project sites. Alternative 2 (Figure 3) modifies the dividing line to explore more ecologically meaningful design opportunities. Alternative 2 would adhere to the Amendment to the

Amendment Description	Design Alternatives Consistency
	Mission Bay Park Master Plan intent to devote the entire north end of NFI to natural systems that support self-sustaining habitat and resilient, dynamic ecological systems in support of water quality improvements and sensitive wildlife within Mission Bay Park. Alternative 2 would also adhere to the Amendment to the Mission Bay Park Master Plan in terms of acreage of the CLT nesting preserve and wetlands restoration.

1. Existing Conditions

Presently, the fenced CLT nesting preserve on NFI is approximately 28 acres consisting of 14 acres of maintained nesting habitat and 14 acres of unmaintained nesting habitat. Maintenance includes mowing and disking to remove weed cover that reduces the suitability of the CLT nesting habitat. The balance of the site supports disturbed alkali vegetation with patches of alkali scalds that are barren. Management of the preserve includes routine predator control, access control, and CLT nest monitoring. CLT nesting suitability is diminished due to recurrent weed growth and vegetation cover that compromise the nest site selection for CLT breeding adults (Sherfy et al. 2011, Stucker et al. 2013). Nesting success appears to be compromised by predator pressure and the fact that much of the site is surrounded by land rather than directly adjacent to open water (USFWS 2023).

1.1 Soils and Topography

Soils are dredged material from the original construction of NFI. Soil borings are being completed to better understand the composition of the soil underlying the CLT preserve and interior island areas. The soil test results, and profile characterization will inform the suitability of the material for use on the new CLT preserve and as fill for other wetland restoration projects such as the Tecolote Creek and Cudahy Creek tidal wetlands and the Enchanted Island expansion project.

A perimeter berm is located along Fiesta Island Drive. The berm appears to be constructed on soil and concrete debris. It is likely that these materials will not be suitable as fill for any of the proposed projects. Inside the berm, the elevation of the land is 8 -16 feet higher than the adjacent roadway at the north end of the project site. Elevations in the middle of the island become a lower depression on the southern extent of the restoration site.

1.2 Vegetation

Vegetation within the NFI area is dominated by non-native species such as ice plant, mustard (Brassica sp.), and annual grasses. Within the CLT preserve exists a mix of disturbed southern coastal salt marsh species and non-native vegetation.

1.3 Land Use

Fiesta Island Drive is a paved asphalt road that runs the perimeter of the North Island recreation zone. The Central Fiesta Island subarea south of the fenced CLT preserve is devoted to recreational activities that are typical

of Mission Bay Park including use of Fiesta Island Road for vehicular circulation and beach access, cycling, jogging, and other sports related activities. The interior of the island area outside the fenced CLT preserve is used for sand processing and remote-controlled model off-road vehicle racing.

2 Restoration Design Background and Criteria

The proposed CLT design alternatives incorporate CLT nesting habitat with coastal strand dunes and vegetation. A description of the physical and biotic components of these design elements is provided below.

2.1 Least Tern Nesting Habitat Basis of Design

Scientific literature is used as a basis for the design criteria that informs a design rationale for the two proposed alternatives. Essential design elements were developed from the literature search to prepare the design alternatives. The relationship of proposed site design features with the relevant scientific studies is the basis of the proposed design alternatives.

2.1.1 Landscape Context

The landscape context of the CLT preserve is integral to the ecological niche that CLT occupy and is important to breeding, rearing, and overall CLT reproductive success. The landscape context provides resources in mutual association to support the life cycle of the species.

Design Criteria:

- Proximity to open water for hunting and mating
- Proximity to shallow water for feeding and raising young
- Large perimeter surface area adjacent to water
- Surrounded on three sides by water, preferably on peninsulas, sand banks or spits
- Proximity to shallow estuaries to provide diverse food sources
- Provide dune habitat to protect from wind, deposit sand, and provide visual deterrents for predators and humans.

Rationale:

The federally endangered CLT is an endemic species along the California coast (San Francisco Bay to the Mexican border) that nests on beaches, mudflats, and sand dunes, usually near shallow estuaries and lagoons with access to the near open ocean (USFWS 2023). They forage in nearshore waters, estuaries and river mouths for slender-bodied fish such as anchovies and topsmelt. Access to open water is necessary for mating; the male flies around with a small fish in his beak, often pursued by a female looking for a fishing mate. CLT hunt for food in shallow water bodies and take turns feeding their young. Juveniles accompany their adults to post-breeding foraging areas where the water is calm, and the food supply is good. It has been shown at Mariners Point in Mission Bay that CLT tend to nest around the perimeter and fence rather than in the middle of the habitat which is probably due to predator avoidance. While the creation of dune structures have shown beneficial to provide visual deterrents for predators and humans, low growing sparse vegetation at the dune fringes also provide cover and shade. CLT do not nest in dunes and care should be taken to place dunes in buffer areas that do not block the CLT's view of potential predators.

2.1.2 Preserve Size

As with any preserve design, the size and shape of the preserve is critical to provide resources that support the target species. Sufficient room for nest spacing and overall colony size, reduced edge effects, and positive relationships between site features all contribute to successful preserve design and species utilization.

Design Criteria:

- Minimal size to provide colonial habitat suitability for at least 15 pairs (ideally more to provide a higher degree of fitness)
- In San Diego, successful nesting habitats are at least 3 – 4 acres in size
- Allow for enough area to provide appropriate nest spacing.

Rationale:

CLT migrate, roost, and nest in colonies and are ground nesters. Colonies consist of 15-300 pairs (USFWS 2023). The nesting area should be large enough to provide enough space for a small colony, but large enough to provide a higher degree of fitness. CLT prefer to establish nests in larger groups and in groups with both mixed pairs and single birds. The larger colony size presumably allows for greater colony defense and maximum vigilance for anti-predatory benefits (Jackson 2022).

As a colonial species, CLT pairs will only be attracted to habitat that already has a presence of birds. After initial habitat creation, this may be aided through conspecific cues (i.e. decoys). Experiments using decoys indicated that unmated CLT choose to nest within mixed groups of pairs and singles. Studies with decoys have shown that CLT were more attracted to the decoy spacing at 1.5m rather than to closer 0.5m distances between decoys. Researchers concluded that this spacing permitted prospecting CLT to establish themselves within the mixed group. Inter-nest spacing in CLT colonies has been measured between 0.5 and 6.8 meters. This distancing is thought to be a compromise between spreading out for cryptic camouflage and clumping together for colony defense (Jackson 2022).

2.1.3 Nest Site Features

Micro-topography, substrate, ground temperature, and other surface features combine and contribute to successful CLT nesting habitat. Crucial to habitat creation is appropriate sand substrate that prohibits non-native vegetation recruitment and establishment. The design team believes a major flaw of the existing CLT preserve is the elevated soil content of fine silt and clay particles that foster vegetation recruitment. Successful CLT design must include a thick layer of pure beach sand that drains quickly and inhibits non-native vegetation establishment. Dune features are the best landform and feature to minimize vegetation growth as required for viable CLT nesting habitat.

