APPENDIX J

SHIPYARD SEDIMENT ALTERNATIVES ANALYSIS CONVAIR LAGOON CONFINED DISPOSAL FACILITY ALTERNATIVE MARINE BIOLOGICAL RESOURCES TECHNICAL REPORT

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FINAL
SHIPYARD SEDIMENT ALTERNATIVES ANALYSIS
CONVAIR LAGOON CONFINED DISPOSAL FACILITY ALTERNATIVE
MARINE BIOLOGICAL RESOURCES TECHNICAL REPORT

REPORT 1 OF 2:
CONVAIR LAGOON EXISTING CONDITIONS AND IMPACT ANALYSIS

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INTRODUCTION

Brown and Winters has contracted Merkel & Associates, Inc. (M&A) to conduct an assessment of marine biological resources for a proposed confined disposal facility (CDF) at Convair Lagoon, located in north San Diego Bay, California (Figure 1). Convair Lagoon is a shallow embayment that was the site of a polychlorinated biphenyl (PCB) remedial action that included the construction of sediment cap that was completed in 1997. In addition, an eelgrass mitigation program was implemented in 1997 and completed in 2003, and included the creation of 4.15 acres (1.68 hectares [ha]) of eelgrass habitat (TDY 2003).

PROPOSED ALTERNATIVE

From a conceptual standpoint, the proposed project consists of the placement of dredge fill material generated from the Shipyard Sediment Project into a CDF constructed in Convair Lagoon. Presently the lagoon is open to San Diego Bay. Therefore, the facility will be confined with the construction of a rock jetty (containment barrier). The barrier will extend the general trend of the shorelines of the adjacent Rental Car Parking and Services and Coast Guard facilities (Figure 2). The barrier will serve to contain the dredge fill material during earthwork filling operations and provide a sediment barrier to mitigate the migration of contaminated dredge fill material into the bay. The barrier would extend an estimated 1,100 feet (ft) (335 meters [m]) from the southwest corner to the southeast corner of the lagoon. Fill material will be placed within the CDF to an approximate elevation of 12 ft (3.7 m) above mean lower level water (MLLW). When complete, the relatively level pad will consist of up to approximately 20 ft (6.1 m) of new fill material. The upper approximately 3 ft (0.9 m) may consist of clean, compacted, import fill material; whereas the underlying material will consist of contaminated dredge fill. A portion of the dredge fill will remain saturated beneath sea level. Construction of the Convair Lagoon Alternative would consist of four phases: 1) Site Preparation; 2) Jetty Construction; 3) Sediment Transport and Placement; and 4) Containment Cap Installation. These construction phases are described in detail below.

PHASE 1 - SITE PREPARATION

Phase 1 construction would involve initial site preparation activities. This phase of construction would include the demolition of existing unsubmerged facilities on the site, including the sea plane marine ramp and pier. This phase of construction would also include extending the existing storm drains onsite to an area beyond the proposed jetty. Each of the extended storm drains would include an energy dissipater at the mouth of the storm drain. The extension of these storm drains would require: 1) the minor over excavation of soils in the storm drain extension area within the existing sand cap; 2) the installation of compacted gravel or alternative bedding material for stabilization purposes; 3) the installation of the pipeline extension; and 4) the installation of rip-rap energy dissipaters.

Figure 1. Vicinity Map, San Diego Bay, CA.

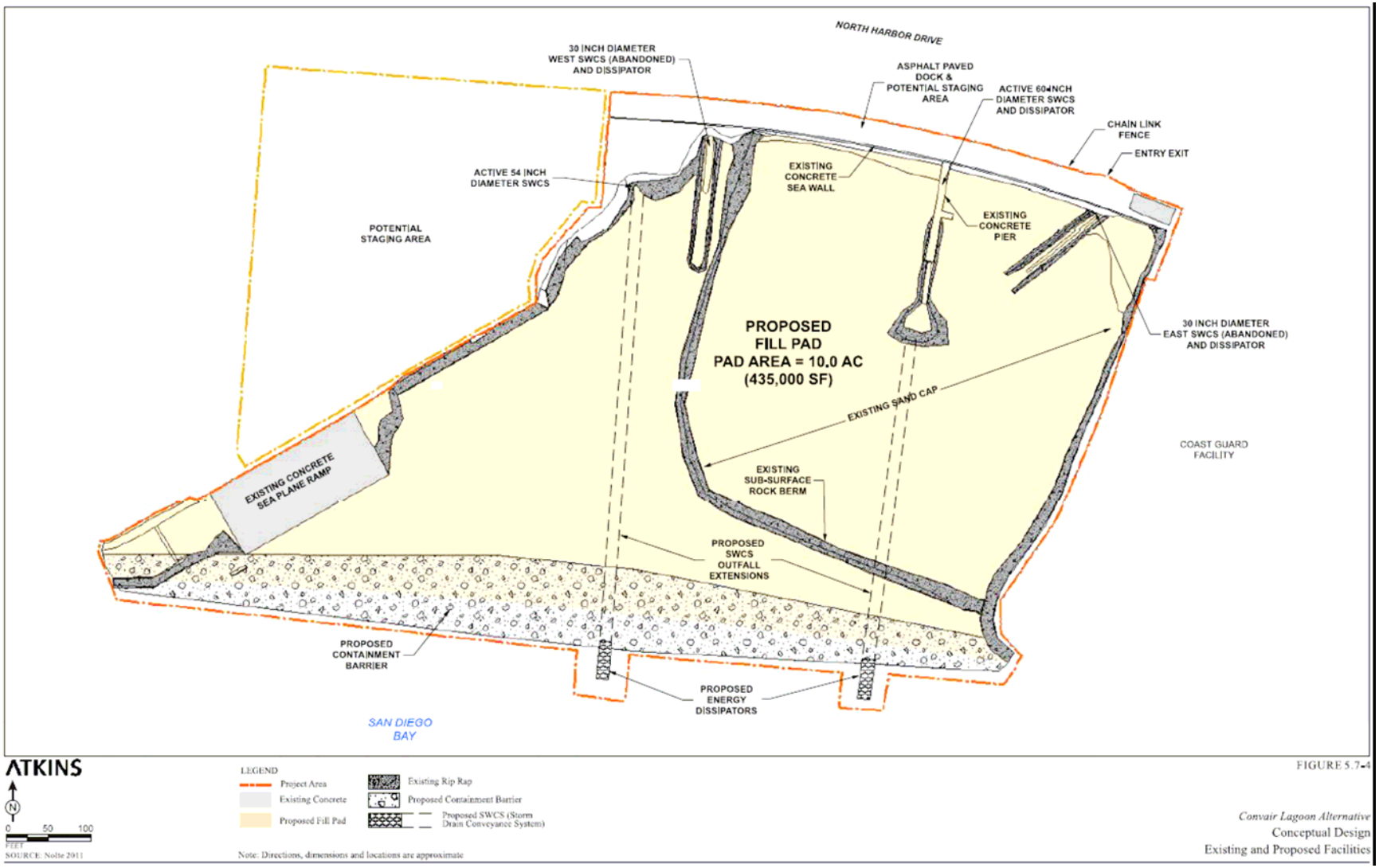

Figure 2. Convair Lagoon Confined Disposal Facility (Conceptual), San Diego Bay.

Removal of sediment underneath the containment barrier may be needed before barrier construction. For structural purposes, material is to be excavated within the footprint of the barrier prior to construction, with excavation to depths of approximately 3 ft (0.9 m). Based on the assumed excavation depth, an estimated volume for excavated material prior to confinement barrier placement is approximately 13,000 cubic yards (cy). Excavated material may be considered for reuse as fill material in the containment area. The excavated material would potentially be removed with appropriate dredging equipment and transported hydraulically or by crane and clamshell from the adjacent shoreline. The excavated material would either be stockpiled in staging areas or placed as fill, likely in shallow water portions of the project. If the removed material is characterized as unsuitable and non-reusable it would potentially need to be transported to an off-site disposal facility.

PHASE 2 - JETTY CONSTRUCTION

A rock jetty would be constructed to serve as a containment barrier during fill placement and provide an engineered shoreline. The barrier would also serve as a filter to reduce migration of contaminated sediment during and after placement. For the purposes of this report, a crest elevation of 12 ft (3.7 m) MLLW has been assumed, which generally matches that of surrounding parcels. For planning purposes, the containment barrier has been assumed to a have a slope gradient of 2:1 (horizontal:vertical) and a crest width of approximately 10 ft (3.0 m). The barrier may comprise of different layers and import rock materials. Specifically, three layers would be placed upon an excavated surface below the marine floor. The core of the containment jetty would consist of quarry-run aggregate or similar material. An under layer consisting of small rock would support an armor layer. An armor rock layer would protect the outside of the barrier from wave action, boat wakes and other erosional forces. It is expected that the rock and aggregate material composing of the containment jetty would be imported from a nearby quarry. A filter (e.g., geotextile filter fabric or graded rock) would be constructed inside the face of the containment barrier to mitigate migration of fill particles into the bay due to tidal fluctuations.

PHASE 3 - SEDIMENT TRANSPORT AND PLACEMENT

Phase 3 construction would involve the transport and placement of the contaminated marine sediment dredged from the Shipyard Sediment Site Project to the Convair Lagoon Alternative site. During this phase of construction, 158,000 cy of dredged contaminated marine sediment from the Shipyard Sediment Site Project would be transported to the Convair Lagoon Alternative site via barges and placed within the submerged areas of the lagoon as hydraulic fill. The contaminated marine sediment would be transported via a barge towed by a tug boat from the shipyard area to the Convair Lagoon Alternative site. Assuming the sediment will be placed in the CDF by hydraulic methods, the dredge fill material would be transferred from barges into the CDF through the use of pumps, pipelines and hoses. Barges used to dredge the sediment potentially have the capability of transporting the dredge material to the site and performing the hydraulic fill operations. Due to the nature of hydraulic fill methods, there is a potential of sediment segregation during placement, as granular material falls out of suspension near the dredging inlet, while fine material remains in suspension. The degree of segregation will depend in part on the selection of the dredge effluent outlet. The influent rate of dredge fill material would be approximately equal to the effluent rate of discharged water through the containment barrier and, if designed, a weir. The discharged water will need to meet effluent quality standards in terms of suspended solids or turbidity, and other constituents defined by water quality protection standards.

PHASE 4 - CONTAINMENT CAP INSTALLATION

Phase 4 construction would involve the importation and installation of a 3-ft (0.9 m) thick sand layer containment cap. During this phase of construction, 41,000 cy of sand would be imported to the site and placed above the contaminated sediment by unloading the sand directly from the trucks. A grader would be used to move the sand such that the cap would have a level surface. The sand containment cap would prevent any hazardous materials from entering the environment. Upon completion of the containment cap, the elevation of the entire site would be at-grade with the existing land, or approximately 12 ft (3.7 m) MLLW.

POST-CONSTRUCTION OPERATION

The Convair Lagoon Alternative does not include the construction or development of any buildings or structures on the converted site and no dewatering would be required. Monitoring of the site would continue to detect any release of hazardous materials from the contaminated marine sediment. Contamination monitoring would be performed in compliance with the Regional Water Quality Control Board standards.

MITIGATION

The project proposes to mitigate for eelgrass impacts by creating eelgrass habitat at one or more locations within San Diego Bay by raising the bayfloor elevation with dredged materials and planting eelgrass on the elevated plateau. Several locations being considered include the former NTC channel, Harbor Island – West Basin, adjacent to Convair Lagoon, A-8 Anchorage, South Bay Borrow Site, Emory Cove Channel, South Bay Power Plant Channel, and South Bay Power Plant. To mitigate for the loss of intertidal and subtidal habitat, as well as, bay coverage, three possible locations are being evaluated: Grand Caribe Isle in the Coronado Cays, D Street Fill just across the Sweetwater Channel from the National City Marine Terminal, the South Bay Power Plant, the Salt Works, and Pond 20 adjacent to the Salt Works. These sites would be lowered from upland elevations to create intertidal and subtidal habitats. The mitigation sites are discussed in a separate report (Report 2).

EXISTING SITE CONDITIONS WITHIN THE CONVAIR LAGOON PROJECT AREA

Existing conditions information is based on a recent habitat survey conducted by M&A on March 29, 2011, as well as, a literature review for specific resources such as fish (Pondella and Williams 2009), avian species (Tierra Data Incorporated 2009), with supplemental information garnered from the San Diego Bay Integrated Natural Resources Management Plan (INRMP) (Navy and SDUPD 2010) and Comprehensive Conservation Plan and Environmental Impact Statement for Sweetwater Marsh and South San Diego Bay Units, San Diego National Wildlife Refuge (USFWS 2006) .

The Convair Lagoon project area occurs near the border of the north and north-central ecoregion (Navy and SDUPD 2010) and is located along the northern shoreline of San Diego Bay. Four general types of habitats described in the INRMP occur in the project area:

- Disturbed Upland (>+7.79 ft MLLW)
- Intertidal (+7.79 to -2 ft MLLW)
- Shallow Subtidal (-2 to -12 ft MLLW)
- Moderately Deep and Deep Subtidal (below -12 ft MLLW)

Within these habitat types, various categories may also be present, and examples include marsh habitat within the intertidal zone, vegetated and non-vegetated habitat, as well as, artificial hard substrate (e.g., rip-rap revetment, concrete bulkhead wall). Table 1 summarizes the extent of the various habitat types present within the project area.

Table 1. Habitat Types within the Proposed Convair Lagoon Project Footprint.

