Revised Analysis of Impacts to Public Trust Resources and Values (APTR) for the Broad Beach Restoration Project

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California State Lands Commission

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AB	Assembly Bill
ADTs	Average Daily Trips
AIS	Aquatic invasive species
AMM	Avoidance and Minimization Measure
APCD	Air Pollution Control District
APTR	Analysis of Impacts to Public Trust Resources and Values
AQMP	Air Quality Management Plan
ASBS	Areas of Special Biological Significance
ATE	Associated Transportation Engineers
ATU	Aerobic Treatment Units
avg	Average
B	Beneficial Effect
BBGHAD	Broad Beach Geologic Hazard Abatement District
BEACON	Beach Erosion Authority for Clean Oceans and Nourishment
BHMP	Beach Habitat Management Plan
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCA	Critical Coastal Area
CCAA	California Clean Air Act
CCC	California Coastal Commission
CCMP	California Coastal Management Program
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CF	Chlorofluorocarbon
CFC	Coastal Frontiers Corporation, Inc.
CFR	Code of Federal Regulations
CH_4	Methane
CINMS	Channel Islands National Marine Sanctuary
cm	centimeter
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Services
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2E	CO_2 equivalent
COP	California Ocean Plan
COTP	Captain of the Port
CRPR	California Rare Plant Rank
CSLC	California State Lands Commission
CSMW	Coastal Sediment Management Workgroup
CUP	Conditional Use Permit
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
cy	cubic yard(s)
cy/yr	cubic yards per year
CZMA	Coastal Zone Management Act
dB	decibel(s)
dBA	A-weighted decibel(s)
DDT	Dichlorodiphenyltrichloroethane
DIP	Ductile Iron Pipe
DoD	Department of Defense
DPM	Diesel particulate matter
DPR	Department of Parks and Recreation
DPS	Distinct Population Segment
DSL	Deep Scattering Layer
DWR	Department of Water Resources
EAP	Emergency Action Plan
EIR	Environmental Impact Report
ENSO	El Niño Southern Oscillation
EO	Executive Order
EPA	Environmental Protection Agency
ERL	Effects-Range Low
ERM	Effect-Range Median
ESA	Endangered Species Act
ESHA	Environmentally Sensitive Habitat Area
$F^{\underline{M}}$	Trancas Formation
FCAA	Federal Clean Air Act
FSAP	Final Sampling and Analysis Plan
FTA	Federal Transit Authority

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

GENESIS	Generalized Model for Simulating Shoreline Change
GHAD	Geologic Hazard Abatement District
GHG	Greenhouse Gas
gpd	gallons per day
GPS	Global Positioning System
GWP	Global warming potential
H_2S	Hydrogen sulfide
HFC	Hydrofluorocarbon
HIC	Chronic health index
HRA	Health Risk Assessment
↑I	Increased Intensity
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
JWPCP	Joint Water Pollution Control Plant
Ldn	Day-Night Average Noise Level
Leq	Equivalent Sound Level
LACDPW	Los Angeles County Department of Public Works
LAE	Lateral Access Easement
LARWQCB	Los Angeles Regional Water Quality Control Board
lb	pound
LCP	Local Coastal Program
LIP	Local Implementation Plan
LOS	Level of Service
LUP	Land Use Plan
LVMWD	Las Virgenes Municipal Water District
M_{MAX}	Maximum Magnitude Earthquake
M_W	Earthquake Momentum Magnitude
MARPOL	Marine Pollution
MBTA	Migratory Bird Treaty Act
MDP	Master Drainage Plan
MHHW	Mean Higher High Water
MHTL	Mean High Tide Line
Mi	Minor Adverse Effect
mi^2	Square miles
MICR	Maximum individual cancer risk
Mj	Major Adverse Effect
MLLW	Mean Lower Low Water
MLPA	Marine Life Protection Act
mm	Millimeter
mm/year	Millimeters per Year
MMA	Marine Managed Areas
MMPA	Marine Mammal Protection Act
MMT	Million metric ton
mph	miles per hour
MPO	Metropolitan Planning Organizations
MR	Maintenance Reach
MSL	Mean Sea Level
MT	Metric ton
N	Negligible Effect
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum - 1988
NCDC	National Climatic Data Center
NE	Noise Element
NGVD29	National Geodetic Vertical Datum - 1929
NISA	National Invasive Species Act
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NO; NO_x	Nitrogen Oxide; Nitrogen Oxides
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	National Response Corporation
NWCLA	Northwest Coastal Los Angeles
O_3	Ozone
OCS	Outer Continental Shelf
OEHHA	Office of Environmental Health Hazard Assessment
OFR	Office of the Federal Register
OHWM	Ordinary High Water Mark
OSPRA	Oil Spill Prevention and Response Act
OTD	Offer to Dedicate
OWTS	Onsite Wastewater Treatment System
PAAP	Public Access Action Plan
Pb	Lead
PCB	Polychlorinated biphenyl
PCE	Passenger car equivalents
PCH	Pacific Coast Highway
PM	Particulate Matter
PM_{10}	Particulate Matter Less Than 10 Microns in Diameter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Microns in Diameter

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
ROC	Reactive organic compound
ROG	Reactive organic gas
RSM	Regional Sediment Management
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SB	Senate Bill
SBCFD	Santa Barbara County Fire Department
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SCB	Southern California Bight
SCS	Sustainable Community Strategies
sf	Square feet
SFM	Single Family Medium
SHPO	State Historic Preservation Officer
SLR	Sea Level Rise
SMBWMA	Santa Monica Bay Watershed Management Area
SMCA	State Marine Conservation Area
SMR	State Marine Reserve
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxide
SPCCP	Spill Prevention Control and Countermeasure Plan
SR	State Route
SSC	Species of Special Concern
SVOC	Semi-Volatile Organic Compounds
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TPH	Total Petroleum Hydrocarbons
TPOA	Trancas Property Owners Association
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
V/C	Volume/Capacity
VOC	Volatile Organic Compound

GLOSSARY OF TERMS

anthropogenic -- Caused by humans.

armor size -- The size of boulders used in a revetment.

aromatic hydrocarbons -- Hydrocarbons with alternating double and single bonds between carbon atoms, many of which have strong, pungent aromas. Many aromatic hydrocarbons are toxic, and they are among the most widespread organic pollutants.

Avoidance and Minimization Measure (AMM) -- A measure intended to avoid or reduce the intensity of an identified impact.

backpassing -- The process of using heavy equipment to excavate sand from the downdrift "sand rich" area of a beach and transport it to the updrift eroding area of the beach.

bathymetry -- Undersea topography.

beach berm -- A nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action, or by means of mechanical deposition as part of a beach nourishment project.

beach nourishment -- process by which sediment (usually sand) lost through longshore drift or erosion is replaced from sources outside of the eroding beach.

benthic -- Relating to the bottom of a sea or lake or to the organisms that live there.

Best Management Practices (BMPs) -- Methods or techniques found to be the most effective and practical means in achieving an objective (such as preventing or minimizing pollution) while making the optimum use of resources.

candidate species -- Under the Federal Endangered Species Act candidate species are defined as plants and animals that have been studied proposed for addition to the Federal endangered and threatened species list by the U.S. Fish and Wildlife Service. Section 2068 of the California Fish and Game Code describes candidate species as native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that the commission has formally noticed as being under review by the department for addition to either the list of endangered species or the list of threatened species, or a species for which the commission has published a notice of proposed regulation to add the species to either list.

coastal access -- A location or area, including vertical access, lateral access, coastal bluff top trails, and upland trails that lead to the shore or traverse inland parklands within the coastal zone.

cultural resources -- The collective evidence of the past activities and accomplishments of people.

depth of closure (closure depth) -- The littoral cell offshore boundary at which no seasonal sand movement occurs whether offshore or onshore.

design water level -- The sea water level that is considered during coastal engineering design and analysis, the basis of which is provided by extreme still water level measurements combined with sea level rise projections.

dike -- A barrier constructed to contain the flow of water or to keep out the sea.

downdrift -- In the direction of the net longshore transport.

easement -- (1) an interest in land owned by another that entitles its holder to a specific limited use or enjoyment, such as right of passage and (2) an area of land covered by an easement.

El Niño Southern Oscillation (ENSO) -- Global-scale climatic variations which tend to occur at frequencies ranging from every 2 to 7 years. In California, these events elevate water levels, increase storm intensity, and generate larger waves from a more westerly direction.

endangered species -- As defined in Section 3 of the Federal Endangered Species Act The term “endangered species” means any species which is in danger of extinction throughout all or a significant portion of its range. Similarly under Section 2062 of the California Fish and Game Code an endangered species is defined as a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. For this Project, species listed as endangered under the federal Endangered Species Act or the California Endangered Species Act.

environmental justice -- The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations, and policies.

estuary -- A water passage where the tide meets a river current; an arm of the sea at the lower end of a river.

euphotic -- Of, relating to, or being the uppermost layer of a body of water that receives sufficient light for photosynthesis and the growth of green plants.

geotextile -- Any strong synthetic fabric used in civil engineering, as to retain an embankment.

infauna -- Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom.

intertidal -- Of denoting the area of seashore that is covered at high tide and uncovered at low tide. This area is part of the public trust in California.

intertidal zone -- Of, relating to, or being the part of the zone lying above the low-tide mark but below the high-tide line.

isobath -- A line on a map connecting points of equal underwater depth.

lagoon -- A shallow sound, channel, or pond near or communicating with a larger body of water.

land use -- Natural conditions or human-modified activities occurring at a particular location.

lateral access -- Coastal access along a beach.

Lateral Access Easement (LAE) -- All easements, deed restrictions, or other legal documents providing lateral public access to Broad Beach.

leach field -- Septic drain fields are used to remove contaminants and impurities from the liquid that emerges from the septic tank.

liquefaction -- A phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading.

littoral cell -- A littoral cell is a coastal compartment that contains a complete cycle of sedimentation including sources, transport paths, and sinks, generally bound by geographic features such as headlands or submarine canyons that limit the movement of sand between cells.

littoral drift -- See littoral transport.

littoral process -- The physical process, resulting from the interaction of winds, waves, currents, tides, sediments, and other phenomena, that moves sediment along the coastal region.

littoral transport -- The transport of sediments, i.e. mainly sand, along the shoreline due to the action of the breaking waves and the longshore current. The littoral transport is also called the longshore transport or littoral drift.

longshore transport -- See littoral transport.

mean high tide line (MHTL) -- Long-term average of shoreline position at high tide

mean lower low water (MLLW) -- Long-term average of shoreline position at lower low tide

non-point discharge -- Discharges of water and air pollution from diffuse sources.

onsite wastewater treatment systems (OWTS) -- Systems used for the treatment of sewage effluent, typically septic systems, but also includes other types of systems such as drywells and aerobic treatment units.

ordinary high water mark (OHWM) -- Generally measured at the mean high tide line, except where there has been fill or artificial accretions, or where the boundary has been fixed by agreement or court decision.

Pacific Decadal Oscillation (PDO) -- A pattern of long-term climate variability in the Pacific Ocean that shifts every 20 to 30 years and is described as being in either a warm or cool phase. The phases are associated with changes in sea surface temperatures north of 20° N in the Pacific Ocean that result in changes to the jet stream path and resulting weather patterns.

paleontological resources -- Fossilized remains of extinct plants and animals, and associated deposits.

point source discharge -- Any discernible confined and discrete conveyance including but not limited to a pipe, ditch, channel, or conduit from which pollutants are or may be discharged.

public access easement -- An easement used specifically for the right of public access.

public trust -- Trust created for the promotion of public welfare and not for the benefit of one or more individuals.

Public Trust Doctrine -- Public Trust Doctrine refers to a common law doctrine creating the legal right of the public to use certain lands and waters. The right may be concurrent with private ownership. The rights of the public are vested in each state as owner and trustee of Trust lands.

public trust lands -- Lands owned by the state and held in trust for the benefit of the public, including tidelands, submerged lands, and lands under navigable waterways.

revetment -- A revetment is a facing of stone, concrete units or slabs, etc., built to protect a scarp, the foot of a cliff or a dune, a dike or a seawall against erosion by wave action, storm surge and currents.

run-up -- The upper level reached by a wave on a beach, or coastal structure.

sand trap -- An obstruction to littoral transport that results in the accumulation of sediment, often constructed at harbors to prevent harbor entrance infilling.

seawall -- A structure separating land and water areas, designed to resist the full force of waves and storm surge in order to prevent coastal erosion and other damage.

sediment transport -- The movement of solid particles (sediment), typically due to a combination of the force of gravity acting on the sediment, and/or the movement of the fluid in which the sediment is entrained.

septic system -- An onsite waste water treatment system, usually comprising a septic tank which promotes the biological digestion of the waste, and a leach field which is designed to let the left over liquid soak into the ground.

Species of Special Concern (SSC) -- A species, subspecies, or distinct population of an animal native to California that meets the State's definition for threatened or endangered, or is in danger of becoming threatened or endangered, but has not been formally listed.

still water level -- Average water surface elevation at any instant, excluding local variation due to waves and wave set-up, but including the effects of tides and storm surges.

submarine canyon -- A steep-sided valley cut into the sea floor of the continental slope, sometimes extending well onto the continental shelf.

submerged lands -- Land extending from mean low water seaward out to 3 nautical miles offshore. In California, these are public trust lands.

subtidal -- Of, relating to, or being the part of the zone lying below the low-tide mark but still shallow and close to shore.

swell -- An ocean wave system not raised by the local wind blowing at the time of observation, but raised at some distance away due to wind blowing there, with long waves that have smoother and flatter wave crests than local wind-generated waves.

swell decay distance -- The distance over which a swell travels as the energy of the swell dissipates.

take -- To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

threatened species -- Section 3 of the Federal Endangered Species Act defines threatened species as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Similarly Section 2067 of the California Fish and Game Code describes threatened species as a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter. For the Project, species listed as threatened under the federal Endangered Species Act or California Endangered Species Act.

tide -- The periodic rise and fall in the level of the water in oceans and seas as a result of the gravitational attraction of the sun and moon.

tidelands -- Lands generally covered and uncovered by the daily rise and fall of the tide, lying between the mean high tide line and the mean low water. In California, these are public trust lands. Also knows as the intertidal zone.

training dike -- A longitudinal structure designed to change the flow direction of flood waters, debris flows or avalanches in order to protect a particular area.

turbidity -- The cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye.

updrift -- The direction which is opposite the prevailing movement of littoral transport.

upwelling -- An oceanographic phenomenon that involves wind-driven motion of dense, cooler, and usually nutrient-rich water towards the ocean surface, replacing the warmer, usually nutrient-depleted surface water.

vertical access -- Coastal access from an upland street, parking area, buff, or public park to the beach.

wave run-up -- The rush of water up a beach or coastal structure that is caused by or associated with wave-breaking.

EXECUTIVE SUMMARY

The purpose of this Revised Analysis of Impacts to Public Trust Resources and Values (Revised APTR)[1] is to provide information to the California State Lands Commission (CSLC) and its staff, regarding the potential impacts of the Broad Beach Restoration Project (Project), proposed by the Broad Beach Geologic Hazard Abatement District (BBGHAD), to public trust resources and values. The BBGHAD is seeking approval from the CSLC, through the issuance of a 20-year lease, for the portions of the proposed Project on state sovereign lands. Generally, the CSLC relies on an environmental review pursuant to the California Environmental Quality Act (CEQA; Pub. Resources Code, § 21000 et seq.) to assess a project's impacts to its lands and associated resources and uses. However, implementation of the Project by the BBGHAD is statutorily exempt from CEQA as an *"[i]mprovement caused to be undertaken … and all activities in furtherance thereof or in connection therewith, shall be deemed to be specific actions necessary to prevent or mitigate an emergency....*" (Pub. Resources Code, §§ 26601 & 21080, subd. (b)(4).) This statutory exemption precludes the CSLC from conducting a review under CEQA. **Therefore, this Revised APTR serves solely as an informational document to assist the CSLC in deciding whether to issue a lease for portions of the Project within its jurisdiction**

The Project includes: (1) restoration of approximately 46 acres of beach and sand dunes primarily overlying state sovereign land at Broad Beach, in the city of Malibu, Los Angeles County (Figure ES-1), using an estimated 600,000 cubic yards (cy) of sand hauled from commercial quarries in Ventura County, and (2) continued use of this sovereign land by limited portions of an existing, 4,100-foot-long, emergency rock revetment. The CSLC did not previously authorize this revetment, and the BBGHAD is also seeking approvals from other agencies for the revetment to remain in place.

The Broad Beach area lies within the Point Dume State Marine Conservation Area (SMCA), a Marine Protected Area (MPA) created pursuant to the Marine Life Protection Act (MLPA; Fish & G. Code, §§ 2850-2863; added by Stats. 1999, Ch. 1015, Sec. 1), which extends from Encinal Canyon in the north to Westward Beach in the south. This area is also adjacent to the Point Dume State Marine Reserve (SMR), which begins at Westward Beach, and continues around Point Dume to the west end of Paradise Cove (see Figure ES-2).[2]

[1] This Revised APTR replaces a Draft APTR released in October 2012.

[2] MPA means "a named, discrete geographic marine or estuarine area seaward of the mean high tide line or the mouth of a coastal river, including any area of intertidal or subtidal terrain, together with its overlying water and associated flora and fauna that has been designated by law, administrative action, or voter initiative to protect or conserve marine life and habitat. An MPA includes marine life reserves and other areas that allow for specified commercial and recreational activities … provided that these activities are consistent with the objectives of the area and the goals and guidelines of [the MLPA]…." (Fish & G. Code, § 2852, subd. (c).)

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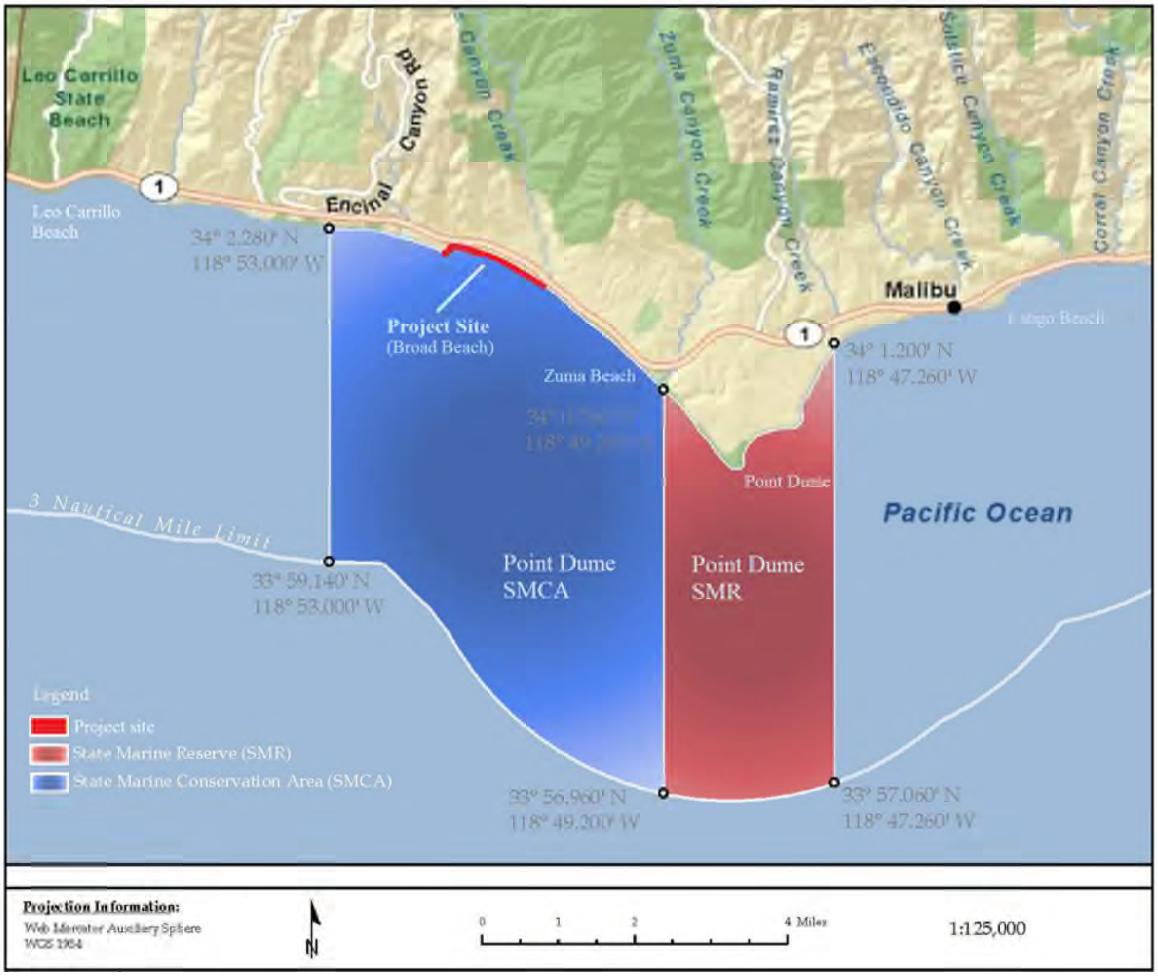
Regional Setting and Project Location

FIGURE ES-1

Figure ES-2. Marine Protected Areas in the Project Area



Source: Adapted from CDFW 2011.

As described in this Revised APTR, the BBGHAD's Project area encompasses all of the following three areas:

- **CSLC Lease Area:** state sovereign lands that the BBGHAD is seeking to lease, including numerous Lateral Access Easements (LAEs) held by the CSLC;
- **Public Trust Impact Area:** includes the CSLC Lease Area and the following adjacent areas: (1) offshore and down coast of Broad Beach; (2) Broad Beach Road; and (3) sections of the sand transport route for the Pacific coastline section of State Route 1 (Pacific Coast Highway [PCH]) to the Project site; [3]
- BBGHAD Inland Project Area: Project areas outside the Public Trust Impact Area and CSLC's jurisdiction, specifically three quarries in Ventura County and the sand transportation routes inland from the Pacific coastline section of PCH

[3] As a Trustee agency, the CSLC has a trust responsibility for projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public trust easement in navigable waters.

APTR PURPOSE AND SCOPE

This Revised APTR analyzes potential impacts of the Project against the existing environmental setting or baseline. To the extent possible, using available information, the Revised APTR also considers the existing setting prior to installation of sand bag revetments and the emergency rock revetment under emergency permits. In addition to examining adverse and beneficial effects of the Project on public trust lands and resources, the Revised APTR identifies avoidance and minimization measures (AMMs) to lessen impacts and maximize public benefits associated with the Project's use of state sovereign lands and describes Project alternatives that may lessen or eliminate adverse Project effects. The Revised APTR addresses affected resources within the BBGHAD Inland Project Area for qualitative informational purposes.

THE PUBLIC TRUST DOCTRINE AND PUBLIC TRUST LANDS

The origins of the Public Trust Doctrine are traceable to Roman law concepts of common property. Under Roman law, the air, the rivers, the sea, and the seashore were incapable of private ownership; because they were dedicated to the use of the public (Institutes of Justinian 2.1.1). Under English Common Law, this principle evolved into the Public Trust Doctrine whereby the sovereign held the navigable waterways and submerged lands as a trustee, for the benefit of the people. Upon admission to the Union in 1850, California, as a sovereign state, received title to public trust lands (i.e. the tide and submerged lands and navigable waterways) within its borders, in trust, for the benefit of the public. These lands are to be used to promote the public's interest in water dependent or water oriented activities. The Public Trust Doctrine and California's Constitution establish the right of the public to access and use public trust lands, as well as the public's right to fish on public trust lands (Cal. Const. Article X, Section 4; Cal. Const. Article I, Section 25).

The California Legislature has delegated to the CSLC exclusive control and jurisdiction over ungranted public trust lands. (Pub. Resources Code, §§ 6216, 6301). The CSLC also retains the remaining State authority over lands that have been legislatively granted in trust to other governmental agencies (Pub. Resources Code, § 6301). The CSLC implements the Public Trust Doctrine through careful consideration of its principles and the exercise of discretion within the specific context and location of proposed uses. In administering its trust responsibilities, the CSLC exercises its discretionary authority in the best interests of the State, accommodating the changing needs of the public while preserving the public's right to use public trust lands for the purposes to which they are uniquely suited. The California Department of Fish and Wildlife (CDFW), Department of Water Resources, and Department of Parks and Recreation also have responsibilities over certain public trust resources.

PROJECT HISTORY AND OBJECTIVES

High erosion rates during the 2009-2010 winter season and widespread failure of then-existing temporary emergency rock, sandbag and geotextile revetments led the Trancas Property Owners Association to apply to the city of Malibu and California Coastal Commission (CCC) for emergency coastal development permits (CDPs) to construct an emergency rock revetment.[4] At that time, the emergency rock revetment was accepted as the minimum action necessary and the least environmentally damaging alternative to implement the interim shore protection required for structural stability of Broad Beach homes, and to protect public health by preventing accidental releases of sewage effluent related to threatened septic system leach fields. Approximately 36,000 tons of rock were placed along Broad Beach adjacent to homes located between 30760 and 31346 Broad Beach Road. The existing emergency revetment is approximately 4,100-feet-long, rises approximately 12 to 15 feet above average low tide elevation (mean lower low water [MLLW]), is approximately 22- to 38-feet-wide at its base, and covers approximately 3.02 acres of beach. In 2011, the city of Malibu approved the BBGHAD's formation, and the BBGHAD submitted a lease application to the CSLC for the proposed Project. The BBGHAD's Project objectives are as follows:

- Protect existing homes, structures, and other improvements – including septic systems – from ongoing coastal erosion along Broad Beach;
- Create and maintain a wide sandy beach backed by a restored dune system similar to that which historically occurred along this reach of coastline;
- Provide for enhanced public access along Broad Beach while maintaining homeowner beach access and privacy through establishment of consistent lateral access along the beach; and
- Restore and enhance native dune habitats along Broad Beach and add sandy intertidal habitat to support native fauna (e.g., grunion, shorebirds).

PROJECT DESCRIPTION

Components of the BBGHAD's proposed Project include (see Table ES-1):

- Permitting of the as-built 2010 emergency rock revetment and any associated storm drain improvements within and through the revetment and to the beach for a 20-year period (this includes the use of unpermitted rock material deposited at the west end of Broad Beach in 1997-1998 pursuant to emergency CDPs, and subsequently reused as part of the 2010 as-built emergency rock revetment);

[4] Between 1997 and 1998, rock was deposited at six properties along Broad Beach Road under emergency CDPs. Several thousand feet of sand bag or geotextile revetments were also later installed by individual homeowners. The rock was relocated and used as part of the 2010 emergency revetment, and many of the sand bag and geotextile revetments were covered by the emergency revetment.

Table ES-1. Broad Beach Restoration Project By the Numbers (Proposed Project)

Project Setting	
Beach length (from Lechuza Point to Trancas Creek Lagoon)	~6,200 feet
Estimated volume of sand lost from Broad Beach: 1974-2009	600,000 cy
Current sand loss rate at Broad Beach	35,000-45,000 cy/yr
Number of lots bordering Broad Beach	121
Number of residences bordering Broad Beach	109
Number of residences located landward of existing revetment	76
Number of Lateral Access Easements (LAEs) on Broad Beach that provide lateral (parallel to shore) public access	51
Number of vertical public access ways (from street to Broad Beach)	2
Existing Temporary Emergency Rock Revetment Data	
Number of acres of beach covered by revetment	~3.02 acres
Length	4,100 feet
Width	22-38 feet
Height (average above MLLW where revetment exists)	12-15 feet
Volume of boulders used to build revetment[1]	36,000 tons
Acres of public trust lands under CSLC jurisdiction covered by revetment[2]	0.86 acre
Acres of LAEs covered or impacted by revetment[2]	0.73-1.04 acre
Estimated Project Size and Acreage	
Total area of beach and sand dunes proposed for restoration	46 acres
Total volume of sand: initial restoration work	600,000 cy
Total volume of sand: supplementary renourishment (after ~10 years)	450,000 cy
Volume of sand periodically backpassed per annual event	25,000-35,000 cy
Width of restored dry sandy post-construction beach	85-230 feet
Width of restored post-construction sand dune	40-60 feet
Height of restored post-construction sand dune	17-22 feet
Area required for staging: Zuma Beach Parking Lot	1.4-1.9 acres
Area required for sand stockpile: Zuma Beach (along 1,000 feet of beach)	5 acres
Estimated Project Timing (Beach Nourishment and Dune Construction Elements)	
Project life (after initial restoration and supplementary renourishment)	20+/- years
Interval between initial restoration and supplementary renourishment	10+/- years
Project duration • Beach nourishment and dune construction • Sand movement and placement into proposed location/dimensions • Planting, fencing, signage, and irrigation placement in dune systems	8 months (total) 6 months 1 month 1 month
Construction Staging and Sand Transport Information: Initial Nourishment Project	
Duration of hauling of inland quarry material to Broad Beach	5 months
Number of truck trips required between inland quarries and Broad Beach, estimating 840 trips (420 inbound and 420 outbound) per day	43,000
Distance between quarry sand sources and Project site: ....over land Distance between quarry sand sources and Project site: ....by road	20-25 miles 40-45 miles

Abbreviations used: cy = cubic yards; MLLW = Mean Lower Low Water; yr = year.

[1] Larger (> 2-ton) boulders are located at the revetment's west end (due to increased erosion hazard).

[2] Based on Mean High Tide Line (MHTL) survey conducted in January 2010.

- Permitting of the as-built sand bag and geotextile revetments that were either unpermitted or installed under emergency conditions in 2008-2009 and used as temporary shoreline protection devices (many of which are now wholly or partially buried under rock revetment) for a 20-year period;
- Removal of exposed sand bags and Sakrete debris from the beach prior to nourishment, as well as existing informal unpermitted stairways that cross the rock revetment from various private residences to the beach;
- Import of approximately 600,000 cy of sand that would be trucked along 40 to 45 miles of roads from the Simi Valley region in Ventura County (northwest of the Project area) to Zuma Beach Parking Lot 12 via approximately 43,000 heavy haul truck trips (trucking of sand to Zuma Beach would be conducted in accordance with a Transportation Management Plan that identifies the maximum or average number of trucks allowable per day, and their allowable routes, schedule, speed restrictions, and duration);
- Deposition of delivered sand within a 1.4- to 1.9-acre staging area on Zuma Beach that fronts the western 1,000 feet of the western Zuma Beach parking lots;
- Use of heavy equipment (e.g., scrapers, large 40-ton/30-cy capacity off-road trucks, and bulldozers) to distribute sand to desired locations and depths, including covering the existing rock and sand bag revetments and creating a restored sandy beach and dune system;
- Deposition of sand to a depth of roughly 12 to 17 feet in areas seaward of the revetment to create an initial post-construction dry sandy beach of 85 to 230 feet wide seaward of the dunes;
- Development, construction, and maintenance of a system of sand dunes roughly 40 to 60 feet in width and 17 to 22 feet in height, with restored native southern foredune habitat, crossed by 112 access pathways from 109 private residences, the beach club, and two public access points;
- Removal of non-native vegetation from dune areas and planting of native vegetation with the created sand dunes consistent with applicable CCC and city of Malibu standards for dune habitat restoration areas;
- Ongoing monitoring of Project performance, including beach width measurements, changes in local or regional sediment supply, general effects on beaches down coast, establishment of dune vegetation, and performance of the revetment (if exposed);
- Maintenance of beach width using heavy-duty scrapers and other equipment to backpass sand from the wider eastern downdrift reach of Broad Beach to narrower updrift areas to the west, in accordance with objective guidelines, to occur annually as needed;

- Ongoing coordination with the CSLC and CCC regarding monitoring results and required actions, such as potential for more frequent backpassing and future major renourishment;
- One major beach renourishment event with approximately 450,000 cy of sand occurring approximately 10 years after completion of initial nourishment. Renourishment would begin in accordance with objective triggers based on monitoring of beach erosion and width; and
- Receipt of permits to allow installation of up to 550 feet of emergency sand bag or geotextile revetments at Broad Beach's east end and in the 100-foot gap in the revetment.

After every backpassing or major beach nourishment event, the constructed beach would remain subject to ongoing natural wave and littoral transport processes and resulting redistribution of sand. As a result, initially constructed beach profiles would evolve and change until the constructed beach reaches a natural equilibrium consistent with ongoing coastal processes.

Sand Sources

The Project would include the initial deposition of 600,000 cy of sand on Broad Beach. This sand would be excavated from one or more of three privately owned quarries located inland in Ventura County—CEMEX, Grimes Rock, and P.W. Gillibrand—and trucked to Broad Beach. These quarries are located in the Moorpark/Simi area of Simi Valley and are approximately 40 to 45 miles away from Broad Beach. The full quantity of sand required for initial Project beach nourishment (i.e., 600,000 cy) is available from CEMEX and Grimes Rock quarries. The P.W. Gillibrand Quarry can supplement the Project if the other quarries cannot meet the capacity needed to serve the Project. All three quarries and associated trucking operations are fully permitted by Ventura County.

Beach and Dune Design and Dune Habitat Restoration

Of the 600,000 cy of sand proposed for deposition onto Broad Beach, approximately 500,000 cy would be used to construct the beach while the remaining 100,000 cy would be used to construct the dune system. The total area of new dunes, beach berm, and beach face would cover up to 46 acres, 40.5 acres of which would be located on public trust lands administered by the CSLC while the remaining 5.5 acres would be located on private land. The new post-construction dry sand beach berm is projected to extend seaward of the dunes by 90 to 230 feet, with the beach narrower at the west end and wider in the central and eastern sections.[5] Beach widths in Lechuza Cove would be as narrow as 90 feet while the entire area east of 31330 Broad Beach Road would be at least 200 feet wide. The profile of the new dry sand beach berm would be roughly 12

[5] Beach widths and sand depth assume the MHTL is at an elevation of 5 feet above MLLW.

feet above MLLW in most areas, while the beach profile at the west end (i.e., west of 31412 Broad Beach Road) would be between 14 and 17 feet above MLLW.

The dune system would be roughly 50 feet wide along most of Broad Beach. The dunes would rise up to 17 to 22 feet above MLLW, depending on location. The height of the proposed sand dunes would be typical of the existing dunes at the east end of the Project, which are approximately 20 feet higher than MLLW, which is the average low tide line during spring tides. The top of the existing emergency rock revetment would be buried beneath a minimum of 2 feet of sand. The dune system would be primarily constructed over and behind the existing emergency rock revetment. At the east end where no revetment is present, the dunes would be constructed on private land and LAEs landward of the MHTL. At the west end where there is no revetment, the dunes would be located primarily on public trust lands, since no dry sand beach remains along this section. As proposed, the Project includes roughly one footpath across the constructed dune system for each property along Broad Beach (approximately 109 private paths or approximately every 35 feet), one path adjacent to the Malibu West Beach Club, and two trails provided to incorporate existing public access points.

The Project would include measures to restore native coastal dune habitats through planting of appropriate native species typical of southern foredune and southern coastal scrub plant communities. Native habitat restoration would include planting species such as beach verbena, dune primrose, and other characteristic species found in this community. To increase foredune stability, targets for plant cover would be set between 30 and 60 percent, with most dunes achieving 40 percent cover. As proposed, the Applicant would assume responsibility for the construction, planting, and maintenance of the restored dune system (BBGHAD Resolution No. 2012/06). Signs would be posted to demarcate sensitive dune habitats (e.g., "Habitat Area: Please Remain Seaward of Dunes on Sandy Beach"), and no public access would be permitted on the dunes. Further, protocols would be implemented for long-term maintenance of restored habitats, including initial irrigation plans, ongoing invasive species/weed control and maintenance of signs and access control measures.

Future Beach Management Events

Future beach management events include backpassing, expected to occur annually, and a single renourishment event. The timing of these events would be determined based on the performance of the initial nourishment project and the effect of coastal erosion on sand loss at the beach, as measured by the Applicant’s engineers via long-term beach profile monitoring. The goal of this monitoring would be to identify the need to initiate backpassing or a major renourishment episode to offset coastal erosion, and the results of the monitoring program would be used to determine when conditions would trigger the need for a beach management event.

