SOUTH MISSION BEACH WATERSHED MASTER PLAN

FINAL
BIOLOGICAL RESOURCES REPORT

August 2019

Prepared for:

Rick Engineering Company
Contact: Mr. Brendan Hastie
5620 Friars Road
San Diego, CA 92110
Office: (619) 291-0707

Prepared by:

Merkel & Associates, Inc.
Contact: Keith W. Merkel
5434 Ruffin Road
San Diego, California 92123
Phone: (858) 560-5465
Fax: (858) 560-7779
E-mail: kmerkel@merkelinc.com

Amanda K. Gonzales, Senior Biologist

Keith W. Merkel, Principal Consultant

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY OF TERMS AND ACRONYMS

BS Beaufort scale
BSA Biological Study Area
CCA California Coastal Act
CCC California Coastal Commission
CDFW California Department of Fish and Wildlife
CDP Coastal Development Permit
CEMP California Eelgrass Mitigation Policy
CEQA California Environmental Quality Act
CESA California Endangered Species Act
City City of San Diego
CNDDB California Natural Diversity Database
CWA Clean Water Act
DEM Digital Elevation Model
DSD Development Service Department
DTM Digital Terrain Model
EFH Essential Fish Habitat
ESA (Federal) Endangered Species Act
ESRI Environmental Systems Research Institute
°F degrees Fahrenheit
FGC Fish and Game Code
FP Fully Protected
GIS Geographical Information System
HAPC Habitat Area of Particular Concern
HHT Highest High Tide
LCP Local Coastal Program
M&A Merkel & Associates, Inc.
MBTA Migratory Bird Treaty Act
MHPA Multi-Habitat Planning Area
MHW Mean High Water
MLLW Mean Lower Low Water
MMPA Marine Mammal Protection Act
MSCP Multiple Species Conservation Plan
NMFS National Marine Fisheries Service
PTS Permanent Hearing Threshold Shifts
RMS Root Mean Squared
RWQCB Regional Water Quality Control Board
R&HA Rivers & Harbors Act
SEL Sound Exposure Level
SSC Species of Special Concern
SWRCB State Water Resources Control Board
TTS Temporary Threshold Shifts
USACOE/Corps U.S. Army Corps of Engineers
USFWS U.S. Fish and Wildlife Service
USGS U.S. Geological Survey
WL Watch List
WMP Watershed Management Plan
WoUS Waters of the U.S.

1.0 INTRODUCTION

1.1. Purpose of the Report

Merkel & Associates, Inc. (M&A) has prepared this biological resources report for the South Mission Beach Watershed Master Plan (WMP or Project). The purpose of this report is to document the existing biological setting of the project, identify jurisdictional water resources, and natural resources of concern, and to provide an assessment of potential biological impacts of Project implementation. This report makes recommendations for completion of work in a manner that would avoid or minimize project impacts and the report further identifies impacts that will likely occur and require mitigation. Recommendations for mitigation of potential significant biological impacts are made within this report.

1.2. Project Location

The project area is located within the City of San Diego, California. The project site includes a portion of the community of Mission Beach known as South Mission Beach located north of the Mission Bay Entrance Channel near the end of Mission Boulevard and extending northward to Belmont Park (Figure 1). The WMP includes storm drain discharges to Mariner's Basin and the Mission Bay Entrance Channel. For this reason, the biological study area (BSA) has been expanded beyond the WMP project area to include a broader envelope potentially affected by the storm drain outfalls from South Mission Beach.

The project area consists predominantly of dense single family residential, beach rental, and small visitor serving commercial developed lands that are bounded on the west by the Pacific Ocean beach shoreline and which are bounded on the east by Mariner's Basin within Mission Bay Park (Figure 2). The central portion of Mariner's Basin is a federally maintained facility that is part of the Mission Bay federal channel maintained by the Army Corps of Engineers, Los Angeles District. Across Mariner's Basin from South Mission Beach is the Mariner's Point Least Tern Nesting Site, the largest of four such sites in Mission Bay Park. This site is in the City of San Diego's Multiple Species Conservation Plan (MSCP) Multi-Habitat Planning Area (MHPA). Mariner's Basin is also part of Mission Bay Park and subject to the Mission Bay Park Master Plan Update (City of San Diego 1994, as amended 2002).

While this report includes a broader BSA than the focused project area to provide biological context, the focal investigations have been directed to areas within 100 feet of the current and proposed drain discharge points as well as the last segment of the storm drain extending to the terminal discharge locations. The developed portions of South Mission Beach have not been investigated for biological resources as these areas are highly urbanized with limited numbers of trees, no native vegetation, and no potential for sensitive biological resources to be affected by the propose storm drain work that is principally underground activities within street and alley right-of-ways.

N
W E
S

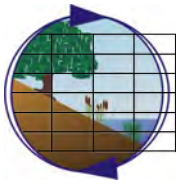
1:24000

Project Vicinity Map

South Mission Beach Watershed Master Plan

Source: USGS 7.5' La Jolla, CA Quadrangle

Figure 1



N
W E
S

Local Setting Map

South Mission Beach Watershed Master Plan

Aerial Source: ESRI 2017

Figure 2

1.3. Project Description

The proposed project consists of evaluating the biological and littoral zone effects of four existing storm drains, four realigned storm drain outlets, and one proposed new storm drain outlet. The proposed work includes a combination of actions ranging from no alteration of the conveyance outlet to removal and consolidation of outfalls, upsizing capacity, and extending outfalls. Table 1 briefly summarizes the planned activities at each drain outlet.

Table 1. Summary of actions at each project outfall

Outfall ID		Proposed Action
System 1 (120001)	Realigned	Storm drain realigned and outfall extended
System 2 (120002)	Existing	Storm drain replaced by the realigned storm drain 120008 (System 2)
System 7 (120003)	Existing	Broken outfall pipe with duck bill valve to be replaced
System 2 (120004)	Realigned	Storm drain realigned and consolidated into one outfall with 120008
System 5 (120005)	Existing	Storm drain replaced and outfall extended
System 8 (120006)	Existing	Storm drain left as is
System 9 (120007)	Realigned	Storm drain realigned and outfall extended
System 2 (120008)	Realigned	Storm drain realigned and outfall extended as part of System 2
System 6 (120010)	Proposed	New storm drain outfall

The overall WMP includes work within streets and alleys of South Mission Beach as well as activities on the beach adjacent to and waters within Mariner's Basin as well as on the shoreline of the Mission Bay Entrance Channel. Work within the urban developed lands of the WMP area are not addressed within this document as they have little potential for biological resource or jurisdictional waters affects.

Construction activities are expected to employ cut and cover trenching within the upland areas and either marine construction using in water excavation and placement of bedding gravel and pipe segments, or construction of temporary sheetpile containment, dewatering, and construction with standard dry environment methods within the dewatered containment. This methodology has been used for the completion of other marine outlet facilities within Mission Bay, including the subtidal storm drain outlets within Sail Bay and the Santa Clara Cove storm drain outlet. For

purposes of impact analysis in this assessment, a 100 foot wide cofferdam work area has been assumed around each drain outlet. This sizing is extremely liberal with respect to potential impacts, but it would ensure that any effects of the project would be adequately inclusive during the early phases of design such that impacts would only be expected to decrease over time.

Cofferdam construction methodology is illustrated for the Bessemer Street storm drain outfalls into San Diego Bay

The extension of storm drains to subtidal discharge points will require some excavation and regarding of beach and subtidal slopes around the storm drains in remove accumulated sand deltas and flatten the subtidal slopes around and over the pipe. This will reclaim previously displaced beach sand and replace it on the intertidal and supratidal beach while removing the storm drain deltas that extend bayward from the existing intertidal drain discharge locations. This removal will reduce the potential for burial of the drain outlet due to steep slope slumping. It will remove the steep shoreline scarp and it will provide opportunities for the restoration of mitigation eelgrass.

The proposed project is anticipated to be implemented concurrent with other underground utilities activities within the South Mission Beach area. The work is expected to be completed during the period from June 2020 to February 2022. No work is proposed on the beach or within the waters of Mission Bay from Memorial Day to Labor Day of any given year.

Implementation of the proposed project is expected to occur following acquisition of all applicable permits/authorizations. Construction of the project is expected to occur over an approximate 20 month period, with the work on the outfalls on the beach and in the water being completed over a period of approximately 20 months.

1.4. Data Collection Methodologies

1.4.1. Literature and Data Review

Historical and currently available biological literature and data pertaining to the project area were reviewed prior to initiation of the field investigations. This review included examination of: 1) aerial photography for the project site (Google Earth Pro and SDG&E 2014); 2) composite topography and bathymetry for the study area from LiDAR collected digital terrain model (DTM) data (SDG&E 2014) and swath bathymetry (M&A 2016); 3) soil types mapped on the project site (SanGIS 2002); 4) City of San Diego MSCP (City of San Diego 1997); 5) Mission Bay Park Master Plan Update (City of San Diego 2002); 6) federally designated critical habitat for the project vicinity (USFWS 2017a); 7) CDFW

California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service (USFWS) special status species records for the project vicinity (CDFW 2017a and USFWS 2017b, respectively); and 8) previous biological reports/data for the project site and local vicinity, including the 2013 baywide eelgrass survey (M&A 2013).

1.4.2. Biological Surveys and Investigations

1.4.2.1. Survey Date(s), Time(s), and Conditions

Field surveys of the sites have included marine resource surveys and mapping, sediment characterization sampling, upland habitat assessment and jurisdictional waters determinations. Surveys have included general biological survey to map vegetation and identify botanical and wildlife species, as well as a marine habitat survey that included eelgrass (*Zostera marina*) mapping. Table 2 summarizes the survey dates, times, and conditions.

Table 2. Survey Date(s), Time(s), and Conditions

Survey	Date	Time	Conditions (start to end) 1	Staff
Marine Habitat	July 23, 2018	0730-1300	Weather: 0% cc Wind: 1 BS Temperature: 72-81° F	Jordan Volker Daniel Kahl
Marine Habitat	August 6, 2018	0730-1400	Weather: 0% cc Wind: 1 BS Temperature: 74-83° F	Jordan Volker Daniel Kahl
General Biology, Jurisdictional Waters	January 20, 2019	0730-1030	Weather: 100% cc Wind: 0-1 BS Temperature: 55-60° F	Keith Merkel
Marine Habitat Inspection	August 13, 2019	0800-0900	Weather: 100% cc Wind: 0 BS Temperature: 62-64° F	Jordan Volker Daniel Hartsook

[1] cc = cloud cover; BS = Beaufort scale; °F = degrees Fahrenheit

1.4.2.2. Field Survey Methods

1.4.2.2.1. General Terrestrial Biology: Vegetation Mapping and Botanical/Wildlife Survey

M&A conducted a general biological review of the study area on with the primary focus being on the undeveloped beach and intertidal environments and upper tide lines. The investigation also included a drive through investigation of the developed portions of the South Mission Beach WMP area to confirm the absence of any substantial wildlife habitats. A focused investigation was made along the beach and rip rap environments to confirm the absence of any adjacent wetlands or any native terrestrial vegetation. During this investigation, the general condition of the beach was investigated to determine if any obvious differences existed from those previously identified in aerial surveys (latest August 2017) or LiDAR topographic mapping. No new in water investigations were conducted in January 2019, thus making the prior summer 2018 investigations the most current marine habitat surveys. However, a quick inspection of the eelgrass beds was made in August 2019 to verify the continued general distribution of eelgrass in areas mapped the prior year.

The baseline eelgrass mapping was not updated as the distribution of eelgrass appeared generally similar to that previously mapped in 2018.

Existing habitat types were classified according to the Holland (1986) code classification system as modified by Oberbauer et al. (2008), and have been mapped in accordance with the City Biological Guidelines and Guidelines for Conducting Biological Surveys (2012).

The scientific and common names utilized for the floral and faunal resources were noted according to the following nomenclature: flora, Baldwin (2011) Calflora (2018); butterflies, Klein and San Diego Natural History Museum (2002) and Opler et al. (2010); amphibians and reptiles, Crother et al. (2012); birds, American Ornithologists' Union (1998 and 2017); and mammals, (species level) Wilson and Reeder (2005) and (sub-species level) Hall (1981).

Photographs of the project area were taken to record the biological resources present within the study area and data collected from the survey were digitized in Environmental Systems Research Institute (ESRI) Geographical Information System (GIS) software, using ArcGIS® for Desktop.

1.4.2.2.2. Marine Habitats and Eelgrass Survey

Intertidal marine habitats were surveyed from shore in conjunction with the general biological survey described above as well as by survey vessel with interferometric sidescan sonar and ROV. In addition, an in-water eelgrass survey was completed of the site by SCUBA diver.

Eelgrass habitat mapping was completed using interferometric sidescan sonar (ISS), which provided an image of seafloor backscatter within the entire project area. Interpretation of the backscatter data allowed for an assessment of the distribution of eelgrass. Sidescan backscatter data were acquired at a frequency of 468 kHz, with a scanning range of 31 meters for both the starboard and port channels, resulting in a 62 meter wide swath. All data were collected in latitude and longitude using the North American Datum of 1983 (NAD 83). The survey was conducted by running transects spaced to allow for overlap between adjoining sidescan swaths. Transect surveys were performed until the entirety of the survey area was captured in the survey record. Following completion of the survey, the data were converted into a geographically registered mosaic through digital post-processing, and plotted on a geo-rectified aerial image of the project area. Marine resources of interest were then digitized to show their distribution within the survey area.

Following the sidescan survey, the survey area was examined to assess the eelgrass quality, verify the sidescan data, and measure the density of actively growing leaf shoots by conducting shoot counts within a 1/16-m^2 quadrat. Twenty replicate quadrats were randomly placed within five widely distributed eelgrass beds throughout the study area to obtain a mean shoot density.

Following completion of the survey, ISS traces were joined together and geographically registered. Eelgrass was then digitized as a theme over and projected on an aerial image of the project site to calculate the amount of eelgrass coverage and present its distribution. This method of eelgrass distribution calculation allows for monitoring eelgrass trends at the project site with a substantial degree of accuracy and repeatability over time.

The reported metrics for eelgrass are as follows:

- **Spatial Distribution –** The spatial distribution of eelgrass habitat was delineated by a contiguous boundary around all areas of vegetated eelgrass cover extending outward a distance of 5 meters. The resultant spatial distribution boundary of the eelgrass habitat

was then clipped to remove areas that were determined to be unsuited to supporting eelgrass based on depth, substrate, or existing structures.

- **Areal Extent –** The eelgrass habitat areal extent includes vegetated cover and extent of unvegetated habitat that defines a coalesced bed with gaps of less than 1 meter across being considered part of the defined bed.
- **Percent Vegetated Cover -** Eelgrass vegetated cover exists when one or more leaf shoots (turions) per square meter is present. The percent bottom cover within eelgrass habitat is determined by totaling the area of vegetated eelgrass cover and dividing this by the total eelgrass habitat area.
- **Turion (Shoot) Density -** Turion density is the mean number of eelgrass leaf shoots per square meter within mapped eelgrass vegetated cover. Turion density should be reported as a mean ± the standard deviation of replicate measurements. The number of replicate measurements (n) is reported along with the mean and deviation. Turion densities are determined only within vegetated areas of eelgrass habitat; and therefore, it is not possible to measure a turion density equal to zero.

1.4.2.2.3. Directed Sensitive Species Survey/Assessment

Concurrent with the habitat mapping and botanical/wildlife survey, a directed survey/assessment for special status species, as defined under the California Environmental Quality Act (CEQA), was conducted within the study area. Only the South Shores staging are supported any terrestrial vegetation within work areas and as such, this area was the focus for the rare species investigations. Further, during each field visit, note was made of the absence of marine mammals within or in proximity to the project sites.