Design Criteria:

- Shallow, flat area near a lagoon or estuary
- Sandy (not compacted) to enable the creation of shallow depressions
- Availability of fine-grained loose sand and abundance of shells and/or fine debris
- Barren or sparsely vegetated (around 5% at habitat edges for juvenile cover)
- Sighted above the tidal inundation zone to avoid tidal flooding of nests

- The tips/extensions of small, undulated dune may be used for nesting and cover.

Rationale:

CLT require an undisturbed stretch of sparsely vegetated sandy or gravelly ground near a lagoon, estuary or bay to nest. Nest sites are not randomly distributed but reflect tidal conditions, predator pressure, and exposure to weather (Jackson 2022). Nest habitat selection seems greater for constructed nest sites than natural nest sites when the microhabitat characteristics are associated with wind and water-sourced habitats. In addition, coarse substrate (including shells and fine debris) with little vegetation was also more successful than natural sites with more vegetation surrounding the nest site (Stucker et al. 2013).

Topography: CLT make simple, shallow depressions in the ground to lay their eggs, occasionally decorating it with a few pebbles, shells or debris; shells are a preferable nesting substrate (Sherfy et al. 2011; Stucker et al. 2013; USFWS 2023). Nests, simple scrapes in sand or small gravel substrates, are located in barren to sparsely vegetated places. The color of the sand and fine gravel on which these CLT lay their eggs varies from nesting site to nesting site and the color of the eggs, and the down color of chicks varies to match the sand. They can be very pale blond, speckled brown or gray, and even reddish where the sand is reddish to provide camouflage from predators (Stucker et al. 2013).

Heavy cover and large debris (i.e. driftwood) seems to compromise the tern's ability to detect nest predators by obstructing their viewshed. A heterogeneous landscape with open sandy areas interrupted by areas with sparse vegetation may produce best results (Swaisgood et al. 2018). Terns selected against mound contours in the sand for nest-site selection, but mounds increased overall nesting success because the terns may use them as perches to detect predators (Sherfy et al. 2011).

Substrate: According to a study performed at Mission Bay (Jackson in progress 2024), sand, shells, and specifically oyster shells showed a significant and favorable temperature reduction and equilibrium relative to organic matter substrate. In addition, the light-colored sandy and shell-dominated substrate also assisted in camouflaging nests and chicks, while the darker colored organic substrate provided a higher contrast and, therefore, higher visibility of the chicks. In addition, chicks tended to get overheated on more organic substrates versus sandy substrates. While sand is clearly preferred, the sand should not be compacted to allow terns to scrape to create nest divots; compacted sand at the FAA site precluded CLT nesting.

Vegetation: Vegetation management to reduce habitat to 5-15% is most successful, but nest-site selection was optimal at less than 5% cover (Swaisgood et al. 2018). In studies, CLT selected for open areas but placed nests in the vicinity of sparse vegetation to provide cover for juveniles; this indicated that nests surrounded by sparse vegetation were less likely to fail due to being less susceptible to predation (Swaisgood et al. 2018). Terns seem to be attracted by a specific spatial arrangement and habitat ratio, avoiding prominent habitat features such as vegetation and large debris and preferring a mix of sand and sparse vegetation; specifically, tern appear to avoid vegetation (specifically grass, salt bush and beach bur), silt and leaf litter preferring sand and gravel features (Sherfy et al. 2011). Placement of shallow and sparse vegetation at the fringes of dunes has shown to be used as cover as well as shading for chicks and indicated higher fledgling success.

2.1.4 Predators

The existing CLT preserve is plagued with predators of all types including different kinds of meso-predators and avian predators. While CLT are often subject to predation mainly by peregrine falcons (*Falco peregrinus*), and corvids such as common ravens (*Corvus corax*) and American crows (*Corvus brachyrhynchos*) who prey on CLT

chicks, the NFI population is also subject to predation by the blue heron (*Ardea herodias*) from a rookery across the bay at Sea World. Other predators reported at NFI include mammals such as voles, skunks, and feral cats that either use the land bridge to NFI or that are being released by pest companies or rescue organizations. Therefore, an important aspect of the preserve design is to create hiding places or refugia for CLT chicks and to prevent mesopredators from entering or being dropped off at the site.

Design Criteria:

- Provide physical and visual barriers from predators such as vegetated back dunes separating the estuary from the CLT nesting habitat (i.e. dunes) to interrupt direct lines of sight into nesting preserve for herons foraging in adjacent tidal wetlands restoration area
- Provide cover for juveniles such as distributing roof tiles within the nesting habitat and providing low-growing sparse (5-15% cover) vegetation at the habitat edges (undulated dune extensions)
- Avoid predator perches (i.e. large woody debris, i.e., driftwood, and perching structures, including power lines and lamp posts)
- Avoid obstructions to provide optimal visibility to spot predators.

Rationale:

Nest abandonment can be attributed to multiple factors such as stress related to predator avoidance, food shortages related, or anthropogenic disturbances (Jackson 2022). In addition, encroaching development near beaches and estuaries increases access of predators like dogs, cats, crows, skunks, foxes and raccoons to CLT nests. Larger birds of prey such as burrowing owls, peregrine falcons and American kestrels may feed on CLT. The high chick mortality in Mission Bay is predator-induced (and human disturbed induced) and due to lower breeding densities; higher breeding densities/colony size have less chick mortality (Jackson 2022).

The CLT colonies in Mission Bay are in the middle of a large urban park setting with multiple predator and anthropomorphic stressors that can disturb incubating terns. The bay is surrounded by tall trees and buildings that provide excellent habitat for multiple predator species, and Mission Bay Park has limited open space for these foraging predators. These predators potentially focus their efforts on concentrated food sources originating from the pelagic realm, such as the seasonal tern colonies. Mission Bay has heightened pressure from predators given the proximity to the great blue heron rookery, but the same may be true for CLT nesting near gull-billed tern colonies. Herons are not a typical predator on CLT, but the proximity of the rookery at Sea World, paucity of food sources surrounding the rookery, and the proximity of the NFI CLT colony create an unusual predator-prey relationship significantly affecting the NFI CLT colony.

The distribution of roof tiles has been used in San Diego at several nest sites and seems to provide adequate cover from predators as well as shade structures for chicks.

2.1.5 Protection from Human Encroachment

Human activity has been shown to create disruptions that scare off CLT during nesting site selection and during nesting (Jackson 2022, USFWS 2023, Gullatta 2023, Aquarium of the Pacific 2024). Noise, movement, physical presence, and visual and auditory disturbance may create direct and indirect impacts to preserve viability. Human-associated trash attract predators. In addition, trespassing and vandalism has been an ongoing issue at Mission Bay's CLT preserves.