Backpassing. During backpassing, heavy equipment (i.e., scrapers, bulldozers) would excavate sand from the downdrift “sand rich” end of Broad Beach and transport the sand back to the eroding updrift end of Broad Beach (anticipated to be the eastern and western reaches, respectively). The BBGHAD anticipates that backpassing would extend the practical lifetime of this beach nourishment project by recycling sand back within the littoral cell, thereby delaying the need for major beach renourishment, and it proposes to backpass annually, in between nourishment events, for the Project life. Each backpassing event would occur over up to 3 weeks and would involve moving approximately 25,000 to 35,000 cy of sand from the eastern reaches of Broad Beach to the western reaches by Lechuza Point. This would “replace” or move back up coast a portion of the 35,000 to 45,000 cy of sand estimated to be lost from Broad Beach each year. Annual backpassing activities, including borrow area, available volume, extent of backpassing area, and depth of sandy beach cut, would vary depending on the availability of sand and the location of the backpassing borrow and deposition areas.

Renourishment. Given that the current sand loss rate in the Broad Beach area averages 35,000 to 45,000 cy per year, the Project includes one renourishment event. Based on available information at this time, this is anticipated to involve placement of an additional 450,000 cy in approximately 10 years, similar to the original nourishment event. This would be smaller than the initial nourishment event as it is presumed that the 100,000 cy of sand in the new dune system would remain intact, and a certain amount of sand would remain on the beach. The actual timing for when renourishment would occur is unknown and would be determined via monitoring; however, the Applicant’s proposal provides that at least 10 years have passed since the initial nourishment event.

ALTERNATIVES TO THE PROJECT

The Revised APTR also analyzes a range of potential alternatives to the Project with the goal of avoiding or minimizing adverse effects to public trust resources while meeting basic Project objectives. Alternatives to the Project include changes in the location, type and design of coastal protection structure (e.g., relocated or reinforced revetment, seawall construction); removal or shortening of the revetment; and differing approaches to the extent and frequency of beach nourishment and dune construction. Each of these alternatives are analyzed for potential adverse effects on public trust resources, and then compared to the adverse effects associated with the Project. The nine alternatives that are analyzed in this document include:

Alternative 1	Relocation of Improved Revetment Landward of January 2010 Mean High Tide Line (MHTL) with Beach Nourishment and Dune Restoration
Alternative 2	Relocation of Improved Revetment Landward of Lateral Access Easements with Beach Nourishment and Dune Restoration
Alternative 3	Maximum Pull-back of Seawall with Beach Nourishment and Dune Restoration

Alternative 4	Reduced Beach Nourishment Volume and Dune Restoration with Revetment in Current Location
Alternative 5	Beach Nourishment and Dune Restoration with No Shore Protection Structure
Alternative 6	Relocation of Improved Revetment along Upgraded Leach Fields with Beach Nourishment and Dune Restoration
Alternative 7	Removal of Existing Emergency Revetment on the Eastern End of Broad Beach with Beach Nourishment and Restoration
Alternative 8	No Beach Nourishment at West Broad Beach with Revetment at Current Location
Alternative 9	Reduced and Phased Beach Nourishment at West Broad Beach with Existing Revetment

These alternatives are intended to providing a range of options that would feasibly attain most of the basic objectives of the Project, thereby allowing the CLSC, other decision-makers, and interested parties to weigh the benefits with potential adverse effects for each of the alternatives while making a determination about Project approval.

UNRESOLVED ISSUES OR KNOWN AREAS OF POTENTIAL CONTROVERSY

Direct burial impacts to rocky intertidal and subtidal marine habitats at the west end of Broad Beach is of great concern to numerous agencies, particularly as this area lies within and adjacent to the Point Dume SMCA and Point Dume SMR (see Figure ES-2). Although access to these MPAs during the Project would remain open for scuba diving, boating and other recreational activities, the take of all living marine resources within this area is prohibited.[6] This area is described as “rare and vitally important habitat” and was one of the MLPA Science Advisory Teams top preservation priorities. Additional potential issues of public concern or controversy are identified below.

- Location of the fluctuating MHTL; and the location of the Ordinary High Water Mark (OHWM) being the natural MHTL, prior to fill or artificial accretions, and the fixed boundary between public trust lands and private uplands;
- Approval of a lease for the existing, but not previously CSLC-authorized emergency rock revetment;
- Public lateral and vertical access and potential encroachments and restrictions on such access;
- Potential impacts to Trancas Creek Lagoon, sensitive sand dune species, and Environmentally Sensitive Habitat Areas (ESHAs);
- Lack of a comprehensive dune restoration plan with a feasible schedule and reasonably attainable success criteria;

[6] Take pursuant to beach nourishment and other sediment management activities is allowed inside the SMCA pursuant to any required federal, state and local permits, or as otherwise authorized by the CDFW (see https://www.dfg.ca.gov/marine/mpa/scmpas_list.asp, under Point Dume SMCA, accessed July 2014).

- Continued use of Onsite Wastewater Treatment Systems (OWTS) for treatment and disposal of septic effluent in the dunes landward of Broad Beach, instead of transitioning to sewage treatment through a wastewater treatment plant; and
- Trucking of sand from quarries via 43,000 truck trips for the initial nourishment and 32,000 truck trips for the renourishment.

Several issues and details remain unresolved in the Applicant's Project. Review of historic sand loss rates at Broad Beach indicate that the initial nourishment event, not considering backpassing, would result in retention of a relatively wide beach for 8 to 10 years after Project completion. However, computer modeling of sand loss conducted for the Project indicates that the beach could narrow to present conditions, at least at the west end, within 3 years. This unknown erosion rate makes it difficult to predict exactly how much time would pass before the beach exhibits the physical triggers indicating the need for follow-up nourishment. The BBGHAD has committed to one renourishment, and if the beach were to erode at the highest projected rate, the effective lifespan of the restored beach could be only 6 years (i.e., 3 years after initial nourishment plus 3 years after renourishment). In contrast, if historic rates of erosion occur the renourished beach could endure for 10 to 20 or more years. When considering that backpassing may prolong beach life by roughly an additional 6 to 8 years, the total Project life could extend up to approximately 22 to 28 years under this scenario.

A long-term commitment for maintenance of funding for the Project is also unidentified at this time. The BBGHAD has committed to the initial nourishment event, one major renourishment event, annual or biannual backpassing of sand, and sand dune habitat maintenance. However, natural processes would continue to affect the beach, with the beach and dunes predicted to erode within a rough time frame of 10 to 20 years. While the BBGHAD has indicated that additional nourishment *may* occur in the future, no firm commitment yet exists beyond the BBGHAD's initial commitment for one additional nourishment event 10 years after the initial beach renourishment.

Large-scale dune restoration as proposed for the Project is a complex process; in order to succeed, it requires expertise, funding, and ongoing maintenance, including weed removal and remedial planting, long after the initial restoration activities. The success of the proposed dune restoration may also be adversely impacted by habitat fragmentation, such as from the creation of multiple private access footpaths within the restored dune habitat area. The Revised APTR includes a measure to prepare a conceptual dune restoration plan subject to review and approval by CSLC, CCC, CDFW, and city of Malibu. The Plan would outline the goals and objectives of dune restoration, identify the minimum requirements and scope for dune restoration activities, and include provisions for private beach access with walkways spaced not less than 300 feet apart (approximately every six houses) to facilitate the joint goals of continued beach access and the creation of a viable and sustained restored dune system.

Table ES-2. Summary of Environmental Impacts for the Project

Impact Class:
Mj = Major adverse effect that would remain major and adverse even with the application of Avoidance and Minimization Measures (AMMs)
Mi = Minor adverse effect with implementation of AMMs
B = Beneficial impact
N = Negligible effect
↑I = No effect on public trust resources and values; however, increase in intensity of use or effect associated with a specific issue area

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Section 3.1 Coastal Processes, Sea Level Rise, and Geological Resources		
Impact CP/GEO-1: Structural Stability of the Rock and proposed Sand Bag Revetments The rock revetment is subject to remobilization of boulders along with settling from liquefaction events, and proposed sand bags are subject to collapse, reducing long-term protection of onsite wastewater treatment systems (OWTS) from sea level rise (SLR), and wave action.	Mj	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan
Impact CP/GEO-2: Impact of Coastal Processes on Emergency and Sand Bag Revetments Over the long-term, after cessation of nourishment and erosion of the beach, substandard construction of the revetment would provide inadequate protection from coastal processes for septic systems, leach fields and homes.	Mj	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan
Impact CP/GEO-3: Protection of Public Trust Resources, Septic Systems, and Homes from Coastal Processes and Shoreline Erosion Beach nourishment and dune creation would provide short- to mid-term beneficial effect (10 to 20+ years) through protection of public trust resources and private property from coastal erosion.	B	No AMMs recommended
Impact CP/GEO-4: Sand Size and Angularity Compatibility of Inland Sand Sources with Existing Sand on Broad Beach Quarry sand being used as beach fill on Broad Beach is similar to existing sand on Broad Beach in size composition, color, and particle angularity.	N	No AMMs recommended
Impact CP/GEO-5: Impacts of Beach Nourishment and Dune Creation on Coastal Processes Nourishment of the beach would have insignificant effects on wave height, wave direction, tides and currents.	N	No AMMs recommended

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Impact CP/GEO-6: Impacts of Beach Nourishment and Dune Creation on Wave Run-Up Nourishment of the beach would have beneficial effects on wave run-up.	B	No AMMs recommended
Impact CP/GEO-7: Change in Sediment Transport to Down Coast Beaches Nourishment of Broad Beach will increase down shore sediment transport to Zuma Beach, Westward Beach, Point Dume, and other down coast beaches in the Public Trust Impact Area.	B	No AMMs recommended
Impact CP/GEO-8: Impacts of Sea Level Rise Sea level rise would incrementally contribute to erosion of the proposed new beach over the 10 to 20 year Project life span.	N	No AMMs recommended
Section 3.2 Recreation and Public Access		
Impact REC-1: Initial Project Construction and Renourishment Effects on Coastal Access and Recreation Short-term construction would interfere with recreational use and coastal access on public trust lands.	Mi	**AMM REC-1:** Public Access during Construction and Renourishment
Impact REC-2: Backpassing Impacts to Recreational Users Backpassing would interfere with recreational use and access on public lands.	Mi	**AMM REC-2:** Public Access during Backpassing
Impact REC-3: Medium- and Short-Term Effects to Recreational Use Project construction and maintenance of a widened beach and restored dune system would enhance public recreation opportunities through provision of a wide sandy beach berm and increased lateral access.	B	**AMM REC-3:** Beach Profile Reporting
Impact REC-4: Long-Term Effects to Recreational Use Exposure of the revetment though coastal erosion after cessation of beach nourishment would adversely affect recreational beach use and access by blocking public access to public trust lands and LAEs.	Mi	**AMM REC-4a:** Requirement of Additional Nourishment **AMM REC-4b:** Sea Level Rise Effects

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Section 3.3 Marine Biological Resources		
Impact MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms Installation of sand bag and rock revetments from 2008 to 2010 resulted in loss of intertidal habitat and disturbance and mortality of intertidal species.	Mi	**AMM TBIO-3a:** Biologist and Biological Monitors for Backpassing Activities **AMM TBIO-3b:** Avoidance of Sensitive Resource Zones and Vegetation **AMM TBIO-3c:** Sensitive Biological Resources Report **AMM REC-4a:** Requirement of Additional Nourishment
Impact MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms Sand placement from Project construction and one renourishment event would result in direct and indirect burial as well as disturbance of sensitive rocky intertidal habitats within Lechuza Cove.	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation
Impact MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive sandy intertidal habitats along Broad Beach.	Mi	**AMM MB-3:** Monitoring for Grunion **AMM MB-5a** Backpassing Management Plan
Impact MB-4: Sand Placement Impacts to Subtidal Habitats and Organisms Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive subtidal habitats offshore of Broad Beach.	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB 2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts
Impact MB-5: Backpassing Impacts to Marine Resources Annual or biannual backpassing would prolong disturbance of both rocky and sandy intertidal habitats impacting intertidal species diversity and abundance.	Mi	**AMM MB-5a:** Backpassing Management Plan **AMM MB-5b:** Annual Backpassing Plans **AMM MB-5c:** Beach Habitat Management Plan **AMM MB-3:** Monitoring for Grunion
Impact MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release The increased vehicle traffic and equipment use associated with the Project would result in an increased risk of oil or fuel release as a consequence of onshore spillage.	Mi	**AMM TBIO-4a:** Emergency Action Plan Measures Regarding Protection of Biological Resources

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Impact MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources The deposition of sand supply on Broad Beach would contribute additional sand sources to down coast intertidal habitat through longshore transport within the Santa Monica Littoral Cell.	N	No AMMs recommended
Impact MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies Project impacts to ESHAs, relative to public access and use of public trust lands, would potentially conflict with the California Coastal Act policies.	Mj	**AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation **AMM MB-3:** Monitoring for Grunion **AMM MB-5a:** Backpassing Management Plan **AMM MB-5c:** Beach Habitat Management Plan
Section 3.4 Terrestrial Biological Resources		
Impact TBIO-1: Impacts to Terrestrial Biological Resources Resulting from the Installation of Sand Bag and Rock Revetments Past installation of sand bag and rock revetments resulted in direct adverse impacts to dune habitat, considered an environmentally sensitive habitat area (ESHA) under the Malibu Local Coastal Program (LCP), as well as to sensitive species such as the globose dune beetle.	Mj	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM TBIO-1b:** If Applicable, Conform with California Coastal Commission (CCC) Coastal Development Permit for Off-Site Mitigation of ESHA
Impact TBIO-2: Short-Term Project-Generated Construction Impacts to Terrestrial Biological Resources Construction activities associated with proposed beach nourishment and dune creation may adversely impact existing sandy beach and foredune habitats and biological resources, as well as the Trancas Lagoon.	Mj	**AMM TBIO-2a:** California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Construction Activities **AMM TBIO-2b:** Sensitive Resources Impact Avoidance **AMM TBIO-2c:** Protect Stockpiles of Excavated Material **AMM TBIO-2d:** Storage of Materials or Heavy Equipment Prohibited Outside of Staging Area
Impact TBIO-3: Long-term Construction Impacts of Backpassing to Terrestrial Biological Resources Future beach maintenance using backpassing may impact existing environmentally sensitive habitat areas (ESHAs) and/or created sensitive habitat areas, including sandy beach and foredune habitats, as well as Trancas Lagoon.	Mi	**AMM TBIO-3a:** Biologist and Biological Monitors for Backpassing Activities **AMM TBIO-3c:** Sensitive Biological Resources Report **AMM TBIO-2a:** CSLC-Approved Biologist and Biological Monitors for Construction Activities **AMM TBIO-2b:** Sensitive Resources Impact Avoidance

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Impact TBIO-4: Hazardous Spill Impacts to Beach, Coastal Dunes, and Coastal Wetland Biological Resources An accidental hazardous spill and subsequent cleanup efforts would potentially result in take of special-status species, the loss or degradation of functional habitat values, or cause a substantial loss of a population or habitat of native fish, wildlife, or vegetation.	Mj	**AMM TBIO-4a:** Emergency Action Plan Measures Regarding Protection of Biological Resources **AMM TBIO-4b:** Maintain Equipment and Adhere to Work Plan
Impact TBIO-5: Longshore Sand Transport and Down Coast Impacts to Terrestrial Biological Resources Nourishment of Broad Beach with 600,000 cubic yards of beach sand would increase sand supply available for longshore transport down coast, potentially altering the hydrology of the Trancas Lagoon and the Zuma Wetlands ESHAs by widening the beach berm, but also increasing sand supply to beach and dune habitats down coast.	Mi	**AMM TBIO-5a:** Maintain the Hydrology of Trancas Lagoon **AMM TBIO-5b:** Coordination of Backpassing and Berm Breaching
Impact TBIO-6: Impacts to Terrestrial Biological Resources Resulting From Dune Restoration The proposed dune restoration would result in potential short- to mid-term beneficial effects through enhancement of dune habitat values, as well as potentially increase populations of special-status wildlife or plant species.	B	No AMMs recommended
Impact TBIO-7: Impacts to Terrestrial Biological Resources Resulting from Increased Private and Public Access The proposed beach nourishment, including the dune habitat restoration, would occur adjacent to existing private residences. Private and public access ways to Broad Beach would interrupt the continuity of undisturbed dune habitat and may ultimately decrease the functional value of the restored dune system or result in an increase in incidental take, disturbance, and/or harassment of sensitive species.	Mi	**AMM TBIO-7:** Restrict Access Across the Newly Restored Dune System **AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan
Impact TBIO-8: Long-term Degradation and Erosion of Newly Created Dune Habitat Following cessation of the additional renourishment event and backpassing, newly restored dune habitat would gradually erode, eventually exposing the revetment and likely leading to a return to emergency measures for protection of property not protected by the revetment or impacted by the degradation of the revetment.	Mi	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM TBIO-7:** Restrict Access Across the Newly Restored Dune System **AMM REC-5a:** Requirement of Additional Nourishment

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Section 3.5 Marine Water Quality		
Impact MWQ-1: Project Implementation Impacts due to Turbidity or Other Impairment of Area Waters Project construction and nourishment/renourishment activities may increase turbidity in, or result in a violation of other water quality standards for, nearshore waters.	Mi	**AMM MWQ-1a:** Prepare and Implement Turbidity Monitoring Plan **AMM MWQ-1b:** Prepare Pollution Prevention Plan and Implement Best Management Practices (BMPs) **AMM MB-2a:** Sand Placement Footprint Limitation **AMM HAZ-2a:** Develop Hazardous Material Spill Prevention Control and Countermeasure Plan
Impact MWQ-2: Beach Nourishment and Backpassing Impacts to Trancas Lagoon Beach nourishment and construction activities would occur near the mouth of Trancas Creek potentially affecting tidal exchange and the natural functioning of Trancas Lagoon.	Mi	**AMM MWQ-2a:** Construction Limitations **AMM TBIO-5a:** Maintain the Hydrology of Trancas Creek Lagoon
Impact MWQ-3: Revetment Retention Impacts Associated with Nutrient Loading of Area Waters Retention of the revetment would protect Onsite Wastewater Treatment Systems (OWTSs) from wave action and reduce or eliminate contact between marine water and untreated sewage effluent.	B	No AMMs recommended
Impact MWQ-4: Beach Sand Contaminant Resuspension and New Sand Chemical Compatibility Initial and Follow-up Nourishment Events, including annual backpassing, would suspend or resuspend contaminants, particularly if onshore quarry sand sources contain contaminants.	N	No AMMs recommended
Section 3.6 Scenic Resources		
Impact SR-1: Visual Effects from the Presence of the Emergency Revetment The emergency revetment impacts the visual quality of Broad Beach.	Mi	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM REC-4a:** Requirement of Additional Nourishment **AMM REC-4b:** Requirement to Analyze Sea Level Rise Effects

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Impact SR-2: Short-Term Visual Effects from Beach Restoration Construction Activities at Broad Beach and Zuma Beach Construction activities would create temporary negative visual impacts during dune restoration, nourishment events, and backpassing events.	Mi	**AMM SR-2a:** Shielded Lights during Night Operations **AMM SR-2b:** Nightly Equipment Removal
Impact SR-3: Visual Effects from the Nourishment of Broad Beach Nourishment of Broad Beach would improve the visual quality of Broad Beach over the short- to mid-term.	B	No AMMs recommended
Impact SR-4: Visual Effects from 43,000 Truck Trips along Pacific Coast Highway Transport activities could create temporary negative visual impacts associated with a high volume of large trucks traversing Pacific Coast Highway during the initial construction phase.	N	No AMMs recommended
Impact SR-5: Visual Effects from the Addition of Sand to the Local Littoral Cell Nourishment of Broad Beach would add sand to the Santa Monica Littoral Cell, which would increase the sand budget of several other beaches down the coast, thus potentially improving their visual qualities.	B	No AMMs recommended
Section 3.7.1 Air Quality		
Impact AQ-1: Construction and Transportation Impacts on Air Quality Construction activities would generate emissions that exceed South Coast Air Quality Management District thresholds, while emissions from Haul Trucks would exceed Ventura County Air Pollution Control District thresholds.	Mj	**AMM AQ-1a:** South Coast Air Quality Management District (SCAQMD) Compliance **AMM AQ-1b**: Ventura County Air Pollution Control District (VCAPCD) Compliance **AMM AQ-1c:** Nitrogen Oxides (NOx), Volatile Organic Compounds (VOCs), and Particulate Matter (PM) Control **AMM AQ-1d:** Fugitive Dust Emission Control
Impact AQ-2: Construction Impact of Greenhouse Gas (GHG) Emissions Potential beach enhancement activities would increase GHG emissions.	N	No AMMs recommended
Impact AQ-3: Construction Toxic Pollutant Emissions and Potential Health Risks Construction activities would generate emissions of toxic air contaminants that would potentially impact human health.	Mi	**AMM AQ-3:** Diesel Particulate Emission Controls **AMM AQ-1c:** NO_x/VOC/PM Emission Controls **AMM AQ-1d:** Fugitive Dust Emission Controls

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Section 3.7.2 Traffic and Parking		
Impact TR-1: Construction-Generated Impacts in the Vicinity of Broad Beach Traffic along Pacific Coast Highway generated from construction activities would have a short-term, unsubstantial impact on public use of roadways to access the shoreline.	Mi	**AMM TR-1:** Traffic Management Plan
Impact TR-2: Increased Parking Demand along Broad Beach Road A wider dry sandy beach at Broad Beach following renourishment may attract more users which would increase parking demand on Broad Beach Road.	N	No AMMs recommended
Impact TR-3: Increased Safety Risk in the Vicinity of Broad Beach 43,000 truck trips along the Pacific Coast Highway portion of the sand transportation routes to the Project site would create an increased traffic safety risk.	Mi	**AMM TR-1:** Traffic Management Plan
Impact TR-4: Impacts of Inland Truck Hauling Routes from the Inland Quarries to Pacific Coast Highway Traffic generated from construction activities would have a short-term, negligible impact on public use of roadways to access the shoreline.	I	**AMM TR-1:** Traffic Management Plan
Section 3.7.3 Cultural and Paleontological Resources		
Impact CR-1: Disturbance of a Significant Cultural or Significant Paleontological Resource due to Construction of the Emergency Revetment. Construction of the emergency revetment may have disturbed cultural or paleontological resources or their surroundings on Broad Beach.	N	No AMMs recommended
Impact CR-2: Disturbance of a Significant Cultural or Significant Paleontological Resource or its Surroundings due to Beach Nourishment Beach nourishment activities may disturb cultural or paleontological resources or their surroundings in the Broad Beach Restoration area.	N	No AMMs recommended
Impact CR-3: Disturbance of a Significant Cultural Resource along Sand Transportation Routes Hauling activities may disturb cultural resources in the BBGHAD Inland Project Area.	N	No AMMs recommended

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Section 3.7.4 Noise		
Impact N-1: Construction Impacts to Recreational Users of Broad Beach Short-term noise levels would increase during Project construction potentially affecting a public beach.	Mi	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment **AMM N-1b:** City of Malibu Approval for Exceedance of City Noise Ordinance
Impact N-2: Construction and Operational Impact to Sensitive Receptors along Pacific Coast Highway (PCH) Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along PCH.	Mj	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment **AMM N-1b:** City of Malibu Approval for Exceedance of City Noise Ordinance
Impact N-3: Construction and Operational Impact to Sensitive Receptors along BBGHAD Inland Project Area Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along roadways within BBGHAD Inland Project Area.	I	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment
Section 3.11 Public Health and Safety, Hazards		
Impact HAZ-1: Authorization of the Revetment Creates Hazards Authorization of the emergency revetment could impact public health and safety by trapping beach users between large rocks and incoming surf and tides.	Mi	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM REC-4a:** Requirement of Additional Nourishment
Impact HAZ-2: Hazardous Materials Release During Construction Hazardous material released from construction equipment on the beach during two nourishment events and backpassing could impact public safety.	Mi	**AMM HAZ-2:** Develop Hazardous Material Spill Prevention Control and Countermeasure Plan (SPCCP)
Impact HAZ-3: Hazardous Conditions During Construction at Broad Beach Construction activities at Broad Beach during nourishment and backpassing events could impact the safety of public beach users.	Mi	**AMM HAZ-3a:** Demarcation of Public Access Routes **AMM HAZ-3b:** Provision of Contact for Reporting Hazards
Impact HAZ-4: Potential for Sediment Placed on Broad Beach to be Contaminated Sediment material introduced to Broad Beach could impact public health and safety due to the chemical content of the new material.	Mi	**AMM HAZ-4a:** Response to Sediment Contamination

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	Impact Class	Recommended AMMs *(see Section 5.0, Monitoring Implementation Program)*
Impact HAZ-5: Burial of the Emergency Revetment Burial of the emergency revetment could have short- to mid-term benefits to public health and safety.	B	No AMMs recommended
Section 3.7.6 Utilities and Service Systems		
Impact UTL-1: Project Increases Protection of Seaside Broad Beach OWTS Authorization of the emergency revetment, proposed supplemental sand bag installation, as needed, and creation of a wide sandy beach and new dune system would protect existing leach and drain fields from damage by wave action over the mid-term, preventing potential water pollution.	B	No AMMs recommended
Impact UTL-2: Long-Term Exposure of OWTS to Coastal Erosion Limited nourishment events and granting permanence to substandard revetment construction would expose OWTS to damage from wave and tidal action over the long-term (e.g., 20+ years).	Mj	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan
Impact UTL-3: Effects on Existing Public Drainage Systems Construction of the revetment covered existing exposed public drainage pipes, and construction of the restored dunes and beach nourishment would potentially further bury or obstruct storm drains.	Mi	**AMM UTL-3:** Master Drainage Plan (MDP)
Section 3.7.7 Environmental Justice		
Impact EJ-1: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Emergency Revetment The presence of the emergency revetment impacts public access, and has the potential to disproportionately affect minority and/or low-income populations.	N	No AMMs recommended
Impact EJ-2: Potential for Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to Beach Nourishment at Broad Beach Beach nourishment activities would not have impacts that could disproportionately affect minority and/or low-income populations in the Project area.	N	No AMMs recommended
Impact EJ-3: Disproportionate Decrease in the Employment and Economic Base of Minority and/or Low-income Populations Residing in the County and/or Immediately Surrounding Cities Beach nourishment activities would not decrease the employment or economic base of minority and/or low-income populations.	N	No AMMs recommended

Table ES-2. Summary of Environmental Impacts for the Project (continued)

Impact	**Impact Class**	**Recommended AMMs** *(see Section 5.0, Monitoring Implementation Program)*
Impact EJ-4: Increased Area of Accessible Public Trust Lands Beach nourishment activities would increase the access to and enjoyment of public trust lands on Broad Beach.	B	No AMMs recommended
Impact EJ-5: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Transportation of Inland Sand to Broad Beach. Transportation activities may have impacts that could disproportionately affect minority and/or low-income populations in the BBGHAD Inland Project Area.	I	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment

Table ES-3. Summary of Environmental Impacts for Project and Alternatives

Impact Class: Mj = Major adverse effect that would remain major and adverse even with the application of AMMs
Mi = Minor adverse effect with implementation of AMMs
B = Beneficial impact
N = Negligible effect
↑I = No effect on public trust resources and values; however, increase in intensity of use or effect associated with a specific issue area

Alternative Key:

Alternative 1 = Relocation of Improved Revetment Landward of January 2010 MHTL with Beach Nourishment and Dune Restoration
Alternative 2 = Relocation of Improved Revetment Landward of Lateral Access Easements with Beach Nourishment and Dune Restoration
Alternative 3 = Maximum Pull-back of Seawall with Beach Nourishment and Dune Restoration
Alternative 4 = Reduced Beach Nourishment Volume and Dune Restoration with Revetment in Current Location
Alternative 5 = Beach Nourishment and Dune Restoration with No Shore Protection Structure
Alternative 6 = Relocation of Improved Revetment along Upgraded Leach Fields with Beach Nourishment and Dune Restoration
Alternative 7 = Removal of Existing Emergency Revetment on the Eastern End of Broad Beach with Beach Nourishment and Restoration
Alternative 8 = No Beach Nourishment at West Broad Beach with Revetment at Current Location
Alternative 9 = Reduced and Phased Beach Nourishment at West Broad Beach with Existing Revetment

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Section 3.1 Coastal Processes, Sea Level Rise, and Geological Resources										
Impact CP/GEO-1: Structural Stability of the Rock and proposed Sand Bag Revetments The rock revetment is subject to remobilization of boulders along with settling from liquefaction events, and proposed sand bags are subject to collapse, reducing long-term protection of onsite wastewater treatment systems (OWTS) from sea level rise (SLR), and wave action.	Mj	Less adverse	Less adverse	Much less adverse	Similar	Much more adverse	Less adverse	More adverse	Similar	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Impact CP/GEO-2: Impact of Coastal Processes on Emergency and Sand Bag Revetments Over the long-term, after cessation of nourishment and erosion of the beach, substandard construction of the revetment would provide inadequate protection from coastal processes for septic systems, leach fields and homes.	Mj	Less adverse	Less adverse	Much less adverse	More adverse	Much more adverse	Much less adverse	More adverse	Similar	Similar
Impact CP/GEO-3: Protection of Public Trust Resources, Septic Systems, and Homes from Coastal Processes and Shoreline Erosion Beach nourishment and dune creation would provide short- to mid-term beneficial effect (10 to 20+ years) through protection of public trust resources and private property from coastal erosion.	B	More beneficial	More beneficial	More beneficial	Similar	Less beneficial	More beneficial	Less beneficial	Less beneficial	Less beneficial
Impact CP/GEO-4: Sand Size and Angularity Compatibility of Inland Sand Sources with Existing Sand on Broad Beach Quarry sand being used as beach fill on Broad Beach is similar to existing sand on Broad Beach in size composition, color, and particle angularity.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact CP/GEO-5: Impacts of Beach Nourishment and Dune Creation on Coastal Processes Nourishment of the beach would have insignificant effects on wave height, wave direction, tides and currents.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact CP/GEO-6: Impacts of Beach Nourishment and Dune Creation on Wave Run-Up	B	Similar	Similar	Similar	Similar	Less beneficial	Similar	Similar	Less beneficial	Slightly less beneficial

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Nourishment of the beach would have beneficial effects on wave run-up.										
Impact CP/GEO-7: Change in Sediment Transport to Down Coast Beaches Nourishment of Broad Beach will increase down shore sediment transport to Zuma Beach, Westward Beach, Point Dume, and other down coast beaches in the Public Trust Impact Area.	B	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Less beneficial	Less beneficial
Impact CP/GEO-8: Impacts of Sea Level Rise Sea level rise would incrementally contribute to erosion of the proposed new beach over the 10 to 20 year Project life span.	N	Similar	Similar	Similar	Similar	More adverse	Similar	Less adverse	More adverse	More adverse
Section 3.2 Recreation and Public Access										
Impact REC-1: Initial Project Construction and Renourishment Effects on Coastal Access and Recreation Short-term construction would interfere with recreational use and coastal access on public trust lands.	Mi	More adverse	More adverse	More adverse	More adverse	More adverse	More adverse	More adverse	Similar	Similar
Impact REC-2: Backpassing Impacts to Recreational Users Backpassing would interfere with recreational use and access on public lands.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact REC-3: Medium- and Short-Term Effects to Recreational Use Project construction and maintenance of a widened beach and restored dune system would enhance public recreation opportunities through provision of a wide sandy beach berm	B	Similar	Similar	Similar	More beneficial	More beneficial	Less beneficial	More beneficial	Less beneficial	Less beneficial

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
and increased lateral access.										
Impact REC-4: Long-Term Effects to Recreational Use Exposure of the revetment though coastal erosion after cessation of beach nourishment would adversely affect recreational beach use and access by blocking public access to public trust lands and LAEs.	Mi	Less adverse	Less adverse	Less adverse	Similar	Less adverse	More adverse	Less adverse	Similar	Similar
Section 3.3 Marine Biological Resources										
Impact MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms Installation of sand bag and rock revetments from 2008 to 2010 resulted in loss of intertidal habitat and disturbance and mortality of intertidal species.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms Sand placement from Project construction and one renourishment event would result in direct and indirect burial as well as disturbance of sensitive rocky intertidal habitats within Lechuza Cove.	Mj	Similar	Similar	Similar	More adverse	Similar	Similar	Similar	Much less adverse	Much less adverse
Impact MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive sandy intertidal habitats along Broad Beach.	Mi	Similar	Similar	Similar	More adverse	Similar	Similar	Similar	Slightly less adverse	Slightly less adverse
Impact MB-4: Sand Placement Impacts to Subtidal Habitats and	Mj	Similar	Similar	Similar	Slightly less	Similar	Similar	Similar	Less adverse	Less adverse

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Organisms Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive subtidal habitats offshore of Broad Beach.					adverse					
Impact MB-5: Backpassing Impacts to Marine Resources Annual or biannual backpassing would prolong disturbance of both rocky and sandy intertidal habitats impacting intertidal species diversity and abundance.	Mi	Similar	Similar	Similar	Less adverse	Similar	Similar	Similar	Similar	Similar
Impact MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release The increased vehicle traffic and equipment use associated with the Project would result in an increased risk of oil or fuel release as a consequence of onshore spillage.	Mi	Slightly more adverse	Slightly more adverse	Slightly more adverse	More adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Slightly less adverse
Impact MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources The deposition of sand supply on Broad Beach would contribute additional sand sources to down coast intertidal habitat through longshore transport within the Santa Monica Littoral Cell.	N	Similar	Similar	Similar	Less adverse	Similar	Similar	Similar	Slightly less adverse	Slightly less adverse
Impact MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies Project impacts to ESHAs, relative to public access and use of public trust lands, would potentially conflict with the California Coastal Act policies.	Mj	Similar	Similar	Similar	Similar	Similar	More adverse	Similar	Less adverse	Less adverse