State CEQA Guidelines §15380 (Title 14, Chapter 3, Article 20) define “endangered, rare or threatened species” as “species or subspecies of animal or plant or variety of plant” listed under the Code of Federal Regulations, Title 50, Part 17.11 or 17.12 (Volume 1, Chapter I) or California Code of Regulations, Title 14, Sections 670.2 or 670.5 (Division 1, Subdivision 3, Chapter 3), or a species not included in the above listings but that can be shown to be “endangered” meaning “when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors” or “rare” meaning “although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens or the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered ‘threatened’ as that term is used in the Federal Endangered Species Act”. State CEQA guidelines Appendix G, Section IV generally refers to species that fall under the above criteria as “special status species”.

Thus, for the purposes of this report, special status species are: 1) federally and state listed species (CDFW 2017c and 2018b); 2) California Department of Fish and Wildlife (CDFW) Species of Special Concern (SSC), Fully Protected (FP), and Watch List (WL) species (CDFW 2017a, 2017b, 2018a); 3) species designated as Special Plants or Special Animals in the CNDDB, which include all taxa inventoried by the CDFW, regardless of their legal or protection status; and 4) MSCP Narrow Endemic and Covered Species (City 1997).

The potential for sensitive species to occur on the project site was assessed based on the presence of potentially suitable habitat, as well as historical and currently available species data.

1.4.2.2.4. Jurisdictional Delineation

Multiple federal and state agencies as well as the City of San Diego have jurisdictional authority over waters and waterways. An analysis was conducted to determine the limits of jurisdictional waters within the BSA. The investigation included an evaluation of the potential for presence of wetlands as well as determination of non-wetland jurisdictional boundaries of waters in the BSA.

An evaluation of the site was completed to determine whether any features existed that would warrant application of wetland determination methods noted in the *USACOE Wetland Delineation Manual* (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACOE 2008a). Specifically, these methods apply a rule-based evaluation of the presence and extent of three parameters defining wetlands (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology). In addition to completion of wetland investigations, the jurisdictional limits of non-wetland waters were also investigated. The limit of jurisdictional waters absent the presence of wetlands is defined by physical manifestations of water inundation. In tidal waters, two inundation levels are applicable. These are the annual highest high tide (HHT) for discharge of fill regulated under section 404 of the Clean Water Act, and the mean high water (MHW) for activities regulated under section 10 of the Rivers & Harbors Act. These elevations are relative to harmonic data that varies from location to location. In Mission Bay, the HHT is +4.50 ft NGVD29 (+7.38 ft MLLW) and the MHW is +1.86 ft NGVD29 (+4.74 ft MLLW).

For the purposes of the WMP investigations, planning and design is being completed using a topographic digital elevation model (DEM) derived from 2014 LiDAR. To remain consistent with design documents, this DEM has been adopted as a base for delineating elevationally driven jurisdictional boundaries. In addition, due to the age of the existing topography, a review of recent historic photographs (Google Earth) and a January 2019 field review of the site was undertaken to confirm that conditions present within the BSA remained relatively consistent with the conditions depicted through the 2014 DEM. With the exception of minor grooming effects and seasonal high beach sand berming to protect against wave swell run-up, the conditions in January 2018 were determined to be generally consistent with the 2014 DEM conditions. Slight differences in the horizontal position of the jurisdictional boundaries would be expected, however because both jurisdictional boundaries are located on a moderately steep beach face, these differences would not be expected to be substantial.

1.4.2.3.Survey Limitations

Biological inventories are generally subject to various survey limitations. Depending on the season and time of day during which field surveys are conducted, some species may not be detected due to temporal species variability. In the present case, the BSA was examined at differing times for marine and terrestrial resources based on seasonality of resource detectability. The resources within the BSA are generally well known and highly influenced by anthropogenic activities. This makes it unlikely that substantial resources of high importance have not been documented within the area. The waters of Mission Bay were investigated to generally characterize marine resources of the bay during the preparation of the Mission Bay Natural Resources Management Plan (included in the Mission Bay Master Plan Update). In addition, the eelgrass habitat within Mission Bay has been inventoried and tracked since 1988 with baywide surveys being completed in 1988, 1992, 1997,

2001, 2007, and 2013 (M&A 2013). The Mariner's Point California least tern nesting site within the BSA is a well-known and monitored element of the City's MHPA and its use has been documented for many years. The remainder of the BSA is highly disturbed urbanized residential, commercial, and developed parklands. These areas are not expected to support any sensitive biological resources. As such, it is believed that the investigations completed to date are adequate to characterize the nature of the biological environment for the purposes of environmental review.

1.5. Applicable Regulations

A variety of federal, state, and local regulations may apply to the proposed project. These regulations are listed herein with a brief description.

1.5.1. Federal Regulations and Standards

1.5.1.1. Federal Endangered Species Act (ESA)

The federal ESA (16 U.S.C. 1513-1543) was enacted in 1973 to provide protection to threatened and endangered species and their associated ecosystems. "Take" of a listed species is prohibited except when authorization has been granted through a permit under Sections 4(d), 7, or 10(a) of the act. Take is defined as harassing, harming, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any of these activities without a permit.

1.5.1.2. Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) was enacted in 1918. Its purpose is to prohibit the kill or transport of native migratory birds, or any part, nest, or egg of any such bird unless allowed by another regulation adopted in accordance with the MBTA. Under the MBTA of 1918 (16 U.S.C. section 703-712; Ch. 128; July 3, 1918; 40 Stat. 755; as amended 1936, 1956, 1960, 1968, 1969, 1974, 1978, 1986 and 1998), it is unlawful, except as permitted by the USFWS, to "take, possess, transport, sell, purchase, barter, import, or export all species of birds protected by the MBTA, as well as their feathers, parts, nests, or eggs (USFWS 2003). Take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (50 CFR 10.12). Birds protected by the MBTA include all birds covered by the treaties for the protection of migratory birds between the United States and Great Britain (on behalf of Canada, 1916), Mexico (1936), Japan (1972), and Russia (1976), and subsequent amendments."

It is important to note that since the MBTA addresses migratory birds by family rather than at a lower taxonomic level, most bird species are protected by the MBTA because most taxonomic families include migratory members. In addition, "take" as defined under the federal MBTA is not synonymous with "take" as defined under the federal ESA. The MBTA definition of "take" lacks a "harm and harassment" clause comparable to "take" under the ESA, thus, the MBTA authority does not extend to activities beyond the nests, eggs, feathers, or specific bird parts (i.e., activities or habitat modification in the vicinity of nesting birds that do not result in "take" as defined under the MBTA are not prohibited). Further, "a permit is not required to dislodge or destroy migratory bird nests that are not occupied by juveniles or eggs; however, any such destruction that results in take of any migratory bird is a violation of the MBTA (i.e., where juveniles still depend on the nest for survival) (USFWS 2003)."

1.5.1.3. Federal Water Pollution Control Act (Clean Water Act), 1972

In 1948, Congress first passed the Federal Water Pollution Control Act. This act was amended in 1972 and became known as the Clean Water Act (CWA). The act regulates the discharge of pollutants into waters of the U.S. (WoUS), including wetlands. The term "waters of the U.S." is defined in 33 CFR Part 328.3(a) as:

> *(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide; (2) All interstate waters and wetlands; (3) All other waters such as intrastate lakes, rivers, streams, (including intermittent streams), mudflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters: (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (iii) Which are used or could be used for industrial purpose by industries in interstate commerce; (4) All impoundments of waters otherwise defined as waters of the U.S. under the definition; (5) Tributaries of waters identified in (a) (1) through (4) of this section; (6) The territorial seas; (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section; and (8) Waters of the U.S. do not include prior converted cropland.*

"Wetlands" are defined in 33 CFR 328.3(b) as:

> *"those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*

Under Section 404 (33 U.S.C. 1344), permits need to be obtained from the USACOE for discharge of dredged or fill material into waters of the U.S. Under Section 401 of the CWA, Water Quality Certification from the Regional Water Quality Control Board (RWQCB) would need to be obtained if there are to be any impacts to waters of the U.S.

1.5.1.4. Rivers & Harbors Act of 1899 (33 U.S.C. 401)

The Rivers & Harbors Act of 1899 (R&HA) is intended to protect the navigability of the nation's waterways. The term "navigable waters of the U.S." is defined in 33 CFR Part 329.4 as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce."

At its core, the R&HA provides for the regulation of obstructions in the waterway and includes regulation of all structures and work. Under section 10 of the R&HA, the Corps regulates structures and work within navigable waters such as tidal waters of Mission Bay. The regulatory reach of the Rivers & Harbors Act extends up to the mean high water line.

1.5.2. State Regulations and Standards

1.5.2.1. California Environmental Quality Act (CEQA)

CEQA requires that biological resources be considered when assessing the environmental impacts resulting from proposed actions. CEQA does not specifically define what constitutes an "adverse

effect" on a biological resource. Instead, lead agencies are charged with determining what specifically should be considered an impact.

1.5.2.2. California Fish and Game Code (FGC)

The California Fish and Game Code (FGC) regulates the taking or possession of birds, mammals, fish, amphibian and reptiles, as well as natural resources such as wetlands and waters of the state. It includes the California Endangered Species Act (CESA) (Sections 2050-2115) and streambed and lake alteration regulations (Section 1600-1616), movement of aquatic plants, as well as provisions for legal hunting and fishing, and tribal agreements for activities involving take of native wildlife.

In addition, Sections 3503, 3503.5, and 3513 of the FGC prohibit the "take, possession, or destruction of bird nests or eggs." Section 3503 states: "It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." Section 3503.5 provides a refined and greater protection for birds-of-prey and states: "It is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." The distinctions made for birds-of-prey are the inclusion of such birds themselves to the protections and the elimination of the term "needlessly" from the language of §3503. Section 3513 states: "It is unlawful to take or possess any migratory nongame bird as designated in the MBTA or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Bird Treaty Act."

The definition of "take" under the FGC is not distinct from the definition of "take" under CESA, which is defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (FGC Code §86); however, it is important to note that the state definition of "take" again does not include a "harm and harassment" clause, and thus, activities or habitat modification in the vicinity of nesting birds that do not result in "take" as defined under the FGC/CESA are not prohibited.

1.5.2.3. Porter-Cologne Water Quality Control Act

This act is substantively the California version of the Federal CWA. It provides for statewide coordination of water quality regulations through the establishment of the State Water Resources Control Board (SWRCB) and nine separate RWQCBs that oversee water quality regulation on a day-to-day basis at the regional watershed basin level.

The RWQCB San Diego Region, under the SWRCB, regulates wastewater discharges to "waters of the State", which is defined in section 13050(e) of the California Water Code as "any surface water or groundwater, including saline waters, within the boundaries of the State." For waters of the State that are federally regulated under the CWA, the RWQCB must provide state water quality certification pursuant to Section 401 of the CWA for activities that may result in discharge of pollutants into WoUS.

1.5.2.4. California Coastal Act (CCA)

Under the CCA of 1976, the California Coastal Commission (CCC) regulates activities that would affect wetlands occurring in the California coastal zone through the CCA. The City has a certified Local Coastal Program (LCP), which covers the developed private lands within South Mission Beach and the adopted Mission Bay Master Plan Update covering lands within Mission Bay Park. The City

has been delegated primary authority for implementation of the Coastal Act within Mission Beach under the Mission Beach Precise Plan and Local Coastal Program Addendum (June 26, 2017, Resolution R-311205). However, the Coastal Commission has retained jurisdiction within many parts of South Mission Beach as well as Mission Bay Park and the waters of Mission Bay. As a result, infrastructure projects that cross into and out of areas under LCP and CCC jurisdiction, such as drainage improvements contemplated under the WMP, would be permitted through a consolidated permitting approach within the Coastal Commission being the permitting agency for the entire project.

Section 30121 of the CCA defines "wetland" as: "lands within the coastal zone that may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats and fens." The CCC uses the same three criteria for defining wetlands as the USACOE (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology); however, only one of the three criteria needs to be present for an area to be classified as a wetland. CCC jurisdiction extends beyond streambeds to include all tidal areas and isolated wetlands; however, jurisdiction is limited to areas within the coastal zone. The CCC wetland definition is generally more encompassing than the USACOE definition in most respects; however, the language of 14 CCR 13577(b) would suggest that, where conditions are not capable of supporting hydric soils or hydrophytic vegetation, hydrologic indicators of saturation or surface waters should be expressed on an annual basis (i.e., "at some time during each year"), not just under ordinary high water conditions as is the case under the federal regulatory standard. As a result, the CCA definition of wetlands would appear to be more limited than the federal act where no soil or vegetation indicators exist. Most particularly, the CCC generally does not consider beaches, devoid of hydrophytes or hydric soils, to be wetlands.

1.5.3. Local Regulations and Standards

The WMP project falls under the local land use authority of the City of San Diego. The City is charged with implementation of development controls under local ordinances and policies and adopted plans such as the Mission Bay Master Plan Update, Mission Beach Precise Plan and Local Coastal Program Addendum. The City is also mandated to meet state and federal obligations for water resources protection that are derived through the CWA. The City is charged with implementation of the Coastal Act within the limits of the Mission Beach Precise Plan. For the full project action, the City will be responsible for environmental evaluation of the project as the lead agency under CEQA and will issue a Site Development Permit for the project.

2.0 SURVEY RESULTS

2.1. Physical Characteristics

The BSA is located within Mission Bay Park on the coastal strand spit that separates Mission Bay from the Pacific Ocean. The BSA includes the dredged Mariner's Basin, and filled lands surrounding the basin that were both developed in the 1950s by hydraulic dredging of the active flood shoal near the mouth of False Bay. This was early in the development of the present day Mission Bay that was constructed predominantly by a relatively balanced dredging and filling of shallow bay, mudflats, and marshlands to construct uplands and deeper navigational basins.

Within the BSA soils have been coarsely mapped by the USDA Soil Conservation Service (2002). From west to east soils are mapped as coastal beaches along the ocean front fringe. The mapped soils underlay existing improvements in these areas. Urban lands dominate the core of the WMP project area of South Mission Beach. Within Mission Bay Park the lands are mapped as made land while the water of Mission Bay is mapped as lagoons of the San Diego area (Figure 3). As a footnote, the mapped interface between made land and urban land is close to, but not precisely at the shoreward limits of the historic dredge material fill placed to construct Mission Bay Park.

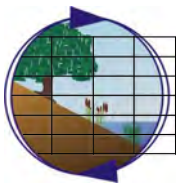
Regionally, the BSA is in the central coast ecoregion of San Diego County. The BSA is located in south Mission Bay, within the Penasquitos Hydrologic Unit/Watershed (Basin No. 4906) (Figure 4). Mission Bay is currently a dynamic low-flux sedimentary environment with sediment transport dominated by tidal and wave action. The main inputs of sediments into the bay are littoral sands entering the bay via the Mission Bay entrance channel, fluvial inputs from Rose Creek (to the north of Fiesta Island) and Tecolote Creek (to the east of Fiesta Island) as well as the San Diego River, and bay beach erosion resulting from wind, wave, and oceanic swell erosion. Other minor inputs include urban storm drains and atmospheric particulates. The main sediment outputs from the bay include tidal export out of the entrance channel, dredging, and shoal or beach reclamation activities. Patterns of accretion and erosion within Mission Bay are defined by a combination of geography and sediment sources, sediment characteristics, and bay hydrodynamics. The BSA is located in a generally well flushed area of Mission Bay with regular tidal circulation and muted oceanic swell entering Mariner's Basin as it is builds and is reflected within the Mission Bay entrance channel that passes through the southern portion of the BSA.

The elevation within the study area ranges from -25 feet NAVD29 within the deepest portions of Mariner's Basin and within the Mission Bay Entrance Channel to approximately +16 feet NAVD29 at the highest portion of the BSA on mounded park lands.

2.2. Biological Resources

The WMP project sites are located predominantly within urbanized land but extend into groomed recreational beaches and waters of Mission Bay. The predominant biological features within the study area are the active park lands and bay, however the BSA also includes a small area of the City's MHPA preserve that is defined as the Mariner's Point least tern nesting site .