Design Criteria:

- Prohibit any public access to the nesting preserve
- Erect physical deterrence for human access (i.e. fencing, dunes, estuary channels, etc.)
- Provide visual barriers for humans
- Provide noise barriers (i.e. dunes to protect from RV parking noise) for CLT
- Increase monitoring and deterrence, such as cameras and signage, and remove trash
- Provide a destination setting and recreational amenities at the end of the seasonally restricted pedestrian/bicycle path including a marsh overlook and educational signage.

Design Rationale:

Recreational use is a significant source of disturbance to CLT particularly because their nests lie in sand or mud underfoot. Even if not directly trampled, humans and their pets can disturb the sand and dune habitat making it unsuitable for nesting (Aquarium of the Pacific 2024).

Mission Bay has increasing anthropogenic threats due to the ever-growing pressure from human activities. Human disturbances around the colony can lead to egg and chick abandonment directly, or indirectly by preventing adults from incubating and/or brooding. Anthropogenic stress may increase predator perturbation and lead to nest abandonment or may even lead to direct depredation of eggs or chicks (Jackson 2022). In Mission Bay, a factor that may likely have contributed to nest abandonment was the proximity of various events. These events include the Over-The-Line Beerfest and Outrigger Iron Championships, fireworks, drones, paddleboarders, canoe races, boats with loud music, etc. (information provided by "Ternwatchers"), which resulted in additional noise and human disturbance directly outside of the buffer area which was disruptive to the CLT colony. These events also resulted in trespassing and nest abandonment (Gullatta et al. 2023). CLT in Mission Bay are under considerable pressure from multiple predators as well as human activity during the breeding season. CLT behavior, nesting chronology, nest distribution, and hatching asynchrony support this conclusion (Jackson 2022).

Protection of nesting areas from human encroachment requires the use of signage, fencing, chick banding and other habitat enhancement measures (USFWS 2023). Restricting access to nesting sites reduces disturbance to breeding pairs while also keeping out certain predators. Fencing is an especially important piece of the species recovery puzzle—in places where fence has been removed or damaged a complete loss of a breeding season (no successful chick survival) has been seen to occur (USFWS 2023). Camera monitoring and associated signage may also deter humans from entering the preserve and may aid in the identification of violators (this could include the installation of fake cameras and signs to indicate active camera monitoring in process, which are means that have worked successfully at other preserves and restoration sites).

2.1.6 Access for Maintenance and Management

Due to the intensity of recreation within Mission Bay both on the land and water, inadvertent and sometimes purposeful releases of non-native species into the island environment, trash and other nuisance attractants, ongoing CLT preserve maintenance is essential. Access for maintenance and CLT monitoring is needed to adaptively manage small preserves to encourage active nesting CLT colonies.

Design Criteria:

- Maintenance access to the preserve shall be on foot only.
- Discourage public access to the preserve by constructing a northern sub-tidal connection from the wetland restoration site to the bay water immediately west of the public access terminus feature.
- Utilize educational signage at the terminal feature to educate the public about sensitive resources.

Rationale:

Developing and implementing secure nesting site management plans is critical to protect the integrity of the few remaining nesting sites for the CLT (USFWS 2023). Habitat management focuses on protection of nesting sites from predators and human disturbances. Site monitoring is important for determining adaptive management decisions such as fencing, signage, enforcement, etc., as well as predator control activities. Access for maintenance should be as far away from active CLT nests as possible. Access should be narrow and use natural substrate to avoid functioning as a heat island and to avoid appearing as an obstacle when CLT detect a suitable nesting site.

2.2 Dune Habitat Basis of Design

2.2.1 Landscape Context

Coastal sand dunes (versus desert sand dunes) are a functional part of the beach ecosystem and provide wave scour and erosion protection. Natural dunes are highly dynamic features that are constantly changing in response to erosion from storm events and recovery during calmer periods via wind- and wave-driven sediment transport. Coastal dunes are a ridge, or a series of ridges, that form at the rear of a beach and are formed by the movement of air (Aeolian transport) rather than by tidal, wave, or current action. Initiation of Aeolian transportation is controlled by wind velocity, direction and turbulence, the characteristics of sediments, beach morphology, moisture content, and the degree of roughness elements (e.g., vegetation) (Pye 1983, Iversen & Rasmussen 1999, Sherman & Bauer 1993, Short & Hesp 1982). It has been shown that the creation of foredune habitat benefits CLT by providing shading and cover (see Section 2.1.1). Restoring sand dunes is the cheapest and most-effective solution to coastal erosion and impending sea level rise, provide valuable ecosystem services such as water filtration and carbon sequestration.

Design Criteria

- Create a row of structurally diverse dunes to separate the salt marsh and CLT nesting habitats
- Design dunes in the context of wind direction and sand deposits typical for the Mission Bay dynamics (i.e. dominant wind velocity and direction, moisture and vegetation, and the geomorphology of the nearshore and beach face)
- Limit the dune morphology to embryo and foredune habitat not exceeding 5-15 feet in height (due to space limitations), excluding mature dune habitats.

Rationale:

The creation of sand dunes as a divider between the CLT nesting habitat and the salt marsh habitat fulfills several purposes, including providing visual barriers of predators and humans, reducing human-generated noise, protecting from wind and potential flooding, and providing a source of sand to the CLT nesting habitat.

2.2.2 Dune Restoration Features

Dunes are naturally mobile and dynamic by transporting sediments down-wind. However, it is understood that in the context of habitat restoration of NFI, the creation of a dune system (or structure) would not consist of naturally mobile dunes but rather stabilized dunes because NFI is a peninsular surrounded by a bay rather than flanked by

an ocean and associated spatial limitations. In addition, there is no source of sand that would naturally replenish an active dune system.

Design Criteria:

- Design the dune morphology as appropriate for the NFI site context; this include the fact that NFI is located in a bay context rather than along wave-intense ocean beaches
- Consider wind direction and velocity to design the respective dune shape (parabolic, dissipative versus reflective with the appropriate stoss and lee slopes)
- Use the appropriate grain size and sand quality in relation to the dune morphology
- Use the parabolic shape considering wind direction to create shallow foredune "fringes" and "wings", which are important to provide cover for CLT
- Use dunes to provide noise protection against human uses of the areas adjacent to the CLT nesting areas
- Stabilize dunes with vegetation (restrict low-growing sparse vegetation to the dune fringes) and bioengineered methods.

Rationale:

Morphology: Dunes are composed of the foredune (the part that faces the ocean), the sand plain (the dune crest or top), and the backdune (the side facing away from the ocean). Down-wind dynamics produce an asymmetrical form comprising a longer, lower gradient (1°–8°) upwind slope known (stoss slope), and a shorter and steeper (32–36°) downwind side (lee slope). This should be reflected in the design even for a stabilized (i.e. non-migrating) dune feature. In the context of CLT habitat creation, the dunes shall be crescentic (wider than long with a concave side called the slipface) and have "fringes" (i.e. parabolic dune shape that create "wings"). These fringes are important as cover for CLT chicks.