Habitat Type	Acres	Hectares
Upland (>+7.8 ft MLLW)		
Urban Disturbed (Man-Modified)	0.64	0.26
Disturbed Upland	0.46	0.19
Intertidal (+7.8 to -2 ft MLLW)		
Intertidal Beach (+7.8 to +2.3 ft MLLW)	0.83	0.34
Coastal Salt Marsh (+7.8 to +2.3 ft MLLW)	0.11	0.04
Intertidal Flats (+2.3 to 0 ft MLLW)	1.65	0.67
Lower Intertidal (0 to -2 ft MLLW)	1.42	0.58
Man Modified	1.12	0.45
Total (Non Man Modified)	4.01	1.63
Shallow Subtidal (-2 to -12 ft MLLW)		
Man Modified	0.19	0.08
Total (Non Man Modified)	4.49	1.82
Total Non-Man-Modified Habitat (Intertidal and Subtidal)	8.50	3.45
Moderately Deep and Deep Subtidal (below -12 ft MLLW)	0.31	0.13
Jurisdictional Waters (<+7.8 ft MLLW)	9.85	3.99
Eelgrass - In Project Footprint*	5.64	2.28
Eelgrass - Adjacent to Project Footprint	0.37	0.15
Eelgrass - Total*	6.01	2.43

*Eelgrass occurs in both the lower intertidal and shallow subtidal habitats.

UPLANDS

On those lands located adjacent to San Diego Bay, upland habitat generally occurs above the areas influenced by tidal action, or above +7.8 ft MLLW. The majority of the native upland habitats that once occurred around San Diego Bay have long since been replaced by development (USFWS 2006). The upland habitat in the vicinity of Convair Lagoon consists of man-modified features, such paved surfaces, concrete debris, and rip-rap revetment, accounting for approximately 0.64 acres (0.26 hectares [ha]) (Figure 3). Undeveloped uplands around Convair Lagoon consist primarily of nonnative grasslands and disturbed, weedy areas, and account for approximately 0.46 acres (0.19 ha) in the project area (Table 1).

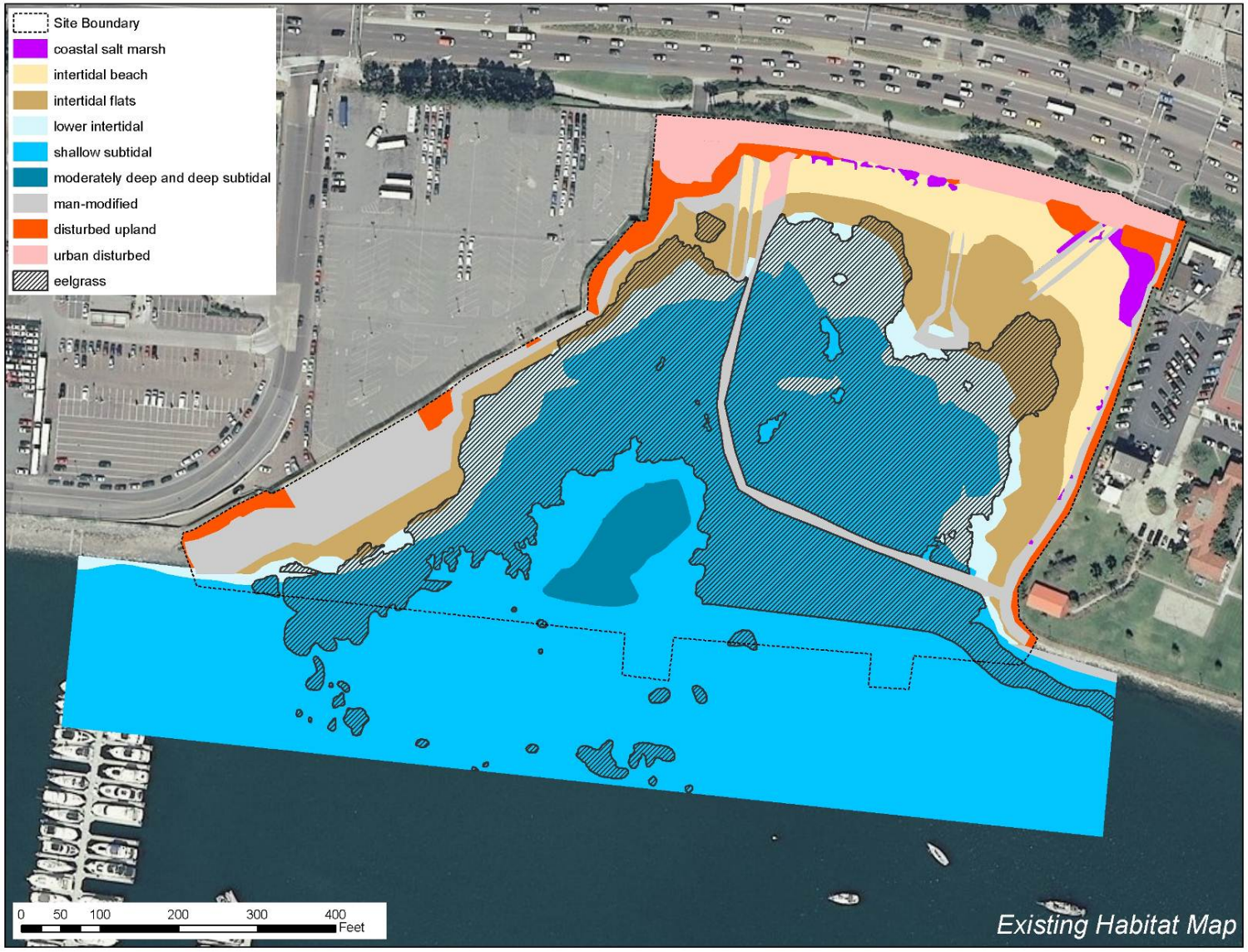

Figure 3. Habitats in the Vicinity of Convair Lagoon, San Diego Bay.

COASTAL SALT MARSH

Coastal salt marsh is composed of salt tolerant vegetation and occurs in the upper intertidal zone above the intertidal mudflats (> +2.3 ft MLLW). It is within the range of regular (daily) to irregular (less than daily) tidal inundation and is exposed more than inundated. The region's semi-arid Mediterranean climate yields only limited rainfall; therefore tidal circulation is the most important water source for this habitat. The tides also carry necessary nutrients into this habitat, and in San Diego Bay, coastal salt marsh habitat occurs between approximately +2.3 to +7.8 ft MLLW (Navy and SDUPD 2010).

In the project area, approximately 0.11 acres (0.04 ha) of coastal salt marsh habitat is present (Table 1), represented by pickleweed (*Salicornia* spp.), saltbush (*Atriplex semibaccata*), and salt grass (*Distichlis spicata*), as well as, numerous weedy species characteristic of disturbed habitat. The majority is present in northeastern portion of the project area, with small patches present along the northern, and to a lesser extent, the eastern fringe of the project area (Figure 3). The remaining upper intertidal area is unvegetated beach habitat, and accounts for approximately 0.83 acres (0.34 ha) within the project area (Table 1).

INTERTIDAL FLATS

Intertidal flats in the project area include mudflats and sand flats between +2.3 to 0 ft MLLW, and can consist of various combinations of clay, silt, sand, shell fragments, and organic debris. The water levels on the flats are determined by the daily tidal cycles, which submerge or expose the surface approximately twice per day. These mudflats contain abundant organic matter and microorganisms, but not at the level found in eelgrass beds or salt marsh habitat (USFWS 2006). Although generally thought of as unvegetated, mudflats often contain areas of microorganisms, including diatoms and blue-green algae, which provide food for various species of worms and other invertebrates. Seasonal growth of macroalgae, such as *Enteromorpha* sp., *Cladophora* sp., and sea lettuce (Ulva sp.), can also occur. The invertebrates found on these mudflats include organisms that feed on detritus and algae, as well as snails, crabs, and polychaete worms, that glean food from the mud substrate or capture prey in the shallow water. Approximately 1.65 acres (0.67 ha) of intertidal flats are present in the project area (Table 1 and Figure 3).

LOWER INTERTIDAL ZONE

The lower intertidal zone (0 to -2 ft MLLW) is generally inundated for the majority of the day, and is only exposed during periods of extreme low tides. The substrate is similar to the intertidal flats, and is considered the upper limit for eelgrass (*Zostera marina*) beds within San Diego Bay (Navy and SDUPD 2010). In the project area, approximately 1.42 acres (0.58 ha) of lower intertidal habitat is present, some of which supports eelgrass (Figure 3)

SHALLOW SUBTIDAL

The majority of the open waters in the project area are classified as shallow subtidal habitat. This habitat is defined as continually submerged, shallow water habitat that extends from -2 to -12 ft MLLW. In San Diego Bay, shallow subtidal habitat supports an abundance of fish, and bird abundance and diversity is higher in this habitat than in any other subtidal habitats in the bay possibly due to the higher abundance of fish (Navy and SDUPD 2010).

Eelgrass

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. 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 (Navy and SDUPD 2010).

The Southern California Eelgrass Mitigation Policy (SCEMP, Revision 11; NMFS 1991), a policy developed by the Federal and State resource agencies (National Marine Fisheries Service [NMFS], U.S. Army Corps of Engineers [ACOE], U.S. Fish and Wildlife Service (USFWS], and California Department of Fish and Game [CDFG]), offers specific guidelines for appropriate responses and mitigation measures for activities that threaten eelgrass vegetated habitats. As dictated by the SCEMP (see Appendix A), pre- and post-construction surveys are required within 30 days of project commencement and completion, and will be used to determine any potential mitigation. The SCEMP requires that impacts to eelgrass be mitigated by restoration at a 1.2:1 area ratio (NMFS 1991).

Extensive eelgrass beds are present and extend from +1 ft to -12 ft (+0.3 m to -3.7 m) MLLW with a coverage of approximately 5.64 acres (2.28 ha) in the project footprint (Figure 3 and Table 1). In addition, eelgrass is present outside of the direct project footprint, with an approximate coverage of 0.37 acres (0.15 ha).

Unvegetated Soft-Bottom Habitat

Where bare mud occurs, few invertebrates were observed although evidence of burrowing invertebrates, possibly tube dwelling anemones, arthropods (e.g., ghost shrimp, *Callianassa*), or bivalves, were observed. Although only round stingray (*Urobattus halleri*) were observed, other fish species including barred and spotted sand bass (*Paralabrax nebulifer* and *P. maculatofasciatus*), and midshipman (*Porichthys myriaster*) are likely to use this habitat.

MODERATELY DEEP SUBTIDAL

Moderately deep subtidal habitat occurs between the depths of -12 ft to -20 ft MLLW. The habitat extends from the approximate lower depth of most eelgrass to the approximate edge of the shipping channel. It represents areas that generally have been dredged in the past but are not maintained as navigational channels. In the project area, approximately 0.31 acres (0.13 ha) of moderately deep subtidal habitat is present (Table 1 and Figure 3).

ARTIFICIAL STRUCTURES

Man-made habitat consisting of rip-rap revetment extends along the entire eastern shoreline, while a mixture of rip-rap revetment, concrete bulkhead walls, as well as, a boat launch ramp extends along the entire western shoreline (Figure 3). The northern shoreline is a mixture of rip-rap revetment, a small pier structure, and several pocket beaches. Further offshore in water depths of approximately -5 ft (-1.5 m) MLLW, subtidal rip-rap delineates the perimeter of the remedial sediment cap, with several navigational hazard warning piles installed (Figure 3). The sediments consist of fine-grained sand in the intertidal zone and within the remedial cap, with sand and bay muds present beyond the perimeter of the remedial cap.

Within the intertidal zone, barnacles (*Chthamalus* spp., *Balanus* sp.) were the most common invertebrates on the bulkhead walls or rip-rap. While limited algal growth was observed during the survey (e.g., *Ulva* spp, foliose red algae.), some common algae found attached to hard structures include *Corallina pinnatifolia, Gelidium coulteri, Gelidium robustum, Laurencia pacifica, Sargassum muticum, Polisiphonia* sp., and *Ulva* sp (Navy and SDUPD 2010). Invertebrates included colonial tunicates (e.g., *Botryllus* sp.), oysters (*Ostrea lurida*), sponges (*Leucilla nuttingi*), mussels (*Mytilus* sp.), feather duster worms (Sabillidae), colonial ascidians (*Botrylloides* sp.), solitary tunicates (e.g., *Ciona* sp., *Styela plicata*), bryozoans (e.g., *Eurystomella* sp.), and the non-native bryozoan *Zoobotryon verticillatum*. Rip-rap structures are known to attract and support a variety of fish and have been reported as good lobster diving and sport fishing sites (Navy and SDUPD 2010), as they provide refuge and feeding areas for certain juvenile and predator fishes, such as perches, basses, dogfish, opaleye, and croaker. In a study to describe Essential Fish Habitat (EFH) (M&A 2010), a number of artificial structures were examined qualitatively for relative abundance and diversity of fish communities and found that, for both fish and invertebrates, artificial reefs ranked as the habitat with the highest number of species observed. Sand and eelgrass habitats also ranked high in number of fish species.

FISH

In 2008, Pondella and Williams (2009) conducted fish surveys throughout San Diego Bay. Surveys were conducted using a variety of methods (e.g., beach seines, trawls) and occurred in both vegetated and unvegetated locations. Convair Lagoon is situated between the North Ecoregion (Ecoregion 1) and North-Central Ecoregion (Ecoregion 2) sampling stations (Figure 4). A total of 7,233 fishes, belonging to 33 species and weighing 36 kg, were collected in the North Ecoregion over the two sampling periods in 2008. Slough anchovy (*Anchoa delicatissima*) was the most abundant species (33.8%), followed by top smelt (*Atherinops affinis*) (29.2%), salema (*Xenistius californiensis*) (18.6%), arrow goby (*Clevelandia ios*) (8.1%), and giant kelpfish (*Heterostichus rostratus*) (2.9%). Salema led in total biomass (24.1%), followed by slough anchovy (15.8%), topsmelt (14.2%), round stingray (*Urobatis halleri*) (9.7%), and spotted sand bass (*Paralabrax maculatofasciatus*) (7.6%). For the North-Central Ecoregion, a total of 3,355 fishes, belonging to 27 species and weighing 55 kg, were collected over the two sampling periods in 2008. Slough anchovy was the most abundant species (49.0%), followed by topsmelt (23.6%), giant kelpfish (6.8%), and bay pipefish (*Syngnathus leptorhynchus*) (6.7%). Round stingray led in total biomass (38.9%), followed by spotted sand bass (24.8%), shortfin corvina (*Cynoscion parvipinnis*) (8.6%), topsmelt (5.3%), and giant kelpfish (4.6%).