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Section 3.4 Terrestrial Biological Resources										
Impact TBIO-1: Impacts to Terrestrial Biological Resources Resulting from the Installation of Sand Bag and Rock Revetments Past installation of sand bag and rock revetments resulted in direct adverse impacts to dune habitat, considered an environmentally sensitive habitat area (ESHA) under the Malibu Local Coastal Program (LCP), as well as to sensitive species such as the globose dune beetle.	Mj	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact TBIO-2: Short-Term Project-Generated Construction Impacts to Terrestrial Biological Resources Construction activities associated with proposed beach nourishment and dune creation may adversely impact existing sandy beach and foredune habitats and biological resources, as well as the Trancas Lagoon.	Mj	More adverse	More adverse	More adverse	Less adverse	More adverse	Much more adverse	More adverse	Similar	Similar
Impact TBIO-3: Long-term Construction Impacts of Backpassing to Terrestrial Biological Resources Future beach maintenance using backpassing may impact existing environmentally sensitive habitat areas (ESHAs) and/or created sensitive habitat areas, including sandy beach and foredune habitats, as well as Trancas Lagoon.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact TBIO-4: Hazardous Spill Impacts to Beach, Coastal Dunes, and Coastal Wetland Biological Resources An accidental hazardous spill and subsequent cleanup efforts would	Mj	More adverse	More adverse	More adverse	More adverse	More adverse	More adverse	More adverse	Slightly less adverse	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
potentially result in take of special-status species, the loss or degradation of functional habitat values, or cause a substantial loss of a population or habitat of native fish, wildlife, or vegetation.										
Impact TBIO-5: Longshore Sand Transport and Down Coast Impacts to Terrestrial Biological Resources Nourishment of Broad Beach with 600,000 cubic yards of beach sand would increase sand supply available for longshore transport down coast, potentially altering the hydrology of the Trancas Lagoon and the Zuma Wetlands ESHAs by widening the beach berm, but also increasing sand supply to beach and dune habitats down coast.	Mi	Similar	Similar	Slightly more adverse	Less adverse	Similar	Similar	More adverse	Less adverse	Slightly less adverse
Impact TBIO-6: Impacts to Terrestrial Biological Resources Resulting From Dune Restoration The proposed dune restoration would result in potential short- to mid-term beneficial effects through enhancement of dune habitat values, as well as potentially increase populations of special-status wildlife or plant species.	B	Similar	Similar	More beneficial	Similar	Less beneficial	Less beneficial	More adverse	Less beneficial	Similar
Impact TBIO-7: Impacts to Terrestrial Biological Resources Resulting from Increased Private and Public Access The proposed beach nourishment, including the dune habitat restoration, would occur adjacent to existing private residences. Private and public access ways to Broad Beach would	Mi	Similar	Similar	Similar	Similar	Similar	Less adverse	More adverse	Similar	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
interrupt the continuity of undisturbed dune habitat and may ultimately decrease the functional value of the restored dune system or result in an increase in incidental take, disturbance, and/or harassment of sensitive species.										
Impact TBIO-8: Long-term Degradation and Erosion of Newly Created Dune Habitat Following cessation of the additional renourishment event and backpassing, newly restored dune habitat would gradually erode, eventually exposing the revetment and likely leading to a return to emergency measures for protection of property not protected by the revetment or impacted by the degradation of the revetment.	Mi	Less adverse	Less adverse	Slightly more adverse	Similar	Much more adverse	Similar	More adverse	Slightly more adverse	Similar
Section 3.5 Marine Water Quality										
Impact MWQ-1: Project Implementation Impacts due to Turbidity or Other Impairment of Area Waters Project construction and nourishment/renourishment activities may increase turbidity in, or result in a violation of other water quality standards for, nearshore waters.	Mi	Similar	Similar	Similar	Similar	More adverse	Similar	Similar	Less adverse	Slightly less adverse
Impact MWQ-2: Beach Nourishment and Backpassing Impacts to Trancas Lagoon Beach nourishment and construction activities would occur near the mouth of Trancas Creek potentially affecting tidal exchange and the natural functioning of Trancas Lagoon.	Mi	Similar	Similar	Similar	Slightly less adverse	Similar	Similar	Slightly more adverse	Less adverse	Slightly less adverse

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Impact MWQ-3: Revetment Retention Impacts Associated with Nutrient Loading of Area Waters Retention of the revetment would protect Onsite Wastewater Treatment Systems (OWTSs) from wave action and reduce or eliminate contact between marine water and untreated sewage effluent.	B	More beneficial	More beneficial	More beneficial	Similar	Less beneficial	Much more beneficial	Much less beneficial	Less beneficial	Similar
Impact MWQ-4: Beach Sand Contaminant Resuspension and New Sand Chemical Compatibility Initial and Follow-up Nourishment Events, including annual backpassing, would suspend or resuspend contaminants, particularly if onshore quarry sand sources contain contaminants.	N	Similar	Similar	Similar	Similar	Similar	Similar	Slightly more adverse	Similar	Similar
Section 3.6 Scenic Resources										
Impact SR-1: Visual Effects from the Presence of the Emergency Revetment The emergency revetment impacts the visual quality of Broad Beach.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact SR-2: Short-Term Visual Effects from Beach Restoration Construction Activities at Broad Beach and Zuma Beach Construction activities would create temporary negative visual impacts during dune restoration, nourishment events, and backpassing events.	Mi	Slightly more adverse	Slightly more adverse	Slightly more adverse	More adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Similar
Impact SR-3: Visual Effects from the Nourishment of Broad Beach Nourishment of Broad Beach would improve the visual quality of Broad Beach over the short- to mid-term.	B	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Less beneficial	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Impact SR-4: Visual Effects from 43,000 Truck Trips along Pacific Coast Highway Transport activities could create temporary negative visual impacts associated with a high volume of large trucks traversing Pacific Coast Highway during the initial construction phase.	N	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Similar	Slightly less adverse	Similar
Impact SR-5: Visual Effects from the Addition of Sand to the Local Littoral Cell Nourishment of Broad Beach would add sand to the Santa Monica Littoral Cell, which would increase the sand budget of several other beaches down the coast, thus potentially improving their visual qualities.	B	Similar	Similar	Similar	Slightly less beneficial	Similar	Similar	Similar	Slightly less beneficial	Slightly less beneficial
Section 3.7.1 Air Quality										
Impact AQ-1: Construction and Transportation Impacts on Air Quality Construction activities would generate emissions that exceed South Coast Air Quality Management District thresholds, while emissions from Haul Trucks would exceed Ventura County Air Pollution Control District thresholds.	Mj	More adverse	More adverse	Much more adverse	Similar	Slightly more adverse	More adverse	Slightly more adverse	Less adverse	Less adverse
Impact AQ-2: Construction Impact of Greenhouse Gas (GHG) Emissions Potential beach enhancement activities would increase GHG emissions.	N	Slightly more adverse	More adverse	More adverse	Similar	Slightly more adverse	Slightly more adverse	Slightly more adverse	Less adverse	Slightly less adverse
Impact AQ-3: Construction Toxic Pollutant Emissions and Potential Health Risks Construction activities would generate emissions of toxic air contaminants	Mi	Slightly more adverse	Slightly more adverse	Slightly more adverse	Similar	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
that would potentially impact human health.										
Section 3.7.2 Traffic and Parking										
Impact TR-1: Construction-Generated Impacts in the Vicinity of Broad Beach Traffic along Pacific Coast Highway generated from construction activities would have a short-term, unsubstantial impact on public use of roadways to access the shoreline.	Mi	Slightly more adverse	Slightly more adverse	More adverse	Slightly less adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Less adverse	Slightly less adverse
Impact TR-2: Increased Parking Demand along Broad Beach Road A wider dry sandy beach at Broad Beach following renourishment may attract more users which would increase parking demand on Broad Beach Road.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact TR-3: Increased Safety Risk in the Vicinity of Broad Beach 43,000 truck trips along the Pacific Coast Highway portion of the sand transportation routes to the Project site would create an increased traffic safety risk.	Mi	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Slightly less adverse
Impact TR-4: Impacts of Inland Truck Hauling Routes from the Inland Quarries to Pacific Coast Highway Traffic generated from construction activities would have a short-term, negligible impact on public use of roadways to access the shoreline.	I	Similar	Slightly more adverse	More adverse	Slightly more adverse	Similar	Similar	Slightly more adverse	Less adverse	Slightly less adverse
Section 3.7.3 Cultural and Paleontological Resources										
Impact CR-1: Disturbance of a Significant Cultural or Significant Paleontological Resource due to Construction of the Emergency Revetment	N	Slightly more adverse	Slightly more adverse	Slightly more adverse	Similar	Slightly More adverse	Slightly More adverse	Slightly More adverse	Similar	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Construction of the emergency revetment may have disturbed cultural or paleontological resources or their surroundings on Broad Beach.										
Impact CR-2: Disturbance of a Significant Cultural or Significant Paleontological Resource or its Surroundings due to Beach Nourishment Beach nourishment activities may disturb cultural or paleontological resources or their surroundings in the Broad Beach Restoration area.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact CR-3: Disturbance of a Significant Cultural Resource along Sand Transportation Routes Hauling activities may disturb cultural resources in the BBGHAD Inland Project Area.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Section 3.7.4 Noise										
Impact N-1: Construction Impacts to Recreational Users of Broad Beach Short-term noise levels would increase during Project construction potentially affecting a public beach.	Mi	Slightly more adverse	Slightly more adverse	Much more adverse	Slightly more adverse	More adverse	More adverse	More adverse	Slightly less adverse	Similar
Impact N-2: Construction and Operational Impact to Sensitive Receptors along Pacific Coast Highway (PCH) Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along PCH.	Mj	Slightly more adverse	Slightly more adverse	More adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Similar
Impact N-3: Construction and Operational Impact to Sensitive Receptors along BBGHAD Inland Project Area	I	Similar	Slightly more adverse	More adverse	Slightly more adverse	Similar	Similar	Similar	Less adverse	Slightly less adverse

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along roadways within BBGHAD Inland Project Area.										
Section 3.7.5 Public Health and Safety, Hazards										
Impact HAZ-1: Authorization of the Revetment Creates Hazards Authorization of the emergency revetment could impact public health and safety by trapping beach users between large rocks and incoming surf and tides.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact HAZ-2: Hazardous Materials Release During Construction Hazardous material released from construction equipment on the beach during two nourishment events and backpassing could impact public safety.	Mi	Slightly more adverse	Slightly more adverse	More adverse	Slightly more adverse	More adverse	Slightly more adverse	Slightly more adverse	Slightly less adverse	Slightly less adverse
Impact HAZ-3: Hazardous Conditions During Construction at Broad Beach Construction activities at Broad Beach during nourishment and backpassing events could impact the safety of public beach users.	Mi	Slightly more adverse	Slightly more adverse	More adverse	Similar	Slightly more adverse	Slightly more adverse	Slightly more adverse	Similar	Similar
Impact HAZ-4: Potential for Sediment Placed on Broad Beach to be Contaminated Sediment material introduced to Broad Beach could impact public health and safety due to the chemical content of the new material.	Mi	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact HAZ-5: Burial of the Emergency Revetment Burial of the emergency revetment	B	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
could have short- to mid-term benefits to public health and safety.										
Section 3.7.6 Utilities and Service Systems										
Impact UTL-1: Project Increases Protection of Seaside Broad Beach OWTS Authorization of the emergency revetment, proposed supplemental sand bag installation, as needed, and creation of a wide sandy beach and new dune system would protect existing leach and drain fields from damage by wave action over the mid-term, preventing potential water pollution.	B	Much more beneficial	Much more beneficial	Much more beneficial	Similar	Much less beneficial	Much more beneficial	Less beneficial	Less beneficial	Similar
Impact UTL-2: Long-Term Exposure of OWTS to Coastal Erosion Limited nourishment events and granting permanence to substandard revetment construction would expose OWTS to damage from wave and tidal action over the long-term (e.g., 20+ years).	Mj	Much less adverse	Much less adverse	Much less adverse	Similar	Much more adverse	Much less adverse	Much more adverse	More adverse	Similar
Impact UTL-3: Effects on Existing Public Drainage Systems Construction of the revetment covered existing exposed public drainage pipes, and construction of the restored dunes and beach nourishment would potentially further bury or obstruct storm drains.	Mi	Similar	Similar	Similar	Similar	Less adverse	Similar	Similar	Similar	Similar
Section 3.7.7 Environmental Justice										
Impact EJ-1: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Emergency Revetment The presence of the emergency revetment impacts public access, and has the potential to disproportionately	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar

Table ES-3. Summary of Environmental Impacts for Project and Alternatives (continued)

Impact	Project	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9
affect minority and/or low-income populations.										
Impact EJ-2: Potential for Dispro-portionate Adverse Impacts to Minority and/or Low-income Populations due to Beach Nourishment at Broad Beach Beach nourishment activities would not have impacts that could disproportionately affect minority and/or low-income populations in the Project area.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact EJ-3: Disproportionate Decrease in the Employment and Economic Base of Minority and/or Low-income Populations Residing in the County and/or Immediately Surrounding Cities Beach nourishment activities would not decrease the employment or economic base of minority and/or low-income populations.	N	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact EJ-4: Increased Area of Accessible Public Trust Lands Beach nourishment activities would increase the access to and enjoyment of public trust lands on Broad Beach.	B	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Impact EJ-5: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Transportation of Inland Sand to Broad Beach. Transportation activities may have impacts that could disproportionately affect minority and/or low-income populations in the BBGHAD Inland Project Area.	I	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar	Similar

1.0 INTRODUCTION

In 2011, the city of Malibu (City) approved the formation of the Broad Beach Geologic Hazard Abatement District (BBGHAD) by the Trancas Property Owners Association (TPOA). The BBGHAD, or Applicant, is seeking approval from the California State Lands Commission (CSLC), through the issuance of a lease, for a portion of the BBGHAD's proposed Broad Beach Restoration Project (Project). The Project includes: (1) restoration of approximately 46 acres of beach and sand dunes primarily overlying state sovereign land at Broad Beach, Los Angeles County, using an estimated 600,000 cubic yards (cy) of sand hauled from commercial quarries in Ventura County, and (2) continued use of this sovereign land by limited portions of an existing, 4,100-foot-long, emergency revetment (Figure 1-1). The CSLC did not previously authorize this revetment.

Generally, the CSLC has exclusive jurisdiction over state sovereign lands (Pub. Resources Code, §§ 6216, 6301) and relies on an environmental review pursuant to the California Environmental Quality Act (CEQA; Pub. Resources Code, § 21000 et seq.) to assess a project's impacts to its lands and associated resources and uses. However, implementation of the Project by the BBGHAD is statutorily exempt from CEQA as an *"[i]mprovement caused to be undertaken … and all activities in furtherance thereof or in connection therewith, shall be deemed to be specific actions necessary to prevent or mitigate an emergency....*" (Pub. Resources Code, §§ 26601 & 21080, subd. (b)(4).). This statutory exemption precludes the CSLC from conducting a review under CEQA. **Therefore, this Revised Analysis of Impacts to Public Trust Resources and Values (Revised APTR) serves solely as an informational document to assist the CSLC in deciding whether to issue a lease for portions of the Project within its jurisdiction.**[1]

As described in this Revised APTR, the BBGHAD's Project area encompasses all of the following three areas (see Figure 1-2):

- **CSLC Lease Area:** state sovereign lands that the BBGHAD is seeking to lease, including numerous Lateral Access Easements (LAEs) held by the CSLC;
- **Public Trust Impact Area:** includes the CSLC Lease Area and the following adjacent areas: (1) offshore and down coast of Broad Beach; (2) Broad Beach Road; and (3) sections of the sand transport route for the Pacific coastline section of State Route 1 (Pacific Coast Highway [PCH]) to the Project site; [2]

[1] This Revised APTR replaces a Draft APTR released in October 2012. (See Table 3-1 in Section 3.0, *Issue Area Analysis* for a summary of changes between the 2012 APTR and 2014 Revised APTR.)
[2] As a Trustee agency, the CSLC has a trust responsibility for projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public trust easement in navigable waters.

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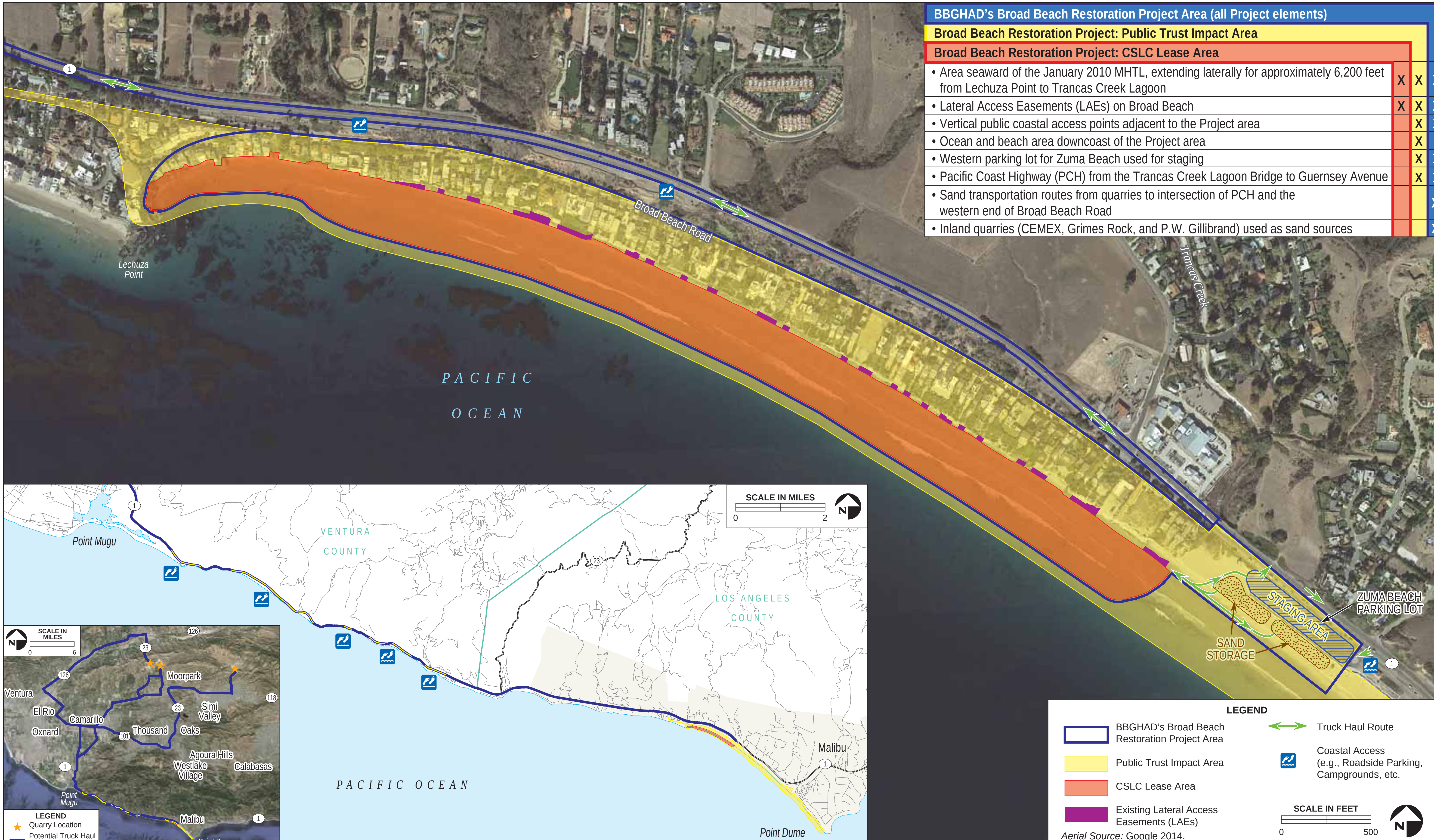
Regional Setting and Project Location

FIGURE 1-1



Jurisdiction Impact Area Boundaries

FIGURE 1-2

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- **BBGHAD Inland Project Area:** Project areas outside the Public Trust Impact Area and CSLC's jurisdiction, specifically three quarries in Ventura County and the sand transportation routes inland from the Pacific coastline section of PCH.

1.1 APTR PURPOSE AND SCOPE

This Revised APTR will assist the CSLC in deciding whether or not to issue a lease of state sovereign lands for the portion of the Project along Broad Beach, and if so, under what terms. Because the BBGHAD proposes to maintain the existing emergency rock revetment, which was installed with emergency permits in 2010 but without a lease from the CSLC, the CSLC will use this document to identify any conditions that should now be incorporated into the lease to avoid or minimize impacts associated with the revetment's presence on sovereign lands. To the extent possible, using available information, the analysis considers the existing setting prior to installation of sand bag revetments and the emergency rock revetment. Analyses of impacts are evaluated against this baseline setting where possible. In addition to examining adverse and beneficial effects of the Project on public trust lands and resources, the Revised APTR identifies avoidance and minimization measures (AMMs) to lessen impacts and maximize public benefits associated with the Project's use of sovereign lands and describes Project alternatives that may lessen or eliminate adverse Project effects.

The Revised APTR analyzes potential impacts to sovereign land and associated public trust resources and values, including affected resources outside the Public Trust Impact Area for qualitative information purposes (see subsection 1.1.2). Although the information in this Revised APTR may inform other agencies in their decision-making processes, the BBGHAD must obtain approvals from other local, state, and federal agencies, in addition to the CSLC, as noted in Section 1.4, *Leases, Permits, Approvals, and Other Requirements*.

1.1.1 The Public Trust Doctrine and Public Trust Lands

The origins of the Public Trust Doctrine are traceable to Roman law concepts of common property. Under Roman law, the air, the rivers, the sea, and the seashore were incapable of private ownership; they were dedicated to the use of the public (Institutes of Justinian 2.1.1). Under English Common Law, this principle evolved into the Public Trust Doctrine pursuant to which the sovereign held the navigable waterways and submerged lands, not in a proprietary capacity, but as a "trustee of a public trust for the benefit of the people" (*Colberg, Inc. v. State of California ex rel. Dept. Pub. Works*, 67 Cal.2d 408, 416 [1967]).

Upon admission to the Union in 1850, California, as a sovereign state, received title to these tide and submerged lands and navigable waterways under the equal-footing doctrine (*Martin v. Waddell*, 41 U.S. 367, 410 [1842]). The Public Trust Doctrine, as a common law doctrine, is not static but is continuously evolving. Pursuant to the Public

Trust Doctrine, tide and submerged lands, including lands under navigable waterways (collectively referred to as “public trust lands”) are owned by the states and held in trust for the benefit of the public. Public trust lands are not alienable in that all of the public’s interest in them cannot be extinguished (*People v. California Fish Co.*, 166 Cal. 576, 597-99 [1913]; *Illinois Central v. Illinois*, 146 U.S. 387 [1892]; Cal. Const. Article X, Section 4; Pub. Resources Code, § 7991). Public trust lands cannot be bought and sold like other State-owned lands; only in rare cases may the public trust be terminated, and only where consistent with the purposes and needs of the trust (*City of Long Beach v. Mansell*, 3 Cal. 3d 462 [1970]). These lands are to be used to promote the public’s interest in water dependent or water oriented activities including, but not limited to, water-related commerce, navigation, fisheries, environmental preservation and recreation. The Public Trust Doctrine and California’s Constitution establish the right of the public to access and use public trust lands, as well as the public’s right to fish on public trust lands (Cal. Const. Article X, Section 4; Cal. Const. Article I, Section 25).

The California Legislature, representing the people of California, is the ultimate trustee of California’s public trust lands and resources and exercises its authority and responsibility to enact laws to protect and promote prudent use of public trust lands and the living resources therein. *National Audubon Society v. Superior Court,* 33 Cal. 3d 419 (1983) states that the core of the Public Trust Doctrine is the State’s authority as sovereign to exercise a continuous supervision and control over the waters of the state to protect ecological and recreational values. The Legislature has delegated to the CSLC exclusive control and jurisdiction over ungranted public trust lands. (Pub. Resources Code, §§ 6216, 6301). The CSLC also retains the remaining State authority over lands that have been legislatively granted in trust to other governmental agencies (Pub. Resources Code, § 6301). The CSLC implements the Public Trust Doctrine through careful consideration of its principles and the exercise of discretion within the specific context and location of proposed uses. In administering its trust responsibilities, the CSLC exercises its discretionary authority in the best interests of the State, accommodating the changing needs of the public while preserving the public’s right to use public trust lands for the purposes to which they are uniquely suited. The California Department of Fish and Wildlife (CDFW), Department of Water Resources, and Department of Parks and Recreation also have responsibilities over public trust resources held in trust.

Use of public trust lands is generally limited to water dependent or related uses, including commerce, fisheries, and navigation, environmental preservation and recreation. Public trust uses include, among others, ports, marinas, docks and wharves, buoys, hunting, commercial and sport fishing, bathing, swimming, and boating. Ancillary or incidental uses – those that directly promote trust use, are directly supportive and necessary for trust use, or that accommodate the public’s enjoyment of trust lands – are also permitted; examples include facilities to serve visitors, such as hotels and restaurants, shops, parking lots, and restrooms. Other examples are commercial facilities that must be located on or directly adjacent to the water, such as warehouses, container cargo storage, and facilities for the development and production of oil and gas. Uses that are generally not permitted on public trust lands are those that are not trust use related, do not serve a public purpose, and can be located on non-waterfront property, such as residential and non-maritime related commercial and office uses. Public trust lands may also be kept in their natural state for habitat, wildlife refuges, scientific study, or use as open space (*Marks v. Whitney*, 6 Cal 3d 251 [1971]). Because public trust lands are held in trust for all citizens of California, they must be used to serve statewide goals, as opposed to purposes that are purely of local benefit (*Mallon v. City of Long Beach*, 44 Cal.2d 199 [1955]; Pub. Resources Code, § 6009). In addition, the living resources (e.g., the fish and aquatic plant and animal life) inhabiting public trust tide and submerged lands and the overlying waters are public trust resources and also subject to the protections of the Public Trust Doctrine.

1.1.2 Project Area Public Trust Resources and Impact Analysis

As identified in Figure 1-2, the analysis focuses on public trust resources affected by initial construction and long-term operations over the estimated 20-year Project life. The Project areas with potential to affect public trust resources include the CSLC Lease Area and the Public Trust Impact Area. Affected public trust resources include: water and shoreline dependent recreation and related support facilities; public access (including LAEs dedicated by former or current owners of land within the BBGHAD and held by the CSLC); fish and wildlife and their habitats; and scenic resources. The analysis also considers impacts pertaining to geologic hazards and shoreline protection, marine water quality, air quality, cultural resources, noise, public health and safety hazards, traffic and parking, utilities and service systems, and environmental justice.

Also examined are areas down coast of Broad Beach (e.g., Zuma Beach) that may be affected by the deposition of Project-imported sand via littoral drift. During an informal public use survey of Broad Beach conducted in June 2012 to obtain a better understanding of public use of Broad Beach (see Appendix E), anecdotal observations were made regarding the interconnection between use of Zuma Beach and Broad Beach. Documented uses included surfing, swimming, tidepooling, dog walking, beachcombing, and walking and running for exercise and enjoyment. Since haul trucks carrying sand to Broad Beach may impact public coastal access to and recreation on public trust lands, impacts along PCH upcoast of Broad Beach are also evaluated.

As identified in Figure 1-2, the BBGHAD Inland Project Area includes the inland quarries and the sand transportation routes from the quarries to the PCH. Although this portion of the Project area is outside the Public Trust Impact Area, other resources may be affected by Project activities (e.g., traffic, air quality, etc.) in comparison to existing conditions. As these affected resources are outside the Public Trust Impact Area, they are evaluated qualitatively for information purposes.

1.2 PROJECT OBJECTIVES

The BBGHAD proposes to reestablish a wide sandy beach berm backed by a restored dune system at Broad Beach while maintaining and burying the existing emergency rock and sand bag revetments under these restored sand dunes. In order to explain the need for the Project, and to guide development and evaluation of Project alternatives, the BBGHAD was asked to define its Project objectives, which are as follows:

- Protect existing homes, structures, and other improvements – including septic systems – from ongoing coastal erosion along Broad Beach;
- Create and maintain a wide sandy beach backed by a restored dune system similar to that which historically occurred along this reach of coastline;
- Provide for enhanced public access along Broad Beach while maintaining homeowner beach access and privacy through establishment of consistent lateral access along the beach; and
- Restore and enhance native dune habitats along Broad Beach and add sandy intertidal habitat to support native fauna (e.g., grunion, shorebirds).

1.2.1 Description of the Existing Emergency Revetment

High erosion rates during the 2009-2010 winter season and widespread failure of temporary emergency sand bag revetments resulted in the TPOA applying for and receiving emergency permits from the city of Malibu and California Coastal Commission (CCC) to construct a temporary emergency rock revetment on Broad Beach. At that time, the emergency revetment was accepted as the minimum action necessary and the least environmentally damaging alternative to implement the interim shore protection required for structures, and to protect public health from accidental releases of sewage effluent related to threatened leach fields (Illustration 1-1). In total, approximately 36,000 tons of boulders were placed along 4,100 feet of Broad Beach in front of homes located

Illustration 1-1. *The existing emergency rock revetment completed in April, 2010, is 4,100 feet long, rises approximately 12 to 15 feet above the low tide beach, and is 22 to 38 feet wide at its base.*

between 30760 and 31346 Broad Beach Road. (The property owner at 30822 Broad Beach Road opted to not participate in the revetment project, resulting in a more than 100-foot-long break in the continuity of the revetment in front of this property.)

1.2.2 Project Summary

The CSLC Lease Area and Public Trust Impact Area include Broad Beach and the western portions of Zuma Beach. The proposed beach and dune restoration would encompass 46 acres to extend laterally for approximately 6,200 feet from Lechuza Point on the west to Trancas Creek Lagoon on the east, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment (Figures 1-1 and 2-3 through 2-6). Additionally, this area includes the construction staging area at the west-end Zuma Beach Parking Lot 12 (1.4 to 1.9 acres), and a sand stockpile area located along 1,000 feet of Zuma Beach adjacent to the parking lot.

Initial Nourishment. The initial nourishment event would take approximately 8 months to complete, including 30 days to construct the dune system and another 30 days for dune restoration, including planting, fencing, signage, and placement of temporary irrigation systems (Section 2.3, *Construction Operations and Procedures*). Hauling of inland quarry sand to Broad Beach is expected to take 5 months (102 working days at 5 days per week), and an additional 2 weeks would be required to complete hauling of imported sand from the stockpile area to complete construction of the sand dunes on Broad Beach. The western 1,000 feet of Zuma Beach, the Trancas Lagoon mouth, and Broad Beach would be closed for an estimated 102 weekdays during initial Project construction due to the intensity of construction activities and operation of heavy trucks and equipment (Section 2.3.4, *Construction Details*).

Heavy equipment (e.g., scrapers, large capacity trucks, and bulldozers) would distribute sand to desired locations and depths, cover the existing revetment, and create a restored sandy beach. Construction staging would use 1.4 to 1.9 acres of the public Zuma Beach Parking Lot 12 parking lot and 260 coastal access parking spaces; 42 informal free road shoulder spaces along PCH would also be needed, a portion of which would be converted into a truck lane for the 8-month period (see Section 2.3, *Construction Operations and Procedures*).

After initial nourishment, the new beach and dune system is expected to extend over approximately 46 acres: 27 acres of dry sandy beach where intertidal wet sand beach currently exists; 11 acres of generally intertidal beach; and 8 acres of dunes backing the beach. The longevity of this nourishment will depend on a variety of natural factors at Broad Beach, including climatic cycles, wave energy and direction, longshore transport of sand in the littoral cell, sand grain size and sea level rise (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards)*. Proposed BBGHAD activities that may affect nourishment longevity include backpassing, renourishment, and installation of additional emergency sand bag revetments.

Backpassing. In order to extend the longevity of the proposed beach nourishment, the Applicant would conduct monthly beach profile measurements (Section 2.2.9, *Long-Term Beach Profile Monitoring*) and, based upon and in accordance with objective beach nourishment triggers, would use scrapers, bulldozers, or other heavy equipment to “backpass” sand from the wider dry sand beach berm on the eastern reach of beach to the narrower western reach of beach. The volume of sand backpassed would vary depending on sand availability and need, as determined by monitoring, but is anticipated to range from as low as 25,000 cy over 1.5 weeks to as high as 35,000 cy over 3 weeks (Section 2.2.10, *Future Beach Management Events*). Although the Applicant would attempt to provide public access to the beach during backpassing operations through implementation of a construction vehicle traffic management plan, signage, and flagmen, the majority of the working area below Mean Higher High Water (MHHW) would be closed to the public during these operations (Section 2.2.10, *Future Beach Management Events*).

Renourishment. Even with backpassing, maintenance of the newly established beach for a planned 20-year period is anticipated to require a second major renourishment event. Timing for renourishment would be determined via monitoring triggers and is projected to occur in 10 years (Section 2.2.9, *Long-Term Beach Profile Monitoring*). Renourishment would involve adding 450,000 cy of sand to Broad Beach, similar to the original nourishment. As renourishment operations progress, public access to portions of the beach would be maintained to the extent possible with implementation of a construction vehicle traffic management plan (see Section 2.3, *Construction Operations and Procedures*), but public lateral access to Broad Beach and the west end of Zuma Beach would likely be restricted during working hours (Monday through Friday, 7:00 AM to 6:00 PM) for an estimated 180 days due to heavy equipment traffic. On weekends and holidays the beach would remain open for public access.

Additional Emergency Sand Bag Revetments. During major periods of erosion (e.g., toward the end of the useful life of either the initial or follow up nourishment events), the Project contains a provision to install emergency sand bag revetments on private property along the eastern 550 feet of Broad Beach (which is not protected by the emergency rock revetment) and the 100-foot break in the revetment. Sand bags would be filled using beach sand only, and the dunes would not be disturbed.

1.3 PUBLIC REVIEW AND COMMENT

In October 2012, a Draft APTR was released for review and comment by governmental agencies and the public, and verbal and written comments were also accepted at a noticed public meeting. All comments received were considered in the context of potential impacts to public trust resources and values. In May 2013, based on comments and a range of issues, the Applicant revised the Project description. Key public comments and new information addressed in this Revised APTR include:

- Changes to sand sources for beach nourishment from offshore dredged sources to inland quarry sources;
- Public access and recreational amenities;
- Impacts to sensitive marine habitat at the west end of the Project area and proposed impact minimization and monitoring;
- Long-term planning for septic systems management and protection and storm water management and flooding related to the existing storm drains, rock and sand bag revetment, and future nourishment activities;
- Concern about longevity, (i.e., that more than one major renourishment event might be required to maintain the beach for the life of the Project);
- Monitoring of CSLC Lease Area and adjacent Public Trust Impact Area;
- Consideration of a revised impact analysis using a baseline setting prior to installation of sand bag revetments and the emergency rock revetment; and
- Consideration of alternatives that further avoid and minimize impacts.

1.4 LEASES, PERMITS, APPROVALS, AND OTHER REQUIREMENTS

The CSLC's discretionary action for this Project is the issuance of a lease that would allow for the continued occupation of state land by portions of the 2010 emergency revetment and underlying unpermitted sand bag revetments, as well as the proposed placement of 600,000 cy of sand at Broad Beach to create a sandy beach and dune system. Of the 46 acres that would be covered with the new beach and dune system, 5.5 acres would be located on private land while the remaining approximately 40.5 acres would be located on public land administered by the CSLC and would require issuance of the lease.

The lease would contain an end-of-lease provision that will require the BBGHAD to submit to the CSLC at least 2 years prior to the end of the lease term either an application requesting a new lease for the continued use and occupation of state land by the Project, or a plan to restore the lease area. At that time, the CSLC would consider the potential for continuation of nourishment or the disposition of the revetment and other improvements that overlie or block access to public lands or LAEs (e.g., potential removal or retention of these protective structures).

The BBGHAD must also obtain other permits and approvals from reviewing authorities and regulatory agencies for the Project and any future Project beach nourishment efforts (e.g., annual transportation of sand via backpassing and major renourishment after a 10-year interval) (Tables 1-1 and 3.3).

Table 1-1. Local, State, and Federal Permit/Consultation Requirements

Local	Los Angeles County Department of Beaches and Harbors Right of Entry Permit (for use of Zuma Beach for Project construction and staging) and Encroachment Permit (for use of the parking lot at Zuma Beach for staging).
State	CCC consolidated Coastal Development Permit (CDP), issued pursuant to the Chapter 3 policies of the California Coastal Act, with the city of Malibu's certified Local Coastal Program (LCP) as guidance.[3]
	CDFW consultation pursuant to California Endangered Species Act (ESA) and Fish and Game Code for potential impacts to marine habitat and sensitive species and Point Dume State Marine Conservation Area; possible Streambed Alteration Agreement for work in Trancas Creek.
	California Department of Transportation approvals to allow ingress/egress via PCH.
	Los Angeles Regional Water Quality Control Board Section 401c Water Quality Certification and National Pollutant Discharge Elimination System permit.
U.S.	U.S. Army Corps of Engineers Sections 10 and 404 Permits.
	National Marine Fisheries Service/U.S. Fish and Wildlife Service consultation pursuant to federal ESA and/or Magnuson-Stevens Fishery Conservation and Management Act.

[3] Coastal Act section 30601.3 provides that when a project requires a CDP from a local government with a certified LCP and the CCC, the CCC may process a single, consolidated CDP if the applicant and local government agree. The BBGHAD, city of Malibu, and CCC have agreed to process the BBGHAD application as a consolidated CDP (see city of Malibu, Resolution No. 12-42, November 2012).

2.0 PROJECT DESCRIPTION

This section of the Revised *Analysis of Impacts to Public Trust Resources and Values* (APTR) document prepared by the California State Lands Commission (CSLC) describes the history and details of the Broad Beach Restoration Project (Project) proposed by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant). Section 2.1 presents the Broad Beach area history and an overview of previous efforts to address beach erosion, damage to structures, and potential damage to private sewage disposal systems. Section 2.2 provides a detailed description of the components of the Project, and Section 2.3 describes construction activities associated with the Project. Basic Project information is presented in Table 2-1.