Beach morphology also plays an important role in the supply and transportation of Aeolian sediment. Changes in the slope and morphology of the beach face and back-shore profiles can increase or decrease wind velocity, as well as produce a roughness element that can result in the deceleration of wind velocity (Short & Hesp 1982, Sherman & Bauer 1993, Iversen & Rasmussen 1999). The dune morphology is dependent on the grain size of the available substrate. For example, dissipative beaches, with a wider foredune and low gradient, provide less resistance to wind flow, and are more conducive to Aeolian sand transport than the steeper reflective beaches (Short & Hesp 1982). In addition, dissipative beaches are generally comprised of finer sand (Hesp 1999). In contrast, reflective beaches are generally composed of coarse-grained material requiring higher threshold velocity to overcome the gravitational force and static friction. The steeper profile and the more irregular nature of the reflective beach also results in a zone of reduced wind speeds at the rear of the foredune which is less conducive to Aeolian transport (Short & Hesp 1982, Hesp 1999).

Substrate: Dunes are usually built from fine or coarse grain sand (see above). Common dune sands have median grain diameters between 0.02 and 0.04 cm (0.008 and 0.016 inch). The maximum common range is between 0.01 and 0.07 cm. Most dune sands are well sorted, and a sample of sand from a dune will usually have particles all of very similar size. Sand-on-sand sheets, however, are poorly sorted and often bimodal—i.e., it is a mixture of coarse sands, often about 0.06 cm in diameter, and much finer sands, as well as particles of intermediate size. The moisture content of the sand controls the cohesion between individual grains and should be incorporated into the design to stabilize the dune and providing an appropriate vegetation substrate.

Vegetation: Vegetation is a significant controlling factor influencing the formation and morphology of coastal dunes, and vegetation usually plays an important role both in the development and stabilization of coastal dunes. In the coastal environment, plants are the most common roughness element that can cause a reduction in the wind velocity and significantly increase the potential for trapping sand (Olson 1958, Hesp et al. 2009). Furthermore, vegetation also provides dune stabilization and cover for CLT.

It is important to consider dune structure when planting dune vegetation because the micro-environments of the dune components limit the types of plants that can thrive on them. Foredune plants need to be tolerant to salt spray, strong winds, and some burial by wind-blown sand from the berm and beach environment, while sand plain and backdune plants can be less tolerant of these stresses. The NFI dune vegetation would mostly be planted at the lee side of the dune and consist of densely planted native dune-adapted vegetation. Only low growing and sparse vegetation is recommended at the dune fringes that face the CLT habitat to provide cover and shade for the CLT chicks while not impeding nesting due to dense vegetation cover. Recommended species are red sand verbena (*Abronia maritima*), Nuttals lotus (*Acmispon prostrates*), coastal dunes milkvetch (*Astragulus tener* var. *titi*), Lewis' evening-primrose (*Camissoniopsis lewisii*), Orcutt's pincushion (*Chaenactis glabriuscula* var. *orcuttiana*), salt marsh bird's-beak (*Chloropyron maritimum* ssp. *maritimum*), Palmer's frankenia (*Frankenia palmeri*), coast woolly-heads (*Nemacaulis denudata* var. *denudate*), short-lobed broomrape (*Orobanche parishii* ssp. *brachyloba*), Brand's star phacelia (*Phacelia stellaris*), and sea dahlia (*Leptosyne maritima*). Native dune grasses and taller shrubby vegetation would be planted at the dune crest and leeside of the dune.

Stabilization: As stated above, the NFI dune habitat would need to be stabilized to limit the amount of dynamic migration. The recommended protection, stabilization, and restoration methods utilize measures to reduce the transport of sand by wind and water, such as planting vegetation, constructing sand fences, and selecting access areas that avoid damage to dunes and dune vegetation from wind and storms as well as maintenance-associated foot traffic. When stabilizing dunes, care shall be taken to avoid losing flexibility which often results in a gradual disappearance of the dune due to erosion. Initial Best Management Practices and erosion control may need to be considered until the dunes have stabilized over time.

Different methods of dune creation and stabilization have been used in San Diego County.

1. For example, 30-centimeter wooden shims buried in linear rows or elliptical arrays to mimic native dune plants like red sand verbena, which catches sand blown by the wind. Just as the plants continue to grow and catch more sand, maintenance would be required by pulling the shims up a few inches as the sand accumulates, allowing more sand to be “trapped.” Where the dunes grow, the verbena also grows. More sand leads to more vegetation, which, in turn, traps more sand, allowing more vegetation to grow (Elwany 2022).

2. At some of the CLT sites in San Diego, piles of vegetation following vegetation removal have been left at the fringes if the CLT habitat to capture wind transported sand. The method is similar to the shims except it uses vegetation piles. The resulting dunes are small and the process requires for time for proper dune development.

3. Sand fencing or fascines are bioengineering methods to trap sand and build or stabilize new dunes. This technique, in concert with planting suitable vegetation, to hold the sand in place effectively. The fences or fascines would be placed in the wind alleys to trap the sand.

4. Dunes can be strengthened by incorporating an artificial hard core as the foundation of the created dune. Such dunes are internally reinforced with gabions and/or geotextile mattresses. These reinforcement materials account for only about 1% of the dune's volume. The sand is then established on top of the hard core structure.

3 CLT Preserve Design Alternatives

The design team explored two basic options for the configuration of a CLT nesting preserve. The design alternatives inherently define the layout of the adjacent tidal salt marsh restoration area, as well. A more detailed description of design features and elements in each alternative is provided in Section 3.1 and 3.2.

- Alternative 1 adheres to the CCC-requested baseline (Figure 1) of dividing Fiesta Island Point by a straight line into the two distinct habitat areas for CLT nesting habitat and estuarine restoration. The CCC dividing line results in approximately 28 acres of CLT nesting preserve area with approximately 2,400 linear feet of CLT shoreline and approximately 34 acres of coastal saltmarsh wetland restoration.

- Alternative 2 takes more flexible approach by providing a more natural habitat division informed by biological opportunities and constraints. In this scenario, the CCC dividing line is not directly followed, but the total acreage of CLT habitat area and estuarine restoration is achieved in accordance with the CCC dividing line as described above. In Alternative 2, the length of CLT shoreline is reduced to approximately 1,900 linear feet.