ESSENTIAL FISH HABITAT

Under the provisions of the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Federal Register 1997), the amendments require the delineation of EFH for all managed species. EFH has been designated over all tidal marine waters in southern California. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with the NMFS regarding the potential effects of their actions on EFH, and respond in writing to the NMFS's recommendations.

The ichthyofauna in San Diego Bay has been previously studied (M&A 2000, Allen 1999, Hoffman 1994). These studies have identified 78 species of fish in San Diego Bay. The following analysis makes extensive use of Allen's (1999) data set because it is both recent and comprehensive (surveys

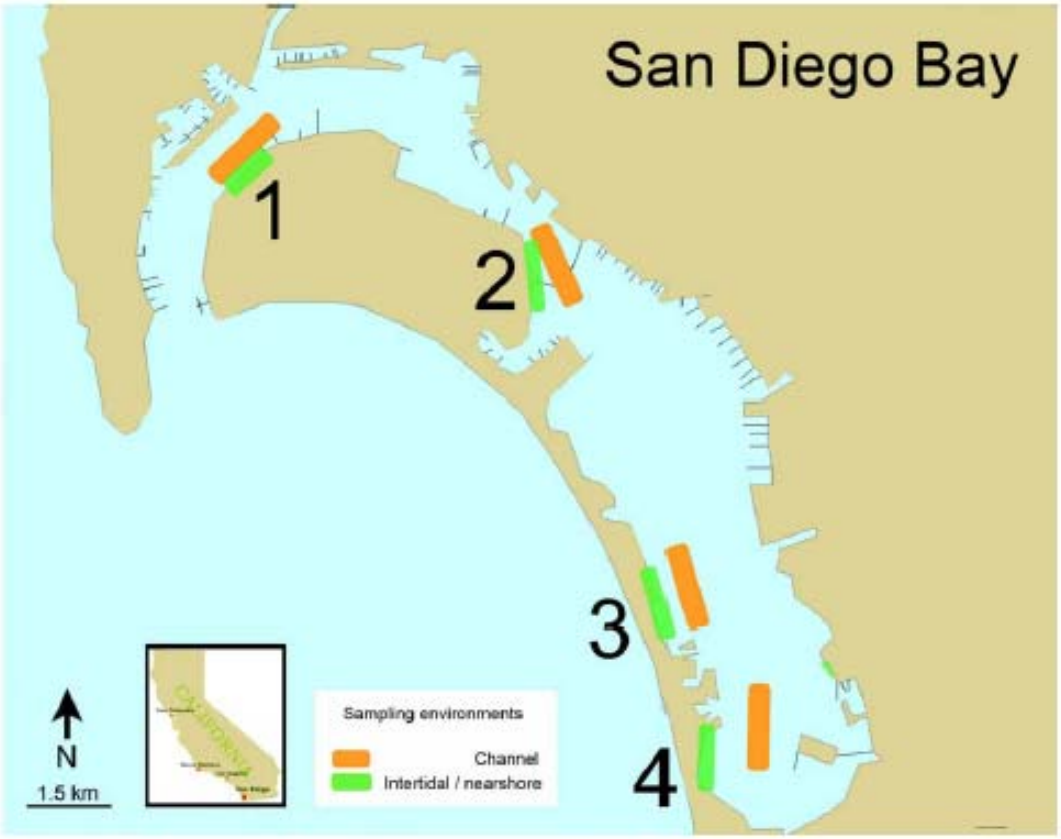

Figure 4. Fish Sampling Locations of the North (1), North-Central (2), South- Central (3) and South (4) Ecoregions in San Diego Bay. From Pondella, and Williams 2009.

were completed quarterly for five and a half years, at four stations throughout San Diego Bay, utilizing six sampling gear types) with a total of 78 species identified. The other studies reviewed for this analysis are utilized primarily to confirm the presence of fish species and to identify any additional species not captured by Allen.

Of these 78 species observed in San Diego Bay, six are managed by the NMFS under two Fishery Management Plans (FMPs)-the Coastal Pelagics and Pacific Groundfish Management Plans (Table 2) (NMFS 1998a, 1998b). Four of the five fish managed under the Coastal Pelagics FMP are represented in San Diego Bay. The northern anchovy and pacific sardine are the most abundant pelagics identified by Allen, ranking 1st and 4th in abundance and 3rd and 10th in biomass, respectively (Table 2). Together, these two species accounted for 46.3% of the total abundance and 11.6% of the total biomass of fish enumerated by Allen (1999). The pacific mackerel and jack mackerel are the other two coastal pelagics of potential concern in the project area. These two species were much lessabundant than the northern anchovy and pacific sardine and were ranked by Allen as 32nd and 52nd in total abundance and 24th and 73rd in total biomass, respectively. Together the two species accounted for less than 1% of total abundance and biomass of fish captured (Allen 1999).

Of the 89 species managed under the Pacific Groundfish FMP (NMFS 2008), two have been found in San Diego Bay during the studies analyzed for this assessment: California scorpionfish and English

sole. These species were observed only rarely in San Diego Bay during the five and a half years of Allen's study, ranking 41st and 76th by abundance and 24th and 73rd by biomass, respectively (Table 2). Together these two species accounted for less than 0.5% of the total abundance and biomass of fish captured (Allen 1999).

Table 2. Table of NMFS managed fish species previously found in San Diego Bay. Rank refers to the relative rankings among 78 fish species observed by Allen (1999). Ranks are total abundance and biomass, respectively.

Common Name	Scientific Name	Rank	
		Abundance	Biomass
Coastal Pelagics FMP			
Northern Anchovy	*Engraulis mordax*	1st	3rd
Pacific Sardine	*Sardinops sagax*	4th	10th
Pacific Mackerel	*Scomber japonicus*	32nd	17th
Jack Mackerel	*Trachurus symmetricus*	52nd	29th
Pacific Groundfish FMP			
California Scorpionfish	*Scorpaena gutatta*	41st	24th
English Sole	*Parophrys vetulus*	76th	73rd

BIRDS

San Diego Bay avian surveys were conducted between March 2006 and February , partially in support of the San Diego Bay INRMP revision and in concert with the 2000 San Diego Bay INRMP (Tierra Data Incorporated 2009). One point count sampling location was located in the project area (Location 6; Figure 5). A total of 44 species were observed at Location 6. Of these, only one species, the California least tern (*Sternula antillarum browni*), is listed as endangered (Table 3).

MARINE MAMMALS

Marine mammal species known to be regularly encountered within San Diego Bay, primarily north San Diego Bay, include the California sea lion (*Zalophus californianus*) and coastal bottlenose dolphin (*Tursiops truncatus*). Species that are occasional-to-frequent visitors to the north channels of San Diego Bay include the Pacific harbor seal (*Phoca vitulina*) and gray whale (*Eschrichtius robustus*). The project area is not considered a major seal or sea lion haul out area (Navy and SDUPD 2010).

RARE, THREATENED, AND ENDANGERED SPECIES

The closest nesting site for California least terns (*Sternula antillarum browni*) is located at the San Diego International Airport – Lindbergh Field, approximately 0.25 miles from Convair Lagoon. The nesting areas are found on the southern part of the Air Operations Area, and include three sites (or ovals) that are protected with a seven-inch tall plastic fence to keep chicks from wandering onto the taxiways. The site is managed by the San Diego County Regional Airport Authority.

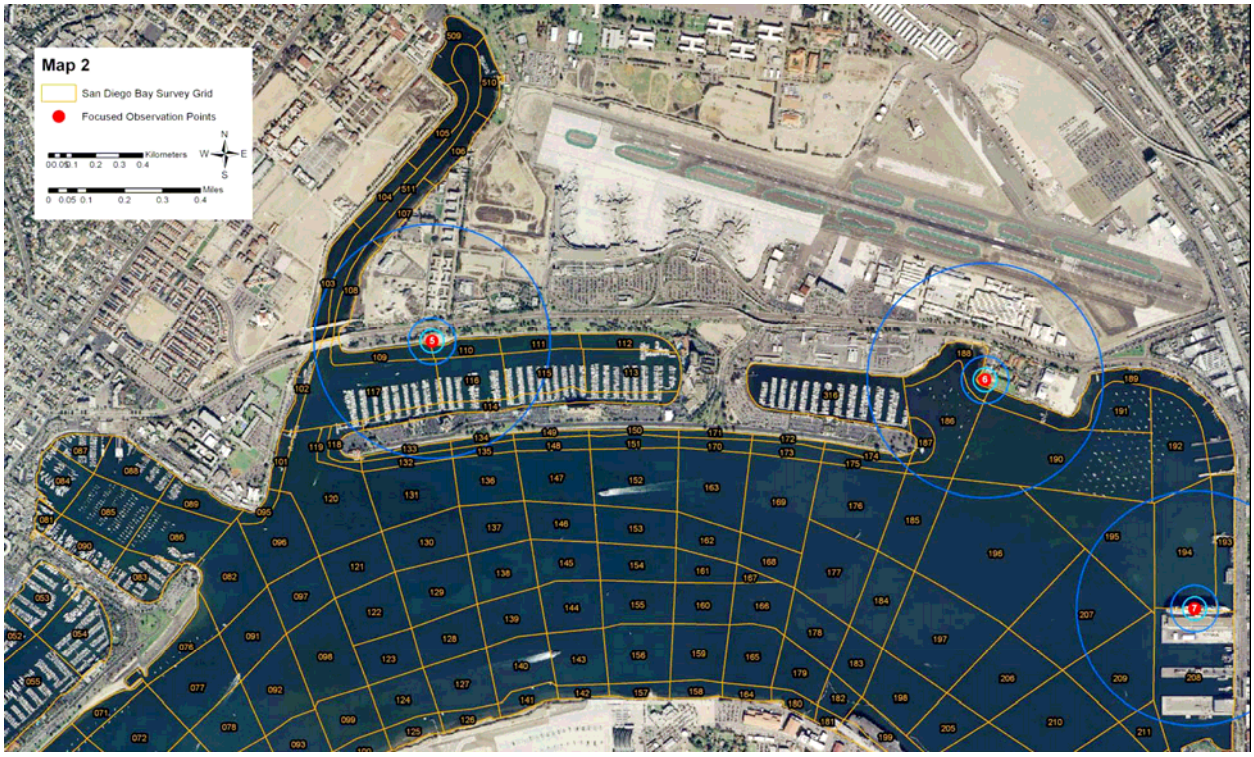

Figure 5. Bird Survey Location at Convair Lagoon (Location 6). From Tierra Data Incorporated 2009.

Colony size and reproductive success have varied widely from year to year depending on prey availability, predation and predator presence, and human disturbance. In 2010, at least 161 chicks from 88 nests hatched successfully, and it was estimated that 29 to 38 young fledged from the site (SDUPD pers. comm.). Predators observed in the area and suspected of predation included ants, peregrine, kestrel, and raven. Also in the area and possibly responsible were opossum, rats, raccoon, cat, great blue heron, night-heron, Cooper's hawk, gulls, barn owl, crow, and starlings.

Western snowy plover (*Charadrius alexandrinus nivosus*), a federally threatened subspecies, has not been observed at the project area but has been observed on the mudflats west of the nesting site at the D Street Fill area in south San Diego Bay. The small sandy beach habitat probably precludes extensive use of the project area by plover species, and none were observed during surveys in 2006 and 2007 (Tierra Data Incorporated 2009).

The only turtle found in San Diego Bay is the east Pacific green sea turtle (*Chelonia mydas*) (Macdonald et al. 1995), which is listed as endangered under the federal Endangered Species Act. They do not breed or nest in San Diego Bay (McDonald et al. 1995), but rather are associated with a breeding population on Islas Revillagigedos, Mexico (Dutton, pers. com.). Both adults and juveniles have been sighted, with individuals seen year round in the channel at the South Bay Power Plant, in South Bay, and around Naval Air Base Coronado.

Table 3. Summary of Bird Abundance at Location 6 (Convair Lagoon) during Falling and Peaking Tide from March 2006 to February 2007. From Tierra Data Incorporated 2009.