The BSA holds eight mapped habitat types (Figure 5) within the approximately 200 acre area. The breakdown of habitats within the BSA by habitat type, area, and MSCP Tier as well as MHPA status is summarized in Table 3. The individual habitats are subsequently characterized.



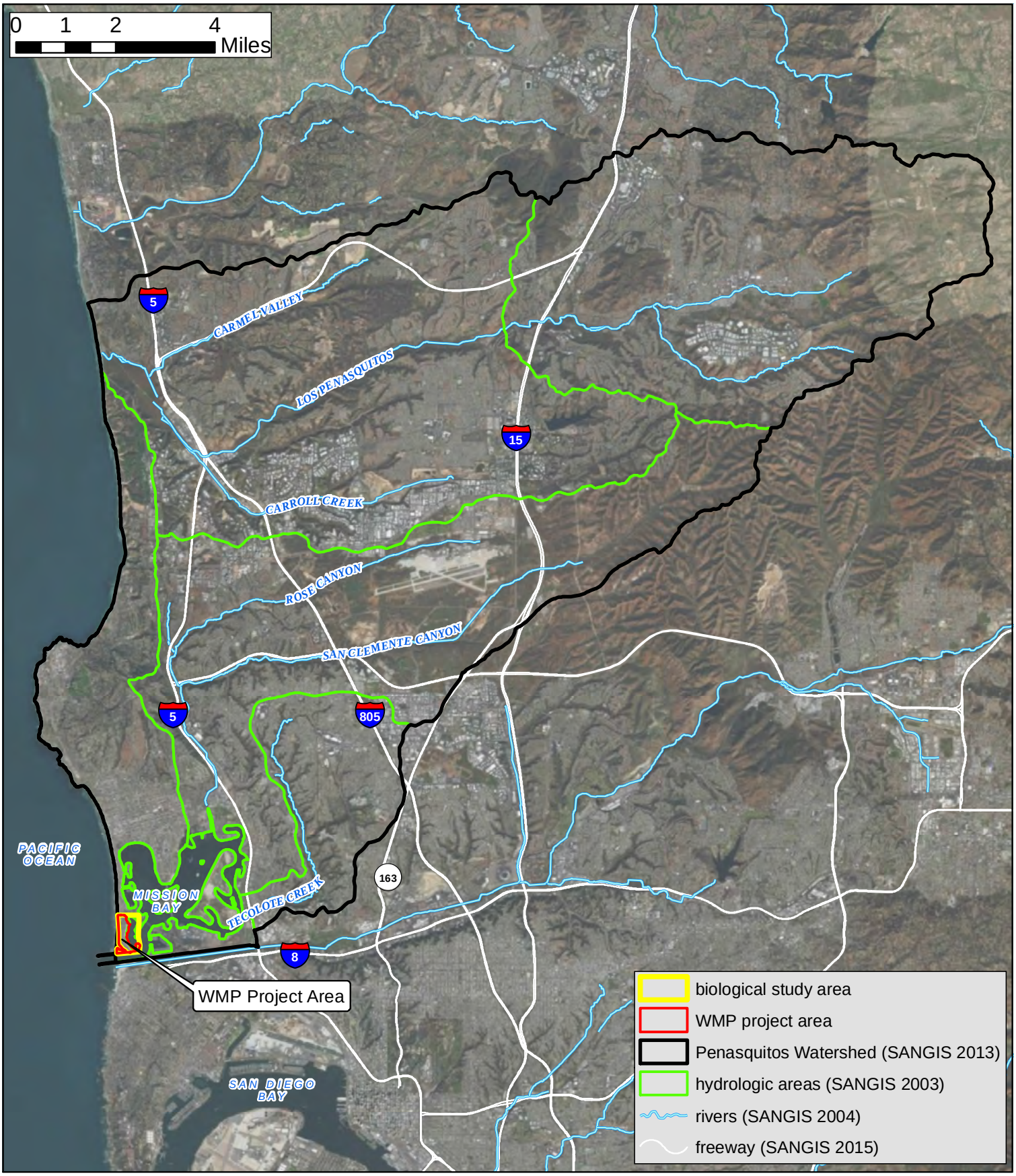
N
W
E
S

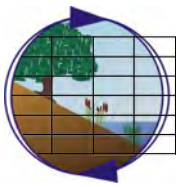
Soils Map

South Mission Beach Watershed Master Plan

Aerial Source: ESRI 2017

Figure 3





N
W E
S

Regional Watershed Map

South Mission Beach Watershed Master Plan

Aerial Source: ESRI 2017

Figure 4

N
W
E
S

Biological Resources & Jurisdictional Resources Map

South Mission Beach Watershed Master Plan

Aerial Source: ESRI 2017

Figure 5

Table 3. Biological Habitat Areas

Habitat/Vegetation Community	Holland/ Oberbauer Code	MSCP Tier; Habitat Type	Existing (acres)	City of San Diego *Inside MHPA*	City of San Diego *Outside MHPA*
Urban/Developed	12000	Tier IV	96.28	0	96.28
Supratidal Beach	64400		15.61		15.61
Mariners' Point Least Tern Nest Site	21230	Tier 1	2.39	2.39	0
Intertidal Beach	64000		22.51		22.51
Subtidal Soft Bottom	64122		52.13		52.13
Eelgrass Beds*	64122		5.58		5.58
Revetment	64122		4.59		4.59
Canopy Kelp Beds*	64122		1.05		1.05
Total:			**200.14**	**2.39**	**197.75**

*Dynamic habitat features that fluctuate interannually and seasonally.

2.2.1. Habitats

2.2.1.1. Urban/Developed – (Oberbauer 12000)

Urban/Developed lands within the BSA consist of the residential and commercial development areas of South Mission Beach, turfed parklands, parking lots and streets, and supratidal rip rap revetment. Within this habitat feature, hardscape is the dominant land cover and plants are limited and are either recreationally purposed turfs and trees, or part of horticultural landscaping. Native floristic species are uncommon and associated with landscaping rather than natural community assemblages. These areas of the BSA were not exhaustively investigated but rather characterized by aerial photograph inspection and brief drive through surveys of the neighborhood and developed parklands.

Wildlife species noted in this habitat consisted primarily of common urban associated species as well as species commonly found in nearshore coastal bay environments. Avian species observed included house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*) and rock pigeon (*Columba livia*), and American crow (*Corvus brachyrhynchos*) throughout the BSA.

2.2.1.2. Supratidal Beach – (Oberbauer 64400)

A band of sand beach occurs around the shoreline of Mariner's Basin. The beach is bounded by manicured turf and walking paths. This habitat is heavily utilized for recreational purposes by visitors to Mission Bay. The supratidal beach is actively groomed by the City Parks and Recreation Department mechanized beach maintenance staff. The supratidal beach is unvegetated.

Within Mission Bay Park were additional more coastal associated species such as western gull (*Larus occidentalis*) and California gull (*Larus californicus*). While these species were observed on the beach area, they were relatively ubiquitous within the parklands including beach, turf, parking lot, and on the water.

2.2.1.3. Mariner's Point Least Tern Nesting Site – (Oberbauer 21230)

The Mariner's Point least tern nesting site is a continuation of the upland of Mission Bay Park that has been fenced off from public use and which is maintained by San Diego Audubon Society volunteers in conjunction with the City to serve as one of the four California least tern nesting sites in Mission Bay Park. The site could be alternatively considered southern foredune or supratidal beach. While activities have been undertaken to foster native dune vegetation such as *Camissonia cheiranthifolia suffruticosa*, *Ambrosia chamissonis*, *Abronia maritima*, and *Calystegia soldanella*, as well as the sensitive species *Lotus nutallianus*, the site vegetation has regularly been thinned to create a predominantly barren sandy environment suited to nesting use by least terns. The ongoing maintenance to foster dominance by native dune species, while maintaining open sandy conditions is the result of overly stabilized conditions that would ultimately convert to fully vegetated lands, should the nest site maintenance intervention cease.

The Mariner's Point Least Tern Nesting Site is not within the South Mission WMP project area, however it is within the BSA to provide context of proximity for purposes of impact discussions. While the Mariner's Point tern nesting site was not investigated during the present surveys, a breeding season video and acoustic monitoring effort was undertaken during 2017 within the site. During this monitoring, least terns (*Sterna antillarum browni*) and horned larks (*Eremophila alpestris*) were the most common avian species observed on the colony site (M&A 2018).

2.2.1.4. Intertidal Beach – (Oberbauer 64000)

Intertidal beach occurs below the highest high tide along most of Mariner's Basin. The intertidal beach is predominantly unvegetated, however at the lowest margins of the beach, some eelgrass beds occur. These are discussed as a separate habitat feature. The lower portions of the intertidal beach provide loafing and foraging area for shorebirds and gulls; however, human disturbance along the shoreline prevents extensive use of this habitat by disturbance sensitive birds. Avian species observed along the sand beach and in shallow bay waters included western gull, California gull, and great egret (*Ardea alba*). Terns forage along the shallow margins of the bay within intertidal and subtidal areas. The California least tern forages in these areas when present in the Bay from about April through September.

2.2.1.5. Subtidal Soft Bottom – (Oberbauer 64122)

Below low tide, the sand beach transitions to subtidal sandy soft bottom that ultimately transitions to a mud bottom below the sandy basin slope. Subtidal soft bottom occurs from the lowest low tide down to -25 feet NGVD 29. Subtidal bottom habitat within Mariner's Basin is predominantly unvegetated, although eelgrass occurs in some areas as discussed separately. The basin supports

patches of sea pens, some sand dollars, and mobile gastropods and echinoderms (sea stars and urchins). Demersal fish such as round ray (*Urobatis halleri*), bat ray (*Myliobatis californica*) are common on the floor of Mariner's Basin. Other species that are more common at the south end of the basin include California halibut (*Paralichthys californicus*).

The benthic sediments within Mission Bay support a broad range of infaunal and epifaunal organisms that vary depending upon the nature of the substrate and position within the Bay. In the sandier sediments, purple olive snail (*Olivella biplacata*), sea pansy (*Renilla koellikeri*), and moon snails (*Neverita lewisii*) are the visually dominant epifaunal species (Merkel 1988). In muddier conditions sponges, slender sea pen (*Stylatula elongata*), the solitary hydroid, *Corymorpha*, and the burrowing anemones (*Harenactis attenuata*) and tube-dwelling anemones (*Pachycerianthus fimbriatus*) are common. The mud bottoms typically show evidence of burrowing by macroinfaunal invertebrates such as bivalves (*Chione* spp., *Macoma nasuta*), the amphipod (*Grandidierella japonica*), and bay ghost shrimp (*Callianassa californiensis*). The non-native bryozoan (*Zoobotryon verticillatum*) is seasonally encountered in both unvegetated as well as vegetated portions of the bay floor.

Fish that are regularly observed on the unvegetated bottom are principally demersal fish of warm water embayments and include round stingray (*Urobatis halleri*) and bat ray (*Myliobatis californica*), barred sand bass (*Paralabrax nebulifer*), gobies (Family Gobiidae), and specklfin midshipman (*Porichthys myriaster*). In the more westerly portions of the Bay, the unvegetated bottom often supports California halibut (*Paralichthys californicus*) and other flat fish such as diamond turbot (*Hypsopsetta guttulata*) which become less prevalent further into the bay.

Avian species that are commonly present in these subtidal environments include gulls as well as fish foraging species such as double-crested cormorants (*Phalacrocorax auritus*), western grebe (*Aechmophorus occidentalis*), and California brown pelican (*Pelecanus occidentalis californicus*).

2.2.1.6. Eelgrass Beds – (Oberbauer 64122)

Eelgrass vegetated habitats are an essential component of southern California's coastal marine environment. Eelgrass beds function as important habitat for a variety of invertebrate, fish, and avian species and are considered to be a Habitat Area of Particular Concern (HAPC) within Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Act.

Eelgrass (*Zostera marina*) in habitat typically found in shallow waters of Mission Bay

For many species, eelgrass beds are an essential biological habitat component for at least a portion of their life cycle, providing resting and feeding sites along the Pacific Flyway for avian species, and nursery sites for numerous species of fish. Typical eelgrass associates include pipefish (*Syngnathus* spp.), kelpfish (Family Clinidae), and surfperch (Family Embiotocidae), as well as schooling fish such as topsmelt (*Atherinops affinis*) and anchovy (*Anchoa* spp.).

Eelgrass is present on the shallow fringes of Mariner's Basin where slopes are gentle. The basin supports two species of eelgrass. The common eelgrass (*Zostera marina*) is found throughout the basin, while Pacific eelgrass (*Zostera pacifica*) is found in deeper waters at the mouth of Mariner's Basin. Results of the baseline eelgrass survey completed in 2018 indicate

wide distribution of eelgrass at the southern end of Mariner's Basin and much less common eelgrass at the northern end of the basin (Figure 5).

Eelgrass bed spatial and density metrics from the 2018 investigations are summarized in Table 4. Eelgrass occurs between -3 ft NGVD29 and -19 feet NGVD29 with dense beds being limited to elevations above -13 feet NGVD29.

Table 4. Eelgrass Bed Metrics as defined under the CEMP (July/August 2018).

Eelgrass Spatial Metrics	**Spatial Distribution**	**Eelgrass Areal Extent**	**Vegetated Cover**	**Percent Vegetated Cover**	**Depth Range**
Survey Area	100,780 m^2	34,856 m^2	27,803 m^2	79.8%	0 to -16 ft MLLW
Eelgrass Density Metrics	**Bonita Cove**	**Central Mariner's Basin**	**Mission Cove**	**Mariner's Basin Entrance**	**Mission Bay Channel**
Region Densities	138.4±33.4 (n=20)	111.2±33.8 (n=20)	205.6±78.6 (n=20)	140.8±59.1 (n=20)	164.8±64.6 (n=20)
Average Density	152.2±64.1 (n=100)				

Within the survey area, eelgrass consists of scattered fringing beds along the shoreline of the basin and isolated eelgrass plants on the deeper floor of the basin near the better flushed southern end of the basin. The steep beach drop along most of Bonita Cove and the shorelines of the western and eastern margins of Mariner's Basin generally restrict eelgrass occurrence to areas where the gradual slope of the shoreline continues below the -3 ft NGVD29 elevation prior to increasing slope steepness to the bottom of the basin. In areas where the slope breaks above -3 feet, eelgrass is generally not present. While the majority of the eelgrass present within the study area is common eelgrass (*Z. marina*), Pacific eelgrass (*Z pacifica*) was observed within Mariner's Basin Entrance and at a few locations within the Mission Bay Channel south of the West Mission Bay Drive Bridge.

Eelgrass was determined to be healthy throughout all of the beds, though some evidence of wasting disease blemishes were observed on the leaves within the Mission Cove beds. Epiphytic loading ranged from approximately 20 percent to 80 percent throughout the survey area, with the heaviest loading being observed within Mariner's Basin Entrance. Light sedimentation was observed within the Central Mariner's Basin beds, while all other beds were free of sedimentation. The eelgrass leaf canopy extended from 0.1 to 0.9 meters off the bottom.

In addition to the summer 2018 surveys, since 1988 the City has conducted recurrent baywide eelgrass surveys to document the distribution of eelgrass both as an important natural resource with its own merits, but also as a means to track the overall health of the bay as a widely distributed simple metric of water quality properties including turbidity, dissolved oxygen, suspended

sediments, plankton blooms, and temperature. Over the past three decades, six baywide surveys have been conducted in 1988, 1992, 1997, 2001, 2007, and most recently in 2013 (K. Merkel 1988, 1992, Merkel & Associates 2013). For the baywide surveys, eelgrass has historically been mapped as multiple cover classes on the bay bottom (i.e., <25%, 26-50%, 51-75%, and 76-100%). For multi-year statistics, the bottom cover classes have been pooled. The baywide surveys have revealed highly variable extents of eelgrass ranging from a low of 856.0 acres in 2007 to a high in 1997 of 1,306.6 acres (M&A 2013). Due to its deep dredged nature and steep subtidal slopes, Mariner's Basin has supported relatively limited fringing and often patchy eelgrass throughout the 30 year survey history.