The following design criteria were considered for both design alternatives in accordance with the basis of design:

- CLT biology and nesting behavior/preferences
- CLT habitat suitability and conditions
- Predator protection
- Accessibility for maintenance and management
- Recreation access opportunities and constraints per the NFI Master Plan and California Coastal Commission direction
- Protection from recreational impacts
- Division between created nesting habitat and estuary
- Salt marsh and estuarine functions and values
- Sinuosity and marsh littoral zoning
- Tidal exchange and hydraulics
- North Fiesta Island Master Plan Update (2021)

3.1 Design Alternative #1 Summary

Alternative 1 adopts the boundary line established by CCC and adopted into the NFI Master Plan Update that separates the CLT preserve and tidal wetland restoration project (Figure 2). The CLT preserve area is configured with a shoreline beach area that rises at a 20:1 gradient from the higher high tide elevation to a height of 10 feet. The 2,400 linear feet of gently sloped beach provides a direct connection to open water and clear sightlines for CLT ingress and egress. The 10-foot elevation was selected to be a minimum of two feet above the Year 2100 predicted

sea level rise to protect the CLT preserve from future tidal flooding (CLT tend to avoid flooded areas). At the back of the beach, the terrain flattens out to provide an approximately 8-acre flat CLT nesting area. Two protective dune features are located at the north and south ends of the beach to provide a visual and physical barrier to human entry and sightlines. These dunes would be vegetated with coastal strand vegetation to reduce sand movement, stabilize the overall dune landform, and reduce the migration of sand into the adjacent salt marsh restoration area. The interface between the CLT nesting preserve and the coastal tidal restoration areas will be a steepened sand embankment that is typical of back dune topography, consisting of loose sand resting at the natural angle of reposed for dry, unconsolidated beach sand. The height of the dune above the tidal salt marsh will serve to interrupt the sightline of herons that may forage within the marsh, screening CLT presence from a potential predator.

The 1,600-foot seasonally restricted, gated public access path for bicycles and pedestrians will lead to a terminal public amenity space. The terminal feature may include seating, wildlife viewing/blinds, educational signage, picnic tables, and trash storage. Maintenance access from the public access terminus into the CLT preserve will be on foot. A sub-tidal channel located west of the public terminus will create a barrier to preserve access. Importantly, no fire rings should be located along the seasonally restricted shoreline and public use will be restricted to daylight hours only. Per the CCC, public recreation will be prohibited during the CLT breeding season.

Tidal wetland features might include one or two sub-tidal connections to the open bay water in addition to the main tidal exchange channel in the southern boundary of the project area. The main crossover channel is intended to increase tidal exchange and mixing on the east side of NFI as well as to create a physical barrier to public recreational activities south the restoration site. However, a bridge or culvert will be necessary to provide seasonal public access and vehicular maintenance and emergency access to the seasonal public access areas. The marsh will feature a mix of low, middle, and upper marsh vegetation communities that is supported by a network of sub-tidal channels.

3.2 Design Alternative #2 Summary

Design alternative #2 provides for greater ecological integration of the CLT nesting preserve and the tidal saltmarsh restoration project (Figure 3). This alternative maintains the 28-acre and 34-acre CLT preserve and salt marsh restoration, respectively. However, by wrapping the salt marsh area around the CLT preserve, a more sheltered CLT nesting area is created. The shape of the nesting preserve may be more conducive to CLT colony formation with a saltmarsh buffer habitat area and adjacency to open water. This alternative utilizes dune features in a similar manner as Alternative #1. The configuration of nesting habitat area and ring of dune features may create a more sheltered environment for CLT chick rearing; low growing native dune vegetation (not exceeding 20 percent cover) at the toe and fringes of the dunes would also provide cover for checks to escape predators.

3.3 Design Alternative Sections

Elevation sections cut through each alternative provides a greater understanding of the vertical and horizontal relationships between the CLT nesting preserve and the adjacent NFI wetlands restoration site (Figure 4). The sections are vertically exaggerated 10 (v):1 (h) to highlight vertical topographic relationships. Importantly, both alternatives provide a gradual 20:1 beach slope and direct connection between open water and the main CLT nesting area. However, it should be noted that the beach is also considered to be suitable CLT nesting habitat. The CLT preserve is elevated above the proposed wetland area by eight vertical feet with a steep back dune sand slope.

With the addition of dune features on the back side of the CLT preserve, the vertical height may be increased to 12-16 feet. This rapid change of elevation interrupts sightlines from the wetland area into the CLT preserve. Therefore, nesting CLT will be screened from pedestrians on the seasonally restricted access path and potential opportunistic predators such as herons that would forage in the wetlands.

4 Recommendations

Based on the literature review of CLT nesting habitat, behavior, and nesting preferences that are used as a basis of design, the design team unanimously recommends Alternative 2 as the preferred alternative. The large and more compact CLT nesting area provides a configuration of nest resources that is intuitively superior to the more linear Alternative 1 layout. The salt marsh in Alternative 2 functions as a more complete buffer for the CLT preserve while maintaining the integrity of the salt marsh ecological functionality. Furthermore, Alternative 2 would also provide a more hydrologically and ecologically sustainable design option because it provides for the hydraulic forces to keep the estuarine inlets open, provide more diverse dune habitat to protect CLT nesting areas and provide cover for chicks, and prevent wind erosion of the dune and CLT habitats.

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Projects\300.Environmental\10523 - Mission Bay Park\GIS&Graphics\N Fiesta Island