2.1 PROJECT BACKGROUND

2.1.1 Project History

Historical Conditions of Broad Beach

Development along Broad Beach began in the 1930s, consisting of small beach cottages; most lots were developed by the late 1980s. During this period, the beach remained considerably wider than it is today, especially through the early 1970s. The width of Broad Beach reached a peak in 1970 at a yearly average of 60 feet landward of the mean high tide line (MHTL); however, the beach has been receding since. Between 1974 and 2009, approximately 600,000 cubic yards (cy) of sand were lost at Broad Beach, moving the shoreline landward approximately 65 feet during this period (Illustration 2-1). The sand budget turned negative around 1974, accelerating to approximately 35,000 cy per year from 2004 to 2009 and to 45,000 cy per year from 2009 to 2012 (Everts Coastal 2009 & 2014).

Western reach of Broad Beach, 1972 *Western reach of Broad Beach, 2013*

Illustration 2-1. *Recent analyses (Everts Coastal 2010, Coastal Frontiers 2011) indicate that Broad Beach has been subject to considerable sand loss over the last 40 years, while new home construction during this period has exposed many more structures to damage and erosion hazards (Photos: California Coastal Records Project 2013). The majority of the sand moved east to nourish Zuma Beach and other locations down coast (Everts Coastal 2009). The area of greatest beach erosion occurred near Lechuza Point, with less erosion occurring to the east towards Trancas Creek.*

Table 2-1. Broad Beach Restoration Project By the Numbers (Proposed Project)

Project Setting	
Beach length (from Lechuza Point to Trancas Creek Lagoon)	~6,200 feet
Estimated volume of sand lost from Broad Beach: 1974-2009	600,000 cy
Current sand loss rate at Broad Beach	35,000-45,000 cy/yr
Number of lots bordering Broad Beach	121
Number of residences bordering Broad Beach	109
Number of residences located landward of existing revetment	76
Number of Lateral Access Easements (LAEs) on Broad Beach that provide lateral (parallel to shore) public access	51
Number of vertical public access ways (from street to Broad Beach)	2
Existing Temporary Emergency Rock Revetment Data	
Number of acres of beach covered by revetment	~3.02 acres
Length	4,100 feet
Width	22-38 feet
Height (average above MLLW where revetment exists)	12-15 feet
Volume of boulders used to build revetment[1]	36,000 tons
Acres of public trust lands under CSLC jurisdiction covered by revetment[2]	0.86 acre
Acres of LAEs covered or impacted by revetment[2]	0.73-1.04 acre
Estimated Project Size and Acreage	
Total area of beach and sand dunes proposed for restoration	46 acres
Total volume of sand: initial restoration work	600,000 cy
Total volume of sand: supplementary renourishment (after ~10 years)	450,000 cy
Volume of sand periodically backpassed per annual event	25,000-35,000 cy
Width of restored dry sandy post-construction beach	85-230 feet
Width of restored post-construction sand dune	40-60 feet
Height of restored post-construction sand dune	17-22 feet
Area required for staging: Zuma Beach Parking Lot	1.4-1.9 acres
Area required for sand stockpile: Zuma Beach (along 1,000 feet of beach)	5 acres
Estimated Project Timing (Beach Nourishment and Dune Construction Elements)	
Project life (after initial restoration and supplementary renourishment)	20+/- years
Interval between initial restoration and supplementary renourishment	10+/- years
Project duration • Beach nourishment and dune construction • Sand movement and placement into proposed location/dimensions • Planting, fencing, signage, and irrigation placement in dune systems	8 months (total) 6 months 1 month 1 month
Construction Staging and Sand Transport Information: Initial Nourishment Project	
Duration of hauling of inland quarry material to Broad Beach	5 months
Number of truck trips required between inland quarries and Broad Beach, estimating 840 trips (420 inbound and 420 outbound) per day	43,000
Distance between quarry sand sources and Project site: ....over land Distance between quarry sand sources and Project site: ....by road	20-25 miles 40-45 miles

Abbreviations used: cy = cubic yards; MLLW = Mean Lower Low Water; yr = year.
[1] Larger (> 2-ton) boulders are located at the revetment's west end (due to increased erosion hazard).
[2] Based on MHTL survey conducted in January 2010.

Coastal Protection and Public Access Issues

As of March 2014, 109 residences occupied 116 of the 121 lots bordering the beach and adjacent dunes (five residences occupy double lots, one residence occupies a triple lot, four lots remain vacant, and one lot is developed with the Malibu West Beach Club). Over the last two decades, many of these homes have been remodeled and expanded, with larger homes replacing older more modest beach cottages. Such remodels at Broad Beach are ongoing. Given the surrounding area's rural character and limited infrastructure available at the time of development, septic systems and leach fields were typically installed in or close to the sand dunes to the seaward side of the residences. In addition, several private drainage culverts were installed through the dunes to carry local storm water runoff to the Pacific Ocean.[1] Most of those drainage pipes and leach fields remain and are operative.

Due in part to the accelerated coastal erosion, requests from area homeowners for coastal protection structures increased along Broad Beach since the 1970s, and issues arose regarding coastal access, private property rights, and the scope of the public's right to lateral access to and along the beach. As the beach narrowed, Broad Beach homeowners, particularly those along the central and western portions of the beach, applied for and received at least 21 permits to allow installation of individual coastal protection structures, including vertical timber piling and concrete seawalls, caissons or pilings, and rock revetments.

The 1997-1998 El Niño storm seasons caused considerable shoreline erosion. The related storm wave damage along the California coast also threatened many Broad Beach homes. Some homeowners constructed temporary sand bag revetments to protect residential structures and septic leach fields. One home suffered major structural damage (Illustration 2-2).

Illustration 2-2. *Wave action in the 1997-1998 El Niño led to major structural damage to one Broad Beach home (source: Norton Karno, February 1998).*

The 2007-2008 winter season also caused significant coastal erosion at Broad Beach. Many homeowners responded by placing disparate and temporary geotextile or sand bag revetments authorized by emergency coastal development permits (CDPs) issued

[1] The city of Malibu manages the drainage system inland of existing homes; however, the individual homeowners along Broad Beach Road own and manage the storm drains where these drains pass under private parcels and out to Broad Beach (see Section 3.7.6, *Utilities and Service Systems*).

by the city of Malibu; others installed these features without authorization. However, the sand and geotextile bags proved inadequate for reliable shore protection, failed in some instances, and generated debris and litter on the beach the following year.

Over the years, particularly as the beach narrowed, public beachgoers and area homeowners have experienced conflict over the use of the beach due to the ambulatory nature of the boundary between private property and public land (as defined in Section 2.1.3), and the existence of a checkerboard pattern of lots with and without dedicated public access easements (only about half the homes along Broad Beach have dedicated lateral access easements (LAE), and those differ in size [see Section 2.1.4]). Generally, these LAEs allow "public access and passive recreational use along the shoreline" at the affected properties. Most of the dedicated public LAEs are referenced to the location of the daily high water line or the MHTL. Because of these inconsistent and varying reference points, neither the public nor homeowners have an easily definable way to visually see or estimate the location of the LAEs at any given time, which, coupled with the narrowing of the beach, has created greater uncertainty over the areas open to public access and areas under private ownership.

<u>Mean High Tide Line Surveys Prior to Construction of Emergency Revetment</u>

CSLC and the Applicant disagree on the location of the MHTL. The Applicant's engineers conducted a MHTL survey on October 15, 2009. This surveyed MHTL location was used as a guide to locate the toe of the revetment when the rock was placed to construct the emergency revetment between February and April 2010. The CSLC's MHTL survey at Broad Beach was conducted on January 19 to 20, 2010, just prior to installation of the emergency revetment. The results of the CSLC survey located a MHTL more landward of the Applicant's MHTL, although an approximately 100-foot portion of both surveyed lines overlap at the western end, and are within approximately 10 feet or less of each other over a significant portion of the surveyed area. CSLC is confident that its January 2010 MHTL survey is correct and legally controlling. Consequently, the January 2010 MHTL survey is the basis for the analyses contained in this Revised APTR.

<u>Construction of Emergency Revetment (2010)</u>

The Trancas Property Owners Association (TPOA) obtained permits to construct the emergency revetment (subject to final permitting) from the agencies below, but did not obtain a lease from the CSLC.

- City of Malibu: Emergency CDP No. 09-021; Engineering Permit No. 10-002;
- California Coastal Commission (CCC): Emergency CDP No. 4-10-003-G;
- U.S. Army Corps of Engineers (ACOE): Rivers and Harbors Act Section 10 and Clean Water Act (CWA) Section 404 Permit File No. SPL-2009-00979-PHT;

- California Regional Water Quality Control Board, Los Angeles Region (LARWQCB): CWA Section 401 Water Quality Certification No. 10-003;
- Los Angeles County Department of Beaches and Harbors: Permit Nos.: RE-043-09; RE-029-10; and,
- California Department of Transportation Encroachment Permit No. 710-6TK-0146.

The revetment varies in width from 22 to 38 feet, and rises 12 to 15 feet above the average low tide elevation (mean lower low water [MLLW][2]), with an average crest elevation of 13 feet above MLLW. Elements of the revetment, which was built in April 2010, included: (1) the rock was placed on top of a filter fabric layer to eliminate loss of dune material through voids in the stone matrix; (2) boulders of 0.5 to 2 tons were used to allow for fast construction; and (3) the revetment was built with a shallow toe elevation to reduce the need for digging, resulting in easier construction. Approximately 36,000 tons of rock was placed along 4,100 feet of Broad Beach in front of homes located between 30760 and 31346 Broad Beach Road. (The property owner at 30822 Broad Beach Road opted to not participate in the revetment project, resulting in a more than 100-foot-long break in the continuity of the revetment in front of this property.) Much of the revetment was constructed over and seaward of the mix of private individual sand bag walls or geotextile revetments that were present along the beach at the time of construction (Illustration 2-3). These sand bag revetments remained in place and are currently present beneath and behind the emergency revetment. The condition of these individual sand bag geotextile revetments at the time of burial is unknown.

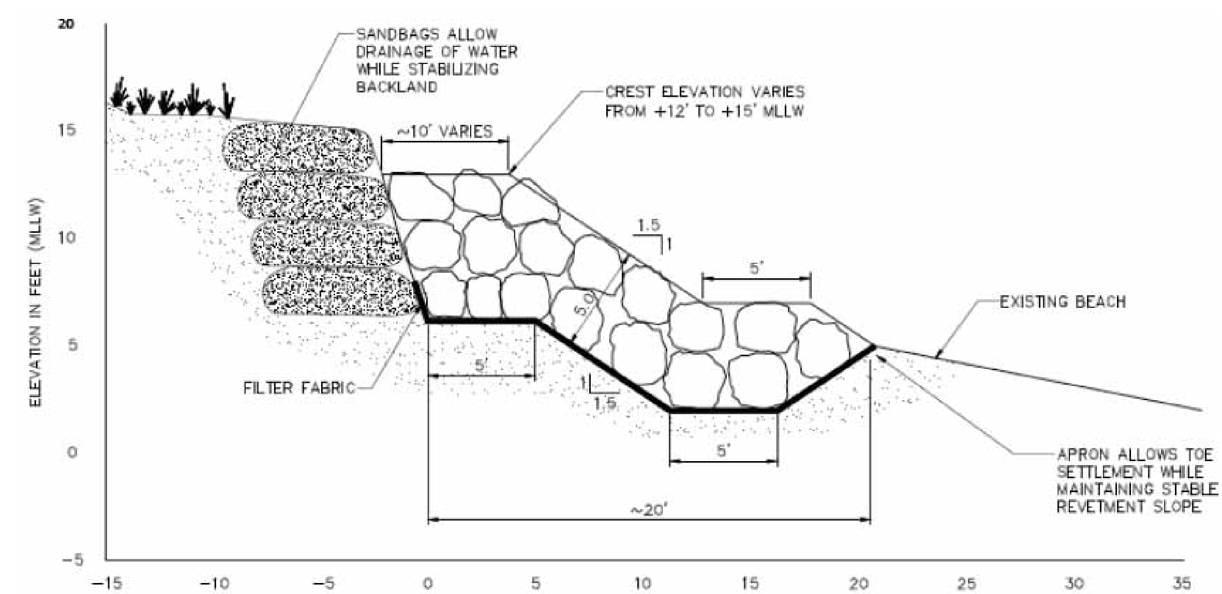


Illustration 2-3. *Along most of Broad Beach (3,700 feet) the emergency rock revetment was built over and in front of existing sand bag geotextile revetments, as shown in this cross section.*

[2] The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch, a 19-year period that currently covers the period from 1983 to 2001.

In accordance with permits issued by the CCC, the city of Malibu, and other public agencies, homes between 31302 and 31346 Broad Beach Road received a more robust rock revetment design and larger rock (up to 4 tons per rock). That project also involved the homeowners redesigning and rebuilding the two current vertical public access ways from the street to the beach. The rebuilt access areas include stairways and guiderails, which traverse over the revetment itself to provide vertical public access to the shore.

Conditions at Broad Beach since Installation of the 2010 Emergency Revetment

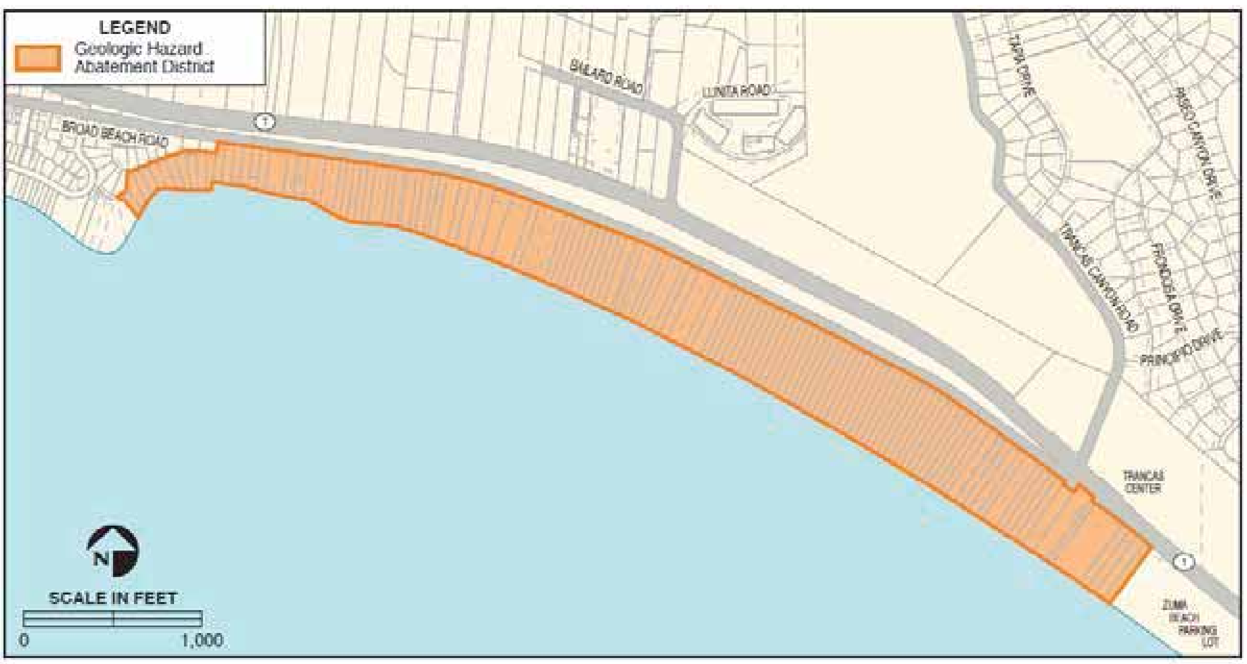
Since installation of the revetment in 2010, wave activity, particularly during winter storms, has continued to erode Broad Beach; however, the remaining dunes landward of the revetment have been largely protected. Erosion is primarily occurring along beach areas seaward of the revetment and outside of the revetment's reach, resulting in: a lowering of the beach profile seaward of the revetment and at the west end of the beach; and the loss of significant portions of the beach and dune system at the east end, past the end of the revetment, and at the 100-foot gap in the revetment.

Since 2010, the east end of Broad Beach has eroded by approximately 80 to 100 feet. In 2010, the beach berm along the east end of Broad Beach generally extended laterally from the east end of the revetment, and the properties in this area had approximately 125 to 150 feet of beach and dunes fronting their homes, which were protected by geotextile, sand bag, and Sakrete revetments (fabric bags filled with concrete, often stacked or keyed back into a bluff or dune). Between that time and February 2014, these properties experienced approximately 50 feet of erosion. In March 2014, a large storm event resulted in severe erosion along this section of Broad Beach, resulting in approximately 50 feet of additional erosion (Illustration 2-4). This erosion resulted in the loss of substantial portions of the beach and dune system at the east end of the beach, which had previously protected the homes on these properties. Additionally, the sand bag and Sakrete revetment that previously existed was either washed away or largely destroyed. The properties at the east end of Broad Beach are now exposed to potential damage from future large wave events as only 30 to 50 feet of beach and low dunes now fronts these houses.

Formation of the Broad Beach Geologic Hazard Abatement District (2011)

The BBGHAD spans the entirety of Broad Beach from 30712 Pacific Coast Highway (PCH), adjacent to Trancas Creek and Zuma Beach on the east end, to 6525 Point Lechuza Drive, adjacent to Lechuza Point on the west end (Figure 2-1). GHADs are political subdivisions of the State, formed pursuant to Public Resources Code section 26500 et seq., to prevent, mitigate, abate, or control defined geologic hazards in a geographic area through maintenance, improvements, or other means. Approximately 40 GHADs exist in California (about four GHADs were formed to address coastal erosion issues and some are inactive).

Illustration 2-4. *Winter storms in 2013-14 eroded the beach and dunes along the east end of Broad Beach where no emergency rock revetment exists. The remnant dunes and temporary sand bag revetment present at 30708 Broad Beach Lane (top left, Sept. 2011) were eroded and the beach face shifted landward by about 50 feet (bottom left, Feb. 2014). The beach and dune system fronting houses at Broad Beach's east end ranged from 125 to 150 feet and was protected by temporary sand bag and Sakrete revetments (top right, Mar. 2012). During the 2013-14 winter storms, the beach was severely eroded, leaving 30 to 50 feet of beach fronting these homes; the area where dry beach berm was lost to erosion is visible between the destroyed revetments and new beach scarp (bottom right, Mar. 2014).*



Geologic Hazard Abatement District

FIGURE 2-1

GHADs are financed through an assessment of only those property owners who own real estate within the designated district boundaries. The guiding document for a GHAD is a Plan of Control, prepared by a certified engineering geologist (see Public Resources Code, § 26509 et seq.). After the city of Malibu approved the BBGHAD's formation and appointed an initial Board of Directors in September 2011, the TPOA withdrew its CSLC lease application, and the BBGHAD submitted a new application as Applicant for the Project. The BBGHAD's Plan of Control was approved by the BBGHAD Board in 2011, and in 2012, a majority of property owners within the BBGHAD voted to approve an assessment to fund the Project. Project construction would require the BBGHAD to obtain the approvals identified in Section 1.4. Improvements undertaken by the BBGHAD, including all activities in furtherance thereof or in connection therewith, shall be deemed to be specific actions necessary to prevent or mitigate an emergency and are statutorily exempt from review under the California Environmental Quality Act (Pub. Resources Code, §§ 21080, subd. (b)(4), and 26601).

2.1.2 Current Conditions at Broad Beach

At most tides, Broad Beach is a narrow ribbon of primarily wet-sand beach that extends for approximately 6,200 feet from the Trancas Creek Lagoon on the east (bordering public Zuma Beach) to Lechuza Point on the west. The beach is often wider with larger pockets of dry sand on the east and narrows to become more of a low-tide beach to the west. The beach becomes increasingly rocky west of the existing rock revetment to Lechuza Point, where rocky intertidal habitat is seasonally intermixed with intermittent sandy beach. The beach and areas of adjacent sand dunes border 121 lots that support 109 residences and a recreational beach facility, the Malibu West Beach Club. The beach is accessible to residents and the public primarily at low to low-moderate tides, but is inundated at medium to high tide.[3]

Roughly 70 percent of the residences along Broad Beach are currently protected by the emergency revetment, which is backed by a geotextile sand bag revetment. Of the 109 residences that border the beach and adjacent sand dunes, 76 are located landward of the existing emergency revetment, while the remaining 33 (27 located at the west end and six at the east end) are located outside the emergency revetment's footprint. The residences toward the west end of the beach beyond the western end of the emergency revetment are not fronted by dunes and many have individual seawalls or rock revetments (see Appendix P), while those at the east end rely on dunes and geotextile, sand bag, and Sakrete revetments. However, due to recent erosion, the east end currently has minimal protection, with only 30 to 50 feet of dry sand beach berm and low dunes fronting these homes.

[3] During field work on September 14, 2011, during a +5-foot high tide, virtually all of Broad Beach excepting the easternmost 100 yards was observed to be submerged.

2.1.3 State Sovereign Lands and Private Property Boundary

The location of the boundary between upland private properties and tidally-influenced state sovereign lands is the Ordinary High Water Mark (OHWM).[4] Generally speaking, the location of the OHWM can be determined by and in most cases is the same as the surveyed MHTL,[5] except where there has been fill or artificial accretions, or where the boundary has been fixed by agreement or court decision. MHTL surveys themselves do not create a permanent boundary line, but rather serve as evidence of a MHTL location at that single point in time. The location of the MHTL at any given point in time represents the location of the intersection of the mean high tide elevation with the shoreline, and its location can change from day to day due to numerous influences, including but not limited to, sand movement along the coast, variations in long-term wave and storm activity, coastal erosion, rising sea levels over the long term, and the introduction of artificial influences.

Key Terms

Ordinary High Water Mark (OHWM): The OHWM is the legal boundary between private uplands and State tidelands, and is ambulatory in the absence of artificial influences, such as revetments and levees. The OHWM can be fixed by agreement or court decision.

Mean High Tide Line (MHTL): A MHTL represents the intersection of the mean high tide elevation with the shoreline.

The **OHWM** and **MHTL** are not observable and must be located by a surveyed MHTL.

Installation of the emergency revetment at Broad Beach artificially inhibited high tides from reaching their maximum landward elevation and extent along the length of the revetment, thus inhibiting the ambulatory nature of the OHWM at these locations. The OHWM was effectively fixed as the boundary between state sovereign lands and private uplands at Broad Beach as a result of the revetment's construction over the last MHTL location surveyed by the CSLC in January 2010 prior to construction of the emergency revetment. Upon completion of the beach nourishment and dune construction, the OHWM would also cease to be ambulatory in areas without the revetment, for as long as the artificial influences remain. Future beach nourishment activities proposed by this Project would also affect the location of the MHTL by moving the MHTL seaward, at least temporarily. Under current conditions, the MHTL is likely located near the face of the revetment. The location of the OHWM at Broad Beach is important to both the public and private property owners, as it defines the boundary between public and private lands along the beach front. As such, the location of the OHWM is a key element affecting the public's right to beach access along the shoreline, as well as the privacy and rights of local property owners. The location of the OHWM also potentially affects the long-term location of the emergency revetment.

[4] Civil Code section 830 states "[e]xcept where the grant under which the land is held indicates a different intent, the owner of the upland, when it borders on tide water, takes to ordinary high-water mark."

[5] Adopting the reasoning of the Ninth Circuit, the U.S. Supreme Court held that the ordinary high-water mark property boundary of lands adjacent to or along tidal waters would be physically located by use of the mean high-water line. *Borax, Ltd. v. Los Angeles*, 296 U.S. 10 (1935).

As discussed in Section 2.1.1, the Applicant's engineers completed one survey of the MHTL on October 15, 2009, and the CLSC staff completed a second survey on January 20, 2010, just prior to installation of the emergency revetment. After construction, the toe of the revetment was excavated at certain points and spot locations were identified along its length for comparison to the two MHTL locations. Relative to the Applicant's MHTL location, approximately 0.12 acre of the revetment encroaches onto State land; relative to the CSLC MHTL, approximately 0.86 acre encroaches onto State land. The January 2010 CSLC MHTL survey is used as the basis for this analysis (Figures 2-2 through 2-6 show both the October 15, 2009, and January 19-20, 2010, MHTL surveys).

2.1.4 Existing Vertical and Lateral Public Access

Public vertical access to Broad Beach is currently provided via two public access easements (Figure 2-2), which include pathways and stairs connecting to Broad Beach Road. Since construction of the emergency revetment in 2010, the two public vertical access points also include engineered stairways over the revetment to the beach. The two gated vertical access ways are owned and managed by the Los Angeles County Department of Beaches and Harbors, and are locked during evening hours for public safety reasons as mandated by Los Angeles County. Unrestricted roadside parking is available within the public right-of-way along Broad Beach Road. Unlimited lateral access during low or moderate-low tides is also available from Zuma Beach, located immediately east of Broad Beach. Extensive public parking exists at Zuma Beach in the county-owned and operated parking lot and along the shoulder on either side of PCH.

Depending on seasonal sand levels and tides, existing public lateral access is currently available both on public trust lands and on those private properties that have deeded such access. However, under conditions observed in 2011, 2012, 2013, and 2014, a moderate tide of 1 to 2 feet can submerge all or most of the sandy beach, limiting public and private lateral access along the shoreline (Illustration 2-5). Under such conditions, the emergency revetment presents a physical barrier to lateral access. Under current conditions, coastal erosion and the rock revetment have resulted in a materially diminished beach for recreation and public uses. In addition to existing physical limitations, lateral access along Broad Beach is affected by a complicated mix of public land, easements for public lateral access,[6] and private property. Land seaward of the OHWM is public.

[6] The CCC (2004) has prepared educational materials showing the location of LAEs. The CCC's Public Access Action Plan also states that the purpose of requiring a public access easement is to mitigate a project's specific impacts on the public access or to mitigate for the project's contribution to cumulative impacts of the new coastal development upon public access. The placement of a shoreline structure on a beach results in both a loss of recreational beach area and impedes lateral access. Therefore, the CCC often requires an Offer to Dedicate (OTD) to help mitigate this public access impact by providing an alternate area that would permanently be available for use (CCC 1999).

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Project Overview and Key Components

FIGURE 2-2

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Illustration 2-5. *Lateral access along Broad Beach from the east can be impeded by high tides that often reach the revetment toe. The emergency revetment design accommodates vertical public coastal access paths and concrete stairways across the revetment; however, the beach is accessible from these stairways during low to moderate-low tides (bottom left), while higher high tides and beach erosion impede access (bottom right). Note kelp on stairway from last high tide (bottom left).*

Approximately 51 of the private parcels along Broad Beach have granted scattered easements, deed restrictions, or other legal documents providing lateral public access. Collectively, these dedications are referred to here as LAEs.[7] Of the existing LAEs along Broad Beach, the CSLC holds 36, while the remaining 15 are categorized as deed restrictions and other legal documents defining easements that are not held by an agency.[8]

Key Terms

Offer to Dedicate (OTD): Offers to dedicate public access easements, or OTDs, are recorded legal documents required by CCC to mitigate for a permitted project's impacts on public access.

Lateral Access Easement (LAE): Easements, deed restrictions, or other recorded documents establishing the right of lateral public access. For purposes of this document, LAEs refer to accepted OTDs (i.e., valid legal easement interests held for the public benefit).

[7] Also known as OTDs; however, OTDs are only offers of easements. The interest belongs to the property owner until the offer is accepted by a government agency or a nonprofit organization acceptable to the CCC. Once the OTD is accepted, the accepting entity obtains title to the easement and the easement remains in the public domain in perpetuity. LAEs are accepted OTDs and have been dedicated by former or current owners of land within the BBGHAD and held by various agencies including CSLC.

[8] These deed restrictions and other legal documents predate the CCC OTD program and therefore are not held by a public agency.

The LAEs vary in terms, but typically extend 25 feet inland from above the daily high water line or the MHTL. In some cases LAEs are restricted by privacy or setback buffers against the residential structures. An estimated 32 of the 51 LAEs (20 of which are held by the CSLC) are partially or entirely covered by the emergency revetment. Those easements landward of and not covered by the revetment are not accessible to the public because the revetment creates an impassible barrier. See Section 3.2, *Recreation and Public Access,* for further discussion of this issue.

2.1.5 Existing Coastal Protection Structures

As discussed in Section 2.1.1, Broad Beach homeowners have responded to threats of coastal erosion by installing a range of inconsistent coastal protection structures, including the 4,100-foot-long emergency rock revetment and prior geotextile, sand bag, and Sakrete revetments extending approximately 4,600 feet, mostly landward of the rock revetment. Approximately 140 feet of rock revetment at addresses 30952, 30948, and 31244 Broad Beach Road are not backed by sand bag revetments. A variety of additional coastal protection structures, both permitted and unpermitted, have been installed. On the east end of Broad Beach, five homes, one large undeveloped lot, and the Malibu West Beach Club fronting approximately 550 feet of beach were previously protected from coastal erosion by the relatively wider beach and sand dunes, and geotextile, sand bag, and Sakrete revetments; however, recent storm activity has eroded the beach and dunes and washed away or destroyed the temporary revetments, leaving only 30 to 50 feet of dry beach berm protecting these homes. Further west, one homeowner elected to rely upon setbacks, sand dunes, and a geotextile revetment for protection, leaving a 100-foot gap in the emergency revetment; this property has also experienced erosion and lacks protection from future erosion (Illustration 2-6).

At the west end of the beach, 22 homes and one vacant beachfront parcel are protected by timber bulkheads, concrete seawalls, or rock revetments, or have been constructed on pilings. Most homes use private individual protection measures, while some homes have used coordinated solutions, such as the four homes from 31364 to 31376 Broad Beach Road that share a large concrete seawall (see Appendix P). Some of the protective measures along this segment of Broad Beach rise up over 20 feet above the existing beach. The state's ownership interest along the west end, if any, has yet to be determined. At the far west end of Broad Beach, six homes are constructed on the bluffs overlooking Lechuza Cove, approximately 20 to 40 feet above the beach. Due to past erosion from wave activity that has resulted in small caves and indentions into the base of the bluffs, the bluffs below some of these homes are currently protected by rock revetments intended to reduce erosion impacts (see Illustration 2-6).

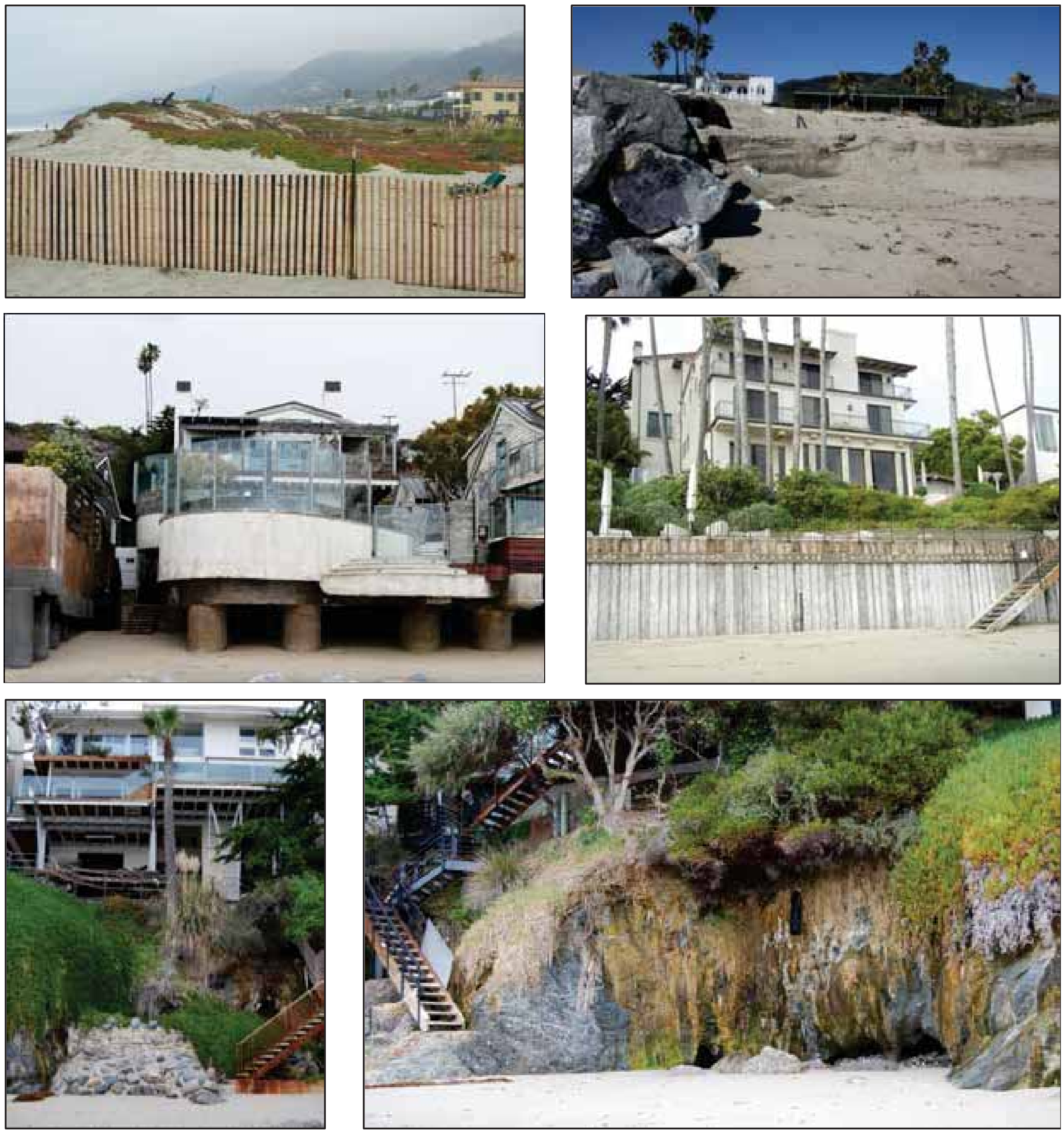


Illustration 2-6. *A wide beach and dune system (left) that protected homes along the far west end of Broad Beach has eroded away. Homes west of Lot 30756 and east of Lot 31350 are protected by the rock revetment, except for Lot 30822, where a 100-foot gap in the revetment exists (top right). Homes along Broad Beach, especially at Little Broad Beach at the west end of Broad Beach, have constructed a variety of coastal protection structures over many years. Along Lechuza Cove, the bluffs are also showing signs of erosion. Some homeowners have placed rock revetments at the base of the bluffs to protect from wave activity and erosion (bottom left and right).*

2.2 PROPOSED PROJECT ACTION

The CSLC is considering the BBGHAD's application requesting a 20-year lease for the use of state sovereign lands for a shoreline protection project including beach nourishment, dune construction, and the long-term retention of portions of the existing emergency rock revetment and geotextile sand bag revetments.

The Project proposed by the BBGHAD would implement a shoreline protection plan along Broad Beach, and would include:

- beach nourishment to create both a dry sand beach and a restored dune system;
- at least 20 years of beach sand supply maintenance—using sand backpassing (see Section 2.2.10, *Future Beach Management Events*) designed to prolong nourishment and one major renourishment event in roughly 10 years—and at least 20 years of dune maintenance;
- permitting the existing emergency rock revetment and geotextile sand bag revetment for the Project duration (at least 20 years) buried under both the beach nourishment and dune, as well as permitting for alterations to existing storm drains that pass through the revetment or empty onto the beach;[9] and
- removal of existing unpermitted stairs that cross the revetment.

In cooperation with the CSLC, the BBGHAD has agreed that recreation and public access are of paramount concern.