2.2.1.7. Intertidal and Subtidal Revetment – (Oberbauer 64122)

Quarried rip rap revetment is located along the Mission Bay Entrance and Main Channel and wrapping into Mariner's Basin at Mission Point. This stone is unvegetated within the upper supratidal margins and is considered urban/developed lands. Within the intertidal and subtidal zones, the rock supports a host of mobile and sessile invertebrates and macroalgae. Within the highest intertidal areas, mobile organisms consisting of amphipods (Family Talitridae) and lined shore crabs (*Pachygrapsus crassipes*) are the most common species. At lower elevations, barnacles (*Balanus*, *Chthamalus*, and others) are common. In subtidal environments, macroalgae dominates the rock. The introduced *Sargassum muticum* is the most common algae, however the rock also supports a host of folios, turf, and encrusting native algae. At deeper elevations, sessile invertebrates become more common as the algae begins to thin out due to light limitation and sand scour.

Birds present along the reveted shoreline include California brown pelican, double-crested cormorant, and western gulls.

2.2.1.8. Canopy Kelp – (Oberbauer 64122)

In addition to the marine algal community that dominates the subtidal revetment along the Mission Bay Entrance Channel, a short section of the revetment within the study area has a flatter relief and scattered rock that extends away from the shoreline. This area supports a small and relatively ephemeral giant kelp (*Macrocystis pyrifera*) bed that is attached to rocks at the base of the revement and those that have been dislodged and scattered into the channel at the toe of the revement. This kelp bed does not extend up the steeper revetment into the shallower portions of the subtidal or intertidal margin and thus is not directly within the WMP project area. In January 2019 this canopy kelp was not noted, however it was present in July 2018.

2.2.2. Jurisdictional Waters

Under federal standards, all three parameters must be present under normal circumstances to be determined a wetland. Because of the high degree of disturbance on the site and the presence of clean and well drained sands that tend not to support terrestrial vascular hydrophytic vegetation, the BSA lacks both hydrophytic vegetation and hydric soils. For this reason, no federal wetlands are present on site. The limits of jurisdictional waters are therefore defined by the HHT (Clean Water Act section 404 and 401), and the MHW (R&HA section 10) as defined by elevational metrics described previously.

2.2.3. Rare, Threatened, Endangered, Endemic and/or Sensitive Species or MSCP-Covered Species

Species identified as protected, rare, sensitive, threatened or endangered by the USFWS, National Marine Fisheries Service (NMFS), or CDFW that may be expected in the project area at various times include three bird species, and two marine mammals (Table 5). All of these species are known in the area but the relative occurrence frequency varies.

Table 5. Special Status Species Observed or Expected to Occur within the Study Area

Common Name	Scientific Name	Status	Occurrence at Project Site
California Brown Pelican	*Pelecanus occidentalis californicus*	CDFW FP	Common
Double-crested Cormorant	*Phalacrocorax auritus*	CDFW WL	Common
California Least Tern	*Sternula antillarum browni*	SE, FE	Regular seasonal
Harbor Seal	*Phoca vitulina*	MMPA	Very uncommon
California Sea Lion	*Zalophus californianus*	MMPA	Uncommon
Bottlenose Dolphin	*Tursiops truncates*	MMPA	Very Uncommon
Green Sea Turtle	*Chelonia mydas*	FE	Rare

SE – State Endangered; **FE**- Federally Endangered; **FT** – Federally Threatened; **CDFW SSC**- CDFW Species of Special Concern; **CDFW-FP** – CDFW Fully Protected Species; **CDFW-WL**- CDFW Watch List; **MMPA** – species protected by the Marine Mammal Protection Act

*Least terns are a migratory species found in the area from April 1 through approximately September 1 of each year.

2.2.3.1. Sensitive Birds

California brown pelican (*Pelecanus occidentalis californicus*) and double crested cormorant (*Phalacrocorax auritus*) are protected at nesting locations and communal roosts. No nesting locations or roosts for these species are found within the BSA, however a communal roost is located on the Misson Bay Channel groin extending out from Hospitality Point, located about 1,000 feet across the channel from the BSA. As a result of the proximity of the roosting area and the presence of highly available forage resources near the mouth of the bay, both pelicans and cormorants are fairly common within the waters of the BSA.

California least terns (*Sternula antillarum browni*) do forage within the project area during summer months. The nearest least tern nesting colonies is located within the BSA at Mariner's Point. This species makes opportunistic use of the bay shallows to forage for small fish.

2.2.3.2. Sensitive Mammals

Other special status species that occur on the study area include marine mammals. Most specifically these are two pinniped species, California sea lion (*Zalophus californianus*) and the much less common harbor seal (*Phoca vitulina*) and one cetacean, the bottlenose dolphin (*Tursiops truncates*). Disturbance of these species is prohibited under the Marine Mammal Protection Act (MMPA).

California sea lion feed on squid and a variety of schooling fish. They are year round residents of Mission Bay and are regular residents in the outer bay with the highest aggregations of animals being found around the bait barge in Quivira Basin, along the south Mission Bay jetty, and following fishing boats into Dana Basin where they are fed bait and fish carcasses from boats using the Dana Landing ramp. Sea lions are more diffuse elsewhere in the westerly most portion of the bay up to about West Mission Bay Drive Bridge and along the Mission Bay Channel towards Dana Basin. Sea lions are rare elsewhere in the bay. Within proximity to the BSA, sea lions haul out on rocks at the Quivira Basin breakwater and on the Mission Bay entrance channel jetties. There are no rookeries or major haul-out locations within Mission Bay. While they do not have any habitual use areas within the BSA, sea lions numbering one or two individuals at a time do make foraging forays into Mariner's Basin on occasion. As such, they are considered to be uncommon visitors to the project area.

The harbor seal prefers sheltered coastal waters and feeds on schooling benthic and epibenthic fish in shallow waters. Being generally less disturbance tolerant than sea lions, harbor seals are far less common in Mission Bay. However, this species is rarely observed in the westerly portions of Mission Bay. Seal strandings have occurred in Mission Bay, but otherwise seals rarely leave the water in Mission Bay Park. There are no specific areas of the bay where seals are common and within in the project area, seals would be expected to be very uncommonly encountered and transitory in its occupancy of the area.

Bottlenose dolphins are commonly observed in the northern portion of San Diego Bay, particularly in the northern channels, however this species is much less common in Mission Bay. This species tends to stay within relatively deep channels where prey is most abundant and follows schools of bait fish. As a result, low dolphin occurrence in Mission Bay is somewhat driven by low entry of schooling pelagic fish into the bay. Bottlenose dolphins are considered to be rare visitors to inner Mission Bay, however due to the presence of a portion of the BSA extending over the Mission Bay Entrance Channel where dolphin occurrence may be more common.

2.2.3.3. Sensitive Turtles

The final sensitive species in the BSA is the green sea turtle (*Chelonia mydas*). The Mexican Pacific coast breeding population, to which the San Diego turtles belong, is federally listed as endangered. Green sea turtles are herbivores, feeding primarily on algae and eelgrass (*Zostera marina*). Mission Bay does not presently support an established resident population of turtles. Historically turtle were reported from Mission Bay in newspaper accounts from 1872 through 1903, but reports in the San Diego area disappeared until the 1960s when they were again reported in San Diego Bay (Stinson 1984). In recent years, green sea turtles have been observed more regularly in various southern California bays and estuaries than in the past several decades. While the increase in turtle presence is not fully understood, acoustic tracking of turtles has aided in the understanding of turtle movements along the southern California coast and tracking of turtle stranding events by NOAA has further enhanced understanding of turtle distribution, although stranding data can provide a biased picture of distribution patterns as it tends to track sick and injured animals that may not exhibit normal distribution patterns or behavior.

Within Mission Bay, NMFS has provided data for turtle strandings since 1950 (Dan Lawson, email transmittal 2017). These data indicate 8 reported strandings including 2 live turtles and 6 deceased turtles. In addition, a report of an additional turtle was made by a fisherman in 2016 (Alan Monji, RWQCB, pers. comm.). Of the turtle reports, three have been in the main Mission Bay channel near

the inlet to Mariner's Point within the past several years. In addition, SeaWorld of San Diego has conducted green turtle rescue, rehabilitation, captive rearing, and releases through time. While SeaWorld's facilities are located on Mission Bay, none of the turtles released have been released into Mission Bay. Most recently SeaWorld released 15 turtles offshore in July 2016 from eggs hatched at SeaWorld in 2009. These turtles were identified by PIT tags and were fitted with satellite tags. While most of the released turtles never returned, Dan Lawson, NMFS, reported that he is "generally aware that at least 2 of the green turtles released by SeaWorld in 2016 with a satellite tag on it did appear to visit Mission Bay during the fall of 2016". Based on the information available, it is anticipated that turtles could occur within the BSA on rare occasions.

2.3. Wildlife Movement and Nursery Sites

The WMP project area within Mission Bay is not considered to be wildlife movement areas. While migratory birds make use of Mission Bay as part of their migration, the majority of the bird use by migratory birds is within areas around the Northern Wildlife Preserve at the north end of the bay and the Southern Wildlife Preserve in the San Diego River Flood Control Channel where animals are able to rest and forage with less harassment pressure than within the recreational areas of the bay where the project sites are centered.

Eelgrass is considered to be an important nursery habitat for several fish species and is considered to be Essential Fish Habitat (EFH) and a Habitat Area of Particular Concern (HAPC) under the Magnuson-Stevens Fisheries Conservation and Management Act, as well as a Special Aquatic Site under the Clean Water Act. While eelgrass habitat is considered to provide important nursery functions, there are no unique nursery functions believed to be associated with the eelgrass that may be impacted by the project over other eelgrass habitat in Mission Bay. This nursery function is one aspect of eelgrass beds that lead to the determination that impacts to eelgrass habitat would be significant without mitigation.

3.0 BIOLOGICAL IMPACT ANALYSIS

State CEQA Guidelines §15065 (a) (Title 14, Chapter 3, Article 5) states, "A project may have a significant effect on the environment" if:

- "The project has the potential to substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; substantially reduce the number or restrict the range of an endangered, rare or threatened species; or eliminate important examples of the major periods of California history or prehistory."
- "The project has possible environmental effects, which are individually limited but cumulatively considerable."

The following analysis identifies potential impacts to biological resources that could result from implementation of the proposed project, and addresses the significance of these impacts pursuant to CEQA, in accordance with the Issues listed under CEQA Guidelines Appendix G, Section IV.

3.1. Impact Definitions

Project impacts are categorized pursuant to CEQA as direct, indirect, or cumulative impacts.

- CEQA Guidelines §15358 (a) (1) and (b) (Title 14, Chapter 3, Article 20) defines a "direct impact or primary effect" as "effects, which are caused by the project and occur at the same time and place" and relate to a "physical change" in the environment.
- CEQA Guidelines §15358 (a) (2) and (b) (Title 14, Chapter 3, Article 20) defines an "indirect impact or secondary effect" as "effects, which are caused by the project and are later in time or farther removed in distance, but are still reasonably foreseeable" and relate to a "physical change" in the environment.
- CEQA Guidelines §15355 (Title 14, Chapter 3, Article 20) defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."

Direct, indirect, and cumulative impacts can be described as either permanent or temporary. Permanent impacts are generally defined as effects that would result in an irreversible loss of biological resources; temporary impacts can be defined as effects that could be restored, thus providing habitat and wildlife functions and values effectively equal to the functions and values that existed before the area was impacted.

3.2. Mitigation Definitions

CEQA Guidelines §15370 (Title 14, Chapter 3, Article 20) defines "mitigation" as:

- "Avoiding the impact altogether by not taking a certain action or parts of an action."
- "Minimizing impacts by limiting the degree or magnitude of the action and its implementation."
- "Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment."

- "Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action."
- "Compensating for the impact by replacing or providing substitute resources or environments."

3.3. Project Impacts, Significance, and Recommended Mitigation

Potential project impacts were evaluated based on examination of the proposed project within the context of the biological resources documented during the field survey and those biological resources assessed as having a likely potential to occur in the project area. Direct impacts were determined by overlaying the project plans on the mapped vegetation communities/habitats in GIS ESRI software platforms. Indirect impacts were determined based on the design, intended use, and location of the proposed project elements relative to biological resources.

3.3.1. Habitats/Vegetation Communities

Implementation of the proposed project as described in Section 1.3 of this report would result in permanent and temporary direct impacts to terrestrial and submerged habitats identified within (Table 3; Figure 5).

3.3.1.1. Terrestrial Habitats

Within the terrestrial habitats of urban/developed and supratidal beach, the implementation of the WMP is anticipated to result in temporary impacts since the majority of the WMP facilities are subsurface. Impacts in these areas would also be to low sensitivity habitat types. As such, they are considered to not result in significant impacts.

3.3.1.2. Intertidal and Subtidal Habitats

Intertidal and subtidal habitat impacts are similarly anticipated to be principally temporary in nature; however storm drain systems outlet removals and replacements are expected to result in permanent features in the subsurface environment while eliminating similar features within the intertidal beach environment. Repairs and retrofit of existing outlets in the existing rip-rap revetment are expected to result in limited and temporary impacts around the drains themselves. Typically the fish and invertebrate communities in soft bottom bay environments recover rapidly following impacts from sediment disturbance (M&A 2009).

The effects of extending drain outlets to lower discharge points would reduce the sand migration from intertidal to subtidal areas by elimination of the flow gradients across the intertidal beach. This would be expected to reduce the beach maintenance requirements within the intertidal areas and reduce infill of subtidal portions of Mariner's Basin. It would also result in a long-term reduction in impacts to eelgrass habitat as a result of sand overrun of eelgrass and raising of the shallows that typically support eelgrass to elevations that are too high to support continued eelgrass presence due to desiccation stress.

Notwithstanding long-term reduction in eelgrass impact anticipated as a result of extension of the drains to subtidal elevations, the initial construction of the drains is expected to result in temporary impacts to eelgrass within the construction corridor through which the drains are extended. Eelgrass impacts are regulated under federal, state, and local regulatory programs and mitigation of impacts are subject to the adopted California Eelgrass Mitigation Policy (CEMP) (National Marine Fisheries Service 2014). Except under particular unique circumstances, the CEMP requires in kind

eelgrass mitigation in southern California to be implemented by planting at not less than 1.38:1 at a planting to impact ratio and that not less than 1.2:1 mitigation to impact be achieved from the restoration efforts. Impacts and mitigation needs are estimated during the environmental review and permitting phases of project development and authorization. However, the ultimate impact determination, and subsequent mitigation required is determined at the time of project implementation through the use of pre-construction and post-construction eelgrass surveys coupled with evaluation of natural variability by coincident assessment of change within an unaffected reference site(s).

The drain extensions including anticipated extent of temporary coffer dam construction and grading have been designed to a 60% design level and based on the designs it is anticipated that impacts to eelgrass will occur at multiple drain outlets to Mariner's Basin as identified in Table 6.

Table 6. Anticipated Eelgrass Impact from Drain Construction into Mariner's Basin

Drainage No.	Estimated Impacts
1 & 9	95 ft^2 (9 m^2)
2 & 3	8,170 ft^2 (759 m^2)
5	4,280 ft^2 (398 m^2)
6	1,090 ft^2 (101 m^2)
Total Eelgrass Impact	**13,635 ft^2 (1,267 m^2) (0.31 acre)**

By applying this assumption of eelgrass impacts, it has been determined that the project may result in impacts to approximately 0.31 acre of eelgrass as a result of storm drain construction activities. The areas within the construction zone would be restored to sandy intertidal and subtidal slopes suitable to support eelgrass. Subsequently, eelgrass would be restored within the impact area. Because eelgrass within the impact area is very limited, the flattening of the subtidal slope around the storm drains will allow for an expansion of suitable habitat to support eelgrass and mitigation in accordance with the CEMP is expected to be possible within Mariner's Basin in association with the project implementation. Impacts to eelgrass are considered to be significant and requiring of mitigation in accordance with preliminary mitigation measure BIO-1. An eelgrass mitigation plan to address this mitigation need is included as Appendix 1 of this biological report.