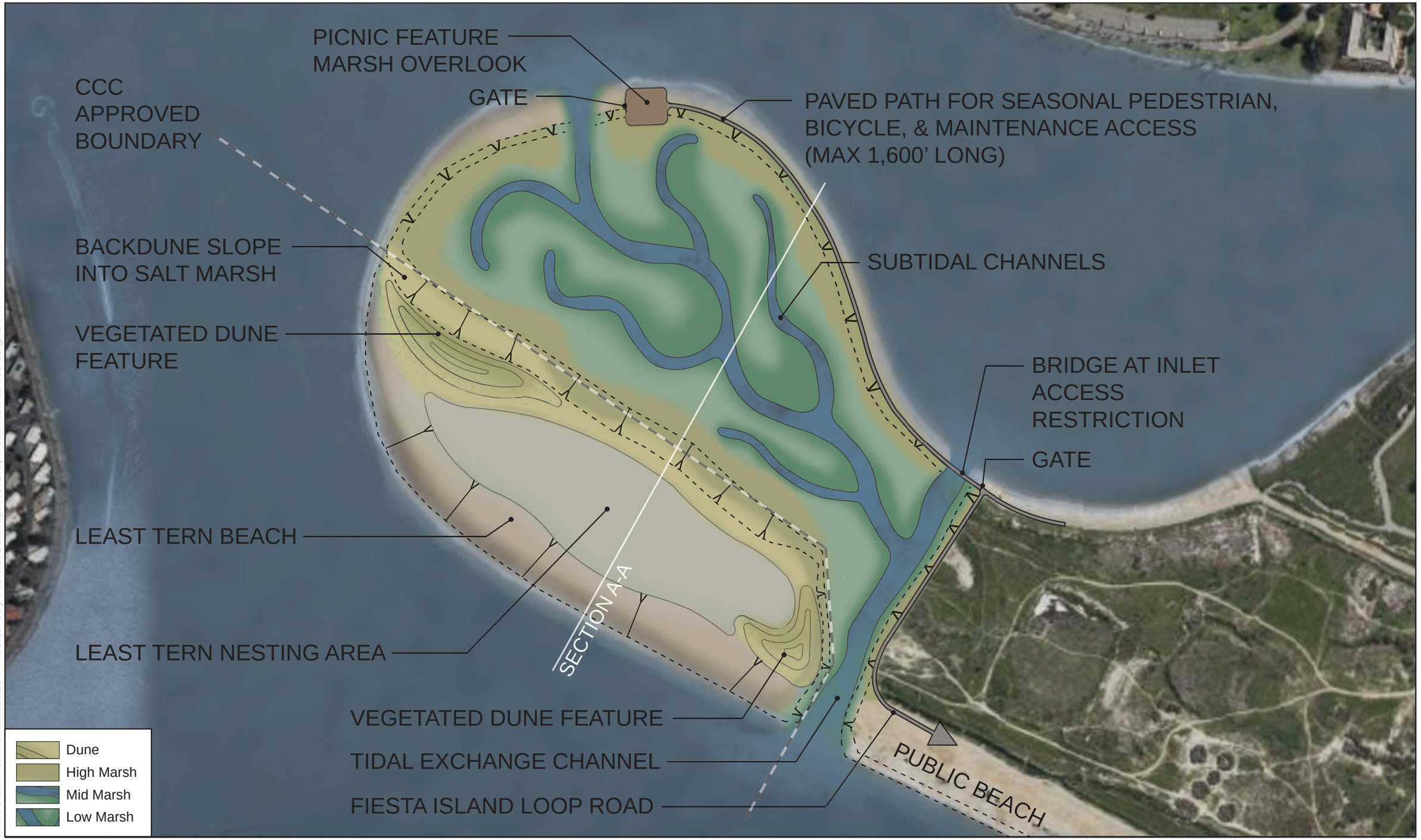
SOURCE: BING 2022

FIGURE 1

Mission Bay Master Plan Land Use Designations

North Fiesta Island Least Tern Preserve Design

DUDEK N NTS

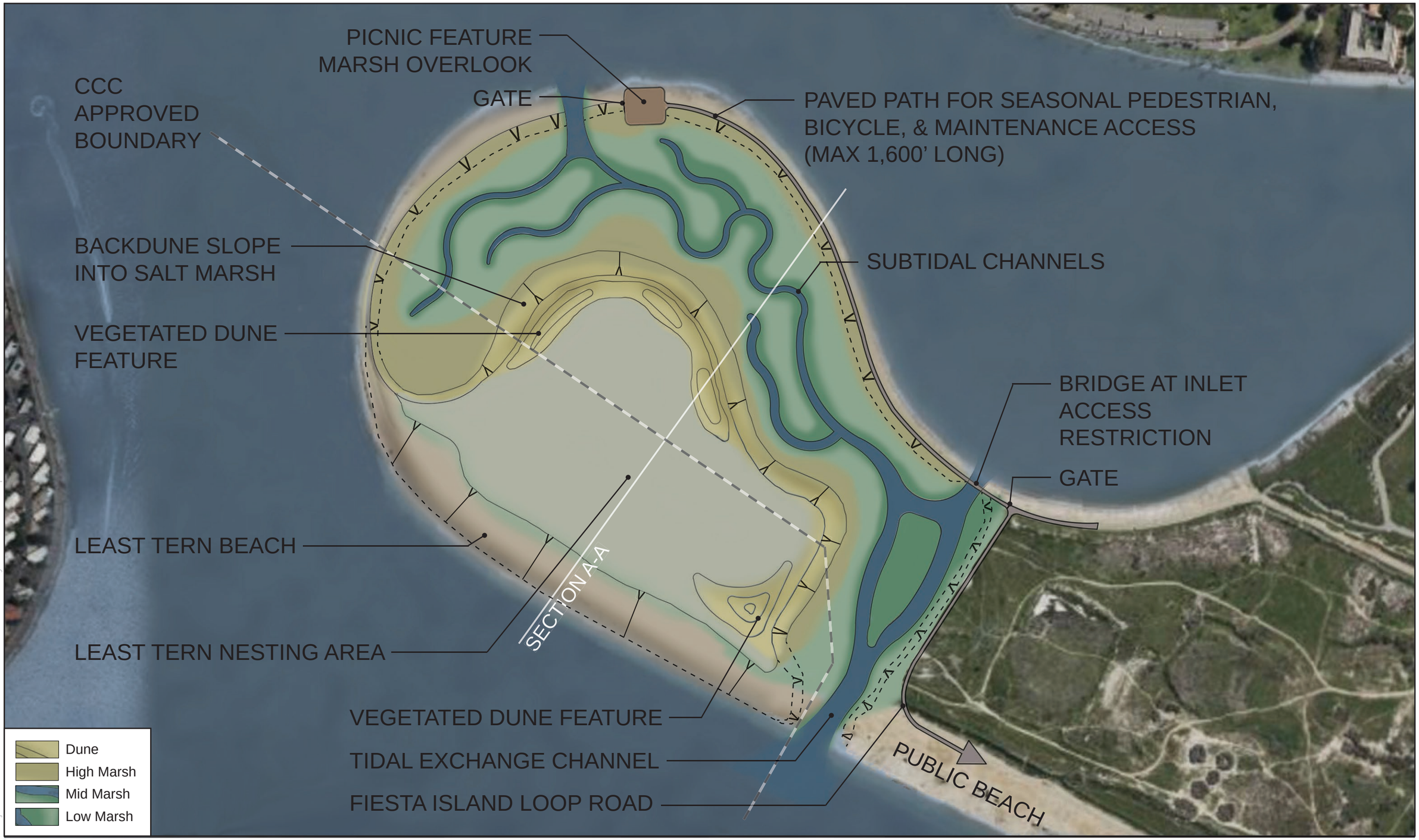


P:\300.Environmental\10523 - Mission Bay Park\GIS&Graphics\Graphics\AlternativeDesigns

DUDEK

0 300 600 Feet

FIGURE 2
MISSION BAY NORTH FIESTA ISLAND ALTERNATIVE 1
North Fiesta Island Least Tern Preserve Design