If the lease is granted, the BBGHAD has committed to funding one major future renourishment event in roughly 10 years as well as annual smaller-scale “backpassing” from wider reaches of the beach to narrower reaches of the beach according to certain objective guidelines. As discussed further in Section 2.2.10, *Future Beach Management Events,* the BBGHAD may fund additional nourishment events after 20 years, subject to future agency approvals and additional CSLC lease authorization, if coastal erosion eliminates most or all of the coastal protection and beach access benefits of the Project. If a new lease is not authorized by the CSLC at the end of an initial lease term, the CSLC would determine the disposition of all improvements overlying state sovereign lands and LAE’s at that time (e.g., removal or retention of improvements).

2.2.1 Physical Description of Proposed Project

The Project would entail a series of currently planned and to be permitted actions as well as past activities that were either unpermitted or approved under an emergency permit process. Long-term permits for past actions, including unpermitted rock, sand bag, or geotextile revetments, and removal of unpermitted stairways are folded into the Project. Based on the Project, physical changes associated with these past actions are

[9] Both public and private storm drains carry runoff to Broad Beach; however, where public storm drains pass under existing homes, through the revetment and across private property to the beach, they become private property and are generally the homeowner’s responsibility to improve and maintain.

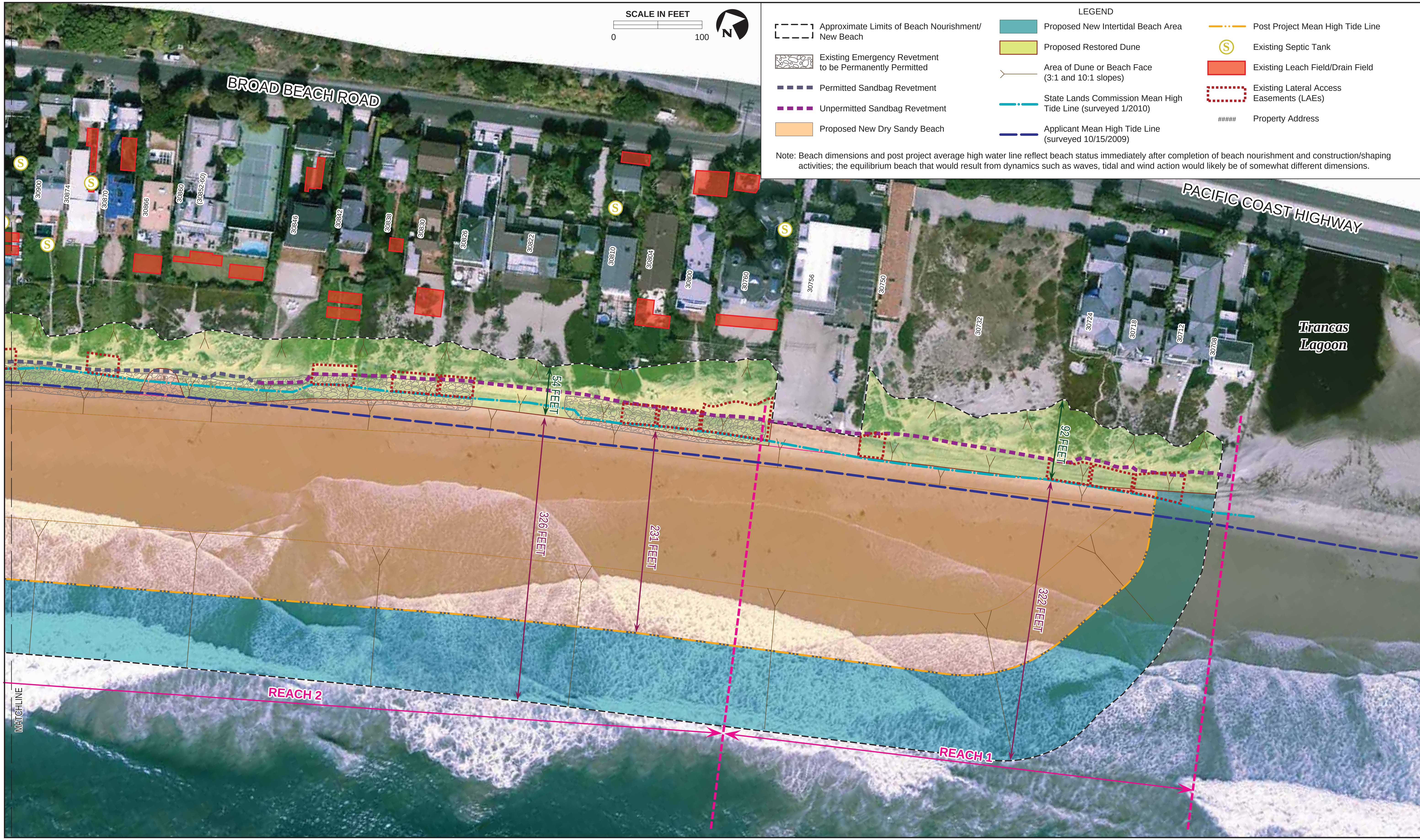
described to the extent information is available (refer to Figure 2-2 through 2-6 for detailed Project plans):

- Permitting of the as-built 2010 emergency rock revetment and any associated storm drain improvements within and through the revetment and to the beach for a 20-year period. This includes the use of unpermitted rock material deposited at the west end of Broad Beach between 1997 and 1998 pursuant to emergency CDPs and later reused as part of the 2010 as-built emergency rock revetment;
- Permitting of as-built sand bag and geotextile revetments that were either unpermitted or installed under emergency conditions in 2008-2009 and used as temporary shoreline protection devices (many of which are now wholly or partially buried under rock revetment) for a 20-year period;
- Removal of exposed sand bags and Sakrete debris from the beach prior to nourishment as well as existing informal unpermitted stairways that cross the rock revetment from various private residences to the beach;
- Import of approximately 600,000 cy of sand that would be trucked along 40 to 45 miles of roads from the Simi Valley region in Ventura County (northwest of Broad Beach) to the Zuma Beach parking lot via approximately 43,000 truck trips (trucking of sand to Zuma Beach would be conducted in accordance with a Transportation Management Plan that identifies the maximum or average number of trucks allowable per day, and their allowable routes, schedule, speed restrictions, and duration);
- Deposition of delivered sand within a 1.4- to 1.9-acre staging area on Zuma Beach that fronts the western 1,000 feet of the Zuma Beach parking lots;
- Use of heavy equipment (e.g., scrapers, large 40-ton/30-cy capacity off-road trucks, and bulldozers) to distribute sand to desired locations and depths, including covering the existing revetment and creating a restored sandy beach;
- Deposition of sand to a depth of roughly 12 to 17 feet in areas seaward of the revetment to create an initial post-construction dry sandy beach of 85 to 230 feet wide seaward of the dunes;
- Development, construction, and maintenance of a system of sand dunes roughly 40 to 60 feet in width and 17 to 22 feet in height, with restored native southern foredune habitat, crossed by 112 access pathways from 109 private residences, the beach club, and two public access points;
- Removal of non-native vegetation from dune areas and planting of native vegetation with the created sand dunes consistent with applicable CCC and city of Malibu standards for dune habitat restoration areas;

- Ongoing monitoring of Project performance, including beach width measurements, changes in local or regional sediment supply, general effects on beaches down coast, establishment of dune vegetation, and performance of the revetment (if exposed);
- Maintenance of beach width using heavy-duty scrapers and other equipment to backpass sand from the wider eastern downdrift reach of Broad Beach to narrower updrift areas to the west, in accordance with objective guidelines, to occur annually as needed (Illustration 2.7; see also Section 2.2.10);
- Ongoing coordination with the CSLC and CCC regarding monitoring results and required actions, such as potential for more frequent backpassing and future major renourishment;
- One major beach renourishment event occurring approximately 10 years after completion of initial nourishment. Renourishment would begin in accordance with objective triggers based on monitoring of beach erosion and width; and,
- Receipt of permits to install up to 550 feet of emergency sand bag or geotextile revetments at the beaches' east end and in the 100 foot gap in the revetment.

After every backpassing or major beach nourishment event, the constructed beach would remain subject to ongoing natural wave and littoral transport processes and resulting redistribution of sand. As a result, initially constructed beach profiles would evolve and change until the constructed beach reaches a natural equilibrium consistent with ongoing coastal processes. Thus, while the discussion below precisely describes the initially engineered beach, the Applicant's engineers anticipate that natural equilibrium of the beach would evolve as described via projections and modeling (refer to Sections 2.2.8 and Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*).

Illustration 2.7. *Sand would be delivered to Broad Beach from Zuma Beach using high-capacity 40-ton off-road haul trucks (left) capable of operating in a beach environment. Approximately 7 of these trucks would transit Broad Beach several times each day. Heavy-duty scrapers (right) would distribute sand on Broad Beach once deposited by the haul trucks. Such scrapers may also be used to transport sand from Zuma to Broad Beach and during backpassing operations.*



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Details of Proposed Project – Eastern Reach

FIGURE 2-3

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Details of Proposed Project – East Central Reach

FIGURE 2-4

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Details of Proposed Project – West Central Reach

FIGURE 2-5

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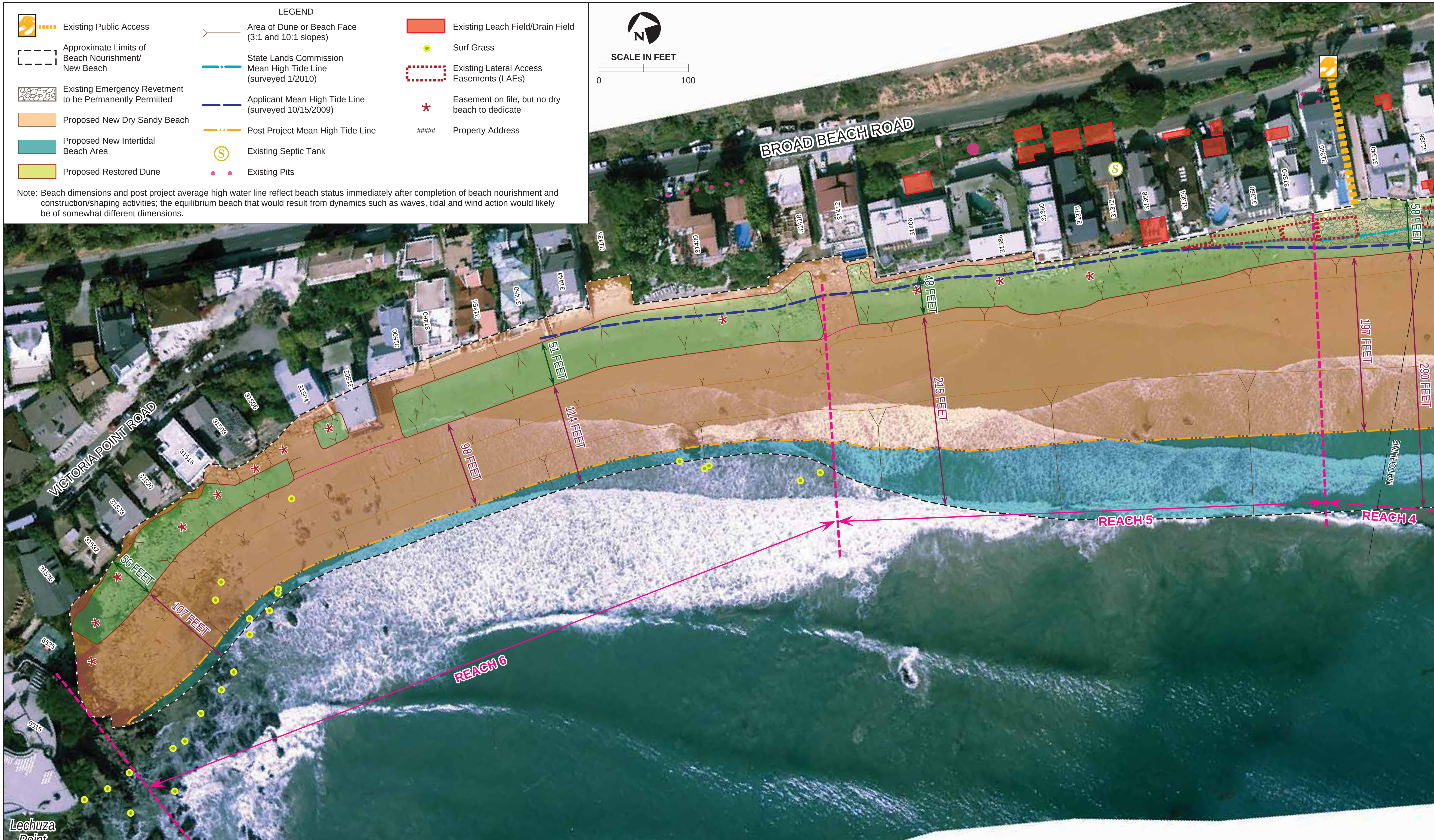

Details of Proposed Project – Western Reach

FIGURE 2-6

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2.2.2 Long-Term Authorization of 2010 As-Built Emergency Revetment and Shoreline Protection Structures

As part of the long-term strategy for protection of homes, ancillary structures (e.g., decks), and septic systems from coastal erosion, the BBGHAD seeks long-term approval of the emergency rock revetment constructed in 2010, as temporarily permitted by the city of Malibu and the CCC, among other agencies. This approval would also incorporate an after-the-fact authorization for shoreline protection structures installed prior to construction of the 2010 emergency revetment, including rock deposited at the west end of Broad Beach between 1997 and 1998 pursuant to emergency CDPs and subsequently used as part of the 2010 rock revetment and several thousand feet of sand bag or geotextile revetments that generally underlie the rock revetment.[10]

Emergency Revetment: The existing emergency revetment rises approximately 12 to 15 feet above MLLW, covers an approximate width of 22 to 38 feet at its base, and extends for 4,100 feet along the beach, covering approximately 3.02 acres of beach. The revetment comprises a mix of rock sizes ranging from less than 0.5 ton to up to 4 tons. The majority of rocks used to construct the revetment in 2010 were imported via heavy trucks and placed in the revetment by cranes and other equipment; an unknown quantity of rock from previously approved emergency rock revetments near the west end of Broad Beach was also incorporated into the 4,100-foot emergency revetment.

The revetment is constructed on both private and public land with the majority (approximately 2.16 acres) on private property located landward of the January 2010 MHTL surveyed by CSLC and approximately 0.86 acre on public trust lands. In addition, the revetment covers approximately 0.53 to 0.77 acre of private land burdened with recorded LAEs dedicated to the State to provide lateral public beach access (Figures 2-3 through 2-6). According to a plat showing the January 2010 MHTL, surveyed by CSLC, and the recorded LAEs, approximately 1.39 to 1.63 acres of the emergency revetment overlies either public trust land or public LAEs along Broad Beach. An additional 0.20 to 0.27 acre of LAEs located landward of the revetment are not accessible by the public, meaning that 1.59 to 1.90 acres of publicly accessible lands are impacted.

Emergency Sandbag or Geotextile Revetments: Between 2008 and 2009, before installation of the emergency revetment, the majority of Broad Beach homeowners had applied for and received emergency CDPs to install approximately 3,800 feet of discontinuous sand bag or geotextile revetments along Broad Beach. These shoreline

[10] Rock was deposited between 1997 and 1998 under emergency CDPs at the following six properties along Broad Beach Road: 31272, 31316, 31322, 31324, 31330, and 31346. This material remained in place until it was relocated and used as part of the emergency revetment rock placed in 2010.

protection structures consist of large stacked sand-filled geotextile bags that generally are 12 to 18 feet wide at the base and 8 to 12 feet high. Though discontinuous, the sand bag/geotextile revetments cover the same general reach of the existing emergency rock revetment (there is no sand bag revetment at 30948, 30952, and 31244 Broad Beach Road). When they were constructed they also extend eastward beyond the revetment, providing protection to residences on the eastern 550 feet of Broad Beach. Many of the sand bag/geotextile revetments were damaged, partially destroyed, and/or had to be repaired to provide shoreline protection prior to installation of the rock revetment. Most were buried under or remain landward of the emergency rock revetment, other than the aforementioned eastern 550 feet of beach and at 30822 Broad Beach, where there is no rock revetment. Data and mapping for these sand bag/geotextile revetments are less precise than for the emergency rock revetment; however, according to the mapped recorded LAEs, more than 900 linear feet of these sand bag revetments partially or fully overlie LAEs along Broad Beach (Figures 2-3 through 2-6).

Unpermitted Stairways: As part of permitting the emergency rock revetment, the Project would also include removal of more than 24 unpermitted stairways that have been constructed across the rock revetment over the nearly 4 years since its installation. These generally minor structures vary from large flat rocks cemented into the revetment with guide handrails to more informal use of stone, cement, and sand bags to provide beach access across the revetment for homeowners.

If the revetment and underlying shore protection structures are approved, these shoreline protection structures would remain in place for the design life of the Project which is up to 20 years. These structures would be buried beneath the landward edge of the beach and a new system of sand dunes located over the rock and sand bag revetments at the landward edge of the widened, nourished beach. Mechanical backpassing of sand and one major additional nourishment event are included in the Project and are intended to keep the revetment buried over approximately 20 years. However, severe beach erosion due to large storm events or other conditions could potentially preclude maintaining sufficient beach width for protection, thereby reducing the period during which the revetment is buried (refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). The rock revetment would serve as a last line of defense against future severe erosion during extreme storm events.

2.2.3 Sand Sources

The Project would include the initial deposition of 600,000 cy of sand on Broad Beach to create a wide sandy beach backed by a system of dunes. This sand would be provided from one or more of three privately owned quarries located inland in Ventura County—CEMEX, Grimes Rock, and P.W. Gillibrand—and trucked to Broad Beach. These quarries are located in the Moorpark/Simi area of Simi Valley (see Figure 1-2). Please refer to Section 2.3.4, *Construction Details*, for details on sand transport and distribution to Broad Beach.

Sand grain size, chemical composition and color are important to determining the suitability of a sand source for use in beach nourishment. Sand from these three quarries has a medium grain size, coarser than the fine-medium grain size present on the existing beach, and is expected to be suitable for use as dune and beach-quality sand based on grain sizes that have performed well in past beach nourishment projects along the California coast (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). The geologic setting of the quarries indicates that sandstone is the sediment source. Sand sieve test results show the quarry material to be between 92.5- and 97.5-percent sand, and between 7.5- to 2.5-percent silts and clays, which is acceptable for use as beach sand. The median diameter of the quarry material is larger than the median diameter of sediment on the current beach, which is expected to be suitable for beach nourishment based on past performance of beach nourishment projects along the California coast that used grain sizes that were larger than the native grain sizes on receiving beaches (coarser sand resides higher on the beach profile and typically results in a wider recreational beach berm area than finer sand) (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*).

The full quantity of sand required for initial Project beach nourishment (i.e., 600,000 cy of material) is available from CEMEX and Grimes Rock quarries. The third quarry, P.W. Gillibrand, can supplement the Project if the other quarries cannot meet the capacity needed to serve the Project, and can expand operations, if needed, to potentially supply additional sand. Authorization to use the Moorpark/Simi quarry material has been provided in the form of written commitments from CEMEX quarry and P.W. Gillibrand quarry to the BBGHAD. Grimes Rock quarry did not provide a letter committing its sand supply, but has sand available for sale to the BBGHAD. In its March 2013 meeting, the BBGHAD Board approved a motion to investigate using material from the Moorpark quarry. All three quarries are permitted by Ventura County under permits CUP 4633 (CEMEX), MCUP 4874-2 (Grimes), and CUP 1367 (P.W. Gillibrand). (See Appendix K for copies of existing permits and reference to certified environmental documents.)

2.2.4 Beach and Dune Design

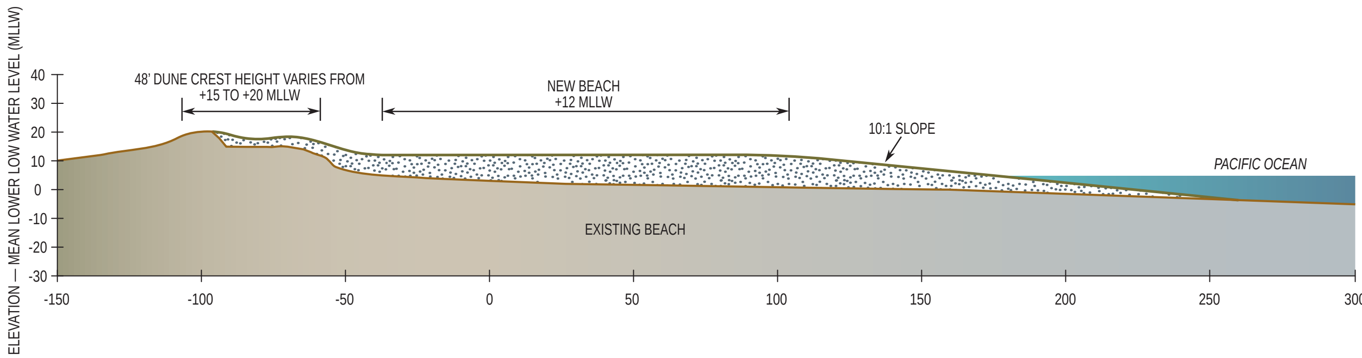
Of the 600,000 cy of sand being put onto Broad Beach, approximately 100,000 cy would be used to construct the dune system. The total area of new dunes, beach berm, and beach face would cover up to 46 acres (40.5 acres on public trust lands administered by the CSLC and 5.5 acres on private land. The profile of the new dry sand beach berm would be roughly 12 feet above MLLW in most areas, while the beach profile at the west end (i.e., west of 31412 Broad Beach Road) would be between 14 and 17 feet above MLLW, depending on location. Under existing conditions, exposed foundations, seawalls, and pilings of homes on the west end of the beach rise 10 to 15 feet or more above existing sand levels. Under the Project, many of these exposed features would be partially covered by sand, although preliminary dune plans indicate that the dune would end landward of some homes, which would limit the coverage of pilings. At its widest point, the combined new beach and dune system would extend approximately 300 feet from the landward side of the restored dune system to the surf zone on the face of the beach berm (Figures 2-7a and 2-7b).

The new post-construction dry sand beach berm is projected to extend seaward of the dunes by 90 to 230 feet, with the beach narrower at the west end and wider in the central and eastern sections (beach widths and sand depth assume the MHTL is at an elevation of 5 feet above MLLW). Beach widths in Lechuza Cove would be as narrow as 90 feet while the entire area east of 31330 Broad Beach Road would be 200 feet wide or wider. The widest section of the post-construction beach would consist of a gently sloping beach face leading down to the ocean, a somewhat narrower level beach berm and a short, steeper berm leading up to and over the revetment into the dune system. The post-construction beach face would range from 50 feet wide with a 3:1 slope down to the ocean in Lechuza Cove at the west end, to 125 feet wide with a 10:1 slope down to the ocean in the beach's eastern segments. The level, post-construction dry sand beach berm would average 50 feet in width over the western 1,000 feet of beach, widening to 100 or more feet in width over the remaining 5,000 feet of central and eastern Broad Beach. The steeper berm at the inland edge of the beach-dune interface would range from 15 to 30 feet in width, with average slopes ranging from 3:1 to 7:1.

The dune system would be roughly 50 feet wide along most of Broad Beach. The height of the proposed sand dunes would be typical of the existing dunes at the east end of the Project, which are approximately 20 feet higher than MLLW (the average low tide line during spring tides). The top of the existing emergency rock revetment would be buried beneath at least 2 feet of sand. The dune system would be primarily constructed over and behind the existing emergency rock revetment. At the east end where no revetment is present, the dunes would be constructed on private land and LAEs landward of the MHTL. At the west end where there is no revetment and no dry sand beach remains, the dunes would be located primarily on public trust lands (see Figure 2-6). The dunes would be constructed by creating a sand berm that runs along the length of the beach, with a minimum of 2 feet of sand over the rock revetment. The berm would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the revetment, depending on location. The dune system would be constructed on top of this berm. The width of the dune system would vary from 40 to 60 feet, with most sections being approximately 50 to 60 feet wide. The dunes would slope downward on the landward side and tie into the existing grade where the dunes integrate with the backyards of the residences. In areas where a constructed dune abuts lower lying non-dune private properties, the dune would slope landward for 10 to 20 feet in a 3:1 slope. On the seaward side of the revetment, the constructed dunes will grade into the toe of the

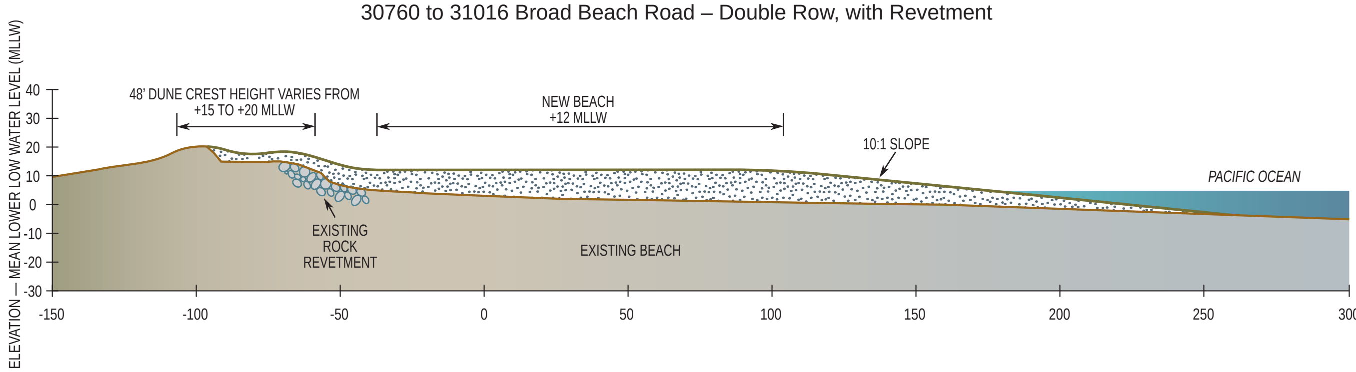
REACH 1 – EAST END

30708 to 30756 Broad Beach Road – Double Row, without Revetment



REACH 2 – TOWARDS EAST END

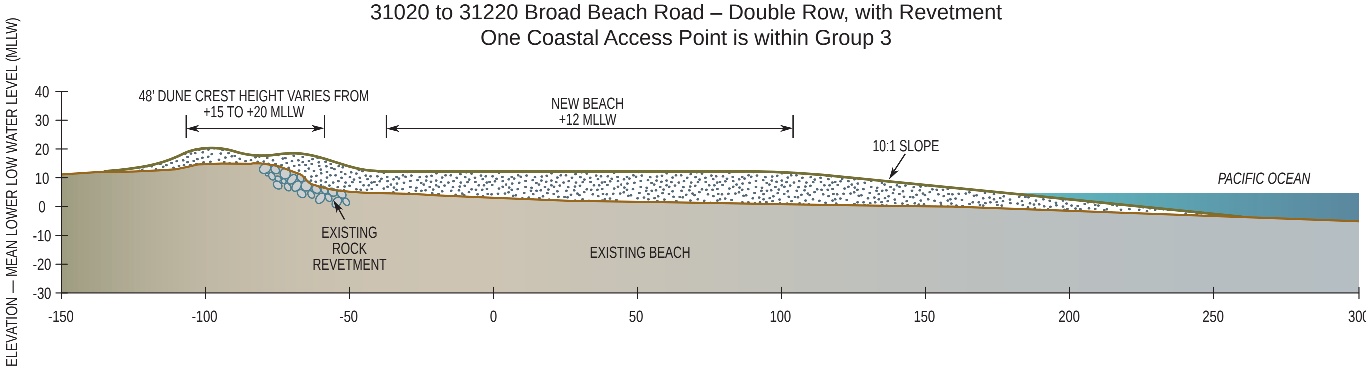
30760 to 31016 Broad Beach Road – Double Row, with Revetment



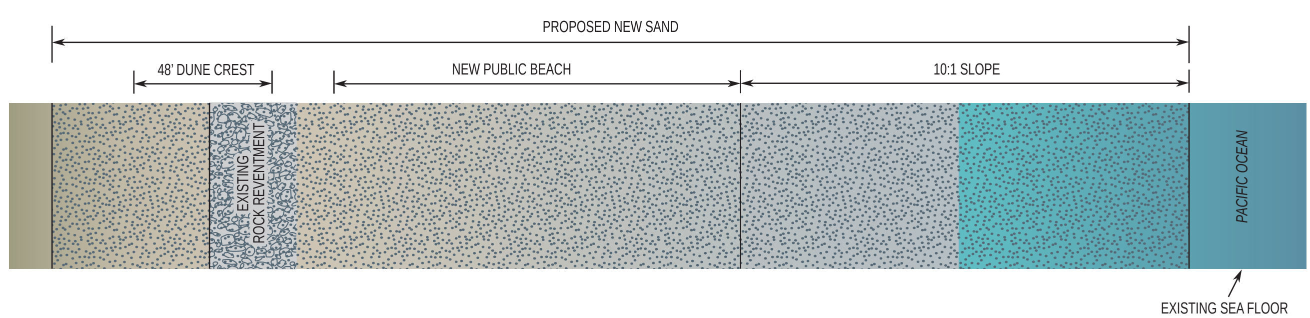
REACH 3 – EAST CENTRAL

31020 to 31220 Broad Beach Road – Double Row, with Revetment

One Coastal Access Point is within Group 3



EXAMPLE PLAN VIEW (REACH 3)



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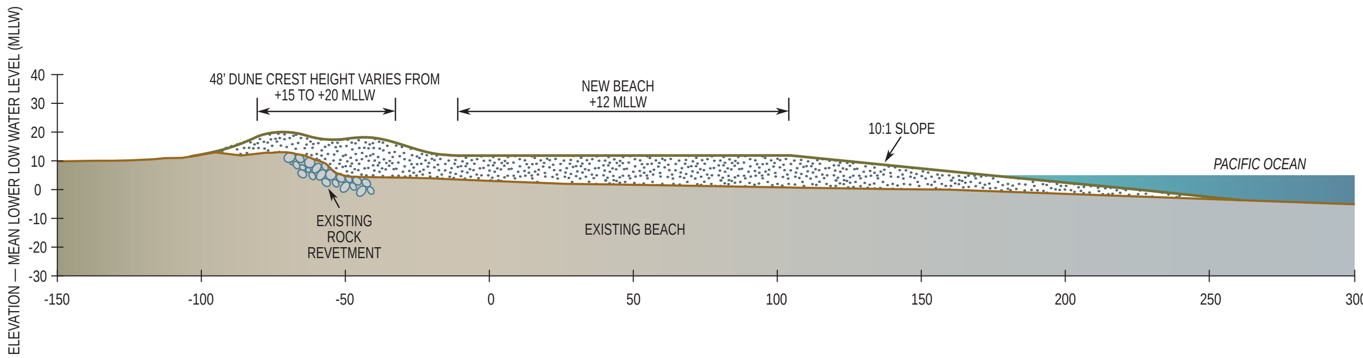
Cross Sections of Restored Beach and Dune Profile – Reaches 1, 2, and 3

FIGURE 2-7a

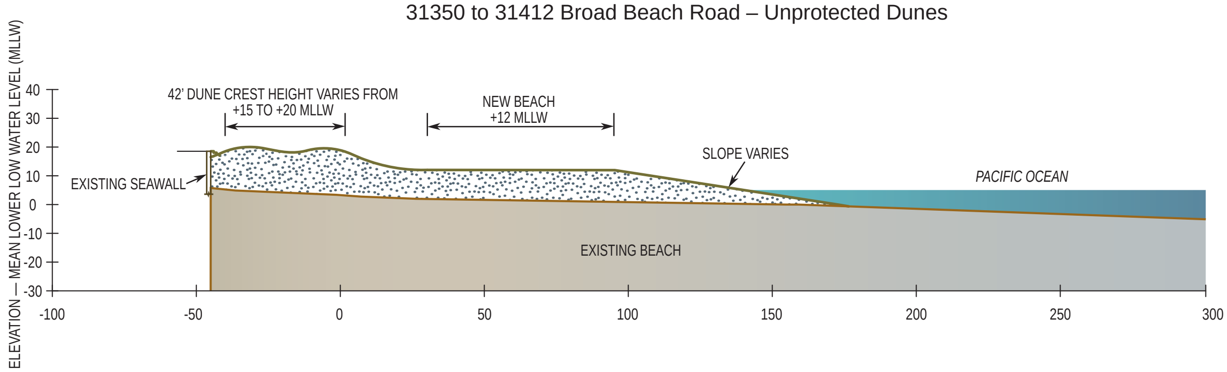
REACH 4 – WEST CENTRAL

31224 to 31346 Broad Beach Road – Double Row, with Revetment



REACH 5 – TOWARDS WEST END

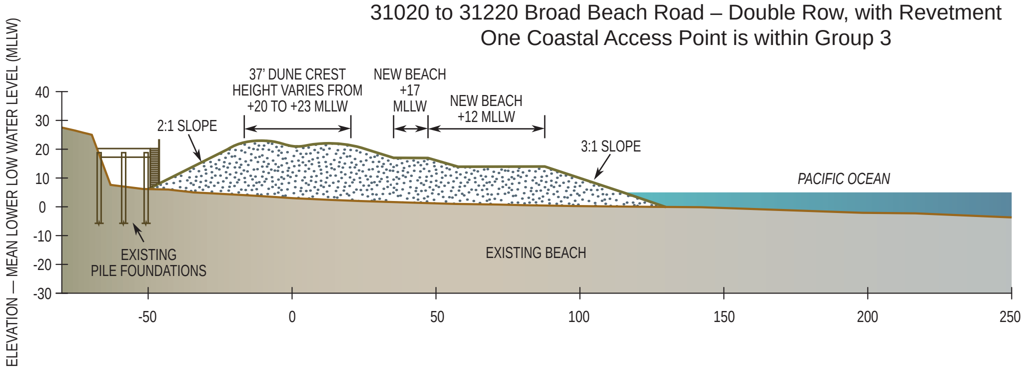
31350 to 31412 Broad Beach Road – Unprotected Dunes



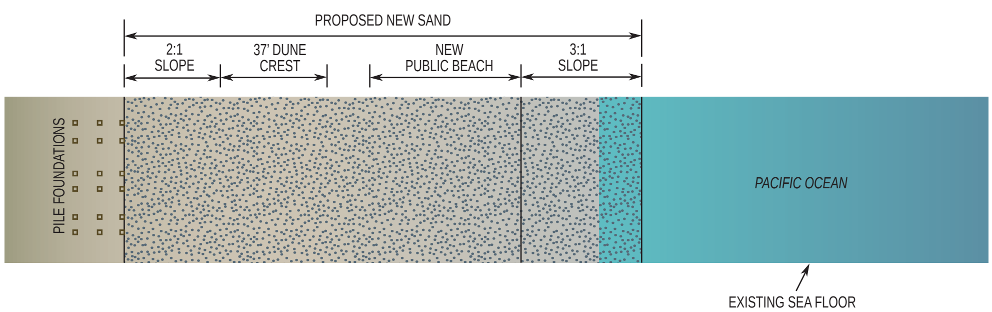
REACH 6 – WEST END

31020 to 31220 Broad Beach Road – Double Row, with Revetment

One Coastal Access Point is within Group 3



EXAMPLE PLAN VIEW (REACH 6)



Cross Sections of Restored Beach and Dune Profile – Reaches 4, 5, and 6

FIGURE 2-7b

steeper inland edge of the beach berm. The sand dune system would typically include two rows of dunes that would range from 2 to 3 feet in height above the underlying sand berm, rising from 4 to 5 feet over the revetment. Individual dunes would range from 15 to 30 feet in width and have side slopes between 10 and 30 percent.

For the purposes of dune and beach design, Broad Beach was separated into six reaches based on environmental sensitivity and geographical considerations (refer to Figure 2-2). The beach nourishment design is intended to account for existing conditions within each reach. Variations in width, slope, and elevation occur across the reaches, with significant variations between Reach 6 at the west end and the remaining five reaches to the east, which are fairly similar to each other in design (Table 2-2).