BIO-1: Mitigation of any unanticipated impacts to eelgrass would be conducted in accordance with the California Eelgrass Mitigation Policy (CEMP) (NMFS 2014). Under this policy any eelgrass impacts would require successful mitigation at a 1.2:1 replacement ratio through transplant of a minimum ratio of 1.38:1. Mitigation of eelgrass shall be undertaken as an element of the Project implementation as identified in the Eelgrass Transplant and Monitoring Plan in Support of the South Mission Beach Storm Drain and Green Infrastructure Project.

The work on the revetment outlet storm drains at System 7 (120003) and System 8 (120006) is limited to the repair of a broken pipe and replacement of the duck bill valve on the System 7 (120003) drain. This will require minor rock disturbance at the drain and replacement of the rock after the repairs are made. The activities will have a localized and temporary impact on intertidal algae and invertebrate communities at the repair location. The activities are to be performed shoreward of the existing kelp habitat and would not be expected to affect the kelp habitat. This impact is not considered to be biologically significant and would not require mitigation.

3.3.2. Jurisdictional Resources

The proposed work would extend storm drains that presently terminate within the intertidal zone within jurisdictional non-wetland waters further to subtidal elevations within the same jurisdictional waters. Some drains would be relocated and consolidated and one new drain would be added. These activities would impact existing jurisdictional waters through temporary cofferdam containment construction and dewatering.

Conversely, the repositioning of storm drain outfalls below the intertidal zone would result in a reduction of beach erosion and sediment transport into the basin. This would have the benefits of reducing the extent and frequency of eelgrass losses and it would reduce the infill of sand into the navigation areas of Mariner's Basin. As a result, the temporary impacts would be offset by permanent improvements and impacts would not be considered significant from a CEQA standpoint. However, regulatory approvals for work within waters are required from the Army Corps of Engineers, California Coastal Commission, Regional Water Quality Control Board, and the City itself. Therefore mitigation measure BIO-2 has been incorporated to ensure that applicable federal, state, and local permits are obtained for the work.

BIO-2: Prior to implementation of the project, the following permits and approvals shall be obtained, or it shall be demonstrated to the Development Services Department that such approvals are not required:

A) A R&HA Section 10 for work in traditionally navigable waters of the U.S.,

B) A CWA Section 404 for discharge of dredged or fill material within waters of the U.S.,

C) A CWA Section 401 state water quality certification for an action that may result in degradation of waters of the State, and

D) A CDP issued by the California Coastal Commission.

3.3.3. Special Status Species Impacts

There were no sensitive species observed within the project sites during the field surveys. The BSA is expected to potentially be intermittently and uncommonly used by marine mammals and rarely used by green sea turtles during the period of work. Marine mammals and turtles may be adversely affected by noise generated within the water as a result of pile driving activities.

For marine mammals, NMFS published technical guidance on sound characteristics that are likely to cause injury in the form of permanent hearing threshold shifts (PTS) and temporary threshold shifts (TTS) resulting in behavioral disruption which would be considered "take" in the context of the MMPA and ESA (NMFS 2018). Under the current guidance, bottlenose dolphin, a mid-frequency cetacean is expected to experience the onset of PTS with impulsive (e.g., impact hammering) is expected at peak sound pressure levels of 230 dB re: 1 µPa or 185 dB re: 1µPa^{2}s for cumulative sound exposure level (SEL_{cum}) over a 24 hour period. Exposure to non-impulsive sounds (e.g. vibratory pile driving) is expected to result in onset of PTS at 198 dB re: 1µPa^{2}s. For Phocid pinnipeds, including harbor seal, the onset of PTS is expected with impulsive peak sound pressure levels of 218 dB re: 1 µPa or 185 dB re: 1µPa^{2}s SEL_{cum}. Sound levels resulting in the onset of PTS from non-impulsive underwater noise are assumed to be 201 dB re: 1µPa^{2}s. For Otariid pinnipeds, including the California sea lion, the onset of PTS is expected with impulsive peak sound pressure levels of 232 dB re: 1 µPa or 203 dB re: 1µPa^{2}s. Sound levels resulting in the onset of PTS from non-

impulsive underwater noise are assumed to be 219 dB re: 1µPa^{2}s (NMFS 2018). For non-impulsive sound the TTL onset for the bottlenose dolphin is taken to be 178 dB SEL_{cum}, that for the harbor seal is taken as 181 dB, and that for the sea lion is 199 dB (NMFS 2018). For in-water noise generation, the current acoustic thresholds of PTS have been applied for marine mammals harassment includes Level A take with the potential for injury and the TTS has been applied for Level B take that may result in behavioral disruption but not injury.

Other marine species of high concern may also be impacted by in water noise. These include green sea turtles. Green sea turtles would be rarely expected to occur near the project area; however, should they be present at any time, they may be potentially exposed to construction related hydroacoustic impact. NMFS has not established specific in-water acoustic thresholds for green sea turtles; however, the U.S. Navy, in coordination with NOAA, developed standards for assessment of sound impacts to turtles for purposes of the Hawaii-Southern California Training and Testing Final EIS/OEIS (U.S. Navy 2013). The document examined sound effects and sea turtle physiological literature in developing criteria for non-impulsive and impulsive noise sources. For sea turtles, the Navy established a threshold for injury from vibratory pile driving and impact driving at 190 dB_{rms}. Behavioral effects thresholds were noted to be more complex to establish than injury as there is limited data on turtle behavioral response to sound. In review of the literature, the lowest sound intensity stimulus that resulted in a behavioral response was 166 dB_{rms} that resulted in increased swimming activity in caged green and loggerhead sea turtles (McCay et al. 2000, as reported in U.S. Navy 2013). However, it also appears from the literature that turtles become habituated to repeated exposures to sound. Under such circumstances, noises even as high as 179 dB_{rms} were tolerated by turtles without behavioral response when exposure became regular (Moein Bartol et al. 1995, as reported in U.S. Navy 2013). Based on the available information, behavioral response by turtles to environmental ensonification is triggered at higher sound intensities than for marine mammals. Further, turtles exhibit a low frequency hearing range typically below 2kHz such that higher frequency sounds (such as from sonar) are generally omitted from audiologic sensors and thus would not be expected to result in behavioral response (U.S. Navy 2013). As a result, the potential for behavioral response to sound is further limited to sounds at both elevated intensity and low frequency. For the present analysis, the lower noise exposure level of 166 dB_{rms} has been adopted.

In 2008, NOAA Fisheries, USFWS, CDFW, and transportation agencies of California, Oregon, and Washington agreed to assess project effects using Interim Criteria for Injury to Fish from Pile Driving Activities (Fisheries Hydroacoustics Working Group 2008). The interim criteria for assessment included both peak noise levels and accumulated sound exposure levels for impulse noise. No exposure levels were developed for non-impulsive sound. The interim criteria for fish were generally developed for endangered salmonids and are considered to be conservative indicating that the criteria are based on a potential for effect rather than a likelihood of effect. It should be noted that while the current interim criteria have not been replaced and stand as the only adopted standards, they were widely criticized at the time of adoption for being too conservative and not based on the best available science at the time (Carlson et al. 2007). Presently, there is considerable quantitative study data that suggests that for physiological effects the cumulative exposure thresholds are lower than necessary to be protective. In studies of the effects of pile driving on the onset of physiologic injury to Chinook salmon (Halvorsen et al., 2011a, b) and other species (Casper et al. 2011a) studies, demonstrated that an SEL_{cum} below approximately 207 dB re 1µPa^2·s do not result in the onset of injury and that SEL_{cum} as high as 210 dB re 1µPa^2·s produced

physiological effects that were considered by the researchers as inconsequential. While the interim criteria remain the standard against which the present project is analyzed, it is important to acknowledge the extremely conservative nature of the thresholds as relevant to their establishment in the context of the "may affect" standard of the Endangered Species Act and has principally been used as a standard for consultation when endangered fish species are involved. However there are no endangered fish in Mission Bay.

A multitude of noise metrics may apply to the assessment of significant effects to wildlife from in water sound generation depending upon the organism exposed and the nature of the sound to which the animal is exposed. It is anticipated that steel sheetpiles will be driven for cofferdam containment of the construction area. It is further anticipated that of the driving will be conducted using vibratory hammer. The in-water sound generation from temporary sheet piles driven into the sandy sediment environment in shallow water is expected to be relatively low. To estimate sound generation, data were derived from the Caltrans hydroacoustic compendium for a similar cofferdam at Ten Mile River Bridge in Fort Bragg. Here construction of the cofferdams consisted of driving four H-piles and a series of 2-foot-wide steel sheet piles using a vibratory pile driver with no sound attenuation. Underwater noise levels were measured during installation of sheet piles. The peak sound pressure levels in water at 10 meters from the sound source ranged from 170 dB (re: 1µPa) to 174 dB and the root mean squared (RMS) sound levels in water ranged from 140 dB_{rms} to 142 dB_{rms} (Caltrans 2015).

However, sound impacts are accumulated over time from non-impulsive sound sources. For this reason, it is necessary to estimate the duration of sound generation from vibratory pile driving during any given 24 hour period. For the present project, a high number of 40 interlocking 24-inch sheet piles has been assumed to be driven in a single day with an estimated 10 minute per pile drive time being employed. This results in an estimated pile driving of 6.7 hours during a single day. Given construction activities being limited to a period from 7am to 7 pm this would result in pile driving for 55.5% of the available work day. This is expected to be a very high estimate of driving time. With the noise level and duration of driving the accumulated SEL can be calculated and the distance from the noise source at which sound exposure thresholds considered to impact organisms can be determined. This has been done with the results expressed as isopleth distances from the pile sound sources at which thresholds will be exceeded (Table 7). Note that no thresholds for non-impulsive sound have been set for fish.

Table 7. Impact Distance from Vibratory Pile Driving for Mammals and Turtles

Species	Acute Exposure (peak sound)		Continuous Exposure (SEL)	
	Distance (m) Physical Impacts	Distance (m) Behavioral Impacts	Distance (m) Physical Impacts	Distance (m) Behavioral Impacts
Bottlenose Dolphin	NA	NA	0.1	2.2
Harbor Seal	NA	NA	0.8	4.3
California Sea Lion	NA	NA	0.1	1.3
Green Sea Turtle	NA	NA	0.1	6.4

From Table 7, it is clear that with the type of piles anticipated to be driven to support cofferdam construction assuming vibratory driving, there is no expectation of acoustic impact from peak sound levels to any resource for either behavioral or physical injury type impacts. For continuous sound exposure, the distances to the piles at which sound impacts would occur from chronic exposure would be too short to expect animals to remain adjacent to the work for the entire duration of pile driving activities. For this reason, no significant hydroacoustic impacts are anticipated in association with the sheet pile cofferdam construction.

Sensitive bird species that occasionally occur in the project site are the California brown pelican, double-crested cormorant, and California least tern. As discussed above, no nesting sites or communal roosts for California brown pelican or double-crested cormorant occur within or adjacent to the project area. These two species are only occasional visitors to the project area. However, both species are fish foragers (California brown pelican forages from the air, and double-crested cormorant dives from the water). Work is expected to be short-term and localized, although mobile as work progresses. Work would affect only a small area of the bay at any given time. As a result, and based on these factors, impacts of the proposed project on California brown pelican and double-crested cormorant are not considered to be significant.

California least tern nests within Mission Bay (with the closest nesting sites being at Mariner's Point. The proposed work would include driving of sheetpiles via vibratory placement and then dewatering inside of the sheet pile cofferdam to allow work in the dry. This would result in minimal turbidity generation and no impact driving that may result in both sharp noise and vibration at the tern nest site. As a result of the use of vibratory driven cofferdams no significant impacts to least tern nesting activities are anticipated to occur from the proposed work.

4.0 REFERENCES

American Ornithologists' Union, et al. 1998. Check-list of North American Birds, 7th ed. American Ornithologists' Union, Washington D.C.

_____. 2017. Fifty-eighth Supplement to the American Ornithologists' Union Check-list of North American Birds [Internet]. Volume 134, 2017, pp 751-773. Available from: http://americanornithology.org/.

Baldwin BG, et al. 2011. Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California [Internet]. Jepson Flora Project, Jepson Online Interchange. University and Jepson Herbaria of the University of California at Berkely and Regents of the University of California. Available from: http://ucjeps.berkeley.edu/interchange/

Calflora. 2018. Information on California plants for education, research and conservation, with data contributed by public and private institutions and individuals, including the Consortium of California Herbaria. [web application]. 2018. Berkeley, California: The Calflora Database [a non-profit organization]. Available: http://www.calflora.org/ (Accessed: May 2018)

California Department of Fish and Wildlife (CDFW). California Natural Diversity Database (CNDDB). 2017a. California Natural Diversity Database (CNDDB). Biogeographic Data Branch. RareFind 3; GIS shapefile update, 2017. Sacramento, California.

_____. 2017b Oct. Special Animals [Internet]. Natural Diversity Database. 55 pp + Endnotes. Available from: https://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp

_____. 2017c Oct. State and Federally Listed Endangered & Threatened Animals of California [Internet]. Natural Diversity Database. 14 pp. Available from: https://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp

_____. 2018a Jan. Special Vascular Plants, Bryophytes, and Lichens List [Internet]. Natural Diversity Database. Quarterly publication. 50 pp. Available from: https://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp

_____. 2018b Jan. State and Federally Listed Endangered & Threatened Plants of California [Internet]. Natural Diversity Database. 7 pp. Available from: https://www.wildlife.ca.gov/Data/CNDDB/Plants-and-Animals

California Natural Resources Agency. 2009. CEQA: The California Environmental Quality Act [Internet]. California Environmental Resources Evaluation System. Available from: http://ceres.ca.gov/ceqa/index.html.

California Office of Legislative Council. 2008. California Fish and Game Code (FGC), Division 2, Chapter 6, section 1602 [Internet]. Available from: http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc.

Caltrans. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. http://www.dot.ca.gov/env/bio/docs/bio-tech-guidance-hydroacoustic-effects-110215.pdf

Carlson, T.J., M.C. Hastings, and A.N. Popper. 2007. Update on recommendations for revised interim sound exposure criteria for fish during pile driving activities. Memorandum dated December

21, 2007, to Suzanne Theiss, California Department of Transportation and Paul Wagner, Washington Department of Transportation.

Casper, B.M., P.S. Lobel, and H.Y. Yan. 2003. The hearing sensitivity of the little skate, Raja erinacea: A comparison of two methods. Environmental Biology of Fishes 68:371-379.

Casper, B.M., F.M. Matthews, M.B. Halvorsen, T.J. Carlson, and A.N. Popper. 2011a. Recovery from exposure to pile driving signals by Chinook salmon. J. Acoust. Soc. Am. 129(4):2436.

City of San Diego. 1994. Mission Bay Park Master Plan Update. Adopted August 2, 1994. Amended July 9, 2002. 369 pages. Available from: http://www.sandiego.gov/planning/programs/parkplanning/pdf/mbpmasterplan1.pdf

_____. 1997. City of San Diego Multiple Species Conservation Program (MSCP) Subarea Plan [Internet]. Prepared by the City of San Diego Community and Economic Development Department. 109 pp. + Appendix. Available from: http://www.sandiego.gov/planning/mscp/pdf/subareafullversion.pdf.