Projects\300 Environmental\10523 - Mission Bay Park\GIS&Graphics\N Fiesta Island

SOURCE: BING 2022

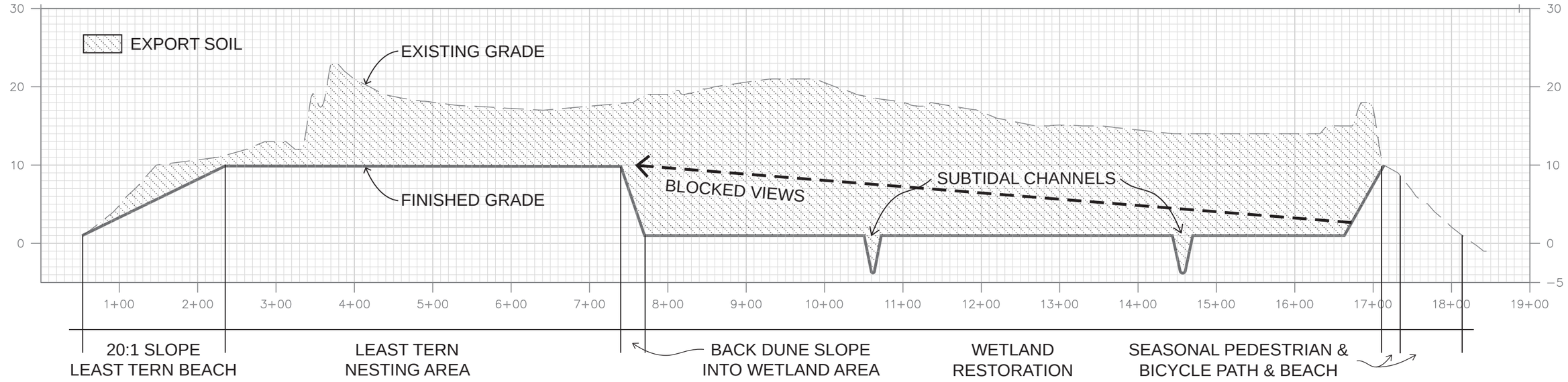
DUDEK

0 300 600 Feet

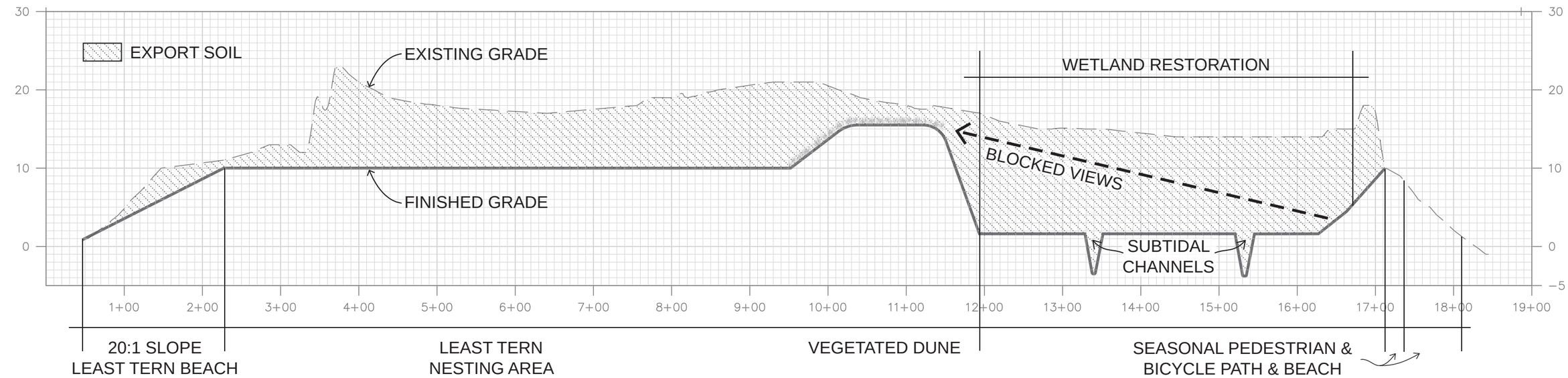
FIGURE 3
MISSION BAY NORTH FIESTA ISLAND ALTERNATIVE 2
North Fiesta Island Least Tern Preserve Design

D Preliminary Project Schedule

ALTERNATIVE 1
SECTION A-A



ALTERNATIVE 2
SECTION A-A

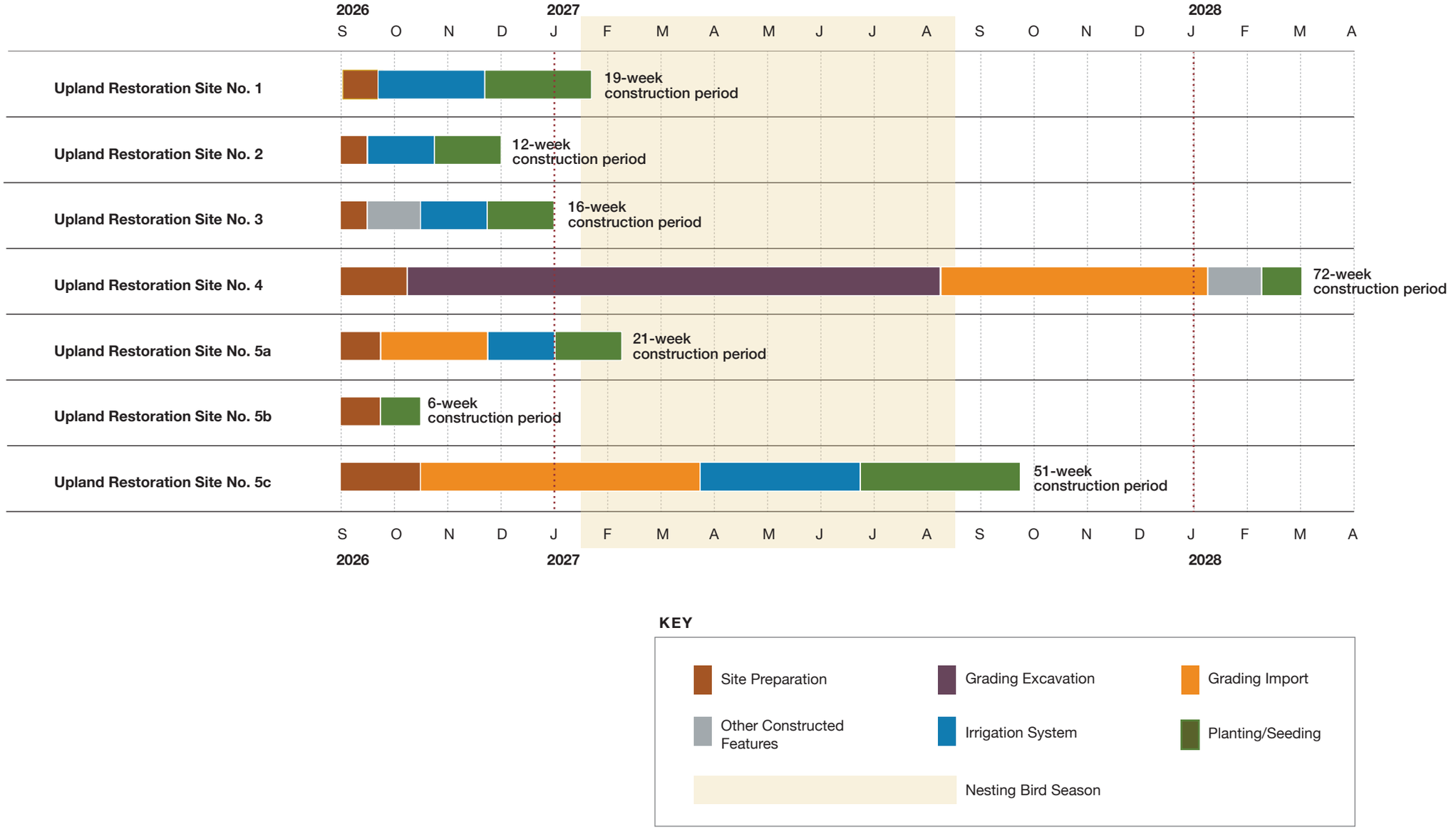


NOTES: 10:1 VERTICAL EXAGGERATION. SECTIONS ARE SHOWN LOOKING NORTH.