Table 2-2. Post-Construction Restored Dune and Beach Design

	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Length of Reach (in feet)	540	1,780	1,225	1,155	565	935
2010 Revetment Present?	No	Yes[1]	Yes	Yes	No	No
Typical Approximate Dune Width (in feet)	60	60	50	50	50	50
Dune Height (base to peak in feet above MLLW[2])	17 to 20	17 to 20	17 to 20	17 to 20	17 to 20	20 to 23[3]
Beach Berm Elevation (in feet above MLLW)	12	12	12	12	12	14 to 17
Typical Approximate Beach Width (in feet)	0 to 220[4]	210	200	200	160	90
Constructed Beach Slope (horizontal: vertical)	10:1[4]	10:1	10:1	10:1	10:1	3:1

[1] Revetment is not present at the 100-foot segment in front of the property at 30822 Broad Beach Road.
[2] Average of lower low water height of each tidal day observed over the National Tidal Datum Epoch, a 19-year period (currently 1983-2001) established by the National Oceanic and Atmospheric Administration.
[3] Existing seawalls along this reach limit the landward extent of the dune.
[4] Beach width and slope vary here due to the cut-in from Trancas Creek on the east end of this reach.

These reaches are defined based on residential addresses along Broad Beach Road with distinguishing landmarks provided as available:

- Reach 1 extends 540 feet from the east end of Broad Beach at Trancas Creek (Lot 30708) along the west edge of the Malibu West Beach Club (Lot 30756) to the eastern end of the existing revetment. This reach supports five homes, the Beach Club, a large vacant lot, the widest section of Broad Beach, and remnant dune habitats that are considered degraded based on lack of native species and other factors (see Section 3.4, *Terrestrial Biological Resources*). Existing homes are set back about 125 to 150 feet from the January 2010 MHTL, surveyed by CSLC, and are partially protected by dunes and geotextile revetments. This section does not contain any portion of the 2010 emergency revetment.

- Reach 2 extends 1,780 feet west from the east end of the existing revetment (Lot 30760) to Lot 31016. This reach supports approximately 36 homes and two vacant lots, approximately 1,680 feet of the existing revetment and the 100-foot-long gap in front of Lot 30822. The beach is narrower than that to the east and is predominantly intertidal, with access available at low to moderate tides. Areas landward of the revetment support limited remnant degraded dune habitat, and homes are set back about 100 to 150 feet from the January 2010 MHTL.
- Reach 3 extends 1,225 feet from Lot 31020 to Lot 31220. The reach begins four homes west of the eastern-most vertical public coastal access path and stairway. This reach is entirely protected by the existing emergency revetment and supports an existing public coastal access point and approximately 22 homes with setbacks of about 70 to 110 feet from the January 2010 MHTL. The beach appears relatively narrow and intertidal.
- Reach 4 extends 1,155 feet from Lot 31224 to Lot 31346. This reach begins just west of the western-most vertical public coastal access path and stairway. This reach is protected by the western portion of the 2010 emergency revetment and includes 19 homes set back about 50 to 100 feet from the January 2010 MHTL. The beach appears relatively narrow and intertidal.
- Reach 5 extends 565 feet from Lot 31350 to Lot 31412 and does not contain the 2010 revetment, with the exception of the tail at the west end of the revetment at Lot 31350. Within this reach, the January 2010 MHTL survey extends approximately 250 feet west of the western-most vertical access path and stairway. Homes on the lots fronting this portion of the survey are set back less than 50 feet from the January 2010 MHTL, with most of these properties right at the January 2010 MHTL. Several permitted and unpermitted coastal protection structures are present within this reach.
- Reach 6 extends 935 feet from Lot 31418 to Lechuza Point. This reach is not protected by the 2010 revetment; many homes here are constructed on pilings or have seawalls to provide shoreline protection, while others are constructed about 20 to 40 feet up on the bluff backing Lechuza Cove (Illustration 2-8). This reach includes the area that supports environmentally sensitive rocky intertidal habitat, rocky outcrops, offshore reef, and associated surf grass and kelp habitats.

The east end of Reach 1 and the west end of Reach 5 would have more variation in beach widths and slopes due to the presence of Trancas Creek at the east end and rocky intertidal habitats at the west end. At the east end of Reach 1, Trancas Creek seasonally breaches and flows out to the ocean, cutting into the beach berm in this area (refer to Figure 2-6). As a result, proposed beach widths from Lot 30708 to Lot 30724 vary from having no beach berm past the dunes to a 200-foot beach berm. The lot at the far east end of Reach 1 (30708) has little to no beach berm and slopes up to 3:1 from the dune area down to the creek. At the west end of Reach 5 the proposed new

Illustration 2-8. *Many of the houses along the west end of Broad Beach are constructed on pilings or include other coastal protection structures. Houses on the far west end along Lechuza Cove are constructed on bluffs that range from 20 to 40 feet in height.*

beach area would narrow down to protect portions of the rocky intertidal habitat in Lechuza Cove within Reach 6 (refer to Figure 2-3). The slope of the beach face would transition from 10:1 to 3:1 and the width from 160 feet to 100 feet in the roughly 200-foot section between Lot 31388 in Reach 5 and Lot 31430 in Reach 6.

Reach 6 is designed to be significantly different from the other five reaches to accommodate sensitive intertidal and nearshore rocky habitat by reducing the footprint of the nourishment area (see Section 3.3, *Marine Biological Resources*). This area, which makes up less than 10 percent of Broad Beach, would have higher beach berms, ranging from 14 to 17 feet above MLLW, and a narrower section of sandy beach, ranging from 90 to 100 feet (refer to Figure 2-3). The slope of the beach face would also be much steeper than in the other reaches, with a 3:1 ratio of horizontal to vertical distance. The dune system in this reach would generally range from 40 to 50 feet wide; however, some areas would only be able to accommodate a 30-foot wide dune system while several pockets would have no dune system at all. There would be breaks in the dune system where the storm drains run down to the beach, east of Lot 31506 and Lot 31418, and at Lot 31502 where the structure protrudes into the beach area that the new dunes would otherwise occupy. The berm that would support the dune system would be constructed to an elevation of 20 feet above MLLW, and the dunes would rise 2 to 3 feet above the berm, up to 23 feet above MLLW.

After every sand backpassing or beach nourishment and renourishment events, the constructed beach would remain subject to ongoing natural wave and littoral transport processes and resulting redistribution of sand. As a result, initially constructed beach profiles would evolve and change until the constructed beach reaches a natural equilibrium consistent with ongoing coastal processes. Thus, while the discussion below describes the initial engineered beach, the Applicant's engineers anticipate that natural equilibrium of the beach would evolve as described via projections and modeling (see

Section 2.2.8 and Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). Potential impacts to rocky intertidal habitats due to sand redistribution are addressed in Section 3.4, *Terrestrial Biological Resources.*

2.2.5 Dune Habitat Restoration

Using variations in footprint and shape, the Applicant's design of the proposed dunes would replicate existing dunes at the beach's eastern end and former dunes that existed along Broad Beach. Dune construction would be undulated along the beach modeled after the natural and historic dune composition in order to accommodate both unobstructed residential views of the ocean and Applicant-proposed private pathways from residences to the shoreline. In areas where constructed dunes would abut existing dunes on the landward side, the constructed dune would meet or exceed the elevation of the existing dune. The proposed dune restoration includes measures to restore native coastal dune habitats through removal of non-native plants, restoration of dune geomorphology, and establishment of appropriate native dune vegetation (Figure 2-8).

Figure 2-8. Conceptual Rendering of Dune System

Source: Moffatt & Nichol 2011

Site preparation would involve preservation or salvage of existing stands of native dune mat vegetation where feasible and practicable, removal of non-native and invasive plants, and sand sculpting prior to placing sand for foredune construction. A program of initial removal of non-native invasive species such as iceplant (Hottentot fig), pampas grass, myoporum, and European dune grass from areas within and adjacent to the restored dunes would be initiated during the later stages of beach nourishment.

The newly constructed dunes would be planted with native species typical of southern foredune and southern coastal scrub plant communities. In general, the seaward row of dunes would be planted with low-growing perennial forbs typical of southern foredune habitat such as red sand verbena, pink sand verbena, beach bur, and beach morning glory. The landward row of foredunes will planted with a mix of these species and additional low growing sub-shrubs and shrubs typical of more stabilized dunes and coastal scrub communities in southern California. The intent of including species typical of more stabilized dunes and coastal scrub communities is to provide increased sand stabilization along the landward side of the dunes. As a further measure to increase foredune stability, targets for plant cover would be set between 30 and 60 percent, with most dunes achieving 40 percent cover. As proposed, the Applicant would assume responsibility for the construction, planting, and maintenance of the restored dune system (BBGHAD Resolution No. 2012/06).

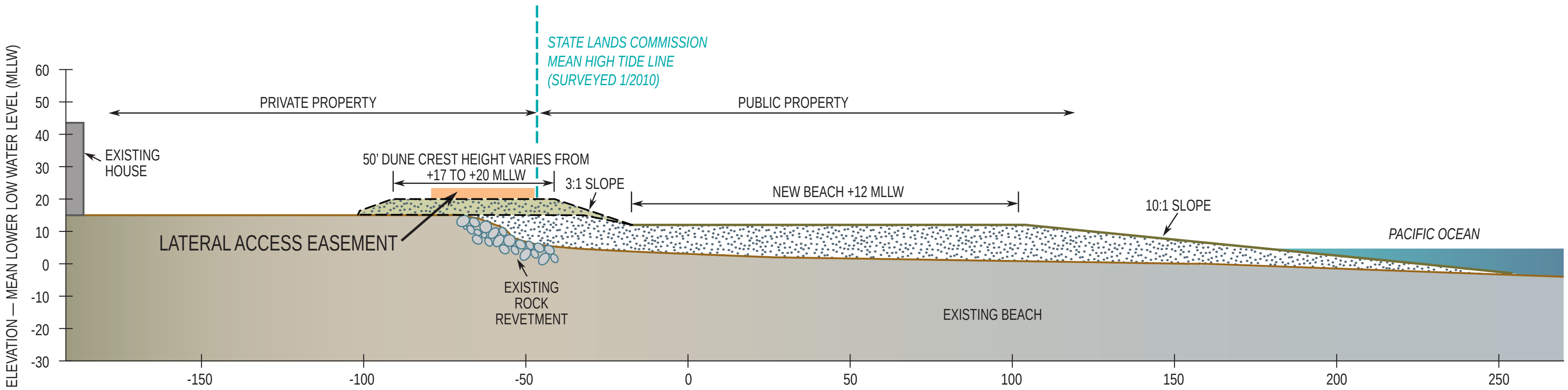
By their nature, dunes attract those who desire to climb up or across them. Doing so would reduce the size of the dunes, weaken their structure, adversely affect burgeoning plant life, and create added risk of trespassing into protected Environmentally Sensitive Habitat Areas (ESHA) and residential areas. As such, the Project would include posting signs to demarcate sensitive dune habitats (e.g., "Habitat Area: Please Remain Seaward of Dunes on Sandy Beach"), and the Applicant is proposing that no public access would be permitted on the dunes. Further, protocols would be implemented for long-term maintenance of restored habitats, including initial irrigation plans, ongoing invasive species/weed control and maintenance of signs and access control measures.

2.2.6 Private Property and Public Lateral Access

Physical public lateral access along Broad Beach is currently limited to times of low and moderate-low tides. Public access landward of the OHWM is also affected by uneven distribution of LAEs for lateral access which are recorded on approximately half of the private parcels along Broad Beach. These LAEs typically extend inland on private property between 10 and 25 feet above the daily high water line or the MHTL; however, in many areas the existing revetment now overlies these LAEs and serves as a physical barrier and impediment to public beach access. The Applicant is proposing that segments of the revetment that overlie existing LAEs on private land would remain in place, with the loss of the public’s use of the LAEs to be offset by improved lateral public access located on public land along a newly widened Broad Beach for the 20-year period of the proposed Lease term. Figure 2-9 shows a conceptual cross section depicting the location of the LAEs and existing revetment relative to the proposed new beach and dunes. The cross section is generally representative of the middle section of Broad Beach from Lot 30760 to Lot 31346. The location of the dunes would shift slightly seaward or landward depending on the location within the section.

2.2.7 Public and Private Vertical Coastal Access

Footpaths would be created between dunes to maintain desired levels of public and private vertical beach access historically enjoyed at Broad Beach. The Project currently includes roughly one path for each property for a total of approximately 110 private paths across the dune system (or approximately every 35 feet); two additional trails would be provided to incorporate existing public access points (see Figure 2-10). The



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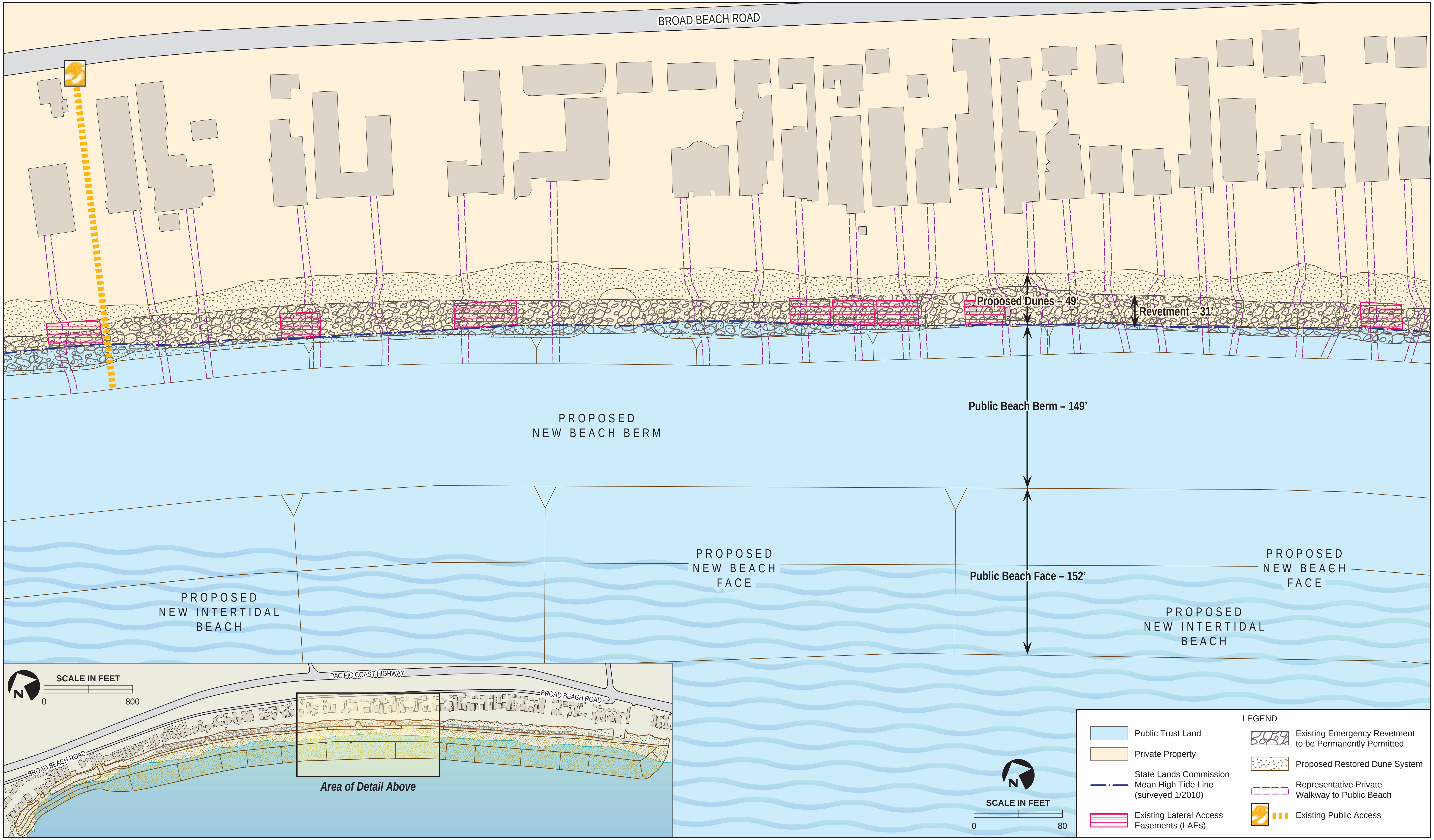
Conceptual Cross-Section of Restored Dune and Beach with Existing OTDs and Proposed Public Access Easements

FIGURE 2-9



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Proposed Beach Access Plan

FIGURE 2-10

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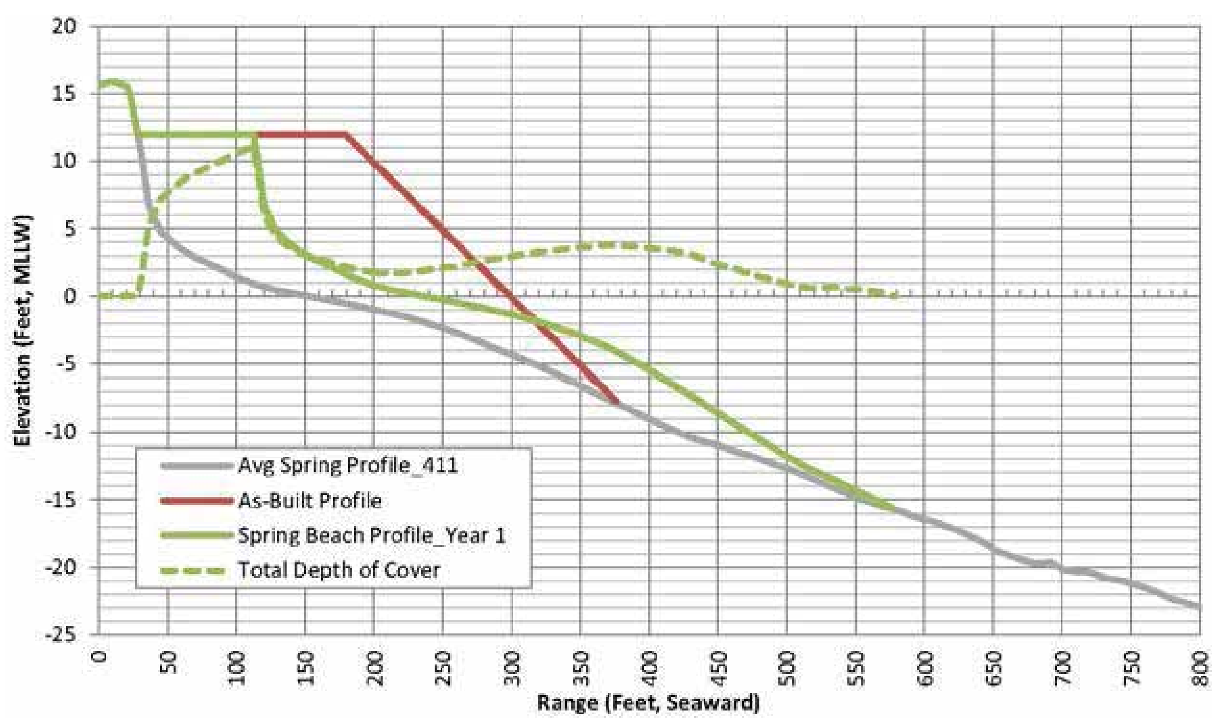
dune system would be vulnerable to damage from foot traffic, and any access to the dunes themselves would be discouraged through the use of sensitive habitat signage and post and rope-type fencing along pathways. However, the Applicant is proposing that Broad Beach property owners would be exclusively allowed to recreate within the new dune area, particularly on landward and dune crest areas.

2.2.8 Equilibrium of the Beach After Nourishment

For a beach nourishment project, sand is initially placed high on the upper portion of the beach profile above the mean lower low tide area. This is done to expand the level beach berm area for immediate benefit, to retain the sand for as long as possible, and to facilitate construction. The constructed beach immediately undergoes reworking by waves and tides that distribute the sand both offshore and alongshore. As sand redistributes, the nourishment project will experience a process of equilibration to a more natural condition of berm width and profile slope that depends on sand grain size and wave energy (the “equilibrium beach profile”).

The equilibrium beach profile was estimated using several different methods. Essentially, the estimates show that approximately 25 to 50 percent of the width of the beach berm would be lost within approximately one season after construction (depending on conditions and nourishment sand quality), and the slope of the beach would flatten as the material deposits slightly farther into the nearshore (Figure 2-11).

Figure 2-11. Example of Equilibrium Beach Profile



2.2.9 Long-Term Beach Profile Monitoring and Beach Measurements

To determine the performance of the nourishment project and monitor the effect of coastal erosion on sand loss at the beach, the Applicant's engineers would perform long-term beach profile monitoring. The goal of this monitoring would be to identify the need to initiate backpassing or a major renourishment episode to offset coastal erosion. This monitoring would include:

1) Semi-annual (spring and fall) full beach profile measurements out to the closure depth (approximate ocean water depth of 40 feet below MLLW) at nine measurement point profiles within Broad Beach:

   a) The nine locations are specified below and shown in Figure 2-12.

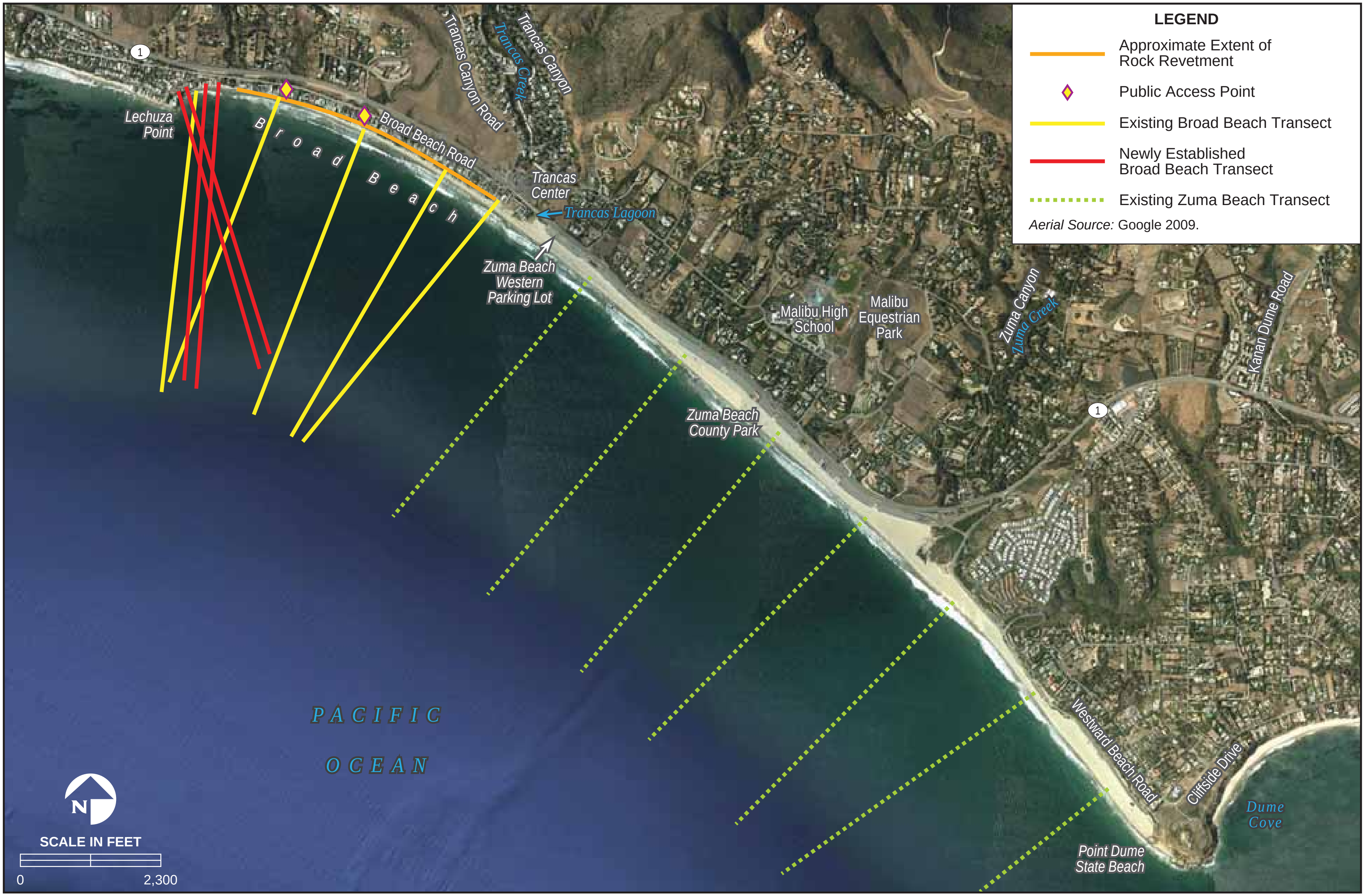
1. 408 (east end – 30756 Broad Beach Rd.) 2. 409 (east-central reach – 30916 Broad Beach Rd.) 3. 410 (central reach – 31108 Broad Beach Rd.) 4. 411 (west-central reach – 31324 Broad Beach Rd.) 5. 412 (west end – 31506/31504 Victoria Point Rd.)	*Existing monitoring locations with official markers embedded landward or upon the crest of the revetment.*
6. 411.7 (west-central A reach – 31438 Broad Beach Rd.) 7. 411.9 (west-central B reach – 31460 Broad Beach Rd.) 8. 412.3 (west end A – 31520 Victoria Point Rd.) 9. 412.5 (west end B– 31536/31532 Victoria Point Rd.)	*New measurement locations established using global positioning system (GPS).*[11]

   b) Estimation of the rate and trend of beach width change and sand volume change at each of the measurement points would occur for 1 year prior to construction and continually after construction for 10 years.

   c) Additionally, a total of seven supplementary beach profiles covering Zuma Beach to the east of Broad Beach would be surveyed every 6 months to quantify total sand volume and width changes within the littoral mini-cell between Lechuza Point and Point Dume (refer to Figure 2-12). This would include historical transects 394, 396, 398, 400, 402, and 406, with transect 394 at the east end of Zuma and transect 406 on the west end, near Broad Beach.

   d) Monthly supplemental measurement (systematically at the same time of each month) of the dry sand beach width (similar to that performed at Zuma Beach by Los Angeles County presently) from the seaward toe of the dune system to the seaward edge of dry sand "towel area" at nine measurement point profiles, as specified below and shown in Figure 2-12. Measurements could be done with a tape measure or roll tape. Of the nine profile locations, five would be used to

[11] GPS was used due to limitations to installing survey markers in unsuitable substrate at the back beach.



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Beach Profile Monitoring Transects

FIGURE 2-12

assess the need for backpassing (see Section 2.2.10), while the remaining four profiles would provide additional data regarding coastal erosion at the western end of Broad Beach.[12]

Based upon the monthly beach profile measurements and in accordance with objective beach nourishment triggers discussed in Section 2.2.10, the Applicant proposes to initiate annual backpassing of sand from the wide reach of beach to the narrow reach of beach and, in approximately 10 years from Project completion, conduct a second single major renourishment event. The Applicant's proposed objective and qualitative beach width monitoring triggers for initiation of these actions are discussed below. Future Beach Management Events

Based on information garnered from the beach profile monitoring program, site conditions would trigger the need to undertake beach management actions. The goal of these triggers would be to identify when beach erosion is reaching a point that threatens Project benefits (e.g., protection of private property, lateral access, recreation, dune restoration, etc.) and to allow sufficient time to implement management actions to maintain these benefits. Management actions would include short-term backpassing events meant to prolong the life of the nourished beach.

Backpassing

During backpassing, heavy equipment (i.e., scrapers, bulldozers) would excavate sand from the downdrift "sand rich" end of Broad Beach (anticipated to be the eastern reach) and transport the sand back to the eroding updrift end of Broad Beach (anticipated to be the western reach) (Illustration 2-9). The Applicant anticipates that backpassing would extend the practical lifetime of this beach nourishment project by recycling sand back within the littoral cell, thereby delaying the need for major beach renourishment. The BBGHAD proposes to backpass annually, in between nourishment events, for the Project life. Each backpassing event would occur over an up to 3-week period.

Illustration 2-9. *Sand backpassing operations such as this one in Long Beach typically involve the use of bulldozers and scrapers to excavate sand from wider downdrift areas for movement updrift to narrow eroded beaches. Backpassing at Broad Beach would likely occur annually and involve moving approximately 25,000 to 35,000 cy of sand from the beach's east end to its west end.*

[12] Transects 411.7, 411.9, 412.3, and 412.5 were first surveyed in spring 2013 and were added at the request of the CCC per its filing status letter dated February 8, 2013.

Backpassing Triggers

The purpose of backpassing triggers is to maintain a balanced benefit of the beach nourishment and to help keep the revetment buried. The goal of these guidelines is to help identify when beach erosion is reaching a point that threatens Project benefits (e.g., lateral access, recreation, and protection of private property) and to permit sufficient time to implement management actions to maintain these benefits with all due consideration given to limit interference with seasonal high-intensity beach/recreational use and enjoyment of public trust lands (i.e., summertime) at Broad Beach. The guidelines, which would be evaluated frequently due to the large variability in potential shoreline change rates, are meant to be used in combination with on-site observations, profile monitoring, and an understanding of historical and projected future trends.

The Applicant's proposed backpassing triggers are based on conditions at five different reaches of the beach, which would be monitored as part of the Project at five beach profile transects: 408, 409, 410, 411, and 412.[13] Each reach is centered on an established beach profile transect and is referred to as a maintenance reach (Table 2-3 and Figure 2-13). By dividing Broad Beach into maintenance reaches, each linked to an established profile monitoring transect, it is possible to determine backpass sand volume, borrow and placement areas and backpass cut depth. Backpassing would be conducted based on trigger conditions and combining beach width measurements, beach profile monitoring results, sand volume calculations and visual observations as discussed in Section 2.2.9.

Table 2-3. Backpassing/Renourishment Maintenance Reaches (MRs)

Beach Profile Monitoring Transect & Transect Location		MR # / Location / Length (ft)		
408	30756 Broad Beach Rd.	MR 408	30708 to 30842 Broad Beach Rd.	1,056
409	30916 Broad Beach Rd.	MR 409	30846 to 31000 Broad Beach Rd.	1,144
410	31108 Broad Beach Rd.	MR 410	31008 to 31236 Broad Beach Rd.	1,530
411	31324 Broad Beach Rd.	MR 411	31240 to 31388 Broad Beach Rd.	1,442
412	31506/31504 Victoria Point Rd.	MR 412	31406 Victoria Point Rd. to 6515 Point Lechuza Dr.	1,154

[13] The BBGHAD would also monitor four additional transects—411.7, 411.9, 412.3, and 412.5—as requested by CCC staff. Although these data would provide greater resolution to assess biological impacts, the data would not be factored into backpassing events since these transects too short to use as backpassing maintenance reaches (i.e., not feasible to separate for a backpassing event).

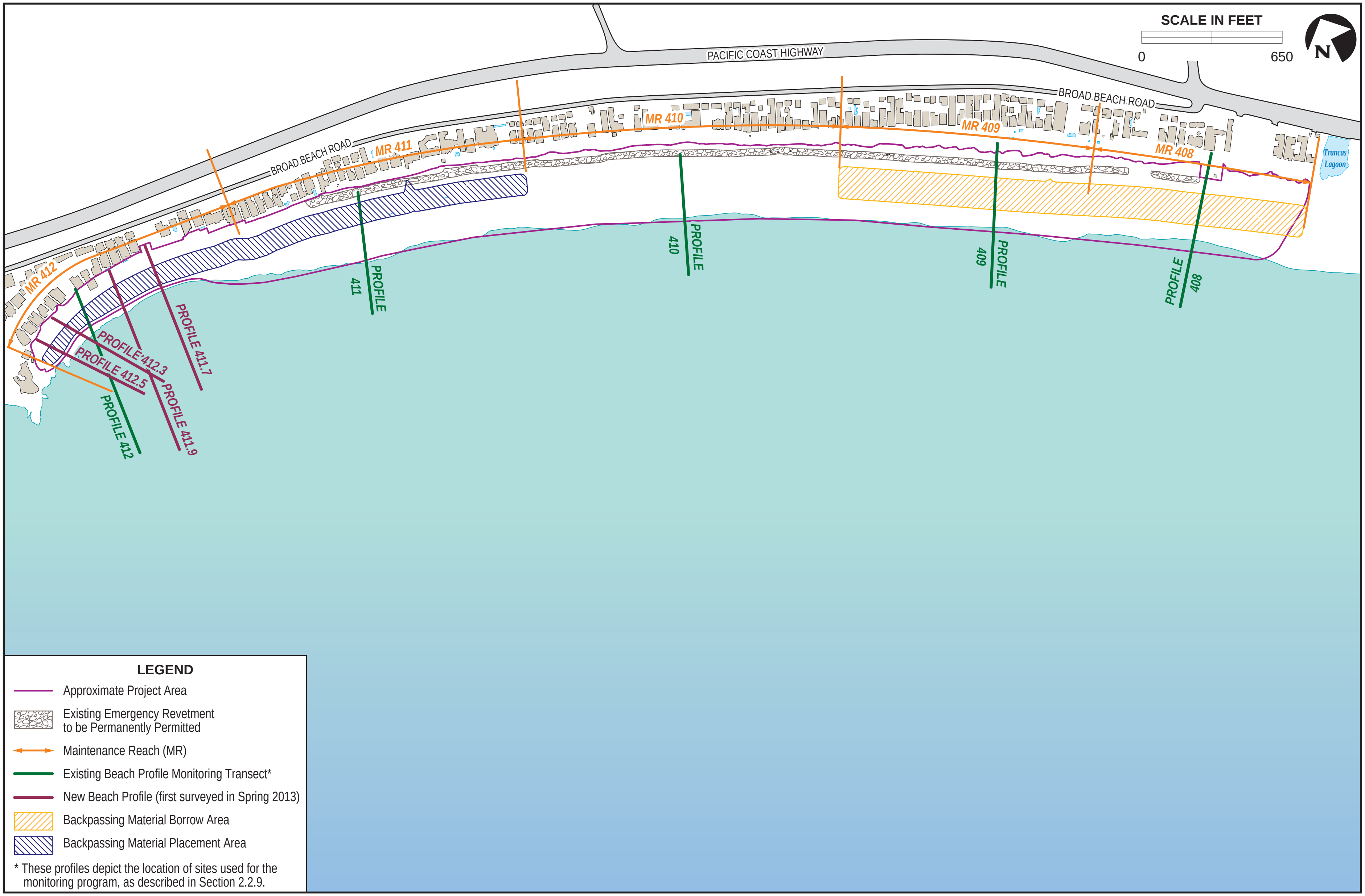
A western end reach of the nourished beach is considered to be in deficit when the reach width average is 50 feet or less for 6 consecutive months and the eastern reach average is at least 25 feet wider than the western average over the same period of time.[14] Since the net direction of sand movement (littoral drift) is to the east, it is anticipated that the predominant backpassing operation will be from east (surplus) to west (deficit). The resulting action would be to backpass using mechanical equipment (scrapers and bulldozers) from the wide reach of beach (surplus area) to widen the narrow reach (deficit area) of beach by between 25 and 50 feet (depending on available volume). The area of possible sand borrow should be maximized to reduce the depth of sand cut needed for the operation at any one location. A maximum 6-foot depth of cut for backpass source material is proposed, in line with backpassing approaches used by the city of Newport and the city of Long Beach.

Backpassing Scenarios

The Applicant's engineers have identified eight backpassing scenarios to determine the backpass volume available along the eastern reaches of the beach. Volume estimates are conservatively based on a minimum 75 feet width of existing dry sand beach at the backpassing borrow site and an existing pre-backpassing available sand cut depth of 5 feet. For example, Scenario 2 proposes the use of two maintenance reaches as the area of sand borrow and would thus require a maximum 4-foot depth of cut to produce 35,000 cy of borrow material (see Table 2-4 and Figures 2-13 and 2-14). Surplus sand to be backpassed would be scraped from the dry sandy beach. The area of possible sand placement should also be maximized to allow flexibility in the operation. Under all scenarios, fill would be placed relatively high on the beach in an effort to avoid sensitive marine resources.