Common Name	Scientific Name	Status[1]	Total
western gull	*Larus occidentalis wymani*		172
marbled godwit	*Limosa fedoa fedoa*		142
least sandpiper	*Calidris minutilla*		114
bufflehead	*Bucephala albeola*		45
willet	*Tringa semipalmata inornatus*		44
western grebe	*Aechmophorus occidentalis occidentalis*		37
double-crested cormorant	*Phalacrocorax auritus*		30
black-bellied plover	*Pluvialis squatarola*		21
eared grebe	*Podiceps nigricollis californicus*		19
surfbird	*Aphriza virgata*		17
lesser scaup	*Aythya affinis*		16
semipalmated plover	*Charadrius semipalmatus*		15
mallard	*Anas platyrhynchos platyrhynchos*		12
scaup sp.			11
spotted sandpiper	*Actitis macularius*		10
great blue heron	*Ardea herodias wardi*		9
surf scoter	*Melanitta perspicillata*		9
snowy egret	*Egretta thula thula*		6
killdeer	*Charadrius vociferus vociferus*		5
ruddy turnstone	*Arenaria interpres*		5
belted kingfisher	*Ceryls alcyon*		5
brown pelican	*Pelecanus occidentalis californicus*		4
ring-billed gull	*Larus delawarensis*		4
pied-billed grebe	*Podilymbus podiceps podiceps*		4
American crow	*Corvus brachyrhynchos hesperis*		3
Forster's tern	*Sterna forsteri*		3
caspian tern	*Hydroprogne caspia*		3
Heermann's gull	*Larus heermanni*		3
long-billed curlew	*Numenius americanus*		2
mourning dove	*Zenaida macroura marginella*		2
California least tern	*Sternula antillarum browni*	FE, SE	2
Anna's hummingbird	*Calypte anna*		2
house finch	*Carpodacus mexicanus frontalis*		2
sanderling	*Calidris alba*		2
European starling	*Sturnus vulgaris vulgaris*		2
black phoebe	*Sayornis nigricans semiatra*		1
common raven	*Corvus corax clarionensis*		1
horned grebe	*Podiceps auritus cornutus*		1
European starling	*Sturnus vulgaris vulgaris*		1
western sandpiper	*Calidris mauri*		1
greater yellowlegs	*Tringa melanoleuca*		1
northern mockingbird	*Mimus polyglottos polyglottos*		1
ruddy duck	*Oxyura jamaicensis rubida*		1
herring gull	*Larus argentatus smithsonianus*		1

[1] FE: Federally Endangered; FT: Federally Threatened; SE: CA State Endangered, ST: CA State Threatened; SSC: CA State Species of Special Concern

1990, McDonald and Dutton 1992). It has been estimated that a group of 30 to 60 sea turtles are estimated to reside generally in south San Diego Bay (Navy and SDUPD 2010). However this group may be as large as 100 individuals (Dutton, pers. com.).

EXOTIC SPECIES

Exotic marine species are present in San Diego Bay and have arrived through direct and indirect means, and for intentional and unintentional purposes (Navy and SDUPD 2010). Invasion risks stem from ballast water exchanges and hull fouling, as well as from aquarium, pet, nursery, aquaculture, and seafood industry trade. During the 1998 Regional Bight Survey, the nonindigenous bivalve *Musculista senhousia* was present in more than 70% of the samples, making it the most widely distributed trawl caught invertebrate in the bay. *Musculista senhousia* together with another nonindigenous species *Microcosmus squamiger*, accounted for over 50% of the total catch (Navy and SDUPD 2010). The ecological ramifications of the introduction of any of these species could range from minor to very significant, depending on local conditions and natural competition. One such species that may have significant local impacts is the green alga, *Caulerpa taxifolia*, which has been eradicated from several regional water bodies. Current regulation require that all marine projects with the potential to disturb the bottom are required to conduct a survey for invasive seaweeds in the genus *Caulerpa* prior to construction, per the *Caulerpa* Control Protocol (NMFS 2007) to avoid any potential spreading or further infestation, and to initiate eradication efforts.

IMPACT ANALYSIS

SIGNIFICANCE CRITERIA

Criteria for determining the significance of project-related impacts on biological resources are based on the resource's relative sensitivity and regional status, including the proportion of the resource that would be affected relative to its occurrence in the project region (San Diego Bay, San Diego County), the sensitivity of the resource to activities (e.g., noise or disturbance) associated with the proposed project, and the duration or ecological ramifications associated with the effect. Impacts are considered significant if they would results in:

- Degradation of critical habitat or reduction in the population size of a listed species (threatened or endangered);
- Degradation or loss of relatively rare or biologically valuable habitat;
- A measurable change in ecological function within the project vicinity;
- A measurable change in species composition or abundance beyond that of normal variability;
- A substantive loss of water surface area through fill or surface water coverage as a result of permanent structures. Small structures such as moorings, navigational aids, individual or widely spaced piles do not result in a substantive loss of water area; or
- An obstruction or alteration of circulation patterns that result in a discernable degradation of water mixing, circulation, or flushing to the extent that biota would be negatively affected in the system.

Short-term impacts are those lasting less than 5 years, while long-term impacts are those that last for longer periods or are permanent (SDUPD 2000). A direct impact is defined as physical modification, such as shading of a previously unshaded habitat or loss of habitat. Indirect impacts are generally more removed from the actual environmental change in both space and time.

CONSTRUCTION

Construction of the proposed CDF will transform the majority of the existing upland and marine habitats to primarily upland habitat. Some man-made modified habitat will be created at the offshore extent of the CDF (Figure 6).

Specific non-significant impacts associated with the proposed project include the following:

- Filling and surfacing of 1.10 acres (0.45 ha.) of upland habitat would not substantively alter the existing biology of the area. This area consists principally of bare soil, man-modified or rip-rap shoreline above the highest high tide line, and paved surfaces. Sparse weedy vegetation occurs along this upland fringe between the existing property line and shore.
- Net loss of approximately 1.12 acres (0.45 ha) of man-made intertidal habitat (i.e., revetment, boat ramp) is not considered significant due to the relative abundance of armored shoreline within San Diego Bay. This is equivalent to approximately 0.25 miles (0.40 kilometers), and represents approximately 0.6% of the armored shoreline habitat within San Diego Bay (Navy and SDUPD 2010).
- Filling of the 0.31 acres (0.13 ha.) of moderately deep subtidal habitat within Convair Lagoon will result in the loss of existing epifauna and infauna assemblages. This is not considered significant due to the relative abundance of moderately deep subtidal habitat within San Diego Bay, as the proposed fill represents approximately 0.01% of this habitat type within the bay (Navy and SDUPD 2010).
- Short-term increases in noise during construction (e.g., dredging and filling) could affect the behavior of some common species. This impact is not considered significant for common waterbirds, fish, and mobile marine invertebrates that can temporarily relocate to adjacent habitats.
- Short-term increases in turbidity in the vicinity during filling activities would result in a potential reduction in foraging opportunities for sensitive diving birds, particularly least tern which nest at Lindbergh Field. This would be considered significant if the dredging activities occurred during the least tern nesting season (April 1 to September 15).
- Impacts to marine mammals and sea turtles are not considered significant, as most are transitory in the vicinity of the project area, and tracking data on sea turtles indicate that movement is generally limited to areas south of the Coronado Bridge (Navy and SDUPD 2010).
- Filling of Convair Lagoon would alter the circulation patterns in the immediate vicinity, although the change in circulation is not expected to degrade water quality to the extent that biota would be negatively affected. In addition, due to the presence of armored shoreline in the immediate vicinity of Convair Lagoon, the proposed project is not expected to lead to any changes to adjacent shorelines. Therefore, no significant impacts due to changes in circulations patterns would occur from the proposed project.

Specific significant impacts associated with the proposed project include the following:

- An unintentional benefit of the rip-rap used to create the remedial cap is the presence of a hard, heterogeneous substrate (i.e., EFH) that creates habitat for a diverse assemblage of fauna and flora (Davis et al. 2002). The loss of approximately 0.19 acres (0.08 ha) of

subtidal man-made habitat within Convair Lagoon is considered significant due to the high value of this habitat type (M&A 2010).

- Loss of approximately 0.11 acres (0.04 ha) of salt marsh habitat, 4.01 acres (1.63 ha) of intertidal habitat, and 4.49 acres (1.82 ha) of shallow subtidal habitat, including an estimated 6.01 acres (2.43 ha) of eelgrass habitat is considered significant due to the high ecological value of eelgrass habitat and the declining trend in the inventory of marsh, intertidal, and shallow subtidal habitats throughout San Diego Bay that are preferentially used by shorebirds, wading birds, some diving birds and waterfowl.
- Introduction of approximately 9.85 acres (3.99 ha) of hard substrate associated with the placement of the CDF. This category includes the sum of all habitat categories below +7.8 ft MLLW. This impact is considered significant due to loss of surface coverage for waterbird foraging habitat.
- Resuspension of contaminated sediments during filling activities could result in distribution of contaminated sediments. This impact is considered significant if contaminated sediment is released into the San Diego Bay beyond the project footprint.

MITIGATION MEASURES

This section discusses measures that would be implemented to reduce impacts of the proposed project to biological resources. Mitigation measures to reduce significant impacts to a less than significant level for the proposed project have been categorized as: 1) Construction Period Impact Minimization/Avoidance Measures; 2) Compensatory EFH Loss Replacement; 3) Compensatory Eelgrass Loss Replacement, and 4) Bay Surface Coverage and Fill Offset.

CONSTRUCTION PERIOD IMPACT MINIMIZATION/AVOIDANCE MEASURES

- Schedule construction outside of the least tern nesting season (April 1 to September 15) or if construction were to occur during least tern nesting season, the use of silt curtains or other turbidity control methods around turbidity generating operations should be implemented. This would restrict the area of surface turbidity. With a control of turbidity to this small portion of the available bay, no significant foraging opportunities for this species are anticipated to be lost.
- Use directional (shielded) lighting on construction lighting and maintain lowered crane booms when not in use during the least tern nesting season to avoid creation of additional foraging perches for raptors to use near the tern colony.
- Monitor least tern foraging behavior and activities on and around the Lindberg Field colony during the breeding season. Halt or alter activities if indications of disturbance or negative behavioral response in terns are observed as a result of construction activities.
- Use of silt curtains or other turbidity control methods around turbidity generating fill operations to control the distribution of sedimentation from extending to areas beyond the project site. The curtain should remain in place through the construction period and until water within the curtain has returned to a clear condition, indicating suspended sediments have resettled to the bottom. Any removed structures should be rinsed within the curtained area for ultimate upland disposal. With the implementation of these measures, impacts to water and sediment quality would not be considered significant.

Figure 6. Impacts associated with the Convair Lagoon Confined Disposal Facility Conceptual Design.

- Pre-construction surveys for the invasive alga, *Caulerpa taxifolia* per the *Caulerpa* Control Protocol version 3 (NMFS 2007) prior to any bottom-disturbing event would reduce the likelihood of *Caulerpa* impacts to less than significant.

COMPENSATORY EFH LOSS REPLACEMENT

The loss of approximately 0.19 acres (0.08 ha) of man-made habitat within Convair Lagoon is offset by the creation in approximately 0.39 acres (0.16 ha) of similar habitat from the creation of the containment jetty (Table 4). The creation of the containment jetty would result in an additional 0.20 acres (0.08 ha) of subtidal man-made habitat, and therefore reduce impacts to less than significant (Table 4).

Table 4. Existing and Created Man-Made Habitat of Proposed Project.

Habitat Type	Existing	Created	Net Change
Shallow Subtidal (-2 to -12 ft MLLW)	0.19 ac (0.08 ha)	0.39 ac (0.16 ha)	+0.20 ac (0.08 ha)

COMPENSATORY EELGRASS LOSS REPLACEMENT

A pre-construction eelgrass survey will be required to determine the areal coverage of eelgrass habitat present in the project area prior to construction, and a post-construction survey will document the actual impact by the proposed project; however, it is estimated that approximately 5.64 acres (2.28 ha.) of eelgrass will be directly impacted due to construction. In addition, eelgrass is present outside of the direct project footprint that may be affected by construction activities (e.g., anchoring of barges, resuspension of sediments during excavation for the containment jetty). The coverage of eelgrass outside of the project footprint is approximately 0.37 acres (0.15 ha). Given the uncertainty regarding the exact construction technique and methodology, this analysis will assume the most conservative impact, which will include the eelgrass that will be directly and indirectly affected, totaling 6.01 acres (2.43 ha). This eelgrass must be replaced by a transplant within the same ecoregion or an adjacent ecoregion within San Diego Bay sufficient to achieve a 1.2:1 replacement ratio in accordance with the current SCEMP (NMFS 1991), with the total mitigation estimated to be 7.22 acres (2.92 ha) (Table 5).

Table 5. Eelgrass Coverage and Mitigation Criteria.

	2011 Eelgrass Coverage Acres (ha)	Eelgrass Mitigation (1.2:1 per SCEMP) Acres (ha)
Direct Project Footprint	5.64 ac (2.28 ha)	6.77 ac (2.74 ha)
Indirect Project Footprint	0.37 ac (0.15 ha)	0.45 ac (0.18 ha)
Total Eelgrass Impact	6.01 ac (2.43 ha)	7.22 ac (2.92 ha)

An eelgrass mitigation plan must be prepared and approved by the Port's Environmental Director and ACOE, acting in conjunction with the resource agencies, including NMFS, USFWS, U.S. Environmental Protection Agency (EPA), and the CDFG. The plan shall include details regarding methods and results of the eelgrass survey, description of the mitigation site, transplant methods, program schedule, 5-year monitoring program, success criteria, and actions to take for failed mitigation goals, all consistent with the SCEMP (NMFS 1991). Transplantation of eelgrass may only occur with the written approval of the CDFG.

Potential eelgrass mitigation sites are discussed in a separate report (Report 2).

BAY SURFACE COVERAGE AND FILL OFFSET

The construction of the CDF will reduce the amount of available habitat within San Diego Bay. It was estimated that 9.85 acres (3.99 ha) of bay fill and surface coverage will result from the completion of the CDF, including the loss of loss of approximately 0.11 acres (0.04 ha) of salt marsh habitat, 4.01 acres (1.63 ha) of intertidal habitat, and 4.49 acres (1.82 ha) of shallow subtidal habitat (Table 1). To mitigate for the loss associated with fills and surface coverage, new bay habitat must be created via excavation of shoreline and creation of tidal influence in previously non-tidal areas. The mitigation ratio for intertidal and subtidal habitats would occur at a 1:1 ratio; however, the coastal salt marsh habitat would have to be mitigated at a 4:1 ratio (i.e., creation of 0.44 acres [0.18 ha] of salt marsh habitat for 0.11 acres [0.04] impact). Potential bay fill/coverage mitigation sites are discussed in a separate report (Report 2).

UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

Based on the proposed mitigation measures outlined above, no unavoidable adverse impacts to terrestrial and marine habitats and/or biota would be expected.