DUDEK

FIGURE 4
MISSION BAY NORTH FIESTA ISLAND ALTERNATIVE 1 & 2 SECTIONS
North Fiesta Island Least Tern Preserve Design

Preliminary Estimated Construction Durations



E Risk Assessment Table

RISK ASSESSMENT TABLE			Project Name: Mission Bay Uplands Expansion Projects					
Risk Description				Risk Assessment			Risk Response	
ID#	Category	Title	Risk Statement	Probability	Cost Impact	Time Impact	Strategy	Response Action
1	PM	Land Ownership	All Upland projects are located within Mission Bay Park. It is owned and maintained by the City of San Diego. As such, there are no known land ownership conflicts that may present risks to this project.	Very Low	Very Low	Very Low	Permit	Permit the projects through the Development Services Department and coordinate with the Real Estate Assets Department.
2	PM	Utilities	Except for the NFI Least Tern Preserve, all upland habitat expansion projects involve placement of fill that would not conflict with existing underground utilities. A thorough field survey should be conducted to identify existing utilities during the final design phase. A water line is located immediately south of restoration site #3 that brings water from the mainland to the San Diego Youth Aquatic Center. A portion of Site 5c overlaps an historic landfill. Stormwater conveyances are located under and around Site 5a.	Very Low	Moderate	Very Low	Permit	The contractor will be required to take due precautionary measures to protect any utilities or structures located at the is the contractor's responsibility Dig Alert and the owners of sewer, gas and electric, water, and storm drain outfall structures prior to any excavation and location of utilities and notification of commencement of work.
3	Construction	Existing Soil Data	Except for the NFI Least Tern Preserve, all upland habitat expansion projects involve import of fill and no excavation. Import soils must meet narrow textural specifications for coarse sand with shell fragments. The specified material may not be locally available, necessitating long haul transportation at high cost. Export material from NFI least tern preserve may not be suitable for reuse under U.S. Army Corps of Engineers Inland Testing Manual. Export and disposal of unsuitable soil will have cost and time implications.	Low	High	Moderate	Permit	A permit from the USACE is likely to place fill within Waters of the U.S. in accordance with the Inland Testing Manual. Further geotechnical or chemical testing and monitoring may be required for permitting and during construction to be determined in final design and permitting. Availability of suitable import material to be determined during final design phase.
4	Construction	Proximity to Neighbors	All sites located within public parklands with few private residential or commercial neighbors that minimizes the risk associated with private land interests. Low risks are present, impacts on Sea World Drive, potential temporary closure of Fiesta Island Road, and noise especially to nearby parks and businesses (e.g., Fiesta Island, South Shores, etc.). Permanent closure of the existing beach areas on North Fiesta Island will reduce recreation opportunities.	Low	Moderate	Moderate	Mitigate	Noise and traffic regulation may be restrict daily work hours and Construction timing of the Project may be scheduled to reduce impacts to visitor use. Peak visitor use spans approximately from Memorial Day (May)through Labor Day (September). Project construction is anticipated to occur from post-Labor Day to February 15th. The risk associated with project controversy will be mitigated by involving the public in project planning and minimizing negative impacts.
5	Environment	Seasonal Restrictions	As a result of constructing the Least Tern Preserve and less than one mile from Kendall Frost					Nesting restrictions are imposed from February 15th to

			Marsh Preserve, the presence of threatened or endangered birds may occur requiring avoidance through seasonal restrictions, mitigation, potential construction delays or prolonged construction schedule.	Moderate	High	High	Permit	September 1st (with some flexibility on the end date for certain bird species) each year for the California Least Tern nesting area. This will limit construction and excavation activities to 5.5 months each year, unless agencies allow construction to continue onsite biological monitoring. Earthwork is loud and distance buffers may delay construction or reduce work intensity to reduce noise. Buffers for listed species typically range from 300 to 500 feet and could potentially affect large areas of the project sites. This may require concurrent construction of the North Fiesta Island wetlands project ands the new least tern preserve.
6	Environment	Water Quality	Temporary water quality impacts may occur during construction, such as increased erosion and blown sand conditions. The project is anticipated to provide permanent improvements to water quality within the Bay in the long term.	Low	Low	Low	Mitigate/ Permit	Use of Best Management Practices can effectively control erosion and protect water quality during construction through implementation of a Storm Water Pollution Protection Plan in conjunction with permitting through the San Diego Regional Water Quality Control Board.
7	Environment	Sensitive Habitat	Existing habitat maps of the Project sites show sensitive habitat and species may occur within planned restoration areas. This includes Nuttall's lotus within the boundaries of Sites 1 and 5c, coastal dune and coastal sage scrub in Sites 1, 2, 3, and 5b, and coastal salt marsh in Site 5a. The presence and extent of sensitive species should be field verified by the City's project consulting team during final design. Sensitive resources identified on-site could be a constraint requiring protection or mitigation. The existing Least tern Preserve is also a sensitive habitat that will be impacted by this project.	Moderate	Moderate	Low	Permit	Confirmation of the on-site habitat will be included in the final design phase. The final design shall maximize avoidance and minimization of all impacts to sensitive habitats. Mitigation will be determined in coordination with appropriate regulatory agencies considering the habitat restoration goal of the projects and self-mitigating aspect of each project and the overall upland habitat expansion program.
8	Environment	Sea Level Rise	SLR may affect projects. If sea levels increase above 3.6 feet, elevated water levels with wind waves or storm surge may submerge low lying upland areas, which could cause terrain alteration and physically damage upland habitat,	Low	Low	Low	Adaptive Management	Sea level rise may require adaptive measures to protect upland habitat such as reinforcing or adding protective berms or raising onsite elevations through placement of fill.
9	PM	Competing Interests	The proposed projects are not identified in the Mission Bay Park Master Plan. The public may oppose projects that decrease or displace public use areas, especially on North Fiesta Island and at South Shores Also, since the Over The	Moderate	Moderate	Low	Mitigate	The risk associated with project controversy will be mitigated by involving the public in the development of the

			Line area is identified as one of the stockpile sites for surplus soils, there could be public opposition to that proposal.					project and negative project impacts.
10	PM	Permitting	As a result of the need to receive approval from multiple resource agencies, the possibility of project delays during permit processing could occur which may result in an increased project schedule and cost and may require new mitigations.	Low	Low	Low	Permit	Early engagement with resource agencies to anticipate and negotiate constraining regulations. Each [project and the overall upland expansion program is likely to be self-mitigating and will avoid additional mitigation that is not contemplated.