_____. 2011, Revised 1991, 1994, 1999, 2001, 2004, 2006, and 2007. California Environmental Quality Act Significance Determination Thresholds [Internet]. Development Services Department. 84 pp. Available from: http://www.sandiego.gov/development-services/pdf/news/sdtceqa.pdf.

_____. 2012. San Diego Municipal Code: Land Development Code, Biology Guidelines [Internet]. Adopted 1999, Amended 2000, 2001, 2012. 104 pp. + Attachments. Available from: http://www.sandiego.gov/development-services/pdf/industry/landdevmanual/ldmbio.pdf.

_____. 2014. San Diego Municipal Code. Chapter 14 (General Regulations), Article 3 (Supplemental Development Regulations), Division 1 (Environmentally Sensitive Lands Regulations) [Internet]. Available from: http://docs.sandiego.gov/municode/MuniCodeChapter14/Ch14Art03Division01.pdf.

Crother, B. I. 2012. Scientific and standard English names of amphibians and reptiles of North America North of Mexico, with comments regarding confidence in our understanding. Seventh ed. SSAR Herpetological Circular No. 39. pp. 92.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual [Internet]. Technical Report Y-87-1, U.S. Army Engineer Waterways Experimental Station. Vicksburg, Mississippi. 117 pp. Available from: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Fisheries Hydroacoustics Working Group (FHWG). 2008. Memorandum: Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities. Signed by NOAA's Fisheries Northwest and Southwest Regions, U.S. Fish and Wildlife Service Regions 1 & 8, California/Washington/Oregon Departments of Transportation, California Department of Fish and Game, and the U.S. Federal Highway Administration. Available online at http://www.wsdot.wa.gov/NR/rdonlyres/4019ED62-B403-489C-AF05-5F4713D663C9/0/BA_InterimCriteriaAgree.pdf.

Google Earth Pro™. V 7.3.1.4507 [Software]. Available from: http://www.earth.google.com. Accessed 2018.

Hall ER. 1981. The mammals of North America. 2nd Edition. John Wiley & Sons. New York, New York. Two volumes. 1,181 pp.

Holland RF. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Nongame-Heritage Program, State of California, Resources Agency, Department of Fish and Game. Sacramento, California. 157 pp.

Halvorsen, M.B., C.M. Woodley, B.M. Casper, T.J. Carlson, and A.N. Popper. 2011a. Derivation of a response severity index model for physiological quantification of fish response to impulsive sound. J. Acoust. Soc. Am. 129(4):2435.

Halvorsen, M.B., B.M. Casper, C.M. Woodley, T.J. Carlson, and A.N. Popper. 2011b. Predicting and mitigating hydroacoustic impacts on fish from pile installations. National Cooperative Highway Research Program Transportation Research Board of The National Academies, (in press).

Hastings, M.C. and A.N. Popper. 2005. Effects of Sound on Fish. Report to California Department of Transportation. January. 82 pp.http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on_Fish23Aug05.pdf.

Klein MW, San Diego Natural History Museum. 2002. Butterflies of San Diego County [Internet]. Available from: http://www.sdnhm.org/science/entomology/projects/checklist-of-butterflies-of-san-diego-county/.

Merkel & Associates, Inc. 2009. Demersal Fisheries Response to the 2004 Channel Deepening Project in San Diego Bay: Supplemental Fish Sampling. .

Merkel & Associates, Inc. 2013. Mission Bay Park Eelgrass Inventory and Bathymetric Change Analysis 1988, 1992, 1997, 2001, 2007, and 2013. Prepared for the City of San Diego Public Works Department, E&CP, AEP Division.

Merkel & Associates, Inc. 2013. Mission Bay Park Eelgrass Inventory and Bathymetric Change Analysis 1988, 1992, 1997, 2001, 2007, and 2013. Prepared for the City of San Diego Public Works Department, E&CP, AEP Division.

Merkel and Associates, Inc. 2018. Analysis of Lighting Effects of the SeaWorld Cirque Twighlight Show 2017 Monitoring Report. Prepared for SeaWorld Park & Entertainment. March 2018.

[NMFS] National Marine Fisheries Service. 2014. California Eelgrass Mitigation Policy (adopted October 2014).

[NMFS] National Marine Fisheries Service. 2018. 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p.

Oberbauer T, Kelly M, Buegge J. 2008, Revised 1996 and 2006. Draft Vegetation Communities of San Diego County [Internet]. Based on "Preliminary Descriptions of the Terrestrial Natural Communities of California", Holland RF, PhD., 1986. Available from: http://www.sdcounty.ca.gov/dplu/docs/Veg_Comm_SDCounty_2008.pdf.

Opler PA, Lotts K., Naberhaus T. coordinators. 2010. Butterflies and Moths of North America [Internet]. Bozeman, MT: Big Sky Institute. Available from: http://www.butterfliesandmoths.org/.

San Diego Geographic Information Source (SanGIS). 2002. Geology, Generalized Soil Download (zip) updated 3/20/2002 [Internet]. Available from: http://www.sangis.org/. Data source: U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS).

U.S. Army Corps of Engineers (USACOE). 2008a. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0), ed. [Internet]. JS Wakeley, RW Lichvar, and CV Noble. ERDC/EL TR-08-28. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Available from: http://www.usace.army.mil/cecw/pages/reg_supp.aspx

_____. 2008b Jun 26. Regulatory Guidance Letter No. 08-02, Subject: Jurisdictional Determinations. Available from: http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/juris_info.aspx

_____. 2016a. National Wetland Plant List, version 3.3. Available from: http://rsgisias.crrel.usace.army.mil/NWPL/. Includes Arid West 2016 Regional Wetland Plant List. Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733XUSACOE Los Angeles District. Available from: http://www.spl.usace.army.mil/Missions/Regulatory/Jurisdictional-Determination/Wetland-Delineations/

_____. 2016b Oct. Regulatory Guidance Letter No. 16-01, Subject: Jurisdictional Determinations. Available from: http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/juris_info.aspx

U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACOE). 2007. U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook [Internet]. Available from: http://www.usace.army.mil/CECW/Documents/cecwo/reg/cwa_guide/jd_guidebook_051207final.pdf

U.S. Fish and Wildlife Service (USFWS). 2017a. Critical Habitat Portal [Internet]. Data Download (zip) updated September 2017. Available from: http://criticalhabitat.fws.gov/.

_____. 2017b. Carlsbad Fish and Wildlife Office, GIS Division Species Occurrence Data Download (zip) updated December 2017 [Internet]. Available from: http://www.fws.gov/carlsbad/giswebpage/giswebpage

U.S. Geological Survey (USGS). 2005. Preliminary Integrated Geological Map Databases for the United States; Western States: California, Nevada, Arizona, Washington, Oregon, Idaho, and Utah. Version 1.2. GIS Data Download California (zip) [Internet]. Available from: http://pubs.usgs.gov/of/2005/1305/#CA.

U.S. Department of the Navy (U.S. Navy). 2013b. Hawaii-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement. August 2013.

Wilson DE, Reeder DM (eds). 2005. Mammal Species of the World. Johns Hopkins University Press. 2,142 pp. Available from Johns Hopkins University Press at: 1-800-537-5487 or (410) 516-6900, or http://www.press.jhu.edu/ or http://nmnhgoph.si.edu/msw/.

APPENDIX 1.
EELGRASS TRANSPLANT AND MONITORING PLAN IN SUPPORT OF THE SOUTH MISSION BEACH STORM DRAIN AND GREEN INFRASTRUCTURE PROJECT MISSION BAY, SAN DIEGO, CALIFORNIA
AUGUST 2019

EELGRASS TRANSPLANT AND MONITORING PLAN IN SUPPORT OF THE SOUTH MISSION BEACH STORM DRAIN AND GREEN INFRASTRUCTURE PROJECT MISSION BAY, SAN DIEGO, CA

Prepared for:
Rick Engineering Company
5620 Friars Road
San Diego, CA 92110
Attn: Mr. Brendan Hastie

Prepared by:
Keith W. Merkel, Principal Consultant
Merkel & Associates, Inc.
5434 Ruffin Road
San Diego, CA 92123
(858) 560-5465

August 2019

Keith Merkel, Principal Consultant

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

Eelgrass Transplant and Monitoring Plan in Support of the South Mission Beach Storm Drain and Green Infrastructure Project Mission Bay, San Diego, California

Merkel & Associates, Inc.
August 2019

INTRODUCTION

Merkel & Associates Inc. (M&A) was retained by Rick Engineering Company to support the City of San Diego Public Works Department in the planning, design, and support of the South Mission Beach Storm Drain and Green Infrastructure Project (Project). The Project is located in South Mission Beach and within Mission Bay Park along the Mission Bay entrance channel (two storm drains within existing revetment) and in Mariner's Basin (six storm drains crossing the beach to discharge into Mariner's Basin).

The Project includes the reconstruction, rerouting, and extension of storm drains that enter Mariner's Basin. The Project intends to lower the drains from their present intertidal discharge points to a deeper subtidal discharge condition. The subtidal discharge relocation of the storm drains is a highly desirable element of the project in that it allows relocation of the drains off of the public beach, it reduces the beach erosion associated with low-tide period discharges from the drains that push sand outward into the deep federal anchorage basin. It also allows for improvements of the health and safety, aesthetics, public usability, and City Park and Recreation staff maintainability of the public beaches of Mission Bay Park by removing existing deteriorating infrastructure from the beach surface. However, biological investigations conducted by M&A (2019) and engineering design by Rick Engineering (2019) have determined that the Project is likely to impact eelgrass (*Zostera marina*) as a result of storm drain reconstruction and extension to subtidal discharge locations. As a result, mitigation of eelgrass impacts is required.

Eelgrass mitigation is to be completed in conformance with the California Eelgrass Mitigation Policy (CEMP) (NMFS 2014). Baseline eelgrass surveys were conducted on July 23 and August 6, 2018 (Merkel & Associates 2019). The survey indicated the wide distribution of eelgrass within Mariner's Basin. Based on the 60% design plans for the project, it has been estimated that 13,635 ft^2 (1,267 m^2 or 0.31 acre) of eelgrass is likely to be impacted as a result of temporary construction activities and permanent recontouring of the basin slope to accommodate drain outlets (See Appendix A, 60% Eelgrass Mitigation Plan Sheet). Concurrent with these impacts, the project is expected to flatten shoreline gradients thorough the removal of shoaling deltas such that a total of 73,490 ft^2 (6,828 m^2 or 1.69 acres) of the intertidal and subtidal margins of Mariner's Basin would be made more suitable to support eelgrass than is the case under the present conditions.

Under the provisions of the CEMP, the losses resulting from the Project are required to be mitigated at a successful mitigation rate of 1.2:1 (replacement for loss) ratio. For the Project, this would result in a successful eelgrass restoration of an estimated 16,362 ft^2 (1,521 m^2 0.38 acre). However, due to regional failure ratios, the initial restoration effort must be planted at a ratio of at least 1.38:1 (NMFS 2014). While the initial planting ratio is helpful as guidance to assist in meeting the Project mitigation goals, it is not usually adequate to ensure successful achievement of the

mitigation objective, and oversizing of the mitigation area based on anticipated risk derived from on site specific factors is the best way to ensure mitigation success. Within Mariner's Basin, eelgrass along the shoreline margins is scattered and likely restricted in its occurrence due to steep slopes and exacerbated sand movement as a result of oceanic swell penetration into the basin that causes basinward migration of sand that exacerbates steep slope development below the mean lower low water (MLLW) contour. Potential for sand migration within eelgrass mitigation sites in Mariner's Basin is considered the greatest potential risk to eelgrass restoration success in this area. As a result, mitigation is proposed to be widely distributed at the drain work locations and the mitigation need is to be anchored by an oversized mitigation site to be developed near Bonita Cove in the far north end of Mariner's Basin where oceanic swell penetration influence would be low even under extreme storm conditions.

This plan outlines the proposed mitigation for the Project anticipating the extent of Project impact to eelgrass and the level of mitigation success risk. The mitigation approach proposed is an in-kind restoration of eelgrass. Planting and donor area maps provided in this report have been collaboratively developed for the Eelgrass Mitigation Plan incorporated within the 60% engineer design submittal. This sheet is provided as Appendix 1 to this document (Rick Engineering 2019).

TRANSPLANT AREA

TRANSPLANT AREA LOCATION

The proposed mitigation transplant location is situated at multiple sites where eelgrass impacts are anticipated to occur as a result of Project construction and opportunities exist for eelgrass restoration within the initial disturbance footprints (Figure 1). In addition, a larger eelgrass mitigation site is to be constructed further into Mariner's Basin near Bonita Cove where the bulk of the mitigation area will be met and mitigation site success risk may be best addressed. The eelgrass restoration is proposed to be completed through bareroot transplant into the prepared sites. Site preparation includes flattening the slopes to less than 5:1 within the planting areas with more gradual slopes being preferred. In addition, site suitability is enhanced by the removal of discharge points above the restoration areas where drain discharges would push sand bayward and overrun existing eelgrass and develop steep slopes that are unsuited to support eelgrass due to instability.

Table 1 summarizes the areas of eelgrass impact and mitigation planting as well as required planting unit counts to achieve the necessary planting on 1 meter centers. The transplant areas identified are in excess of the mitigation anticipated to be required and thus is adequate to address any changes in impact scale identified through the completion of pre- and post-construction eelgrass surveys as required under the CEMP. The planting areas are also of adequate size to reasonably address any risk of mitigation shortfall due to incomplete success within the planting areas.

Table 1. Eelgrass Impact, Planting Area, and Planting Unit Count Summary

Drainage No.	Estimated Impacts	Planting Area	Plant Unit Count
1 & 9	95 ft^2 (9 m^2)	53,950 ft^2 (5,014 m^2)	5,014
2 & 3	8,170 ft^2 (759 m^2)	9,215 ft^2 (856 m^2)	856
5	4,280 ft^2 (398 m^2)	4,185 ft^2 (389 m^2)	398
6	1,090 ft^2 (101 m^2)	6,140 ft^2 (570 m^2)	570
Total	**13,635 ft^2 (1,267 m^2)**	**73,490 ft^2 (6,830 m^2)**	**6,830**