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Appendix A
Southern California Eelgrass Mitigation Policy, rev. 11

SOUTHERN CALIFORNIA EELGRASS MITIGATION POLICY

(Adopted July 31, 1991)

Eelgrass (Zostera marina) vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of non-commercially important species whose ecological roles are less well understood.

Eelgrass is a major food source in nearshore marine systems, contributing to the system at multiple trophic levels. Eelgrass provides the greatest amount of primary production of any nearshore marine ecosystem, forming the base of detrital-based food webs and as well as providing a food source for organisms that feed directly on eelgrass leaves, such as migrating waterfowl. Eelgrass is also a source of secondary production, supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates, larval and juvenile fish, and birds.

In addition to habitat and resource attributes, eelgrass serves beneficial physical roles in bays and estuaries. Eelgrass beds dampen wave and current action, trap suspended particulates, and reduce erosion by stabilizing the sediment. They also improve water clarity, cycle nutrients, and generate oxygen during daylight hours.

In order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources, the following policy has been developed by the Federal and State resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game). While the intent of this Policy is to provide a basis for consistent recommendations for projects that may impact existing eelgrass resources, there may be circumstances (e.g., climatic events) where flexibility in the application of this Policy is warranted. As a consequence, deviations from the stated Policy may be allowed on a case-by-case basis. This policy should be cited as the Southern California Eelgrass Mitigation Policy (revision 11).

For clarity, the following definitions apply. "Project" refers to work performed on-site to accomplish the applicant's purpose. "Mitigation" refers to work performed to compensate for any adverse impacts caused by the "project". "Resource agencies" refers to National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG).

1. **Mitigation Need.** Eelgrass transplants shall be considered only after the normal provisions and policies regarding avoidance and minimization, as addressed in the Section 404 Mitigation Memorandum of Agreement between the Corps of Engineers and Environmental Protection Agency, have been pursued to the fullest extent possible prior to the development of any mitigation program. Mitigation will be required for the loss of

existing vegetated areas, loss of potential eelgrass habitat, and/or degradation of existing/potential eelgrass habitat. Mitigation for boat docks and/or related work is addressed in section 2.

2. **Boat Docks and Related Structures**. Boat docks, ramps, gangways and similar structures should avoid eelgrass vegetated or potential eelgrass vegetated areas to the maximum extent feasible. If avoidance of eelgrass or potential eelgrass areas is infeasible, impacts should be minimized by utilizing, to the maximum extent feasible, construction materials that allow for greater light penetration (e.g., grating, translucent panels, etc.). For projects where the impact cannot be determined until after project completion (i.e., vessel shading, vessel traffic) a determination regarding the amount of mitigation shall be made based upon two annual monitoring surveys conducted during the time period of August to October which document the changes in the bed (areal extent and density) in the vicinity of the footprint of the boat dock, moored vessel(s), and/or related structures. Any impacts determined by these monitoring surveys shall be mitigated per sections 3-12 of this policy. Projects subject to this section must include a statement from the applicant indicating their understanding of the potential mitigation obligation which may follow the initial two-year monitoring.

3. **Mitigation Map.** The project applicant shall map thoroughly the area, distribution, density and relationship to depth contours of any eelgrass beds likely to be impacted by project construction. This includes areas immediately adjacent to the project site which have the potential to be indirectly or inadvertently impacted as well as potential eelgrass habitat areas. Potential habitat is defined as areas where eelgrass would normally be expected to occur but where no vegetation currently exists. Factors to be considered in delineating potential habitat areas include appropriate circulation, light, sediment, slope, salinity, temperature, dissolved oxygen, depth, proximity to eelgrass, history of eelgrass coverage, etc.

Protocol for mapping shall consist of the following format:

1) Bounding Coordinates

   Horizontal datum - Universal Transverse Mercator (UTM), NAD 83, Zone 11 is the preferred projection and datum. If another projection or datum is used, the map and spatial data must include metadata that accurately defines the projection and datum.

   Vertical datum - Mean Lower Low Water (MLLW), depth in feet.

2) Units

   Transects and grids in meters.

   Area measurements in square meters/hectares.

3) File format

   A spatial data layer compatible with readily available geographic information system software must be sent to NMFS and any other interested resource agency when the area mapped has greater than 10 square meters of

eelgrass. For those areas with less than 10 square meters, a table must be provided giving the bounding x,y coordinates of the eelgrass areas. In addition to a spatial layer or table, a hard-copy map should be included within the survey report. The projection and datum should be clearly defined in the metadata and/or an associated text file.

All mapping efforts must be completed during the active growth phase for the vegetation (typically March through October) and shall be valid for a period of 60 days with the exception of surveys completed in August - October. Surveys completed after unusual climatic events (i.e., high rainfall) may have modified requirements and surveyors should contact NMFS, CDFG, and USFWS to determine if any modifications to the standard survey procedures will be required. A survey completed in August - October shall be valid until the resumption of active growth (i.e., in most instances, March 1). After project construction, a post-project survey shall be completed within 30 days. The actual area of impact shall be determined from this survey.

4. **Mitigation Site.** The location of eelgrass transplant mitigation shall be in areas similar to those where the initial impact occurs. Factors such as, distance from project, depth, sediment type, distance from ocean connection, water quality, and currents are among those that should be considered in evaluating potential sites.

5. **Mitigation Size.** In the case of transplant mitigation activities that occur concurrent to the project that results in damage to the existing eelgrass resource, a ratio of 1.2 to 1 shall apply. That is, for each square meter adversely impacted, 1.2 square meters of new suitable habitat, vegetated with eelgrass, must be created. The rationale for this ratio is based on, 1) the time (i.e., generally three years) necessary for a mitigation site to reach full fishery utilization and 2) the need to offset any productivity losses during this recovery period within five years. An exception to the 1.2 to 1 requirement shall be allowed when the impact is temporary and the total area of impact is less than 100 square meters. Mitigation on a one-for-one basis shall be acceptable for projects that meet these requirements (see section 11 for projects impacting less than 10 square meters).

Transplant mitigation completed three years in advance of the impact (i.e., mitigation banks) will not incur the additional 20 percent requirement and, therefore, can be constructed on a one-for-one basis. However, all other annual monitoring requirements (see sections 8-9) remain the same irrespective of when the transplant is completed.

Project applicants should consider increasing the size of the required mitigation area by 20-30 percent to provide greater assurance that the success criteria, as specified in Section 10, will be met. In addition, alternative contingent mitigation must be specified, and included in any required permits, to address situation where performance standards (see section 10) are not likely to be met.

For potential eelgrass habitat, a ratio of 1 to 1 of equivalent habitat shall be created.

Degradation of existing eelgrass vegetated habitat that results in a reduction of density greater than 25 percent shall be mitigated on a one-for-one basis. For example, a 25

percent reduction in density of a 100 square meter (100 turions/meter) eelgrass bed to 75 turions/meter would require the establishment of 25 square meters of new eelgrass with a density at or greater than the pre-impact density. All other provisions of the Policy would apply.

6. **Mitigation Technique.** Techniques for the construction and planting of the eelgrass mitigation site shall be consistent with the best available technology at the time of the project. Donor material shall be taken from the area of direct impact whenever possible, but also should include a minimum of two additional distinct sites to better ensure genetic diversity of the donor plants. No more than 10 percent of an existing bed shall be harvested for transplanting purposes. Plants harvested shall be taken in a manner to thin an existing bed without leaving any noticeable bare areas. Written permission to harvest donor plants must be obtained from the California Department of Fish and Game.

Plantings should consist of bare-root bundles consisting of 8-12 individual turions. Specific spacing of transplant units shall be at the discretion of the project applicant. However, it is understood that whatever techniques are employed, they must comply with the stated requirements and criteria.

7. Mitigation Timing. For off-site mitigation, transplanting should be started prior to or concurrent with the initiation of in-water construction resulting in the impact to the eelgrass bed. Any off-site mitigation project which fails to initiate transplanting work within 135 days following the initiation of the in-water construction resulting in impact to the eelgrass bed will be subject to additional mitigation requirements as specified in section 8. For on-site mitigation, transplanting should be postponed when construction work is likely to impact the mitigation. However, transplanting of on-site mitigation should be started no later than 135 days after initiation of in-water construction activities. A construction schedule which includes specific starting and ending dates for all work including mitigation activities shall be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

8. **Mitigation Delay.** If, according to the construction schedule or because of any delays, mitigation cannot be started within 135 days of initiating in-water construction, the eelgrass replacement mitigation obligation shall increase at a rate of seven percent for each month of delay. This increase is necessary to ensure that all productivity losses incurred during this period are sufficiently offset within five years.

9. **Mitigation Monitoring.** Monitoring the success of eelgrass mitigation shall be required for a period of five years for most projects. Monitoring activities shall determine the area of eelgrass and density of plants at the transplant site and shall be conducted at initial planting, 6, 12, 24, 36, 48, and 60 months after completion of the transplant. All monitoring work must be conducted during the active vegetative growth period and shall avoid the winter months of November through February. Sufficient flexibility in the scheduling of the 6 month surveys shall be allowed in order to ensure the work is completed during this active growth period. Additional monitoring beyond the 60 month period may be required in those instances where stability of the proposed transplant site is questionable or where other factors may influence the long-term success of transplant.

The monitoring of an adjacent or other acceptable control area (subject to the approval of the resource agencies) to account for any natural changes or fluctuations in bed width or density must be included as an element of the overall program.

A monitoring schedule that indicates when each of the required monitoring events will be completed shall be provided to the resource agencies prior to or concurrent with the initiation of the mitigation (see attached monitoring and compliance summary form).

Monitoring reports shall be provided to the resource agencies within 30 days after the completion of each required monitoring period and shall include the summary sheet included at the end of this policy.

10. **Mitigation Success.** Criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the **adjusted project impact area** (i.e., original impact area multiplied by 1.2) and **mitigation site(s)**. Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area present in representative samples within the original impact area, control or transplant bed. Specific criteria are as follows:

a. the mitigation site shall achieve a minimum of 70 percent area of eelgrass and 30 percent density as compared to the adjusted project impact area after the first year.

b. the mitigation site shall achieve a minimum of 85 percent area of eelgrass and 70 percent density as compared to the adjusted project impact area after the second year.

c. the mitigation site shall achieve a sustained 100 percent area of eelgrass bed and at least 85 percent density as compared to the adjusted project impact area for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet any of the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$$

MTA = mitigation transplant area.
A_t = transplant deficiency or excess in area of coverage criterion (%).
D_t = transplant deficiency in density criterion (%).
A_c = natural decline in area of control (%).
D_c = natural decline in density of control (%).

The STA formula shall be applied to actions that result in the degradation of habitat (i.e., either loss of areal extent or reduction in density).

Five conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.
2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.
3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.
4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 8.
5) Annual monitoring will be required of the STA for five years following the implementation and all performance standards apply to the STA.

11. **Mitigation Bank.** Any mitigation transplant success that, after five years, exceeds the mitigation requirements, as defined in section 10, may be considered as credit in a "mitigation bank". Establishment of any "mitigation bank" and use of any credits accrued from such a bank must be with the approval of the resource agencies and be consistent with the provisions stated in this policy. Monitoring of any approved mitigation bank shall be conducted on an annual basis until all credits are exhausted.

12. **Exclusions.**

1) Placement of a single pipeline, cable, or other similar utility line across an existing eelgrass bed with an impact corridor of no more than 1 meter wide may be excluded from the provisions of this policy with concurrence of the resource agencies. After project construction, a post-project survey shall be completed within 30 days and the results shall be sent to the resource agencies. The actual area of impact shall be determined from this survey. An additional survey shall be completed after 12 months to insure that the project or impacts attributable to the project have not exceeded the allowed 1 meter corridor width. Should the post-project or 12 month survey demonstrate a loss of eelgrass greater than the 1 meter wide corridor, then mitigation pursuant to sections 1-11 of this policy shall be required.

2) Projects impacting less than 10 square meters. For these projects, an exemption may be requested by a project applicant from the mitigation requirements as stated in this policy, provided suitable out-of-kind mitigation is proposed. A case-by-case evaluation and determination regarding the applicability of the requested exemption shall be made by the resource agencies.

(last revised 08/30/05)

Southern California Eelgrass Mitigation Policy
Monitoring and Compliance Reporting Summary

PERMIT DATA:

Permit (Type, Number)	Issuance Date	Expiration Date	Agency Contact
ACOE:_____			
CDP:_____			
Other:_____			

EELGRASS IMPACT AND MITIGATION REQUIREMENTS SUMMARY:

Permitted Eelgrass Impact Estimate	(m^2)	
Actual Eelgrass Impact,	(m^2)	(post-const. survey date)
Eelgrass Mitigation Requirement	(m^2)	(mitigation plan ref.)
Impact Site Location		(location)
Impact Site Center Coordinates		(define projection and datum)
Mitigation Site Location		(location)
Mitigation Site Center Coordinates		(define projection and datum)

PERMITTEE CONTACT INFORMATION:

Project Name	(same as permit ref.)
Permittee Information	(permittee name)
	(mailing address)
	(city, state, zip)
	(permittee contact)
	(phone, fax., e-mail)
Mitigation Consultant	(consultant contact)
	(phone, fax., e-mail)

PROJECT ACTIVITY DATA:

Activity	Start Date	End Date	Reference Info.
Eelgrass Impact			
Installation of Eelgrass Mitigation			
Initiation of Mitigation Monitoring			

MITIGATION STATUS DATA:

Mitigation Milestone	Scheduled Survey	Survey Date	Area (m^2)	Density (turions/m^2)	Reference Info.
Requirement					
0-month					
6-month					
12-month					
24-month					
36-month					
48-month					
60-month					

FINAL ASSESSMENT:

Was mitigation met?	
Were mitigation and monitoring performed timely?	
Was delay penalty required or were supplemental mitigation programs necessary?	