The Applicant anticipates performing backpassing operations as outlined in Scenario 1 or 2 (see Table 2-4 and Figures 2-13 and 2-14). The actual approach for a given maintenance event would be driven by beach width measurements, profile monitoring results, and associated volume calculations. The plan view of possible backpassing borrow sites at MR 408 and MR 409 for proposed backpassing under Scenario 2 and the fill placement site at the far west end in MR 412 under this scenario are depicted in Figure 2-13; the cross-section view for each of these areas is depicted in Figure 2-14.

[14] For this Project, "western average" means the width of the dry sand beach measured from the seaward toe of the restored dune to the MHTL at profiles 411 and 412; "eastern average" means the width of the dry sand beach measured from the seaward toe of the restored dune to the MHTL at profiles 408, 409, and 410. If the dune erodes, then the starting point should be the revetment toe until the dune is covered by sand by subsequent nourishment.



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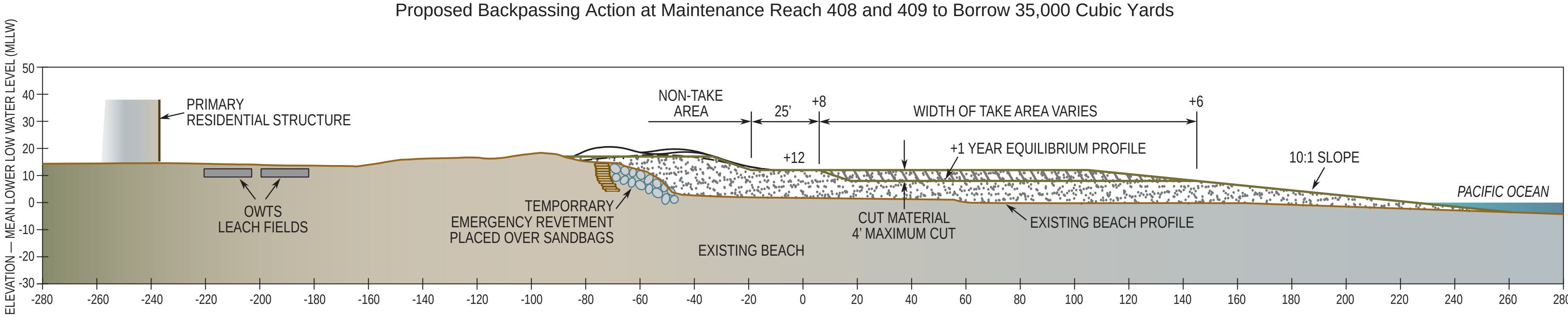
Maintenance Reaches and Backpassing Scenario 2

FIGURE
2-13

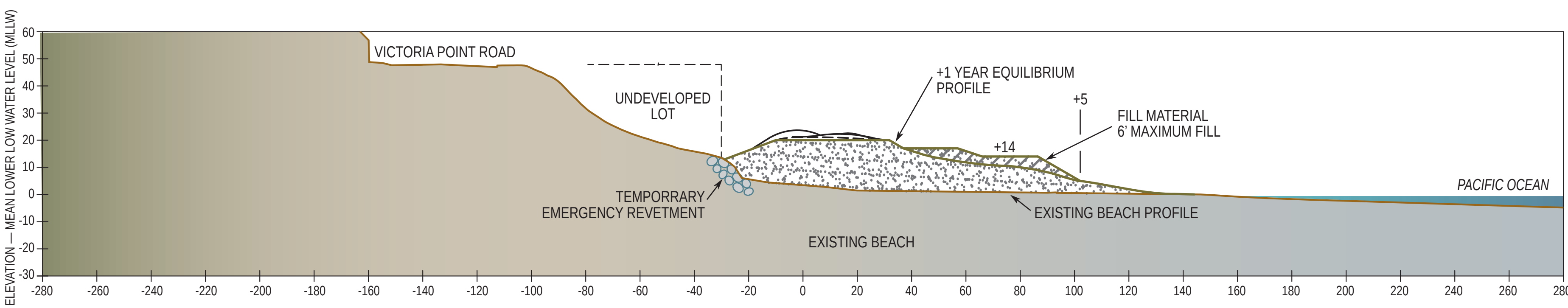
EAST BROAD BEACH

Proposed Backpassing Action at Maintenance Reach 408 and 409 to Borrow 35,000 Cubic Yards



WEST BROAD BEACH

Proposed Backpassing Action at Maintenance Reach 411 and 412 to Place 35,000 Cubic Yards



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Potential Backpassing Borrow and Placement Sites

FIGURE 2-14

Table 2-4. Possible Backpassing Scenarios (based on Area/Volume Estimates)

Backpass Scenario	Borrow Reaches	Borrow Area[1] (sf)	Available Volume[2] (cy)	Borrow Volume (cy)	Depth of Cut (feet)	Placement		
						Reaches	Area[3] (sf)	Average Depth (feet)
Scenario 1	MR 408 & MR 409	264,000	50,000	50,000	5	MR 412 & MR 411	288,440	4.7
Scenario 2	MR 408 & MR 409	264,000	49,000	35,000	4	MR 412 & MR 411	288,440	3.3
Scenario 3 (formerly 2)	MR 408 & MR 409	264,000	49,000	25,000	2.5	MR 412 & MR 411	288,440	2.3
Scenario 4	MR 408 & MR 409	264,000	49,000	10,000	1	MR 412	115,400	2.3
Scenario 5	MR 409 & MR 410	320,880	59,400	50,000	4.2	MR 412 & MR 411	288,440	4.7
Scenario 6	MR 409 & MR 410	320,880	59,400	35,000	3	MR 412 & MR 411	288,440	3.3
Scenario 7	MR 409 & MR 410	320,880	59,400	25,000	2.1	MR 412 & MR 411	288,440	2.3
Scenario 8	MR 408	126,720	23,400	10,000	2.1	MR 412	115,400	2.3

MR=Maintenance Reach; sf=square feet; cy=cubic yards

[1] Borrow area based on a pre-backpassing dry beach width of 75 ft; borrow area begins 25 ft seaward of dune toe and extends to +6 feet MLLW.

[2] Available volume based on a cut depth of 5 ft.

[3] Placement area calculation based on average width of 100 ft for MR 412 and 120ft for MR 411 beginning at back beach/dune toe and extending seaward.

Backpassing is anticipated to occur annually in the fall/winter season to widen the west end beach prior to the winter storm season. This approach would: (1) take advantage of additional sand available from the summer season beach building period for backpassing; (2) minimize interference with seasonal high-intensity recreational use and enjoyment of public trust lands by occurring outside the main summer high-intensity beach use season; and (3) avoid the most productive biological period of spring as well as any possible grunion running.

Sand volumes to be backpassed will vary depending on sand availability and need, as determined by monitoring. The initial backpassing estimate is between approximately 25,000 and 35,000 cy, slightly below the range of annual sand losses observed since 2001. This would "replace" or move back up coast a portion of the 35,000 to 45,000 cy of sand estimated to be lost from the west end of Broad Beach each year. More rapid sand loss is anticipated immediately after nourishment, so the existing loss rate of approximately 35,000 to 45,000 cy per year may temporarily increase.

Annual backpassing activities, including borrow area, available volume, extent of backpassing area, and depth of sandy beach cut, would vary depending on the availability of sand and the location of the backpassing borrow and deposition areas. The proposed sand borrow site for backpassing would be located at the wide reach of

Broad Beach (anticipated to be Reaches 408, 409 and/or 410 at the east end), within an area extending alongshore for approximately 3,700 feet. This site would be between 3 acres and 8 acres in size (depending on sand availability) and would be located entirely on the dry beach at the wide reach of Broad Beach. The borrow area would not extend into the sand dunes or into the low intertidal zone. Excavation at the proposed borrow site would entail a maximum 6-foot thick cut with an elevation of between the existing top of slope (the top of slope is 12 feet above MLLW) to approximately +6 feet MLLW. Given that two of the three proposed maintenance reaches would be used as the borrow site in any given event, the total length of the site would be 2,200 feet when using Reaches 408 and 409, and approximately 2,700 feet when using Reaches 409 and 410. The borrow site would range in width based on availability, and could be up to 120 feet wide. The proposed fill site would be about 2,600 feet in length and an estimated 100 feet wide, and would match the existing top of slope (12 feet above MLLW) and extend to approximately +5 feet MLLW. The deposition area at the narrow end of the beach (anticipated to be Reaches 411 and 412 at the west end) would extend up to 2,600 feet.

The duration of sand backpassing could be up to 3 weeks under the larger quantity scenario of 35,000 cy, and as short as 1.5 weeks for the scenario of moving the smaller quantity of 25,000 cy. This analysis assumes that backpassing sand supply would be more readily available earlier in the life of the Project when the beach is wider as a result of initial nourishment activities. Over time, coastal processes would reduce the availability of sand as the beach narrows.

The Applicant would use the west end of Zuma Beach’s parking lot for a staging area for backpassing operations, as described for beach nourishment (refer to Figure 2-15). Up to 1.5 acres would be required. Ingress and egress for the construction equipment to the staging area would be via existing driveways off of PCH; access to the beach would be via the existing curb cut at the parking lot's west end. The staging area will accommodate construction, materials, parking of support vehicles, and assembly of construction crews. The site would be fenced off and equipment would be stored overnight. This site was used previously for the 2010 emergency rock revetment project.

Direct impacts on Broad Beach would consist of beach disturbance from excavation, driving with heavy equipment, filling, and grading. The parking lot at the west end of Zuma Beach would be used for equipment delivery, staging, and site access.

Public Access during Backpassing

At least 1 week prior to backpassing operations, signs notifying the public of the dates of backpassing operations would be posted at the public access points and at other highly visible locations along the beach. During backpassing operations, public lateral access across the beach would be maintained to the extent possible by implementation of a construction vehicle traffic management plan; the responsible contractor would also station a flagman at each access point to control construction traffic and pedestrian foot-traffic. The majority of the working area below the MHTL would be closed to the public during the operation. Members of the public would be able to use the beach above MHTL, and be able to traverse the beach to the water at the public access points.

Periodic Renourishment

Given that the current sand loss rate in the Broad Beach area averages about 35,000 to 45,000 cy per year, the Project includes one renourishment event. Based on available information at this time, this is anticipated to involve placement of an additional 450,000 cy in approximately 10 years, similar to the original nourishment event. This would be smaller than the initial nourishment event as it is presumed that the 100,000 cy of sand in the new dune system would remain intact, and a certain amount of sand would remain on the beach. The actual timing for when renourishment would occur is unknown and would be determined via monitoring, as previously described in Section 2.2.9. The Applicant proposes the option, at the Applicant's discretion, of providing additional nourishment events after the initial Project term of 20 years provided that subsequent nourishment events shall be not less than 50 percent of the first major nourishment event, or approximately 300,000 cy. However, because the Applicant has not committed to such future nourishment, and the timing would extend beyond the requested 20-year lease term, this conceptual proposal is not considered in this Revised APTR. Therefore, any additional renourishment events beyond the one proposed to occur roughly 10 years from project commencement would require additional analysis, permitting and approval from CSLC and other agencies, as appropriate.

Renourishment Triggers

The Applicant's proposal for renourishment provides that at least 10 years have passed since the last major nourishment, and the trigger to begin a major nourishment event would be when one or more of the maintenance reaches are in deficit, and insufficient sand is available for backpassing in the fall/winter season, as indicated when:

> Any of the western maintenance reaches are in deficit (the point in time when the beach width average is 50 feet or less for 12 consecutive months) measured from the toe of a structure, and the eastern reach average is less than 25 feet wider over the same period of time.

When this trigger is reached, sand would be obtained and transported from the approved Local Inland Sources, and no less than approximately 450,000 cy of sand in the second renourishment episode and no less than approximately 300,000 cy in subsequent renourishment episodes, would be deposited on Broad Beach within 12 months. The sand source for these renourishments would be the same as for the initial nourishment, unless the applicable agencies approve other sources. In the event that new sources are considered, additional analysis and approval would be required at that time. All details of construction described below would apply to renourishment events. Public access during renourishment events and initial construction is addressed below.

2.3 CONSTRUCTION OPERATIONS AND PROCEDURES

Construction for the Project would involve the following sequence of events – some of the tasks may occur concurrently:

- Transporting the sand via truck from inland quarries via an estimated 43,000 truck trips for the initial nourishment (see Figure 1-2). If this source is also used for the renourishment event, an estimated 32,000 truck round trips would be required to transport 450,000 cy of material to the beach. This truck trip number would be reduced to 21,500 for a 300,000-cy renourishment event. These scenarios are based on the use of 14-cy capacity trucks. Sand would be delivered to a staging area along approximately 1,000 feet of Zuma Beach, just south of the west end of the parking lot east of Broad Beach (Figure 2-15).
- Transferring of sand from the staging area to off-road dump trucks for movement onto Broad Beach, where sand would be dumped in appropriate locations.
- Redistributing the sand as needed with earthmoving equipment (e.g., bulldozers and scrapers), and grading the beach fills to required dimensions.
- Annual backpassing of the sand from the wide reach of the beach to the narrow reach using heavy equipment (e.g., bulldozers and scrapers).

2.3.1 Initial Project Construction Schedule

The Applicant estimates that major nourishment construction activity will extend over approximately 8 months, from approximately September 15, 2014, to May 15, 2015. These dates are considered tentative and would be dependent upon Project approval and start dates. The beach nourishment portion of the Project would require approximately 6 months, while physical construction of the dunes, including deposition of sand and movement of the sand into the correct location and dimensions, would require 1 month. Planting, fencing, signage, and placement of temporary irrigation systems (refer to Section 2.3.4) within the dunes would require an additional month, extending into summer 2015. Most activities (e.g., earthmoving and dune planting) within Broad Beach would occur between 7:00 AM and 6:00 PM. However, hauling and stockpiling of inland quarry material to Broad Beach is expected to also be allowed from 6:00 PM to 9:00 PM. Based on the extended trucking hours, the hauling and stockpiling portion of the Project would require approximately 100 working days at 5 days per week, and is estimated to be completed after 20 weeks (5 months).

2.3.2 Construction Staging Area and Equipment

During the construction phase of the Project, construction equipment and materials would be staged at the western most parking lot of Zuma Beach. Additional temporary staging areas for storage or stockpile of sand would be established on the beach approximately 700 feet long by 80 feet wide adjacent to the Zuma Beach parking lot, while maintaining a 100-foot buffer from the Trancas Lagoon (see Figure 2-15). This sand storage area is the maximum that would possibly be used for sand stockpiling to allow for flexibility, efficiency, and safety in truck unloading; a maximum volume of approximately 20,000 cy would be stored in the stockpile area at any given time. Construction vehicles and equipment would access the site via PCH into the Zuma Beach Parking Lot 12.

Currently, vehicular access to Parking Lot 12 is provided by the main Zuma Beach internal circulation roadway. However, during construction, it is proposed that this circulation road be closed south of the existing structure located south of Lot 12 to prevent general public access. To facilitate Project construction, vehicular access to the staging area will be provided via two temporary driveways on PCH (Linscott Law & Greenspan 2013).

Inbound PCH: The inbound PCH driveway at the staging area would be located on the south side of PCH, at the east end of Lot 12 directly across from Guernsey Avenue. This temporary driveway would serve as an inbound-only driveway for Project vehicles and haul trucks and would accommodate limited vehicular ingress access (i.e., right-turn only ingress turning movements). No outbound turning movements would be permitted from this temporary driveway.

Outbound PCH: The outbound PCH driveway at the staging area would be located on the south side of PCH, at the west end of Lot 12. This driveway would serve as an outbound-only driveway for Project vehicles and haul trucks and would accommodate full vehicular egress access (i.e., both left-turn and right-turn egress turning movements. No inbound turning movements would be permitted at this driveway.

To facilitate traffic operations into and out of the site, additional temporary traffic improvements are proposed. First, a temporary eastbound right-turn/deceleration paved lane will be installed at the existing Guernsey Avenue/PCH intersection to ensure that Project truck traffic will safely and efficiently slow to turn right into Lot 12 and not impede eastbound PCH through traffic. In addition, at the Project's outbound PCH driveway, a temporary traffic signal is proposed to be installed to facilitate the safe and efficient movement of outbound haul trucks onto westbound PCH. The circulation and temporary traffic improvements at the staging area are illustrated in Figure 2-15.

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Construction Staging for Proposed Project

FIGURE 2-15

Parking along the south shoulder of PCH would be prohibited during the construction to accommodate the recommended right-turn lane and minimize pedestrian traffic at both staging area driveways. The proposed parking prohibition on the south shoulder of PCH generally adjacent to Parking Lot 12 would be implemented in two segments: (1) the segment between the proposed inbound driveway opposite Guernsey Avenue and the proposed outbound driveway (a distance of approximately 660 feet); and (2) the segment west of the proposed inbound driveway to a point approximately 180 feet west thereof (to join the existing restricted shoulder parking area on the PCH bridge over Trancas Creek).

From the parking lot, equipment would travel down to the wet sand beach and along the beach in front of Trancas Creek and onto Broad Beach. The personnel requirements for the Project, not including haul truck drivers, would include 12 workers during daytime construction hours (7:00 AM to 6:00 PM). Equipment anticipated to be necessary for construction activities associated with the Project is summarized in Table 2-5.

Table 2-5. Preliminary List of Project Construction Equipment

Support Equipment	Vehicles
Contractor’s mobile office (1)	Excavator (1)
Generators (estimated 2)	D-9 Bulldozers (2)
Portable restrooms (3)	Fuel truck (1, located offsite); Service truck (1)
Lighting (2 strands)	Delivery trucks (estimated 70)
“Grizzly” hopper/conveyor system (3)	Front-end loaders (2)
Backhoes (2)	Full-size pick-up trucks (2)
Bob-cats (4)	Scrapers (2)
Plant delivery trucks for dunes (20)	Off-road 40-ton dump trucks (7)

Fuel trucks would travel to the staging area at the Zuma Beach parking lot every morning to fuel Project equipment. The typical amount of fuel dispensed during each fueling visit would be approximately 200 gallons. This is enough to fill the tanks of two D-9 bulldozers; however, equipment is expected not to use a full tank each day, so 200 gallons is expected to be enough to top off fuel tanks for all equipment present at the site. Delivery trucks would use fueling stations along the route and would not be fueled at the site. Service trucks providing lubricant and oils for Project equipment would visit the staging area weekly for maintenance. All fueling and/or maintenance of Project equipment would be restricted to the Zuma Beach parking lot staging area, as CSLC policies prohibit this type of activity occurring on or near tidelands. The Applicant will repair disturbed areas of the parking lot as needed upon Project completion. If Trancas Creek has potential to breach to the Pacific Ocean, then all construction access across the mouth of Trancas Creek would cease until breaching conditions are no longer present. The creek mouth would be visually monitored and photographed. Construction will recommence when the breaching has stopped (i.e., when the water connection between Trancas Creek and the Pacific Ocean stops flowing).

2.3.3 Best Management Practices

Best Management Practices (BMPs) would be implemented throughout the construction phase of the Project. As the Applicant, the BBGHAD or its contractors would implement site-specific construction mitigation plans, including a traffic management plan and equipment refueling plan.

2.3.4 Construction Details

Transportation from Quarries

Approximately 43,000 loaded truck round trips would be required to transport 600,000 cy of sand between the inland quarries and Broad Beach, assuming use of 14-cy capacity trucks. The haul routes, from the quarries to the Project staging area, are shown as “Sand Source Transportation Routes” in Figure 1-2.

Trucks hauling sand from the quarries and other construction equipment accessing the Broad Beach site would enter the construction staging area located at the western end of the Zuma Beach parking lot via a new temporary driveway opposite Guernsey Drive on PCH. Vehicles would enter and exit the lot via the existing driveway connection to PCH. Trucks would travel southeasterly on PCH and enter the new access driveway on PCH opposite from Guernsey Drive. Although a detailed truck access plan has not yet been prepared, trucks would enter the west end of the Zuma Beach parking lot by turning right from PCH into the new driveway and queue in the parking lot to dump their sand onto one of up to three “grizzlies” (a hopper and conveyor belt system) that would carry the sand to the stockpile area on Zuma Beach, south of the parking lot. After unloading, trucks would exit by heading to the existing driveway at the north end of the Zuma lot and turning left out of the driveway across PCH.[15] This left turn would need to be controlled with a temporary traffic signal as this volume and frequency of trucks could not safely cross the highway without such control. Employees would enter/exit the site via the main gate at the Zuma Beach County Park located east of the site.

Beach Building

Beaches would be formed by placement of sand from the off-road haul trucks which would deposit sand in specific unloading areas along Broad Beach. Sand would be graded and spread along the beach to the dimensions of the beach fill plan using two

[15] Several access options were considered; however, the size of trucks prohibits using the PCH/Busch Drive underpass 1.5 miles south of the site. Traversing local neighborhoods was considered and rejected due to local traffic impacts.

bulldozers. Sand placement around storm drain outlets shall be properly engineered and designed to allow for efficient drainage.

Dune Building and Restoration

The dune would most likely be formed by deposition of sand from the trucking deliveries using loaders and backhoes. Trucks would enter the parking lot and drive over a low grizzly that will transport the sand into a stockpile on the beach. Front-end loaders will then load large 40-ton capacity off-road trucks or 30-cy scrapers that will drive the material down the beach and drop it within the target placement area. Bulldozers will then shape the placement area into the desired beach fill template. Dunes will be built in a similar way with front-end loaders moving sand dropped along the toe of the revetment up into the dune template, with small dozers or "bobcats" forming the dunes into their final templates.

Sand would be graded and spread over the existing revetment on the east and up against existing foundations and seawalls in the west to an approximately 50-foot-wide dune field of 17 to 22 feet in height using smaller bulldozers (Illustration 2-10). The 6 existing large-diameter storm drains which currently terminate at the revetment would be protected with a new concrete weir box structure and integrated into the revetment. These drains would issue under the dune and through the beach by percolation. Following sand placement and planting of approved native dune flora, public access would be provided through existing vertical access ways owned and operated by Los Angeles County and private access would be channeled through approved pathways at each property (refer to Section 2.2.4 for details on access restrictions).

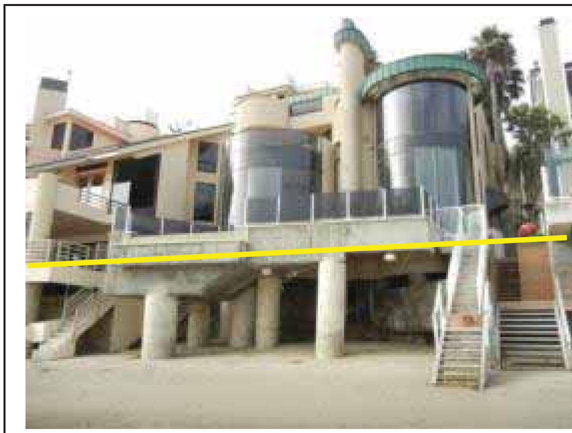

***Illustration 2-10**. The proposed new sand dunes of 17 to 20 feet above MLLW (up to 8 feet above the beach, represented generally by the yellow line) would partially cover existing pilings, seawalls, foundations and lower segments of stairways of homes at Broad Beach's west end.*

Storm Water Management

Storm water drains currently terminate in a variety of locations within the primary CSLC Lease area of the Project. Although poorly documented, some of the drains are located behind the revetment, some extend through the revetment, and at least one large box culvert is located adjacent to the foundation of a home in the western reach of the CSLC Lease area. Under the Project, existing large-diameter public storm drains that currently terminate at the revetment would be protected with a new concrete weir box structure and integrated into the revetment. These drains would issue under the dune and through the beach by percolation. Other drains that terminate prior to the revetment would percolate under the revetment and dune.

Backpassing

Backpassing events are expected to occur annually (see Section 2.2.10). Each backpassing operation would require approximately up to 3 weeks to complete, dependent on the amount of sand to be moved, and would include five personnel, one bulldozer, three scrapers, and a supervisor/foreman vehicle. Standard earthmoving BMPs would be used to reduce impacts from these operations. The contractor would establish a haul route along the seaward edge of the beach, maximizing the distance between the work and residences. The contractor would establish fencing or signs to control public access to the work site. Access points through the work zone would be continuously manned by construction monitors. Sand backpassing implementation is expected to commence in October of each year and is estimated to occur over a 1.5- to 3-week (7 to 15 working day) period. The equipment would typically operate on an 11-hour basis between 7:00 AM to 6:00 PM Monday through Friday.

Renourishment

A single renourishment event would occur after approximately 10 years (see Section 2.2.10). This event would be similar to the initial nourishment, would require much of the same equipment, and would occur over the same timeframe as the beach nourishment portion of the initial nourishment event. However, in comparison to the initial nourishment event, the sand quantity is smaller and the renourishment would not include dune construction and planting. Construction activities would be similar, including trucking of 450,000 cy of sand (32,000 haul trips), transferring of sand from the staging area to off-road dump trucks for movement onto Broad Beach, and redistributing the sand as needed. Renourishment is expected to require approximately 6 months to complete. Construction details, including timing of hauling and beach construction, location of staging areas, and necessary equipment, are expected to remain the same as under the initial nourishment.

Maintenance Activity Impacts Minimization

The Applicant's proposed maintenance activities, including both backpassing and renourishment, would occur in the fall/winter season to avoid conflict with the most productive spring biological period and to avoid the grunion running season, which generally ends in mid- to late-August according to the California Department of Fish and Wildlife grunion schedule. The Applicant will work with its contractor and biological resource consultants to determine a placement method which minimizes impacts including the possibility of phased placement of material in the west end to facilitate movement of subsurface sand dwelling organisms upwards through the placed material.

Construction activities shall be managed and maintained, to the maximum extent possible, to avoid interference with public access and recreational opportunities particularly during periods of seasonal high-intensity beach use and enjoyment of public trust lands. At least 2 weeks prior to commencing nourishment operations, signs notifying the public of the dates of nourishment operations would be posted at the public access points and at other highly visible locations along the beach. Public lateral access to Broad Beach will be restricted during working hours (Monday through Friday, 7:00 AM to 6:00 PM) due to the equipment traffic associated with the beach nourishment activities. On weekends and holidays the beach will remain open for public access. As work progresses, public access to portions of the beach would be maintained during nourishment operations to the extent possible with implementation of a construction vehicle traffic management plan. For example, as beach placement is completed at the western end of Broad Beach, this area would become available for public use. The areas of active work (e.g., access routes and areas where earthmoving equipment is being used, etc.) would be clearly delineated with access controlled by the contractor.

3.0 ISSUE AREA ANALYSIS

3.0.1 Introduction to Public Trust Analysis

This section of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR) document analyzes the potential impacts to public trust resources and values of the Broad Beach Geologic Hazard Abatement District's (BBGHAD, or the Applicant) proposed Broad Beach Restoration Project (Project). The scope of this section analyzes issue areas relevant to public trust resources and values and affected resources outside the public trust impact area for qualitative information purposes.

Issue Areas Driving the BBGHAD's Project Purpose and Objectives:

- Coastal Processes, Sea Level Rise, and Geologic Hazards (Section 3.1)

Issue Areas Related to Ecological Preservation, Open Space, Scientific Study and Other Public Trust Resources and Values:

- Recreation and Public Access (Section 3.2)
- Marine Biological Resources (Section 3.3)
- Terrestrial Biological Resources (Section 3.4)
- Marine Water Quality (Section 3.5)
- Scenic Resources (Section 3.6)
- Additional Analyses (Section 3.7)
  - Air Quality and Greenhouse Gases (Section 3.7.1)
  - Traffic and Parking (Section 3.7.2)
  - Cultural and Paleontological Resources (Section 3.7.3)
  - Noise (Section 3.7.4)
  - Public Health and Safety Hazards (Section 3.7.5)
  - Utilities and Service Systems (Section 3.7.6)
  - Environmental Justice (Section 3.7.7)

3.0.2 Methodology

The analysis of each issue area in Sections 3.1 through 3.7 provides the following information.

- *Environmental Setting Pertaining to the Public Trust*. The analysis begins by examining the environmental setting. Potential Project effects are evaluated by comparing the existing setting to any changes to public trust resources and values that would be attributable to Project components and operations.
- *Regulatory Setting*. Statutes, regulations, ordinances, policies, and common law relevant to the Project and public trust resources and values are identified here or the reader is referred to Table 3-3.

- *Public Trust Impact Criteria*. The criteria provide a benchmark for determining if the Project or a Project component will affect public trust resources and values when evaluated against the existing setting for each section.
- *Public Trust Impact Analysis*. This section describes direct and indirect impacts that may result from Project implementation. Throughout Section 3.0, impact statements are presented inside a text box and identified by a letter-number designation (e.g., Impact REC-1 is a Recreation and Public Access impact). Effects on public trust resources and values are classified according to the four categories in the box below. A fifth category, Increased Intensity, pertains to affected resources outside the public trust impact area (see Figure 1-2).

Major Adverse Effect	**Mj**	The Project would have a major adverse effect on public trust resources and values associated with a specific issue area (e.g., recreation and public access) in comparison to existing conditions.
Minor Adverse Effect	**Mi**	With implementation of AMMs, the Project would have a minor adverse effect on public trust resources and values associated with a specific issue area (e.g., recreation and public access) in comparison to existing conditions.
Beneficial Effect	**B**	The Project would provide an improvement to public trust resources and values associated with a specific issue area (e.g., recreation and public access) in comparison to existing conditions.
Negligible Effect	**N**	The Project would have a negligible effect on public trust resources and values associated with a specific issue area (e.g., recreation and public access) in comparison to existing conditions.
Increased Intensity	**- I**	The Project would have no effect on public trust resources and values within the public trust impact area evaluated in this APTR; however, the Project may cause an increase in intensity of use or effect associated with a specific issue area (e.g., traffic) in comparison to existing conditions outside of the public trust impact area evaluated in this APTR. These affected resources are evaluated qualitatively for information purposes.

- *Avoidance and Minimization Measures (AMMs)*. When potentially adverse effects to a public trust resource or use thereof are identified, AMMs may also be identified that, when implemented, would avoid or reduce the intensity of the adverse effects; these measures may be adopted by the California State Lands Commission (CSLC) as conditions of any lease granted to the BBGHAD for the Project. The AMMs recommended in the Revised APTR are presented with a letter-number designation (e.g., AMM REC-1), numbered to be consistent with the impact they were developed to address. The AMMs are also presented in a Monitoring Implementation Program, which is provided in Section 5.0.

In addition to the impact analysis presented in Section 3.0, the Revised APTR includes impact analyses for a series of alternatives to the Project (Section 4.0, *Alternatives*). The identification, screening, and evaluation of alternatives are provided in Appendix L.

3.0.3 Changes from the 2012 Draft APTR

Table 3-1 provides a summary of the changes by issue area in this Revised APTR compared to the 2012 Draft APTR. Most of the changes result from the BBGHAD's decision to use inland commercial quarries as a sand source versus offshore dredging sites (i.e., Ventura Harbor, offshore Dockweiler and Trancas Sand Deposits) as originally proposed. For example, by eliminating offshore sand sources, Marine Vessel Safety (Section 3.14 in the 2012 Draft APTR) is no longer applicable and was removed. Additionally, the Revised APTR was reformatted to focus more specifically on impacts to public trust resources. As part of the reorganization of the document, land use and policy consistency is now addressed in the table in Appendix M.

Table 3-1. Summary of Changes: 2012 Revised APTR

Coastal Processes, Sea Level Rise, and Geological Hazards (Section 3.1)	Following publication of the 2012 Draft ATPR, additional studies were performed to update beach profiles and sand loss estimates. These studies are incorporated and referenced within Section 3.1. Since no offshore dredging would occur under the revised Project, the following potential impacts identified in the 2012 Draft APTR have been removed from this Revised APTR: Changes to Coastal Processes in the Broad Beach Restoration Area due to Trancas Sediment Deposit Dredging Activities; Changes to Coastal Processes at the Sediment Source Areas due to Dredging Activity; and Extracted Sand Lost as Resource to other Beaches.
Recreation and Public Access (Section 3.2)	The revised Project no longer includes a 25-foot privacy buffer between the restored beach and the private residences. Following publication of the 2012 Draft ATPR, additional studies were conducted to update the description of the surfing conditions and recreational value of the Project area. These studies are incorporated and referenced within the impact analyses presented in Section 3.2. Since no offshore dredging would occur under the revised Project, the recreation impact analyses have shifted from offshore sand source areas to the truck transport routes along PCH and the Zuma Beach parking lot as a result of importing sand from the inland sand sources. Given these changes, the following impacts that were included in the 2012 Draft APTR have been removed from this Revised APTR: Privacy Buffer Effects to Public Trust Lands and Access and Recreational Use Easements; and Sand Supply Effects on Regional Sand Resources.
Marine Biological Resources (Section 3.3)	Since no offshore dredging would occur under the revised Project, the following potential impacts from the 2012 Draft APTR have been removed from this Revised APTR: Dredging Impacts to Marine Resources; Construction and Vessel Impacts to Commercial and Recreational Fishing; and Vessel and Noise Impacts to Marine Mammals and Turtles.
Terrestrial Biological Resources (Section 3.4)	No significant changes have occurred under terrestrial biological resources as a result of changing the sand sources from offshore sites to the inland quarries.