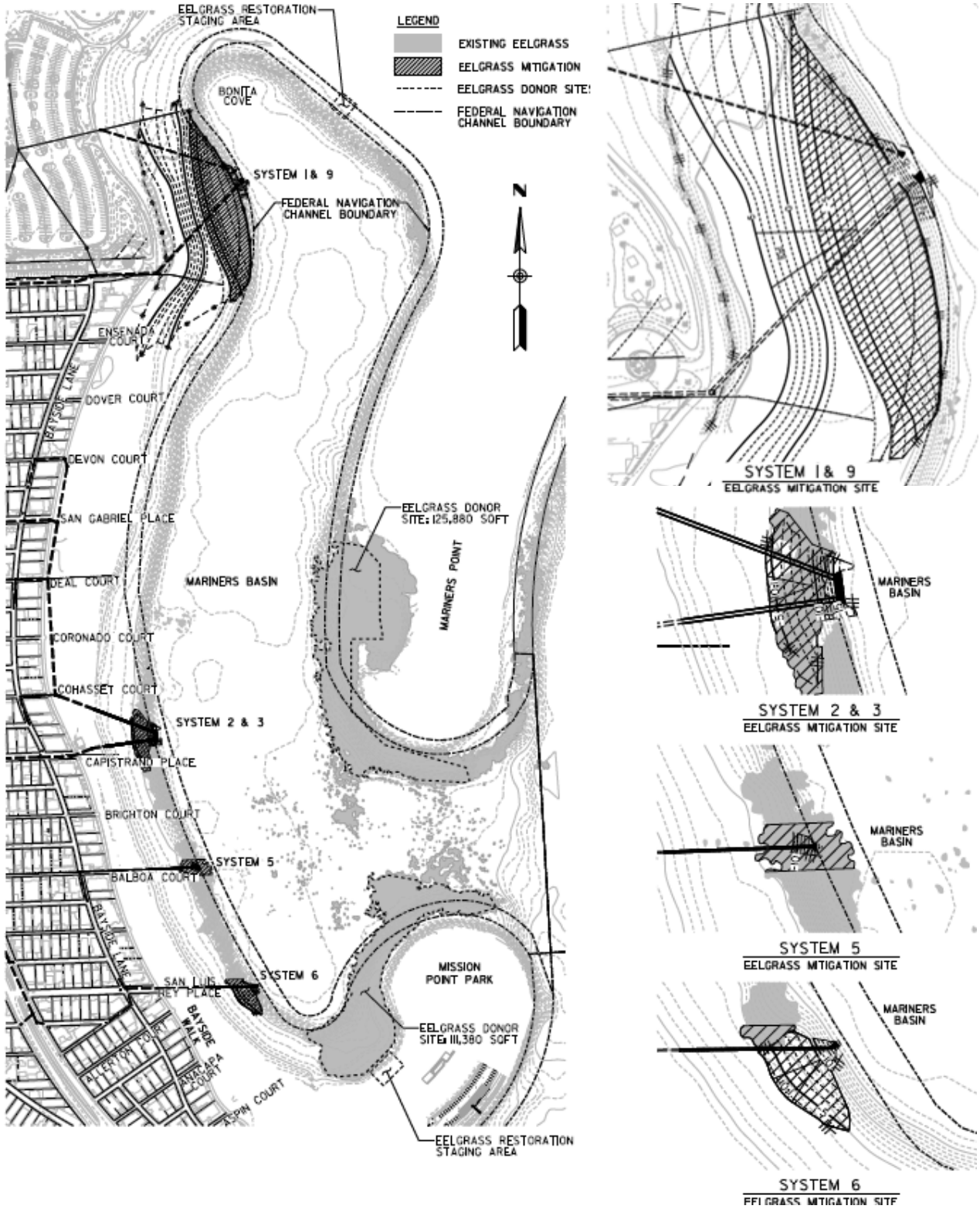


Figure 1. Eelgrass Mitigation Planting Areas

Based on the 2018 baseline eelgrass survey and 60% design, the anticipated eelgrass impact area is 13,635 ft^2 (1,267 m^2). However this impact may expand or contract as the project advances through construction. The planned eelgrass planting area is 5.39 times the impact area and well exceeds the required initial planting ratio of 1.38:1 or the ultimate success ratio of 1.2:1 that is required under the CEMP. This ratio is deemed adequate to avoid risks of shortfall due to impact expansion or risk of incomplete coverage of eelgrass within the mitigation areas. In fact, it is anticipated that surplus mitigation may be developed at this site. For this reason, the City should contemplate this potential for success and discuss how the surplus may be applied to other municipal mitigation needs such as a shortfall in mitigation from Mission Bay improvements projects. The proposed mitigation transplant areas are expected to consist of shallow sandy subtidal extending from MLLW down to approximate -7 feet below MLLW. Sites will be developed through the construction process relying on native sands with no import of sediments to the mitigation areas. Excavated sand will be moved back to the upper beach where it was derived through erosion processes.

In addition to the transplant areas, reference areas are proposed to be selected along the western shoreline of Mariner's Basin outside of the impact and mitigation areas but within locations exhibiting similar conditions as those present within the current beds that will be impacted and areas that are to be restored.

EELGRASS MITIGATION REQUIREMENTS

The initial restoration planting required under the CEMP is anticipated to be a minimum planting area of 18,816 ft^2 (1,748 m^2) (1.38:1 planting ratio) with an ultimate requirement to successfully establish an estimated 16,362 ft^2 (1,520 m^2) (1.2:1). The proposed restoration planting is expected to exceed minimum planting requirements for the contemplated impact level and exceed the ultimate required 1.2:1 replacement ratio of mitigation to initial impact. The final mitigation determination will be made on the basis of the difference between pre-construction and post-construction surveys in accordance with CEMP standards.

EELGRASS PLANTING PLAN

MITIGATION AREAS

The transplant sites to be used as mitigation areas are shown in Figure 1. The proposed transplant area is anticipated to be approximately 73,490 ft^2 (6,830 m^2).

DONOR AREA

Donor eelgrass for the transplants of eelgrass is to be derived from eelgrass beds located adjacent to Mariner's Point and Mission Point (Figure 1). Donor harvesting at Mariner's Point is to be temporally constrained to the months of March, September and October to avoid least tern disturbance. The donor beds have been primarily selected based on a number of factors:

1) Proximity to the transplant receiver area that favors both logistic convenience and selection of appropriate plant materials for the area;
2) Suitability of donor area size and eelgrass density to provide necessary transplant materials;
3) Recovery potential for the donor area; and,
4) Accessibility of the donor area and diver safety.

REFERENCE AREA

Eelgrass reference areas will be established at the time of the pre-construction survey along the western shoreline of Mariner's Basin. Reference areas will be selected based on proximity to and similarity in physical and biological characteristics to the proposed impact and transplant area. Monitoring of the reference areas will be conducted coincident with the monitoring of the transplant areas. The results from the reference areas will be averaged in order to identify the anticipated natural fluctuations within the mitigation areas. Changes in the reference areas over time will be considered to represent natural environmental variability when evaluating the performance of the transplant area (see Monitoring Program sections).

EELGRASS RESTORATION STAGING AREAS

Eelgrass restoration staging will occur at one of two locations. The first identified location is on Mission Point adjacent to the Mission Point eelgrass donor site. An alternative staging area is located in Bonita Cove at the north end of Mariner's Basin. The Staging areas would serve as the base of operations for all transplanting activities including harvesting, planting unit preparation, and vessel loading for planting and harvesting operations at each of the mitigation sites. Staging areas are anticipated to be used for approximately two to three weeks following all of the drain outfall installation.

RESTORATION METHODS

LETTER OF AUTHORIZATION AND NOTIFICATIONS

Prior to commencing eelgrass transplantation work, a letter of authorization to plant eelgrass will be obtained by the private contractor from the California Department of Fish and Wildlife (CDFW) pursuant to §6400 of the California Fish & Game Code. This authorizes work by the contractor in conjunction with the Contractor's Scientific Collector's Permit. The 6,830 m^2 (1.69 acre) planting program will require 6,830 planting units to be planted on one meter centers. The units will be comprised of 6-8 turions each. Following receipt of the planting authorization letter, a minimum five days notification and a preliminary transplanting schedule must be provided to CDFW prior to commencement of the transplant work.

PLANT COLLECTION

Bare-root eelgrass plant material will be salvaged from the donor bed by "raking" rhizomes out of the surface sediment layers and loosely filling a mesh bag with salvaged material. In collecting eelgrass, care will be taken to work the rhizomes free as opposed to ripping the plants free of the sediment. This will preserve as much root material as possible. Salvaging is a mobile exercise and divers will move systematically through an area and collect/groom no more than 10% of the turions and associated rhizome and root material from any given square meter of the donor bed. Salvaged materials should consist of no less than three healthy internodal segments with well-developed root initiates and vigorous shoots. More intact rhizome segments and roots are preferred for use in the planting unit bundles.

Where donor material is removed, rhizomes of the donor plants almost always separate at rhizome nodes. Where this occurs, nodes generally scar over and rebud from meristem tissues within the node. Where damage at the severed node is more severe or the meristem is removed, the preceding node typically branches. The result is initiation of more extensive rhizome branching at the locations of plant material collection.

Collected material will be held in a flow-through seawater source or mesh bags suspended in the harbor until it is processed into planting units. No material will be stored for over 48 hours from harvesting to planting.

TRANSPLANT UNITS

The proposed mitigation plan will utilize anchored bare-root transplant units (Figure 2). Bare-root transplants are the preferred means of transplanting eelgrass in most situations, and anchored bare-root units are the principal planting units used in large-scale restoration projects at the current time. The survival of such planting units has been shown to be quite high when properly prepared (Fonseca *et al.* 1982; Merkel 1987, 1990a). Similarly, bare-root units have shown an ability to rapidly expand and colonize bare substrate (Merkel 1990b). In addition to offering high unit survival and rapid expansion rates, bare-root units can be prepared with limited damage to the donor bed. Unlike plug extractions, bare-root units can be prepared using materials collected without substantial sediment disturbance. Each transplant unit for the Project work will consist of 6-8 turions. The anchors used in this program shall be biodegradable and pliable anchors such as those developed initially for transplants in Mission Bay's Sail Bay (Merkel 1987).

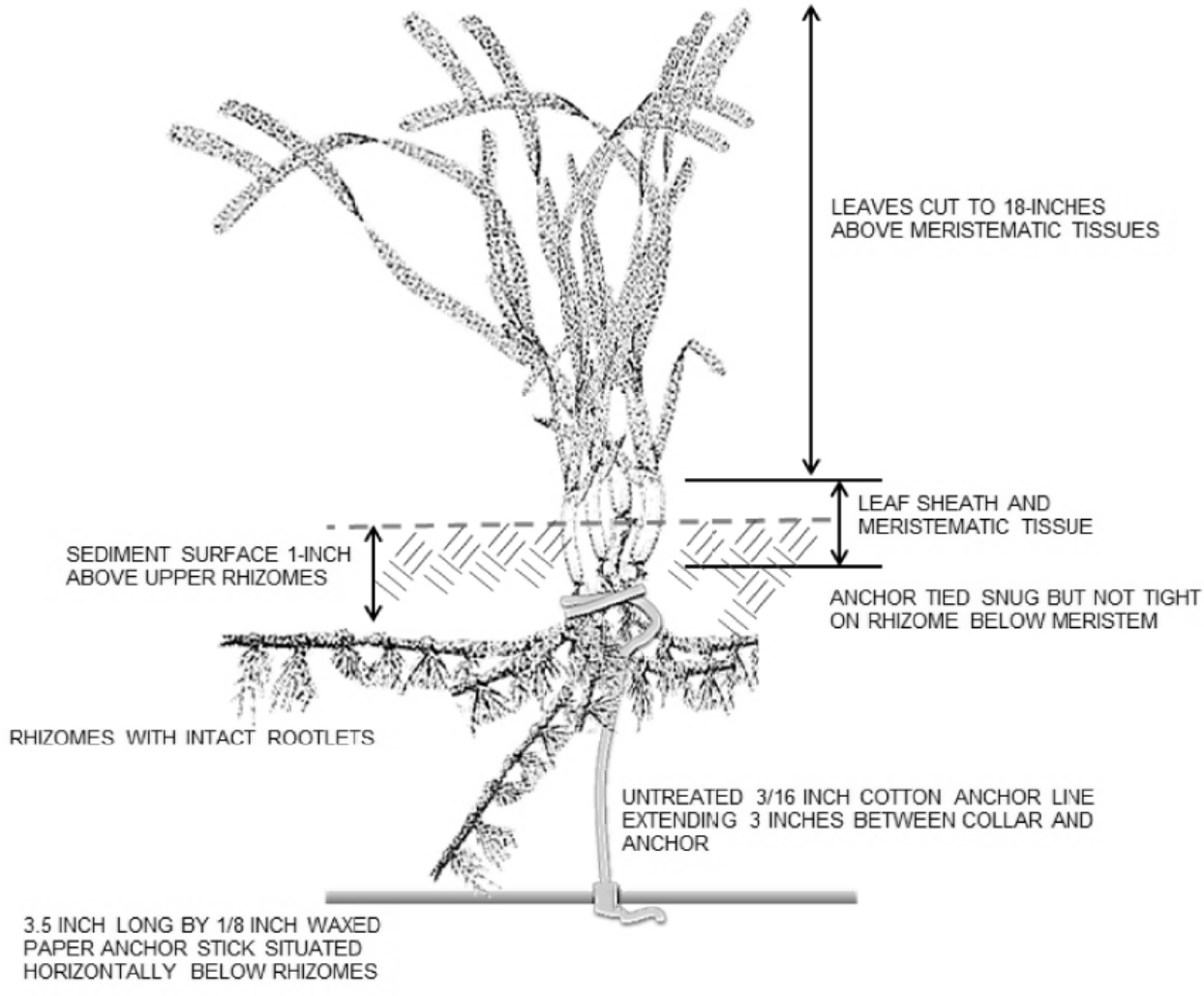


Figure 2. Bareroot Eelgrass Transplant Unit

PLANTING EELGRASS UNITS

A temporary reference grid system will be used to control planting on the site. The grid will be laid out to control plant distribution, track progress on the restoration effort, and assist in completion of quality control inspections. The lines would be placed and subsequently fully removed during the planting phase of work.

The plant materials will be planted by excavating a hole in the sediments with a small trowel or by hand. The anchor will be planted parallel to the sediment surface and the root/rhizome bundle will be planted approximately 1 inch below the sediment surface with the anchor being placed approximately 4 inches below the sediment surface. Eelgrass leaves will be cut to 18 inches in lenght in order to remove any damaged leaf material that develops during the harvesting and preparation of planting units (Figure 2).

Planting unit spacing is typically determined by balancing the rate of bed establishment with the cost of the transplant project. In some instances, rapid bed establishment is required to minimize potential storm damage or scouring of unconsolidated rhizome mats. In other cases, rapid recovery rates are desirable to meet bed establishment milestone objectives. Taking into account the rate of eelgrass growth, a planting unit spacing of one meter on center will be used for the present transplant.

TIMING OF THE RESTORATION WORK

The proposed mitigation will be implemented following the completion of the Project construction and post-construction eelgrass survey. The site planting would occur immediately after Project completion if planting can be conducted prior to September of the construction year. If work cannot be completed prior to September, eelgrass planting would be delayed through the low growth period of November through February with planting commencing in March or April of the following year. In recent years the onset of the high-growth season has typically been delayed into April thus it may be prudent to delay the transplant slightly past the CEMP established March season beginning and commence planting in April. Planting is anticipated to require less than a week to complete, based on difficulty of harvesting and planting transplant units.

Following the initial planting described above, a monitoring program scheduled to extend over a 5-year post-planting period would be initiated as outlined below.

MONITORING PROGRAM

ESTABLISHMENT MONITORING

Upon completion of the planting effort, a monitoring program would be initiated and continued for a 60-month (5-year) period as outlined in the CEMP. Areal extent and density of the transplanted eelgrass and natural reference area will be monitored using interferometric sidescan sonar acoustic survey techniques that have been applied to eelgrass mapping within the harbor and impact assessment. The spatial distribution of eelgrass derived from acoustic survey will be supplemented with bed condition data collection including turion density, leaf length, epiphytic loading, and disease observations.

The monitoring program will be conducted at intervals of 0, 6, 12, 24, 36, 48, and 60-months post-transplant. When monitoring dates fall outside of the normal eelgrass-growing season, dates will be shifted to coincide with the growing season to ensure that valuable information on growth and survival is collected. For each monitoring interval, a summary report will be prepared and submitted to the City, resource agencies, and regulatory agencies within 30 days of completion of the monitoring survey.

Monitoring reports will include information from previous monitoring intervals, including numerical comparisons and graphical presentations of changing bed configurations. The monitoring report will include an analysis of any declines or expansions in eelgrass coverage based on physical conditions of the site, as well as any other significant observations. Finally, the monitoring report will provide a prognosis for the future of the eelgrass bed and will identify the timing for the next monitoring period.

MITIGATION SUCCESS CRITERIA

Mitigation will be deemed successful when it has met the success criteria outlined in the CEMP. Criteria for determination of transplant success will be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the reference area and the transplant areas. The extent of vegetation cover is defined as the area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is identified as the number of turions per meter, as measured from representative areas within the control or transplanted beds. Key success criteria are as follows:

A) A minimum of 70 percent areal coverage and 30 percent density should be achieved after the first year.
B) A minimum of 85 percent areal coverage and 70 percent density should be achieved after the second year.
C) A minimum of 100 percent areal coverage and 85 percent density should be achieved for the third, fourth, and fifth years.