11-004-01

FINAL
SHIPYARD SEDIMENT ALTERNATIVES ANALYSIS
CONVAIR LAGOON CONFINED DISPOSAL FACILITY ALTERNATIVE
MARINE BIOLOGICAL RESOURCES TECHNICAL REPORT

REPORT 2 OF 2:
CONVAIR LAGOON MITIGATION SITE ANALYIS

Prepared for:

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May 31, 2011

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Convair Lagoon Mitigation Site Analysis

INTRODUCTION

Brown and Winters has contracted Merkel & Associates, Inc. (M&A) to conduct an assessment of marine biological resources for a proposed confined disposal facility (CDF) at Convair Lagoon, located in north San Diego Bay, California (Figure 1). Convair Lagoon is a shallow embayment that was the site of a polychlorinated biphenyl (PCB) remedial action that included the construction of sediment cap that was completed in 1997. In addition, an eelgrass mitigation program was implemented in 1997 and completed in 2003, and included the creation of 4.15 acres (1.68 hectares [ha]) of eelgrass habitat (TDY 2003).

Report one of the two part series described the proposed alternative, existing conditions, and potential impacts to marine resources from the proposed project (M&A 2011). This report discusses potential mitigation options to reduce the impacts to less than significant.

It should be noted that mitigation options discussed in this report are only potential locations, and that consultation with resource and regulatory agencies (e.g., Army Corps of Engineers [ACOE], National Marine Fisheries Service [NMFS], U.S. Fish and Wildlife Service [USFWS], U.S. Environmental Protection Agency [EPA], California Department of Fish and Game [CDFG], California Coastal Commission [CCC]) would be required prior to pursuing any option. In addition, there is uncertainty regarding jurisdiction and property ownership of the proposed mitigation sites, and therefore, if mitigation were to occur on non-Port of San Diego property, the Port would have to establish a leasing agreement with the current property owner(s). Lastly, it is generally believed that the agencies would prioritize the potential mitigation options based on the following locational criteria:

1. Within San Diego Bay and within the same ecoregion (e.g., north ecoregion)
2. Within San Diego Bay and within adjacent ecoregions (e.g., north-central ecoregion)
3. Within San Diego Bay
4. Off-site (outside San Diego Bay)

SUMMARY OF IMPACTS

Mitigation to reduce significant impacts to a less than significant level for the proposed project have been categorized as: 1) Compensatory Eelgrass Loss Replacement, and 2) Bay Surface Coverage and Fill Offset. Within these categories, potential locations are described, as in some instances, the mitigation may not be achievable at a single location, or if constraints are present, multiple locations can be utilized. The proposed locations are depicted in Figure 2.

Figure 1. Convair Lagoon, San Diego Bay, CA.

Figure 2. Potential Mitigation Sites for Convair Lagoon CDF Alternative.

COMPENSATORY EELGRASS LOSS REPLACEMENT

It was estimated that approximately 5.64 acres (2.28 hectares [ha]) of eelgrass would be directly impacted due to construction (M&A 2011). In addition, eelgrass was present outside of the direct project footprint that may be affected by construction activities (e.g., anchoring of barges, resuspension of sediments during excavation for the containment jetty). The coverage of eelgrass outside of the project footprint was approximately 0.37 acres (0.15 ha). Given the uncertainty regarding the exact construction technique and methodology, the analysis assumed the most conservative impact, which included the eelgrass that would be directly and indirectly affected (6.01 acres [2.43 ha]). This eelgrass must be replaced by a transplant to achieve a 1.2:1 replacement ratio in accordance with the current Southern California Eelgrass Mitigation Policy (SCEMP; NMFS 1991), and would result in a mitigation requirement of 7.22 acres (2.92 ha).

The project proposes to mitigate for eelgrass impacts by creating eelgrass habitat at one or more locations within San Diego Bay by raising the bayfloor elevation to approximately -5 ft (-1.5 m) mean lower low water (MLLW) with dredged materials and planting eelgrass on the elevated plateau. Several locations being considered include the former Naval Training Center (NTC) channel, Harbor Island – West Basin, adjacent to Convair Lagoon, A-8 Anchorage, South Bay Borrow Site, Emory Cove Channel, South Bay Power Plant Channel, and South Bay Power Plant (Figure 2). It should be noted that the A-8 Anchorage, South Bay Borrow Site, South Bay Power Plant Channel, and South Bay Power Plant sites are located in adjacent ecoregions, and in regards to eelgrass mitigation, it has been the position of the resource agencies (e.g., NMFS) that any mitigation should occur within the impacted ecoregion, if feasible.

An eelgrass mitigation plan must be prepared and approved by the Port's Environmental Director and ACOE, acting in conjunction with the resource agencies, including NMFS, USFWS, EPA, and the CDFG. The plan shall include details regarding methods and results of the eelgrass survey, description of the mitigation site, transplant methods, program schedule, 5-year monitoring program, success criteria, and actions to take for failed mitigation goals, all consistent with the SCEMP (NMFS 1991). Transplantation of eelgrass may only occur with the written approval of the CDFG.

BAY SURFACE COVERAGE AND FILL OFFSET

The construction of the CDF will reduce the amount of available habitat within San Diego Bay. It was estimated that approximately 9.85 acres (3.98 ha) of bay fill and surface coverage will result from the completion of the CDF, including the loss of loss of approximately 0.11 acres (0.04 ha) of salt marsh habitat, 4.01 acres (1.63 ha) of intertidal habitat, and 4.49 acres (1.82 ha) of shallow subtidal habitat. To mitigate for the loss associated with fills and surface coverage, new bay habitat must be created via excavation of shoreline and creation of tidal influence in previously non-tidal areas. The mitigation ratio for intertidal and subtidal habitats would occur at a 1:1 ratio; however, the coastal salt marsh habitat would have to be mitigated at a 4:1 ratio (i.e., creation of 0.44 acres [0.18 ha] of salt marsh habitat for 0.11 acres [0.04] impact).

To mitigate for the loss of intertidal and subtidal habitat, as well as, bay coverage, five possible locations are being evaluated: Grand Caribe Isle in the Coronado Cays, D Street Fill just across the Sweetwater Channel from the National City Marine Terminal (NCMT), the South Bay Power Plant, the Salt Works, and Pond 20 adjacent to the Salt Works (Figure 2). These sites would be lowered from upland elevations to create intertidal and subtidal habitats, except for the South Bay Power

Plant, which would require filling the existing the intake and discharge channels of the power plant to create tidal lands.

DESCRIPTION OF MITIGATION SITES

FORMER NAVAL TRAINING CENTER CHANNEL

The former Naval Training Center (NTC) Channel is located north of North Harbor Drive Boulevard (Figure 3). The channel extends approximately 1 mile (1.6 km) and covers approximately 54 acres (22 ha). The sides of the channel consist of rip-rap, and the majority of the substrate consists for soft bay muds. The average depth of the channel is approximately -12 to -14 ft (-3.7 to -4.3 m) MLLW; however, the edges of the channel are shallow and support extensive eelgrass beds (M&A 2009; Figure 3). Common fauna associated with shallow bay mud habitat include tube dwelling anemones, arthropods (e.g., ghost shrimp, *Callianassa*), round stingray (*Urobatis halleri*), barred and spotted sand bass (*Paralabrax nebulifer* and *P. maculatofasciatus*), and midshipman (*Porichthys myriaster*).

The placement of suitable dredge material at the NTC Channel could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW); however, as depicted in Figure 3, meeting the mitigation requirements (7.22 acres) entirely within the NTC Channel may result in narrowing of the existing channel and potentially creating a navigational hazard.

HARBOR ISLAND – WEST BASIN

Adjacent to the NTC Channel, the west basin of Harbor Island displays a similar habitat regime (i.e., shoreline stabilized with rip-rap and adjacent subtidal bay mud habitat) (Figure 3). The average depth within the basin is approximately -10 to -12 ft (-3.0 to -3.7 m) MLLW, with extensive eelgrass beds in the northern portion and marina development along the south and eastern portions of the basin (M&A 2009; Figure 3). The placement of suitable dredge material at the Harbor Island – West Basin could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW); however, similar to the NTC Channel, meeting the mitigation requirements (7.22 acres) entirely within the basin may result in narrowing of the existing channel and potentially creating a navigational hazard (Figure 4).

ADJACENT TO CONVAIR LAGOON

Adjacent to Convair Lagoon and proposed CDF, the area displays a similar habitat regime (i.e., shoreline stabilized with rip-rap and adjacent subtidal bay mud habitat) (Figure 3). The average depth in the area is approximately -10 to -12 ft (-3.0 to -3.7 m) MLLW, with eelgrass beds just offshore of the Coast Guard facility, and patchy eelgrass located further offshore (M&A 2009; Figure 3). The placement of suitable dredge material could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW); however, similar to the NTC Channel, meeting the mitigation requirements (7.22 acres) entirely in the area may result in potentially creating a navigational hazard (Figure 3).

A-8 ANCHORAGE

A-8 Anchorage is a 65 acre (26 ha) area adjacent to the Sweetwater Channel and was the only long-term free anchorage area available on the west coast (Figure 4). In June 2006, the San Diego Board of Port Commissioners authorized the closure of the A-8 Anchorage, and complete

Figure 3. Potential Eelgrass Mitigation Sites for Convair Lagoon CDF Alternative, North Ecoregion.

Figure 4. Potential Eelgrass and Bay Fill Mitigation Sites for Convair Lagoon CDF Alternative.

closure occurred on October 1, 2008. The water depth within the A-8 Anchorage ranges from -10 to -12 ft (-3.0 to -3.7 m) MLLW, and the substrate generally consists of soft-bottom mud habitat. The area does not currently support eelgrass (M&A 2009). The soft mud-bottomed site has been the focus of extensive debris mapping and clean up (M&A 2006). In general the site lacks substantive marine epibenthic activity although sunken vessel hulls provide hard structure and relief that supports a greater aggregation of fish and invertebrates than the otherwise featureless bottom. The site supports use by a typical suite of fish found in the bay. Barred sand bass are relatively common around the sunken vessel hulls, *Sargassum* growing on the hulls supports use by giant kelpfish. Opaleye are found in small schools around a few portions of the site. Pacific seahorse is also represented in the hard structure debris fields. The placement of suitable dredge material at the A-8 Anchorage could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW). In addition, the site would absorb even greater volumes to expand eelgrass habitat over a considerably larger area of the anchorage to create a mitigation bank site and larger dredged material beneficial reuse area.

SOUTH BAY BORROW SITE

As mitigation for eelgrass impacts from the National City Marine Terminal Extension Project, an existing approximately 20 acre (8.1 ha) sediment borrow pit within south San Diego Bay was partially filled with sandy material to create a suitable eelgrass mitigation area (Figure 4). Filling the borrow pit was intended to raise the bay bottom to elevations similar to those around the upper edge of the pit and within the depth ranges to support eelgrass growth (to -5 ft [-1.5 m] MLLW). The eelgrass mitigation area was completed in early 2004. Investigations of the site following construction indicated that most of the borrow pit was filled to elevations of -6 ft (-1.2 m) MLLW, although there were several areas where the depths were greater than -9 ft (-2.7 m) MLLW (M&A 2004).

The additional eelgrass Mitigation Bank site was approximately 7.5 acres (3.0 ha) and was created north of the eelgrass mitigation site within the backfilled borrow area. The Mitigation Bank site was planted using a series of planting transects, spaced 4 meters apart, within the roughly rectangular sited using a bare-root bundle approach with planting units being placed on 2-meter centers.

Routine monitoring conducted in the area of the borrow pit in February 2006, shortly before the 24-month monitoring period, revealed that the transplant site was performing poorly and signaled the need for a supplemental transplant (M&A 2006). Additional planting was completed in May 2006 and was subsequently surveyed for eelgrass coverage and density at the 24-month post-transplant mark. During the 36-month monitoring survey, a total of 0.03 acres (113 m^2) of eelgrass was mapped within the control site, but there was no eelgrass identified within either the Mitigation Bank Site or the Mitigation Site (M&A 2007). Eelgrass within the Control Site exhibited a 95% decline from that observed during May 2006 while eelgrass disappeared from both the Mitigation Bank Site and Mitigation Site. Notably, eelgrass was nearly absent from much of the central South Bay region including areas surrounding the restoration site and well away from the area. Since this site suffered significant eelgrass losses coincident with similar declines throughout the South Bay and although natural declines in reference control beds have kept the transplants in this site, compliant with the SCEMP requirements, the site is not performing as desired at the present time. However, future efforts and a change in environmental conditions may allow the eelgrass to establish and then serve its intended purpose.

GRAND CARIBE ISLE

The Grand Caribe Isle is located on South Grand Caribe Isle in the Coronado Cays (Figure 4). The South Grand Caribe Isle site is a disturbed upland area that would be regraded to accommodate wetland, intertidal marsh, and subtidal habitat (Figure 5). This area is located adjacent to a small passive use native plant park and has recently been used as a borrow site for sediment cap sand for the former Campbell Shipyard sediment remediation project. This site is expected to able to accommodate up to six and a half acres of wetland mitigation. This site is the only potential mitigation site where conceptual restoration designs have been developed and created habitat estimates provided for three conceptual designs (Figure 6 and Tables 1 and 2).

Table 1. Habitat Created for Potential Design Options at Grand Caribe Isle.

Option	Intertidal Acres (m^2)	Shallow Subtidal Acres (m^2)	TOTAL Acres (m^2)
Existing	2.37 (9,660)	0.38 (1,538)	2.75 (11,198)
Option 1	5.77 (23,350)	2.53 (10,239)	8.30 (33,589)
Option 2	4.44 (17,968)	2.63 (10,643)	7.07 (28,611)
Option 3	4.56 (18,454)	4.18 (16,916)	8.74 (35,370)

Table 2. Breakdown of Habitat Types (Acres) for Potential Design Options at Grand Caribe Isle.