Areas that do not meet the above success criteria may be revegetated, and again monitored until the final goal is achieved. Should replanting of the areas at the Project site fail to meet the success criteria; reconstruction of portions of the mitigation site may be required to carry out this revegetation. Should the reference area fail or decline alongside the mitigation area for reasons outside the control of the City, the City would not be held responsible for similar declines in the mitigation area.

MONITORING PROGRAM SCHEDULE

Based on the presently anticipated transplant window occurring in September 2019 following Project construction, the schedule of work is anticipated to be as follows:

ACTIVITIES	REPORTING PERIOD
1. Complete 0-Month Survey	30 days after survey
2. Complete 6-Month Survey	30 days after 12-month survey
3. Complete 12-Month Survey	30 days after 12-month survey
4. Complete 24-Month Survey	30 days after 24-month survey
5. Complete 36-Month Survey	30 days after 36-month survey
6. Complete 48-Month Survey	30 days after 48-month survey
7. Complete 60-Month Survey	30 days after 60-month survey

REFERENCES

Fonseca, Mark S., W. Judson Kenworthy, G. W. Thayer. 1982. A Low-Cost Planting Technique for Eelgrass (*Zostera marina L.*). Coastal Engineering Aid No. 82-6. U. S. Army Engineer Coastal Engineering Research Center, Fort Belvoir, Virginia. 15 pp.

Merkel, Keith W. 1987. Use of a New Bio-Degradable Anchor Unit for Eelgrass (*Zostera marina*) Revegetation. Presented at the First California Eelgrass Symposium, Tiburon, California. 8-9 May 1987. Pages 28-42.

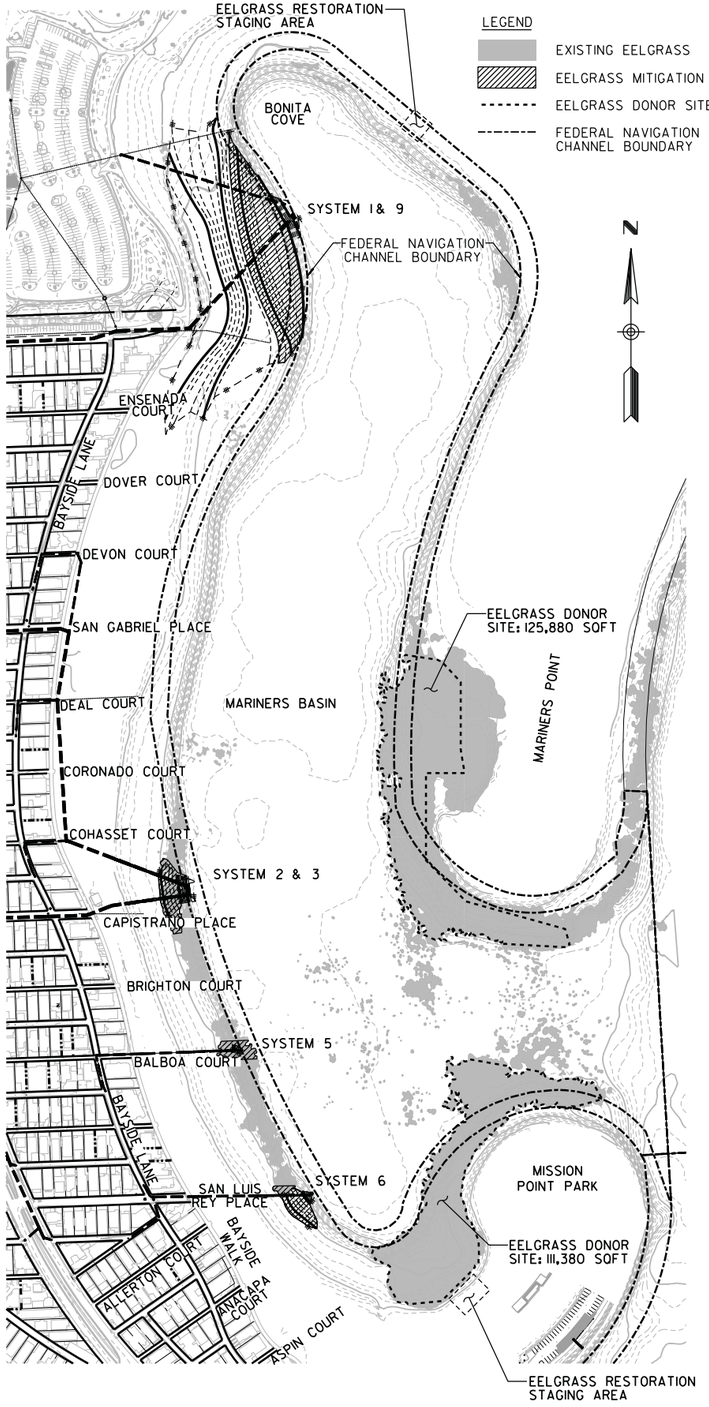
Merkel, Keith W. 1990a. Eelgrass Transplanting in South San Diego Bay, California. In: K. W. Merkel and R. S. Hoffman, eds. Proceedings of the California Eelgrass Symposium, Chula Vista, California, May 27-28, 1988. Pages 28-42.

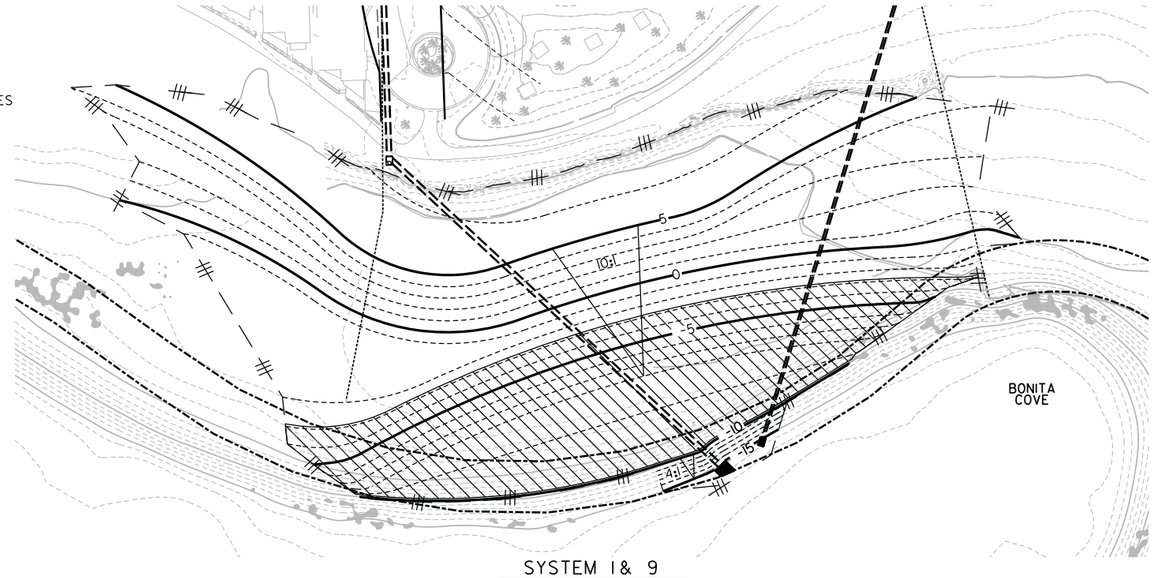
Merkel, Keith W. 1990b. Growth and Survival of Transplanted Eelgrass: the Importance of Planting Unit Size and Spacing. In: K. W. Merkel and R. S. Hoffman, eds. Proceedings of the California Eelgrass Symposium, Chula Vista, California May 27-28, 1988. Pages 70-78.

Merkel & Associates 2019. South Mission Beach Watershed Master Plan Final Biological Resources Report.

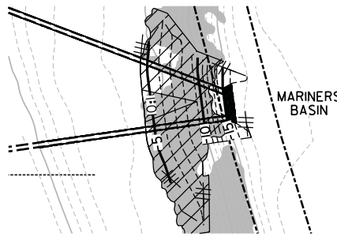
National Marine Fisheries Services. 2014, California Eelgrass Mitigation Policy and Guidance. October 2014.

APPENDIX A. 60% SOUTH MISSION BEACH STORM DRAIN AND GREEN INFRASTRUCTURE EELGRASS MITIGATION PLAN

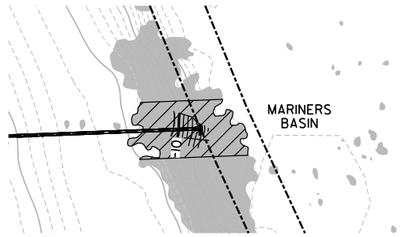




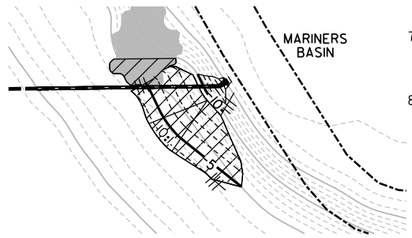
SYSTEM 1& 9
EELGRASS MITIGATION SITE



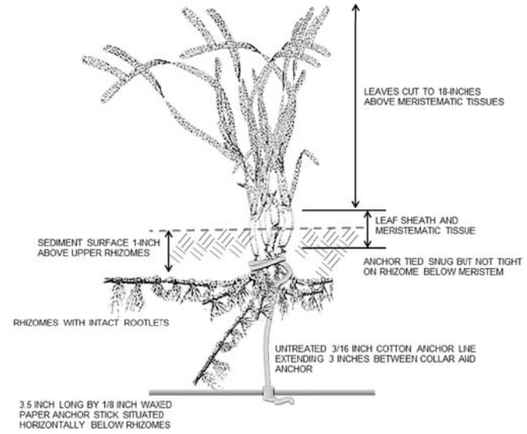
SYSTEM 2 & 3
EELGRASS MITIGATION SITE



SYSTEM 5
EELGRASS MITIGATION SITE



SYSTEM 6
EELGRASS MITIGATION SITE



EELGRASS PLANTING DETAIL

EELGRASS RESTORATION NOTES

1. CONTRACTOR SHALL ADHERE CLOSELY TO THE STANDARDS OUTLINE IN THE EELGRASS PLANTING SPECIFICATIONS, EELGRASS MITIGATION PLAN, AND ISSUED PERMITS AND AUTHORIZATIONS FOR THE WORK. SHOULD CONFLICTS EXIST BETWEEN GUIDANCE FROM THESE SOURCES, THE CONTRACTOR SHALL BRING THIS TO THE ATTENTION OF THE CITY REPRESENTATIVE FOR GUIDANCE ON IMPLEMENTATION.
2. THE CONTRACTOR SHALL OBTAIN A LETTER OF AUTHORIZATION (LOA) TO TRANSPLANT EELGRASS FROM THE CALIFORNIA DEPARTMENT OF FISH & WILDLIFE AND SHALL CONDUCT THE TRANSPLANT WORK UNDER A VALID SCIENTIFIC COLLECTORS PERMIT. BOTH OF WHICH SHALL BE MAINTAINED ON THE PROJECT SITE DURING THE PERIOD OF EELGRASS RESTORATION WORK.
3. STAGING FOR TRANSPLANTS AND CORDONING OFF ANY ON WATER WORK AREAS SHALL BE COORDINATED WITH THE SAN DIEGO LIFEGUARD SERVICES AND THE MISSION BAY PARK MANAGER TO ENSURE WATER SAFETY AND AVOIDANCE OF UNDUE IMPACT TO THE PUBLIC USE OF MISSION BAY PARK. RESTORATION ACTIVITIES WILL BE COORDINATED WITH THE MISSION BAY PARK MANAGER AND LIFEGUARDS TO DECONFILCT RESTORATION WITH SPECIAL EVENTS. THIS MAY RESULT IN PRECULDING WORK IN SOME AREAS FOR MULTIPLE DAYS.
4. THE MARINER'S POINT EELGRASS DONOR AREA MAY ONLY BE USED DURING THE MONTHS OF MARCH, SEPTEMBER, AND OCTOBER TO AVOID ACTIVITES CLOSE TO THE LEAST TERN NESTING SITE DURING THE NESTING SEASON. MISSON POINT DONOR AREAS MAY BE USED DURING ALL PERIODS OF EELGRASS RESTORATION. SPECIFIC DONOR BED USE SHALL BE COORDIATED WITH THE CITY REPRESENTATIVES AND SHALL BE IN ACCORDANCE WITH ISSUED AGENCY AUTHORIZATIONS.
5. EELGRASS SHALL BE CONDUCTED USING BARE-ROOT PLANTING UNITS CONTAINING 6-8 HEALTHY TURIONS PER PLANTING UNIT (SEE EELGRASS PLANTING DETAIL). PLANTS SHALL BE HARVESTED FROM DONOR EELGRASS BEDS, PROCESSED INTO PLANTING UNITS AND PLANTED AS ILLUSTRATED IN THE DETAIL AT 3.28FT (1METER) CENTERS. HARVESTING TO PLANTING FOR ANY INDIVIDUAL UNITS SHALL BE COMPLETED IN 48 HOURS OR LESS AND PLANTS SHALL ALWAYS BE MAINTAINED IN COOL FLOWING SEAWATER OR WITHIN FLOW THROUGH HOLDING TANKS IN THE BAY.
6. EELGRASS RESTORATION SHALL BE COMPLETED IN A CONTINUOUS ACTIVITY SUCH THAT A SINGLE ACCEPTANCE OF WORK COMPLETION CAN BE PROVIDED BY THE CITY AT THE COMPLETION OF PLANTING AND INITIATION OF A 30 DAY PLANT ESTABLISHMENT PERIOD.
7. THE CONTRACTOR SHALL TRACK THE HARVEST, PLANTING UNIT PRODUCTION, AND PLANTING ON A DAILY BASIS AND MAKE INFORMATION AVAILABLE TO THE CITY REPRESENTATIVES ON A DAILY BASIS FOR PROGRESS TRACKING.
8. PLANT MATERIAL SHALL BE HARVESTED, HANDLED, PREPARED INTO PLANTING UNITS, AND PLANTED IN ACCORDANCE WITH EELGRASS PLANTING SPECIFICATIONS AND THE EXAMPLE DIAGRAM ON THIS SHEET. FAILURE TO PROPERLY MANAGE ALL ASPECTS OF THIS WORK MAY LEAD TO PLANT FAILURES DURING THE 30 DAY PLANTING ESTABLISHMENT PERIOD AND THE NEED TO REPLANT UNITS AT CONTRACTOR'S EXPENSE.

EELGRASS PLANTING AREA SUMMARY

SYSTEM	ESTIMATED IMPACT (SF)	PLANTING AREA (SF)	PLANTING UNITS (COUNT)
1& 9	95	53,950	5,014
2 & 3	8,170	9,215	856
5	4,280	4,185	398
6	1,090	6,140	570
TOTAL	13,635	73,490	6,830

EELGRASS MITIGATION PLAN

C-XX

SOUTH MISSION BEACH STORM DRAIN AND GREEN INFRASTRUCTURE

EELGRASS MITIGATION PLAN

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET OF 32 SHEETS

WBS B-18118 (GI) B-18118 (SD)

APPROVED: FOR CITY ENGINEER — DATE
MAHMOUD ORQAT — PRINT DCE NAME — RCE#

SUBMITTED BY: RONALD FAMORCAN, PROJECT MANAGER
CHECKED BY: LYNN HASSOUN, PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			

SEE SHEETS — CCS27 COORDINATE
SEE SHEETS — CCS83 COORDINATE

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

41306– –D

REGISTERED PROFESSIONAL ENGINEER — KEVIN R. GIBSON — NO. 52295 — STATE OF CALIFORNIA

NO SCALE

RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619-291-0707
(FAX) 619-291-4165
rickengineering.com
Riverside - Orange - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver

60% SUBMITTAL