Concept	Open	Mudflats	Low	Middle Marsh	High Marsh	Supra Tidal	TOTAL
Existing	0.0	0.78	0.055	0.62	0.54	8.58	11.07
Option 1	0.62	1.91	2.64	2.46	0.67	2.76	11.06
Option 2	0.92	1.71	2.72	0.82	0.90	3.96	11.03
Option 3	1.87	2.31	1.98	1.75	0.83	2.30	11.04

The following is a summary of biological site conditions from a biological baseline survey conducted by Merkel & Associates (2002) and subsequent review of the site, post-borrow site use in 2009. The Grand Caribe Isle study area encompassed approximately 10 acres of land and adjacent intertidal areas and is part of a low-lying peninsular fill surrounded by San Diego Bay. The man-made isle was created using dredged fill from the Bay during a time when construction of finger channels and waterside development was underway for the Coronado Cays. The site elevation ranges from subtidal conditions around the eastern, southern, and western edges of the peninsula to a high elevation of approximately 13 ft (4.0 m) MLLW on a small hummock near the eastern edge of the existing borrow site excavation.

The on-site soil consists of loamy sand from marine deposits. The Bay surrounds the site, with the peninsular connection being isolated from other native upland habitats by residential development of the Coronado Cays.

The biological resources on the site are dominated by common, widely distributed species, many of which are representative of disturbed lands (M&A 2002). The borrow project served as a stage 1 lowering of the site towards an eventual excavation to intertidal and subtidal habitat restoration. An erosion control seed mix including grasses and a number of fast growing ground covers such as lupines was hydroseeded into the borrow site following completion of the Campbell site use. Species well represented on the site include salt heliotrope (*Heliotropium curvassavicum*), slender-leaved

Figure 5. Existing Conditions at Grand Caribe Isle Mitigation Site.

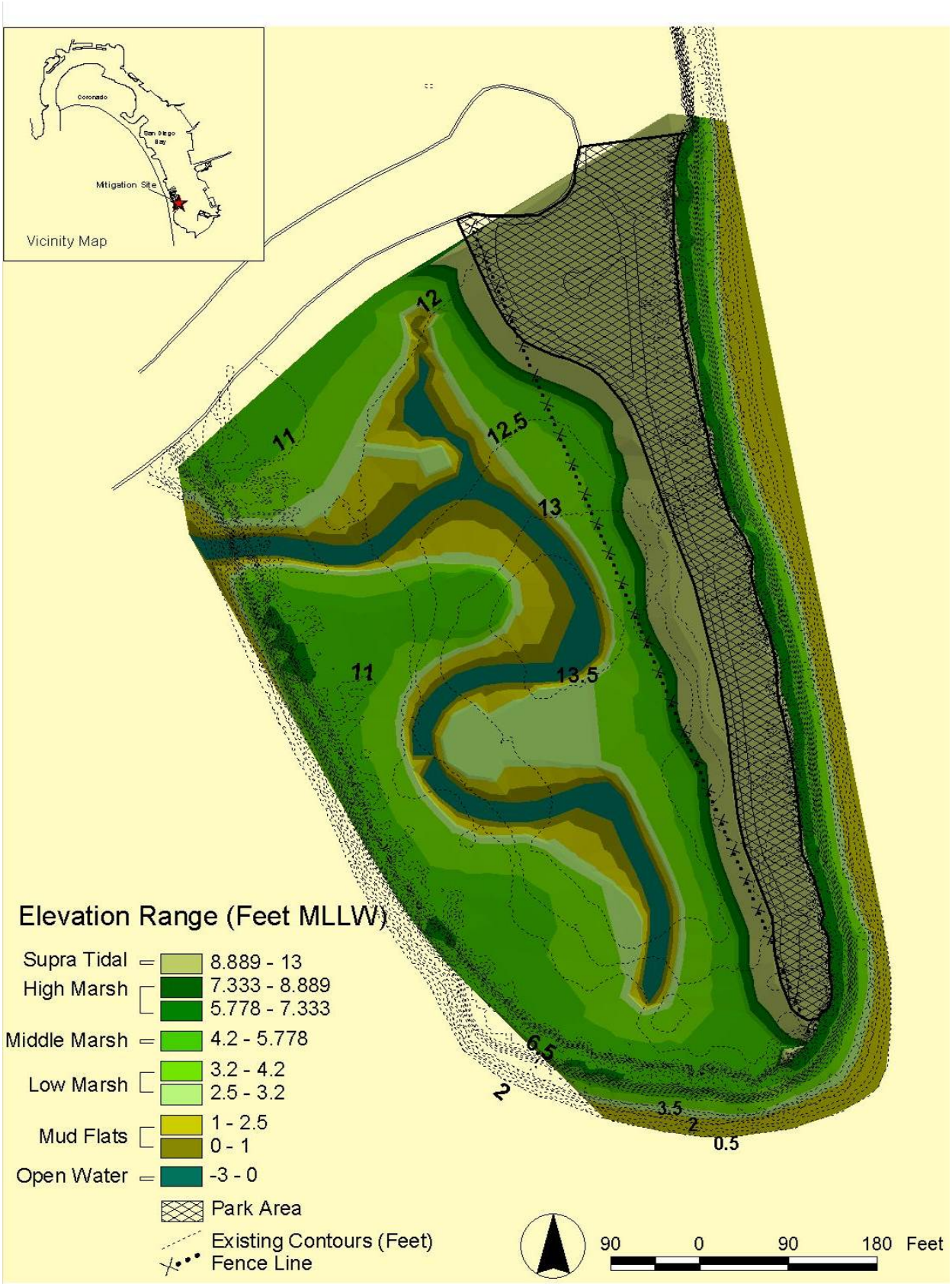


Figure 6. Conceptual Design for Grand Caribe Isle Mitigation Site.

iceplant (*Mesembryanthemum nodiflorum*), garland (*Chrysanthemum coronarium*), and red-stem filaree (*Erodium cicutarium*).

At present, habitat functions and values are considered degraded on the isle due to the limited size of the habitat area and the lack of developed habitat features. Very limited salt marsh habitat is present along the fringes of the island; however, it is not expected to expand given the lack of available tidal environment. No substantial existing habitat features exist within the Grand Caribe Isle site and no sensitive species or other biological resources are believed to make regular or significant use of this site in its current form. However, the site is not large enough to meet all of the potential mitigation requirements for the proposed project, and therefore, if this site were selected, mitigation must occur at an additional location or locations.

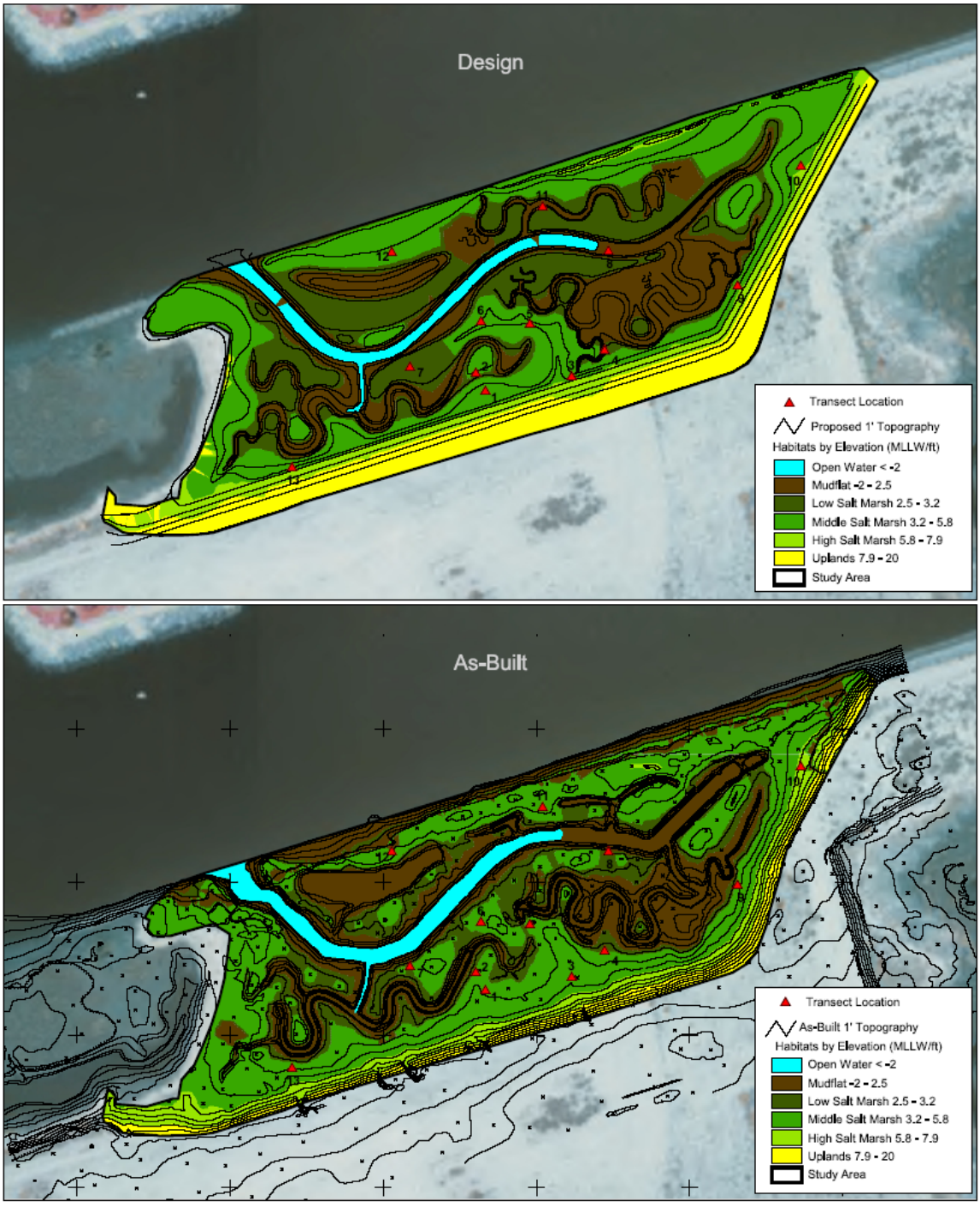
D STREET FILL

Another potential mitigation site is located on the D Street Fill, immediately south of the NCMT across the Sweetwater River channel (Figure 4). A little over six acres of the D Street Fill site could be converted by altering the existing topography to create favorable hydrologic conditions to accommodate saltwater marsh plants, intertidal mudflats, and shallow subtidal habitats. No conceptual plan for D Street Fill has been developed; however, it is anticipated that a design similar to the previous mitigation design developed and implemented for the first phase of the NCMT wharf expansion will be created to meet the mitigation requirements of the proposed project (Figure 7).

The proposed mitigation site is routinely cleared/disked in an effort to provide nesting habitat for the California least tern (*Sterna antillarum browni*). As a result, the area is mostly devoid of vegetation. Plant species that occur are limited to native and non-native species that are typical of disturbed sandy soils found in the area. These species include opportunistic native species such as woolly lotus (*Lotus heermannii* var. *heermannii*), salt heliotrope, beach evening primrose (*Camissonia cheiranthifolia* ssp. *suffruticosa*), coyote brush (*Baccharis pilularis*), coast woollyheads (*Nemacaulis denudata* var. *dunudata*), and fragrant everlasting (*Pseudognaphalium beneolens*). Non-native plant species include hottentot-fig (*Carpobrotus edulis*), slender-leaved iceplant, garland, pineapple weed (*Amblyopappus pusillus*), and red-stem filaree.

Bird species that utilize this area for foraging and/or nesting include horned lark (*Eremophila alpestris*); Northern rough-winged swallow (*Stelgidopteryx serripennis*); and during the winter, American pipet (*Anthus rubescens*) (pers.com Robert Patton). The gull-billed tern (*Sterna nilotica*), a species that predates on California least tern young, is also known to forage over the site. During the survey, California least terns were exhibiting nesting behavior immediately west of the proposed mitigation site.

Similar to Grand Caribe, the D Street Fill site is not large enough to meet all of the potential mitigation requirements for the proposed project, and therefore, if this site were selected, mitigation must occur at an additional location or locations.



Habitat by Elevation	Elevation Range (ft/MLLW)	As-Built Area	Proposed Area	% Difference
open water	< -2	0.24	0.20	1.20
mudflat	-1.99 - 2.5	2.07	1.55	1.34
low salt marsh	2.5 - 3.2	0.96	1.35	0.71
middle salt marsh	3.2 - 5.8	2.27	2.00	1.14
high salt marsh	5.8 - 7.9	0.39	0.33	1.18
uplands	> 7.9	0.50	0.99	0.51

Figure 7. As-Built Specifications for D Street Mitigation Site.

EMORY COVE CHANNEL

Emory Cove, an inlet in the southwest corner of San Diego Bay served as an anchorage until 1987 when the Port District began enforcing rules making it unlawful to anchor, moor, make fast to the bottom, strand or ground (any) vessel or structure within South San Diego Bay, including Emory Cove. The Emory Cove anchorage was subsequently cleaned up in the early 1990s. The channel approaching Emory Cove is slightly deeper (approximately -10 ft [3 m] MLLW) than the adjacent area that supports extensive eelgrass beds. The placement of suitable dredge material could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW), mimicking the surrounding area. While it may also pose a navigational hazard, the area in not heavily traveled by vessels, and as noted, the surrounding areas currently consist of shallow, eelgrass bed. In addition, the area is large enough to meet the entire mitigation requirement (7.22 acres) (Figure 8).

SOUTH BAY POWER PLANT

The South Bay Power Plant (SBPP) is a non-operational electric power generating facility located on the southeastern shoreline of San Diego Bay (Figure 8). When it was in operation, the SBPP used bay water for once-through condenser cooling that was withdrawn from San Diego Bay via an intake channel north of the Chula Vista Wildlife Refuge. The intake channel is about 600 ft (180 m) in length, has a bottom width of about 200 ft (60 m) at its widest point, and tapers to 50 ft (15 m) width near the Unit 4 screenhouse (Duke Energy 2004). The maximum depth of the channel is approximately 18 ft (5.4 m) MLLW. Upon exiting the condensers, warmed cooling water from the SBPP was carried through discharge pipes about 450 ft (137 m) to the discharge basin located at the head of the discharge channel. The discharge channel originates on the side of the jetty, opposite the head of the intake channel.

The aquatic habitats in the vicinity of the SBPP are characteristic of protected inshore marine environments (Navy and SDUPD 2010). The flora and fauna of the region consists of communities living above, on, and within soft benthic substrates. Benthic substrates are composed mostly of alluvial sediments, including fine-grained sand, silt, and clay. Some expanses of bottom along the western shoreline of the bay, however, are dominated by larger-grained sand. Because of the absence of freshwater inflow, plant and animal communities are typical of marine and higher salinity estuarine environments. Aquatic habitats include subtidal areas, eelgrass beds, mudflats, and salt marshes.

South Bay Power Plant Intake Channel

The intake channel to the SBPP is located north of the Chula Vista Wildlife Refuge and consists of slightly deeper water (approximately -10 to -12 ft [-3.0 to -3.7 m] MLLW) than the surrounding areas that support extensive eelgrass beds (M&A 2009). The placement of suitable dredge material could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW), mimicking the surrounding area. While it may also pose a navigational hazard, the area in not heavily traveled by vessels, and as noted, the surrounding areas currently consist of shallow, eelgrass bed. In addition, the area is large enough to meet the entire mitigation requirement (7.22 acres) (Figure 8).

Figure 8. Potential South Bay Mitigation Sites for Convair Lagoon CDF Alternative.

South Bay Power Plant Intake and Discharge Entrance

The nearshore area of the SBPP consisting of the intake and discharge channel is another potential mitigation site that could serve an eelgrass mitigation site, as well as, as bay fill mitigation site (Figure 8). The area is bounded with dikes and the existing habitat includes mudflats and shallow subtidal habitat, with eelgrass present along the northern intake channel (M&A 2009). Like other potential eelgrass mitigation sites, the placement of suitable dredge material could be designed to accommodate eelgrass habitat (to -5 ft [-1.5 m] MLLW). In addition, the placement of dredge or fill material at higher elevations could also be used to create tidal land or marsh habitat, that would create a linkage between existing tidal habitat to the north with the Salt Works to the south.

SALT WORKS

Marsh lands around the mouth of the Otay River in the shallow, south end of San Diego Bay were converted to salt evaporation ponds in the late 1800s (Figure 8). Over the past century, various internal berms have been constructed, repaired, and removed by operational changes and flooding. These changes have resulted in changing topographic conditions that make a continued discussion of distinct pond cells.

The salt ponds consist of shallow, open water cells of different salinity levels interspersed with mudflats, dry dikes, and salt marsh. The salt pond levees consist primarily of unvegetated uplands. The lack of vegetation on many of the levee tops is the result of ongoing maintenance activities associated with the salt operation, as well as the high salinities that exist in the vicinity of the levees (USFWS 2006). The nature of the salt extraction process has facilitated use of this artificial habitat by many shorebirds, sea birds, and waterfowl. It represents one of the few large feeding, roosting, and nesting areas remaining along the urbanized southern California coast. The San Diego Bay National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2006) summarized use of the Salt Works by sensitive birds. The levees provide relatively secluded nesting habitat for thousands of breeding terns and black skimmers, as well as black-necked stilts, American avocets, and western snowy plovers.

Covering approximately 1,451 acres (587 ha), the salt ponds produce sodium chloride and magnesium chloride for industrial use. Primary ponds are approximately 3 ft (1 m) deep at their center, and are the least salty, representing the first stage of the extraction process. Secondary ponds are up to 5 ft (2 m) deep. These ponds are slightly more saline than seawater and are used for commercial brine shrimp production. Pickling ponds have the second-highest salinities. The final step in the extraction process occurs in crystallizer ponds, which support the highest salinity levels. The evaporation process takes 12 to 18 months, depending on rainfall, with each crystallization pond harvested once per year. Brine shrimp thrive in the secondary system; shrimp eggs hatch beginning in mid-May and mature shrimp are collected through mid-December. These are harvested commercially. Most birds use the southern side of these secondary ponds.

The USFWS is proposing to restore portions of the salt ponds to the historic habitats of intertidal mudflat and coastal salt marsh, while retaining other ponds as managed water areas to support species that favor the brine invertebrates present in the current system. The plan would result in the restoration of up to 140 acres (57 ha) of intertidal salt marsh, freshwater wetland, and coastal sage scrub habitat within the Otay River floodplain. In addition, up to 410 acres (166 ha) of salt ponds would be restored to intertidal salt marsh habitat. The trade-off for these gains is a decreased potential habitat for shorebirds by reducing area of salt ponds by 145 to 440 acres (59 to 178 ha).

Nesting habitat for seabirds would be expanded by about 28 acres (11 ha). The increase in tidal wetlands is up to about 800 acres (324 ha).

POND 20

The Pond 20 site, located south of the Salt Works is defined by internal dikes that include three smaller pond cells (herein termed Ponds 20A, 20B, and 20C). Areas involved in the present study are the Port of San Diego-owned portions of Pond 20A and 20B, and encompasses approximately 92 acres (37 ha) (M&A 2008, Figure 8).

The western portion of Pond 20A may have historically supported middle to high salt marsh habitat in the 1800s, prior to its conversion near the turn of the last century for salt production. Historic aerial photographs of the area in the 1940s show some vestigial salt marsh south of Pond 20A immediately south of Palm Avenue in areas that have since been filled. The eastern portion of Pond 20A, immediately north of an off-site mobile home park, includes an area that retains long-ago isolated braided stream patterns associated with the historic mouth of Nestor Creek. Pond 20A was last regularly used as an evaporator pond in the 1940s with a failed subsequent effort in the 1960s to reintegrate the pond into the evaporator process of the salt works.

Pond 20 is isolated from tributary fresh or saltwater surface input and experiences occasional storm runoff from the internal pond basin and a roadway surface drain from Palm Avenue. Seasonally water levels in the pond fluctuate significantly and waters are strongly saline due both to the pond's history as a salt concentrator and the continued closed system evaporative processes occurring in the pond today. Years of drought and heavy rainfall influence the levels of standing water in the pond and the rates of fluctuation of water surface levels. At present, limited standing water is found along the lower-lying "channels" that parallel the dike and generally below a nearly complete salt crust. These deeper channels are believed to be borrow areas for the reconstruction and repair of the pond containment dikes. These channels also historically enhanced water collection for pumped transfers within the salt pond system.

The Lower Otay River runs through the USFWS National Wildlife Refuge (NWR) and is adjacent to Pond 20. Per the San Diego Bay National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2006), potential enhancement and restoration includes realigning the Otay River to a more natural configuration through Pond 20, and excavating 8 acres (3.2 ha) of freshwater-brackish pond, establish 44 acres (18 ha) of tidal salt marsh and channels, and 40 acres (16 ha) of willow-riparian woodland and mudflat riparian scrub.

SUMMARY

Since the final design for any of the mitigation sites has not been determined, it is not possible to determine specifically how much of the mitigation requirements can be met at each site. The capacity, considerations, and constraints to provide mitigation at each site is summarized in Table 3. While off-site locations (i.e., outside San Diego Bay) could be considered, it is generally believed that the agencies would require mitigation to occur somewhere in San Diego Bay. Collectively, the mitigation capacity of the potential sites within San Diego Bay exceeds the project need, and implementation of restoration projects of a similar nature and geography has been adequately demonstrated for past projects. However, given the scale of the impact, other decision-making factors must be considered.

Compensatory eelgrass mitigation would occur by raising the bayfloor elevation to approximately -5 ft (-1.5 m) MLLW with dredged/fill materials, and planting eelgrass on the elevated plateau. Generally, these projects occur in conjunction with a dredging project that can provide material to create the mitigation habitat; however, in this case, it is uncertain if any material would be available. This would require that sufficient suitable material from a separate dredging project were available. Assuming the water depth ranges from -10 to -12 ft (-3.0 to -3.7 m) MLLW at the proposed mitigation site, and if the target depth for eelgrass restoration is -5 ft (-1.5 m), approximately 60,000 to 80,000 cubic yards (45,000 to 63,000 cubic meters) of sediment would be necessary. Another consideration/constraint is the ability to mitigate within the North Ecoregion. The three proposed locations in the North Ecoregion (i.e., NTC Channel, Harbor Island, adjacent to Convair Lagoon) could individually meet the mitigation requirements; however, in doing so, other constraints surface and include potential navigation hazards in areas that can experience heavy vessel traffic, as well as, jurisdictional and property ownership. While it may be possible to create smaller footprints distributed over a larger area within the North Ecoregion, navigational and jurisdictional concerns may still persist. In addition, construction of more numerous, smaller sites may also be more logistically challenging and costly. Therefore, it may be likely that eelgrass mitigation would occur in an adjacent ecoregion, where a variety of potential mitigation sites exist that may have fewer constraints. As noted in the introduction, consultation with regulatory and resource agencies would be required prior to pursuing a mitigation option.

For the Bay Fill and Offset Mitigation, the identified mitigation sites share similar characteristics for restoration. This includes removal and disposal or reuse of historic fills, grading the site to a desired hydrologic condition of channels, subtidal basins, and intertidal flats to support desired compensatory habitat, and planting pilot vegetation plots to allow for natural expansion of marshland vegetation. Similar to previous restoration designs, the created salt marsh habitats would include deeper main tidal channels and areas that provide soft bottom intertidal and shallow subtidal habitats for foraging waterbirds. The remainder of the area would be allowed to become salt marsh to provide greater structural diversity and enhanced habitat value. The recommended approach is to create a grade that is similar to that occurring in the restored D Street Fill marsh, which is dominated by mudflats and low to middle elevation coastal salt marsh. The site also supports some eelgrass within the deeper channels.

The proposed creation of habitat would be expected to provide habitat values that would be as productive or more productive than the intertidal and shallow subtidal habitats affected by the proposed project. Development of each mitigation site is expected to be completed within 4 to 6 months of field construction and restoration planting activities with the excavated material being hauled for disposal or reuse at various material placement sites. Grading would be restricted to a construction window outside of the nesting season for snowy plover and least terns for the D Street Fill, Salt Works, or Pond 20 sites. Similar restrictions may not occur for construction of the Grand Caribe, site. Another consideration is that the mitigation requirements could be met entirely at the SBPP, Salt Works, or Pond 20 sites, while the Grand Caribe and D Street Fill sites do not individually meet the mitigation requirements.

Table 3. Summary of Potential Mitigation Sites.

Mitigation Site	Locational Criteria	Mitigation Requirement	Available Acreage for Mitigation	Meet Entire Mitigation Requirement	Constraints/Considerations
Eelgrass Mitigation Sites					
NTC Channel	Same Ecoregion (North)	SCEMP Requirement 7.22 acres (2.92 ha)	>7.22 acres (2.92 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Potential navigational hazard if implemented Verify property ownership
Harbor Island	Same Ecoregion (North)		>7.22 acres (2.92 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Potential navigational hazard if implemented Verify property ownership
Adjacent to Convair Lagoon	Same Ecoregion (North)		>7.22 acres (2.92 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Potential navigational hazard if implemented Verify property ownership
A-8 Anchorage	Adjacent Ecoregion (South-Central)		65 acres (23 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Uncertain performance
South Bay Borrow Site	Adjacent Ecoregion (South)		7.5 acres (3.0 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Poor historical performance
South Bay Power Plant Channel	Adjacent Ecoregion (South)		13.5 acres (5.5 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Uncertain performance
Emory Cove Channel	Adjacent Ecoregion (South)		>7.22 acres (2.92 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Uncertain performance
South Bay Power Plant	Adjacent Ecoregion (South)		17.3 acres (7.0 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Uncertain performance
Bay Coverage and Fill Offset Mitigation Sites					
D Street Fill	Adjacent Ecoregion (South)	Open Water - 9.84 acres (3.98 ha) Coastal Salt Marsh - 0.44 acres (0.18 ha) Intertidal – 4.01 acres (1.63 ha) Shallow Subtidal – 4.49 acres (1.82 ha)	6.2 acres (2.5 ha)	No	Cannot meet entire mitigation requirement, therefore must combine with other location(s) Similar work has been performed on past occasions Coincides with NWR goals for the South San Diego Bay Unit of the San Diego NWR Construction limited to non-breeding season for birds
Grand Caribe	Adjacent Ecoregion (South)		6.5 acres (2.6 ha)	No	Cannot meet entire mitigation requirement, therefore must combine with other location(s) Project would be in an area already identified for use for wetland mitigation purposes Existing conceptual grading plans exist and partial sediment removal was already performed by Port in a borrow operation
South Bay Power Plant	Adjacent Ecoregion (South)		17.3 acres (7.0 ha)	Yes	Requires large quantity of suitable dredge/fill material to create habitat. Uncertain of source Construction limited to non-breeding season for birds Property ownership
Salt Works	Adjacent Ecoregion (South)		1,451 acres (587 ha)	Yes	Various conceptual plans already prepared Construction limited to non-breeding season for birds Property ownership
Pond 20	Adjacent Ecoregion (South)		92 acres (37 ha)	Yes	Easy restoration with potential for material reuse or disposal locally Construction limited to non-breeding season for birds Property ownership

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