Table 3-1. Summary of Changes: 2012 Revised APTR

Marine Water Quality (Section 3.5)	Since no offshore dredging would occur under the revised Project, the following potential impacts from the 2012 Draft APTR have been removed from this Revised APTR: Dredging Impacts to Marine Water and Sediment Quality; and Impacts to Water and Sediment Quality from Potential Marine Vessel Fuel Oil Spill.
Scenic Resources (Section 3.6)	Since no offshore dredging would occur under the revised Project, the following potential impacts from the 2012 Draft APTR have been removed from this Revised APTR: Visual Effects from Dredging Activities Offshore Dockweiler beach and Outside Ventura Harbor; and Potential Indirect Visual Impacts to Los Angeles and Ventura Beaches due to Decreased Sand Supply. These impacts have been replaced with an analysis of the additional impacts to visual quality/aesthetics as a result from the introduction of 43,000 truck trips necessary to haul the sand to the Project area, as well as the additional heavy machinery needed to maneuver and place the sand once imported to the Project area. The potential aesthetic impact from the added net supply of sand to the local littoral cell has also been added to this Revised APTR.
Air Quality and Greenhouse Gases (Section 3.7.1)	The project described in the 2012 Draft APTR included dredging and pumping activities associated with offshore sand sources for beach nourishment activities. As proposed, the Project now involves heavy truck hauling activities to transport sand supply from inland quarry sources. As such, the Project would have resulted in different emission types and quantities. Based on air quality modeling and analysis completed for the 2012 Draft APTR, construction activities of the former project would have resulted in less VOC emissions than the currently proposed Project. However, the 2012 project would have resulted in more SO_X and $PM_{2.5}$ emissions compared to the current Project. CO, $NO_{X,}$ and PM_{10} emissions would be similar between the 2012 Draft APTR and this Project. These changes in air quality impacts result largely from the different equipment that would be used throughout the construction phase (e.g., heavy hauling trucks are associated with relatively high VOC emissions). Since the project described in the 2012 Draft APTR did not include hauling activities, VOC emissions were lesser than the current Project.
Traffic and Parking (Section 3.7.2)	The potential for impacts to onshore transportation and parking associated with the Project as described in the 2012 Draft APTR was lower due to the originally proposed offshore sand source sites. The replacement of offshore sand sources with the onshore quarries increases the direct potential for onshore transportation to be affected as a result of the Project. As such, a complete traffic analysis focusing on the traffic and parking impacts along the PCH and in the vicinity of the Project was conducted for this Revised APTR. Beyond the public trust impact area, traffic impacts are analyzed qualitatively for the inland sand transportation routes.
Cultural and Paleontological Resources (Section 3.7.2)	The replacement of offshore sand sources with the inland sand sources eliminates the direct potential for cultural resources to be affected as a result of dredging and/or excavation activities previously analyzed in the 2012 Draft APTR. Given that there would be no dredging under the currently proposed Project, the AMMs that were previously included in the

Table 3-1. Summary of Changes: 2012 Revised APTR

	2012 Draft APTR to address potential cultural resources are no longer applicable and have been removed.
Noise (Section 3.7.3)	Because there would be no offshore activities associated with the revised Project, there would be no offshore noise sources as were described in the 2012 Draft APTR. As such, the following impacts that were included in the 2012 Draft APTR were removed from this Revised APTR: Construction Impacts to Offshore Recreational Users in the Vicinity of the Borrow Sites and Sand Transportation Routes; and Construction Impacts to Onshore Recreational Users at Ventura Harbor and Dockweiler State Beach. An impact discussion on Project impacts to sensitive receptors along PCH and Zuma Beach has been added to assess the noise impacts from hauling trucks on these receptors. Beyond the public trust impact area, noise impacts are analyzed qualitatively for the inland sand transportation routes.
Public Health and Safety Hazards (Section 3.7.4)	The currently proposed Project would use onshore inland sources of sand, consequently, this Revised APTR does not consider impacts associated with dredging (e.g., potential for contaminants in dredged material) and other hazards resulting from the presence of a dredge pipeline. Additionally, new traffic safety considerations associated with the accommodation of a larger staging area and the travel and maneuvering of large haul trucks near the Project site are discussed in Section 3.8.4, Transportation and Parking. Beyond the public trust impact area, public safety hazards are analyzed qualitatively for the inland sand transportation routes.
Utilities and Service Systems (Section 3.7.6)	One change between the 2012 Draft APTR and this Revised APTR is the strategy for managing runoff from the storm water drains. The previous document described using extendable pipes that would drain the runoff down to the surf. As the beach eroded and the pipes were exposed they could be disconnected and removed to reduce lateral access obstacles. The current document has engineered breaks in the dune system to allow for runoff to drain more naturally to the beach and percolate or flow through the sand into the ocean. As such, the following impact from the 2012 Draft APTR has been removed from this Revised APTR: Extension of Storm Drains May Impede Public Access. This Revised APTR also analyzes potential impacts for sculpting the dune system around drainage outlets and reduced beach fill along the drainage path of the outlet. In addition, the 2012 Draft APTR identified that all homes within the Project areas were served by Onsite Wastewater Treatment Systems (OWTS). New information provided by the city of Malibu actually indicates that 19 homes area on Lechuza Point receive public wastewater disposal service (City of Malibu, 2014).
Environmental Justice (Section 3.7.7)	Since offshore sand sources are no longer included in the Project, Impacts EJ-2 through EJ-3 no longer addresses the impacts of dredging and offshore sand sources. This Revised APTR also revised Impact EJ-4 to include an additional analysis of potential beneficial impacts to public access and enjoyment of public trust resources at Broad Beach. Beyond the public trust impact area, environmental justice impacts are analyzed qualitatively for the inland sand transportation routes.

3.0.4 Future Projects in the Project Area

Table 3-2 identifies future proposed projects would occur near the Broad Beach Restoration Project area. These projects are considered only if they would potentially conflict with Project activities or direct and indirect impacts of the Project.

Table 3-2. Future Projects

PCH Bridge Replacement Project	Caltrans has programmed money to replace and widen the PCH bridge overlying Trancas Creek. Currently the bridge replacement and widening project is in the very early stages of development. Preliminary designs are not yet available; however, a Preliminary Environmental Analysis Report (PEAR) is being prepared for the project. The PCH bridge replacement would likely have short-term construction impacts on Trancas Creek, but long-term beneficial impacts as the piers and footings for the bridge would be relocated out of the water channel. Because construction is envisioned in approximately 3 to 5 years, the PCH Bridge Replacement Project would likely occur after, and would not conflict with, the BBGHAD's initial beach restoration activities.
Trancas Creek Restoration Project	The Trancas Creek Restoration Project, a joint effort between the Resource Conservation District of the Santa Monica Mountains and the National Park Service, includes restoration of Trancas Lagoon and upstream reaches of Trancas Creek. This project is also in the early planning and development stages in association with the PCH Bridge Replacement Project. A formal planning process has begun to develop a comprehensive lagoon restoration plan, including bioengineering for the west bank, excavation of fill to expand the lagoon footprint, restoration of fish passage through obstructions in the concrete culverts, identification of opportunities for associated wetland and transitional upland habitat development, and plans for integrating passive recreational opportunities. Important objectives to be addressed in restoration design would be to provide essential habitat and passage improvement for coastal fish species, including federally endangered tidewater gobies and southern steelhead trout, and reduce sedimentation and erosion. This project is expected to commence after the Caltrans PCH Bridge Replacement Project, which is expected to begin construction in 3 to 5 years, and therefore this project would occur after and would not conflict with, the BBGHAD's initial beach restoration activities. Over the long-term, this project is intended to improved tidal interchange, which could increase the frequency and duration of the opening of Trancas Lagoon to tidal interchange including associated increases in sediment outflow from this creek. As such, it would potentially incrementally contribute to direct and indirect impacts of the Project associated with additional sediment on the beach and associated effects on down coast habitats as. Therefore, Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*, and Section 3.3, *Terrestrial Biological Resources*, analyzes potential impacts from the proposed Broad Beach Restoration Project area with future construction and restoration activities of Trancas Creek.

3.0.5 Regulatory Setting

Federal, State, regional, and local laws, regulations, and policies applicable to each issue area are identified in each subsection in Section 3.0. Table 3-3 identifies coastal-related U.S. and California laws and programs that are relevant to multiple issue areas. Pursuant to a consolidated coastal development permit, the California Coastal Commission (CCC) will address the Project's consistency with the California Coastal Act and Local Coastal Programs (LCPs) of the city of Malibu and other applicable local governments; for reference purposes only, Appendix M summarizes the California Coastal Act policies and Malibu LCP policies that are most relevant to the Project.

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

All-Encompassing Coastal-Related/Multiple Issue Areas		
Public Trust Doctrine		See Section 1.1.1.
U.S.	Coastal Zone Management Act (CZMA) (42 United States Code [USC] 4321 et seq.)	The CZMA recognizes a national interest in coastal zone resources and in the importance of balancing competing uses of those resources, giving full consideration to aesthetic, cultural and historic, ecological, recreational, and other values as well as the needs for compatible economic development. Pursuant to the CZMA, coastal states develop and implement comprehensive coastal management programs (CMPs) that describe uses subject to the CMP, authorities and enforceable policies, and coastal zone boundaries, among other elements. The CZMA also gives state coastal management agencies regulatory control ("federal consistency" review authority) over federal activities and federally licensed, permitted or assisted activities, if the activity affects coastal resources; such activities include military projects at coastal locations and outer continental shelf oil and gas leasing, exploration and development. The CCC coordinates federal consistency review within the Project area.
CA	California Coastal Act (Coastal Act) of 1976 (Pub. Resources Code, §§ 30000 et seq.) CCC Federal Consistency Program/ California Coastal Management Program (CCMP)	Pursuant to the Coastal Act, the CCC, in partnership with coastal cities and counties, plans and regulates the use of land and water in the coastal zone. The Coastal Act includes specific policies (Chapter 3) that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. Development activities in the coastal zone generally require a coastal permit from either the CCC or the local government: (1) the CCC retains jurisdiction over the immediate shoreline areas below the mean high tide line and offshore areas to the 3 nautical mile State water limit; and (2) following certification of county- and municipality-developed Local Coastal Programs, the CCC has delegated permit authority to many local governments for the portions of their jurisdictions within the coastal zone. Through the federally approved CCMP, the CCC also implements the CZMA as it applies to federal activities (e.g., development projects, permits, and licenses) in the coastal zone by reviewing specified federal actions for consistency with the enforceable policies of Chapter 3 of the Coastal Act.
Coastal Processes, Sea Level Rise, and Geologic Hazards (Section 3.1)		
CA	Coastal Act (see also above)	· **Section 30235** applies to the use of revetments to protect existing structures from coastal processes. · **Section 30253** requires, in part, that: New development shall: (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard; and (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. · **Section 30243** states in part: The long-term productivity of soils and timberlands shall be protected….
CA	Surface Mining and Reclamation Act (SMARA) (Pub. Resources Code, §§ 2710-2796),	In accordance with SMARA, the California Geological Survey classifies the regional significance of mineral resources and assists in the designation of lands containing significant aggregate resources. Mineral Resource Zones (MRZs) have been designated to indicate the significance of mineral deposits. The MRZ categories are: · MRZ-1: Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence. · MRZ-2: Areas where adequate information indicates significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

		· MRZ-3: Areas containing mineral deposits the significance of which cannot be evaluated from available data. · MRZ-4: Areas where available information is inadequate for assignment to any other MRZ.
Recreation and Public Access (Section 3.2)		
CA	California Constitution	Public access to tide and submerged lands is protected under the California Constitution, which affirms the common law Public Trust doctrine. Article X, Section 4 prohibits any person or entity with a claim to, or possession of, tidal lands or a harbor, bay, inlet, estuary, or other navigable water, to exclude the right of way to such water when required for any "public purpose." Article X, Section 4 also directs the Legislature to enact laws that give the most liberal interpretation of the section so that the access to navigable waters shall always be attainable for the people. Through decisions of the California Supreme Court, recreational purposes are included among "public purposes" for this provision (*Marks v. Whitney (1971) 6 Cal.3d 251*). In order to implement this constitutional protection, the California legislature enacted California Government Code § 66478.3, which declares that public access to public natural resources is essential to the health and well-being of all citizens of California. The Coastal Act (Pub. Resources Code § 30210) provides that "In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse."
CA	Coastal Act (see also above)	· Section 30001.5. (a) Protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources; (b) Assure orderly, balanced utilization and conservation of coastal zone resources, taking into account the social and economic needs of the people of the State; (c) Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resource conservation principles and constitutionally protected rights of private property owners; (d) Assure priority for coastal-dependent and coastal-related development over other development on the coast; (e) Encourage State and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone. · Section 30220. Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses. · Section 30221. Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area. · Section 30222. The use of private lands suitable for visitor-serving commercial recreational facilities designed to enhance public opportunities for coastal recreation shall have priority over private residential, general industrial, or general commercial development, but not over agriculture or coastal-dependent industry. · Section 30223. Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

		· Section 30224. Increased recreational boating use of coastal waters shall be encouraged, in accordance with this division, by developing dry storage areas, increasing public launching facilities, providing additional berthing space in existing harbors, limiting non-water-dependent land uses that congest access corridors and preclude boating support facilities, providing harbors of refuge, and by providing for new boating facilities in natural harbors, new protected water areas, and in areas dredged from dry land.
Biological Resources—Marine and Terrestrial (Sections 3.3 and 3.4)		
U.S.	Endangered Species Act (FESA) (7 USC 136, 16 USC 1531 et seq.)	The FESA, which is administered in California by the USFWS and NMFS, provides protection to species listed as threatened or endangered, or proposed for listing as threatened or endangered. Section 9 prohibits the "take" of any member of a listed species. · Take is defined as "...to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." · Harass is "an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering." · Harm is defined as "...significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering." When applicants are proposing projects with a Federal nexus that "may affect" a federally listed or proposed species, the Federal agency is required to consult with the USFWS or NMFS, as appropriate, under Section 7, which provides that each Federal agency must ensure that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of areas determined to be critical habitat.
U.S.	Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1801 et seq.)	The MSA is the primary law governing marine fisheries management in U.S. Federal waters. The MSA was first enacted in 1976 and amended in 1996. Amendments to the 1996 MSA require the identification of Essential Fish Habitat (EFH) for federally managed species and the implementation of measures to conserve and enhance this habitat. Any project requiring Federal authorization, such as a USACE permit, is required to complete and submit an EFH Assessment with the application and either show that no significant impacts to the essential habitat of managed species are expected or identify mitigations to reduce those impacts. Under the MSA, Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). The EFH provisions of the MSA offer resource managers a means to heighten consideration of fish habitat in resource management. Pursuant to section 305(b)(2), Federal agencies shall consult with the NMFS regarding any action they authorize, fund, or undertake that might adversely affect EFH.
U.S.	Marine Mammal Protection Act (MMPA) (16 USC 1361 et seq.)	The MMPA is designed to protect and conserve marine mammals and their habitats. It prohibits takes of all marine mammals in the U.S. with few exceptions. The NMFS may issue a take permit under section 104 if the activities are consistent with the purposes of the MMPA and applicable regulations at 50 CFR, Part 216. The NMFS must also find that the manner of taking is "humane" as defined in the MMPA. If lethal taking of a marine mammal is requested, the applicant must demonstrate that using a non-lethal method is not feasible.
U.S.	Marine Protection, Research, and	The Act regulates the dumping of materials into ocean waters. It prevents, or restricts, dumping of materials that would degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

	Sanctuary Act of 1972 (33 USC 1401-1445, 2801-2805; 16 USC 1431-1447f)	economic potentialities. The Act provides for a permitting process to control the ocean dumping of dredged material. The Act also establishes the marine sanctuaries program, which designates certain areas of the ocean waters as sanctuaries in order to preserve or restore these areas for their conservation, recreational, ecological, or aesthetic values.
U.S.	Migratory Bird Treaty Act (MBTA) (16 USC 703-712)	The MBTA was enacted to ensure the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter, of any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit. The responsibilities of Federal agencies to protect migratory birds are set forth in EO 13186. The USFWS is the lead agency for migratory birds. The USFWS issues permits for takes of migratory birds for activities such as scientific research, education, and depredation control, but does not issue permits for incidental take of migratory birds.
U.S.	Rivers and Harbors Act (33 USC 401)	This Act governs specified activities in "navigable waters" (waters subject to the ebb and flow of the tide or that are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce). Under Section 10 of the Act, the building of any wharf, pier, jetty, or other structure is prohibited without Congressional approval, and excavation or fill within navigable waters requires approval from the USACE.
U.S.	Other Federal	· Bald and Golden Eagle Protection Act (16 USC 668-668c) prohibits anyone from taking, possessing, or transporting a bald eagle or golden eagle or the parts, nests, or eggs of such birds without prior authorization. · Executive Order 13158 requires Federal agencies to identify actions that affect natural or cultural resources within a Marine Protected Area (MPA) and, in taking such actions, to avoid harm to the natural and cultural resources that are protected by a MPA.
CA	California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.)	The CESA provides for the protection of rare, threatened, and endangered plants and animals, as recognized by the California Department of Fish and Wildlife (CDFW), and prohibits the taking of such species without its authorization. Furthermore, the CESA provides protection for those species that are designated as candidates for threatened or endangered listings. Under the CESA, the CDFW has the responsibility for maintaining a list of threatened species and endangered species (Fish & G. Code, § 2070). The CDFW also maintains a list of candidate species, which are species that the CDFW has formally noticed as under review for addition to the threatened or endangered species lists. The CDFW also maintains lists of Species of Special Concern that serve as watch lists. Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species may be present in the project site and determine whether the proposed project will have a potentially significant impact on such species. In addition, the CDFW encourages informal consultation on any proposed project that may affect a candidate species. The CESA also requires a permit to take a State-listed species through incidental or otherwise lawful activities (§ 2081, subd. (b)).
CA	California Marine Life Protection Act (MLPA) (Fish & G. Code, §§ 2850–2863)	Passed by the State Legislature in 1999, the MLPA required the CDFW to redesign its system of MPAs to increase its coherence and effectiveness at protecting the state's marine life, habitats, and ecosystems. For the purposes of MPA planning, a public-private partnership commonly referred to as the MLPA Initiative was established, and the State was split into five distinct regions (four coastal and the San Francisco Bay) each of which had its own MPA planning process. All four coastal regions have completed these individual planning processes. As a result the coastal portion of California's MPA network is now in effect statewide. Options for a planning process in the San Francisco Bay have been developed for consideration at a future date. California Fish and Game Code, section 2862

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

		(Adverse Impacts in Analysis of Projects) gives the CDFW discretion to make recommendations to avoid or fully mitigate any impacts inconsistent with the goals and guidelines of Chapter 10.5 (MLPA) or the objectives of the MPA.
CA	Lake and Streambed Alteration Program (Fish & G. Code, §§ 1600-1616)	The CDFW regulates activities that would interfere with the natural flow of, or substantially alter, the channel, bed, or bank of a lake, river, or stream. These regulations require notification of the CDFW for lake or stream alteration activities. If, after notification is complete, the CDFW determines that the activity may substantially adversely affect an existing fish and wildlife resource, the CDFW has authority to issue a Streambed Alteration Agreement.
CA	Other relevant California Fish and Game Code sections	· The California Native Plant Protection Act (Fish & G. Code, § 1900 et seq.) is intended to preserve, protect, and enhance endangered or rare native plants in California. This Act includes provisions that prohibit the taking of listed rare or endangered plants from the wild and a salvage requirement for landowners. The Act directs the CDFW to establish criteria for determining what native plants are rare or endangered. Under section 1901, a species is endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is rare when, although not threatened with immediate extinction, it is in such small numbers throughout its range that it may become endangered. · The California Species Preservation Act (Fish & G. Code §§ 900-903) provides for the protection and enhancement of the amphibians, birds, fish, mammals, and reptiles of California. · Sections 3503 & 3503.5 prohibit the taking and possession of native birds' nests and eggs from all forms of needless take. These regulations also provide that it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nests or eggs of any such bird except as otherwise provided by this Code or any regulation adopted pursuant thereto. · Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), & 5515 (fish) designate certain species as "fully protected." Fully protected species, or parts thereof, may not be taken or possessed at any time without permission by the CDFW. · Section 3513 does not include statutory or regulatory mechanism for obtaining an incidental take permit for the loss of non-game, migratory birds.
CA	Coastal Act (see also above)	· **Section 30230** states: Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes. · **Section 30231** addresses biological productivity and water quality. · **Section 30233**, which applies in part to development activities within or affecting wetlands and other sensitive areas among other requirements, identifies eight allowable uses, requires that the proposed project be the least environmentally damaging feasible alternative, and where applicable, requires feasible and appropriate mitigation. · **Section 30240** states: (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas. (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

Marine Water Quality (Section 3.5)		
U.S.	Clean Water Act (CWA) (33 USC 1251 et seq.)	The CWA is a comprehensive piece of legislation that generally includes reference to the Federal Water Pollution Control Act of 1972, and its substantial supplementation by the CWA of 1977. Both Acts were subsequently amended in 1981, 1987, and 1993. Overall, the CWA seeks to protect the nation's water from pollution by setting water quality standards for surface water and by limiting the discharge of effluents into waters of the U.S. These water quality standards are promulgated by the U.S. EPA and enforced in California by the SWRCB and nine Regional Water Quality Control Boards (RWQCBs). The CWA also provides for development of municipal and industrial wastewater treatment standards and a permitting system to control wastewater discharges to surface waters. Under CWA section 404, the USACE has primary Federal responsibility for administering regulations that concern waters of the U.S. wetlands, which are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration that are sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.
U.S.	Rivers & Harbors Act	See above under Biological Resources—Marine and Terrestrial (Sections 3.3 and 3.4)
U.S.	California Toxics Rule (40 Code of Federal Regulations [CFR] 131)	In 2000, the USEPA promulgated numeric water quality criteria for priority toxic pollutants and other water quality standards provisions to be applied to waters in the State of California. USEPA promulgated this rule based on the Administrator's determination that the numeric criteria are necessary in the State of California to protect human health and the environment. (Under CWA section 303(c)(2)(B), the USEPA requires states to adopt numeric water quality criteria for priority toxic pollutants for which the USEPA has issued criteria guidance, and the presence or discharge of which could reasonably be expected to interfere with maintaining designated uses.) These criteria have been adopted by the State; together with State-adopted designated uses, they satisfy CWA requirements for the establishment of water quality standards for California inland surface waters, enclosed bays, and estuaries.
CA	Porter-Cologne Water Quality Control Act (Cal. Water Code § 13000 et seq.) (Porter-Cologne)	Porter-Cologne is the principal law governing water quality in California. The Act established the SWRCB and nine RWQCBs which have responsibility for protecting State water quality and the beneficial uses of State waters. Porter-Cologne also implements many provisions of the Federal CWA, such as the NPDES permitting program. Pursuant to the CWA Section 401, applicants for a Federal license or permit for activities that may result in any discharge to U.S. waters must seek a Water Quality Certification (Certification) from the State in which the discharge originates. Such Certification is based on a finding that the discharge will meet water quality standards and other appropriate requirements of State law. The LARWQCB issues or denies certification for discharges within the Project Area. If the LARWQCB imposes a condition on its Certification, those conditions must be included in the Federal permit or license. Of note, Water Code section 13142.5 provides marine water quality policies stating that wastewater discharges shall be treated to protect present and future beneficial uses, and, where feasible, to restore past beneficial uses of the receiving waters. The highest priority is given to improving or eliminating discharges that adversely affect wetlands, estuaries, and other biologically sensitive sites; areas important for water contact sports; areas that produce shellfish for human consumption; and ocean areas subject to massive waste discharge.
		Applicable Water Quality Control Plans for the Project include: · The <u>California Ocean Plan</u> establishes water quality objectives for ocean waters and identifies applicable beneficial uses of marine waters and sets narrative and numerical water quality objectives to protect beneficial uses. · <u>Water Quality Control Plan (Basin Plan)</u>. Porter-Cologne (§ 13240) requires each RWQCB to formulate and adopt

Table 3-3. Regulatory Framework Relevant to the BBGHAD's Broad Beach Restoration Project

		a Basin Plan for all areas within the Region. The LARWQCB (2007a) Basin Plan covers the coastal watersheds of Los Angeles and Ventura Counties. The Basin Plan designates specific beneficial uses for onshore surface water and offshore seawater within individual areas of the basin. The Basin Plan also sets water-quality objectives, subject to approval by the USEPA, intended to protect those beneficial uses. The water-quality objectives in the Basin Plan are written to apply to specific parameters (numeric objectives) and general characteristics of the water body (narrative objectives). An example of a narrative objective in the Basin Plan is the requirement that all waters must remain free of toxic substances in concentrations producing deleterious effects upon aquatic organisms.
CA	NPDES Storm Water Permits (Construction Activities)	The LARWQCB oversees on-site treatment of "California Designated, Non-Hazardous Waste" and enforces water quality thresholds and standards set forth in the Basin Plan. Applicants may be required to obtain a General Construction Activities Storm Water Permit under the NPDES program, and develop and implement a Storm Water Pollution Prevention Plan (SWPPP) that includes best management practices (BMPs) to control erosion, siltation, turbidity, and other contaminants associated with construction activities. The SWPPP would include BMPs to control or prevent the release of non-storm water discharges, such as crude oil, in storm water runoff.
CA	Coastal Act (see also above)	Coastal Act **Section 30231** states The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams. See also: **Section 30232** (Oil and hazardous substance spills); **Section 30233** (Diking, filling or dredging; continued movement of sediment and nutrients); and **Section 30235** (Construction altering natural shoreline).
Scenic Resources (Section 3.6)		
CA	California Scenic Highway Program	The California Scenic Highway Program, managed by the California Department of Transportation, was created to preserve and protect scenic highway corridors from change that would diminish the aesthetic value of lands adjacent to highways. State highways identified as scenic, or eligible for designation, are listed in California Streets and Highways Code § 260 et seq.
CA	Coastal Act (see also above)	The Coastal Act is concerned with protecting the public viewshed, including views from public areas, such as roads, beaches, coastal trails, and access ways. Section 30251 states: "Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural landforms, to be visually compatible with the character of the surrounding area, and, where feasible, to restore and enhance visual quality in visually degraded areas."
Air Quality and Greenhouse Gases (Section 3.7.1) – See also local regulations in Section 3.7.1		
U.S.	Federal Clean Air Act (FCAA) (42 United States Code [USC] 7401 et seq.)	The FCAA requires the USEPA to identify NAAQS to protect public health and welfare. National standards are established for O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Pb. In 2007, the U.S. Supreme Court ruled that CO_2 is an air pollutant as defined under the FCAA, and that the USEPA has authority to regulate GHG emissions. Pursuant to the 1990 FCAA Amendments, USEPA classifies air basins (or portions thereof) as in "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the NAAQS are achieved; such classification is determined by comparing monitoring data with State and Federal standards.

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		· "Attainment" for a pollutant: the pollutant concentration is < the standard. · "Nonattainment" for a pollutant: the pollutant concentration > the standard. · "Unclassified" for a pollutant: Not enough data are available for comparisons.
CA	California Clean Air Act of 1988 (CCAA) (Assembly Bill [AB] 2595)	The CCAA requires all air districts in the State to endeavor to achieve and maintain State ambient air quality standards for O_3, CO, SO_2, NO_2, and PM. California's ambient air standards are generally stricter than national standards for the same pollutants; the State has also established standards for sulfates, H_2S, VC, and visibility-reducing particles. CARB sets air quality standards at levels to protect public health and welfare with an adequate margin of safety. The CAAQS describe adverse conditions; pollution levels must be below these standards before a basin can attain the standard. Air quality is considered in "attainment" if pollutant levels are continuously below or equal to the standards and violate the standards no more than once each year. The 1992 CCAA Amendments divide O_3 nonattainment areas into moderate, serious, severe, and extreme categories of pollutant levels to which progressively more stringent requirements apply.
CA	California Global Warming Solutions Act of 2006 (AB 32)	Under AB 32, CARB is responsible for monitoring and reducing GHG emissions in the State and for establishing a statewide GHG emissions cap for 2020 that is based on 1990 emissions levels. CARB (2009) has adopted the AB 32 Climate Change Scoping Plan (Scoping Plan), which contains the main strategies for California to implement to reduce CO_2e emissions by 169 million metric tons (MMT) from the State's projected 2020 emissions level of 596 MMT CO_2e under a business-as-usual scenario. The Scoping Plan breaks down the amount of GHG emissions reductions the CARB recommends for each emissions sector of the State's GHG inventory, but does not directly discuss GHG emissions generated by construction activities.
CA	Other Legislation/ Executive Orders (EOs)	· Pursuant to Senate Bill (SB) 97, the State Office of Planning and Research prepared guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, which were adopted by the Natural Resources Agency and became effective in March 2010. These amendments to the State CEQA Guidelines establish a framework to address global climate change impacts in the CEQA process, and include revisions to the CEQA Environmental Checklist Form (Appendix G of the Guidelines) and the Energy Conservation Appendix (Appendix F of the Guidelines). A new section in the State CEQA Guidelines (§ 15064.4) provides an approach to assessing impacts from GHGs. · EO S-01-07 set forth a low carbon fuel standard; the carbon intensity of California's transportation fuels is to be reduced by at least 10 percent by 2020. · EO S-3-05 established statewide GHG emission targets of reducing emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below the 1990 level by 2050.
CA	Coastal Act (see also above)	Coastal Act section 30253, subdivision (c) requires that new development shall be consistent with requirements imposed by an air pollution control district or the CARB as to each particular development.
CA	Other	· Under California's Diesel Fuel Regulations, diesel fuel used in motor vehicles is limited to 15 ppm starting in 2009. · CARB's Heavy Duty Diesel Truck Idling Rule (Cal. Code Regs., tit. 13, § 2485) prohibits heavy-duty diesel trucks from idling for longer than 5 minutes at a time (except while queuing, provided the queue is located beyond 100 feet from any homes or schools). · The Statewide Portable Equipment Registration Program establishes a uniform program to regulate portable engines/engine-driven equipment units.

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Traffic and Parking (Section 3.7.2)		
CA	California Department of Transportation (Caltrans)	Caltrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, including PCH. Chapter 2, Article 3 of the Vehicle Code defines the powers and duties of the California Highway Patrol, which has enforcement responsibilities for the vehicle operation and highway use in the State. PCH provides the main vehicle access to the Project area. Maximum load limits for trucks and safety requirements for oversized vehicles are generally regulated by Caltrans for operation on highways.
Cultural and Paleontological Resources (Section 3.7.3)		
U.S.	Archaeological and Historic Preservation Act (AHPA)	The AHPA provides for the preservation of historical and archaeological data that might be irreparably lost or destroyed as a result of (1) flooding, the building of access roads, the erection of workmen's communities, the relocation of railroads and highways, and other alterations of terrain caused by the construction of a dam by an agency of the U.S. or by any private person or corporation holding a license issued by any such agency; or (2) any alteration of the terrain caused as a result of a Federal construction project or federally licensed project, activity, or program. This Act requires Federal agencies to notify the Secretary of the Interior when they find that any federally permitted activity or program may cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data. The AHPA built upon the national policy, set out in the Historic Sites Act of 1935, "...to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance...."
U.S.	Archaeological Resources Protection Act (ARPA)	The ARPA states that archaeological resources on public or Indian lands are an accessible and irreplaceable part of the nation's heritage and: · Establishes protection for archaeological resources to prevent loss and destruction due to uncontrolled excavations and pillaging; · Encourages increased cooperation and exchange of information between government authorities, the professional archaeological community, and private individuals having collections of archaeological resources prior to the enactment of this Act; · Establishes permit procedures to permit excavation or removal of archaeological resources (and associated activities) located on public or Indian land; and · Defines excavation, removal, damage, or other alteration or defacing of archaeological resources as a "prohibited act" and provides for criminal and monetary rewards to be paid to individuals furnishing information leading to the finding of a civil violation or conviction of a criminal violator. ARPA has both enforcement and permitting components. The enforcement provision provides for the imposition of both criminal and civil penalties against violators of the Act. The ARPA's permitting component allows for recovery of certain artifacts consistent with the standards and requirements of the NPS's Federal Archeology Program.
U.S.	National Historic Preservation Act (NHPA) (16 USC 470 et seq.)	This applies only to Federal undertakings. Archaeological resources are protected through the NHPA, as amended, and its implementing regulation, Protection of Historic Properties (36 CFR 800), the AHPA, and the ARPA. The State implements the NHPA through its statewide comprehensive cultural resource surveys and preservation programs coordinated by the California Office of Historic Preservation (OHP) in the State Department of Parks and Recreation, which also advises Federal agencies regarding potential effects on historic properties. The OHP also maintains the California Historic Resources Inventory. The State Historic Preservation Officer (SHPO) is an appointed official who implements historic preservation programs within the State's jurisdictions. Under the NHPA,

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		historic properties include "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (16 USC 470w [5]).
U.S.	Omnibus Public Land Management Act of 2009 - Public Law 111-11 (123 Stat. 991)	Public Law 111-011 at title VI, subtitle D lays out statutory requirements for Paleontological Resources Preservation (PRP). PRP provides definitions but requires the definition of some terms, and uses other terms and concepts that need further definition or details to clarify intent or enforcement. PRP identifies management requirements, collection requirements, curation requirements, need for both criminal and civil penalties, rewards and forfeiture, and the need for confidentiality of some significant resource locations. PRP at section 6310 also states that "As soon as practical after the date of enactment of this Act, the Secretary shall issue such regulations as are appropriate to carry out this subtitle, providing opportunities for public notice and comment."
CA	Coastal Act (see also above)	Coastal Act section 30244 states: Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.
CA	Public Resources Code section 5097.5	Section 5097.5 prohibits excavation or removal of any "vertebrate paleontological site or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands."
CA	Health and Safety Code § 7050.5	This code states that if human remains are exposed during construction, no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code section 5097.998. The Coroner has 24 hours to notify the Native American Heritage Commission (NAHC) if the remains are determined to be of Native American descent. The NAHC will contact most likely descendants, who may recommend how to proceed.
Noise (Section 3.7.4)		
CA	California Streets and Highways Code & Government Code	Section 216 (Control of Freeway Noise in School Classrooms)requires, in general, that Caltrans abate noise to 55 dBA, L_{10}, or 52 dBA, L_{eq} or less. In Government Code, section 65302, Caltrans is also required to provide cities and counties with a noise contour map along State highways. The State Motor Vehicle Code includes regulations related to the use of vehicles that do not meet specified noise limits.
CA	Other	State regulations for limiting population exposure to physically and/or psychologically significant noise levels include established guidelines and ordinances for roadway noise under Caltrans and the now defunct California Office of Noise Control. Office of Noise Control land use compatibility guidelines provided the following: An exterior noise level of 60 to 65 dBA CNEL is considered "normally acceptable" for residences; a noise level of 70 dBA CNEL is considered to be "conditionally acceptable" (i.e., the upper limit of "normally acceptable" noise levels for sensitive uses such as schools, libraries, hospitals, nursing homes, churches, parks, offices, and commercial/professional businesses); and a noise level of greater than 75 dBA CNEL is considered "clearly unacceptable" for residences.
Public Health and Safety Hazards (Section 3.7.5)		
CA	California Health and Safety Code	· *Hazardous Material Release Response Plans and Inventory Law (Chapter 6.95).* This law is designed to reduce the occurrence and severity of hazardous materials releases. This State law requires businesses to develop a Release Response Plan for hazardous materials emergencies if they handle more than 500 pounds, 55 gallons, or 200 cubic feet of hazardous materials. In addition, the business must prepare a Hazardous Materials Inventory of all hazardous materials stored or handled at the facility over the above thresholds. Also, all hazardous materials must be stored in a safe manner. Both the Release Response Plan and the Hazardous Materials Inventory must be supplied to the Certified Unified Program Agency (CUPA) for the program. In this case, the CUPA is the Santa

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		Barbara County Fire Department (SBCFD). · *Hazardous Waste Control Law (Chapter 6.5 and California Code of Regulations, Titles 22 and 26)*. This is the basic hazardous waste law for California. It establishes the criteria for defining hazardous waste, and its safe handling, storage, treatment, and disposal. The law is designed to provide cradle-to-grave management of hazardous wastes and reduce the occurrence and severity of hazardous materials releases. California regulates the management of hazardous wastes through the Health and Safety Code Chapter 6.5, sections 25100, et seq., and through the California Code of Regulations, Title 22, Environmental Health Standards for the Management of Hazardous Wastes, as well as California Code of Regulations, Title 26, Toxics.
CA	Coastal Act (see also above)	**Section 30232** of the Coastal Act addresses hazardous materials spills and states that "Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur."
Utilities and Service Systems (Section 3.7.6)		
CA	Coastal Act (see also above)	· Section 30254 states: New or expanded public works facilities shall be designed and limited to accommodate needs generated by development or uses permitted consistent with the provisions of this division; provided, however, that it is the intent of the Legislature that State Highway Route 1 in rural areas of the coastal zone remain a scenic two-lane road. Special districts shall not be formed or expanded except where assessment for, and provision of, the service would not induce new development inconsistent with this division. Where existing or planned public works facilities can accommodate only a limited amount of new development, services to coastal-dependent land use, essential public services and basic industries vital to the economic health of the region, state, or nation, public recreation, commercial recreation, and visitor-serving land uses shall not be precluded by other development. · Section 30254.5 states in part: Notwithstanding any other provision of law, the commission may not impose any term or condition on the development of any sewage treatment plant which is applicable to any future development that the commission finds can be accommodated by that plant consistent with this division….
Environmental Justice (Section 3.7.7)		
U.S.	Federal Executive Order (EO) 12898	On February 11, 1994, President Clinton issued an "Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (EO 12898). This EO was designed to focus attention on environmental and human health conditions in areas of high minority populations and low-income communities, and promote non-discrimination in programs and projects substantially affecting human health and the environment (White House 1994). The EO requires Federal agencies (as well as State agencies receiving Federal funds) to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.
CA	CSLC	The CSLC has adopted an Environmental Justice Policy to ensure consideration of environmental justice as part of CSLC processes, decisions, and programs. The policy stresses equitable treatment of all members of the public and commits to consider environmental justice in its processes, decision-making, and regulatory affairs. It is implemented, in part, through identification of, and communication with, relevant populations that could be adversely and disproportionately affected by CSLC projects or programs, and by ensuring that a range of reasonable alternatives is identified to minimize or eliminate environmental issues affecting such populations.

3.1 COASTAL PROCESSES, SEA LEVEL RISE, AND GEOLOGIC HAZARDS

This section of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR) describes and analyzes the coastal processes, climatic conditions, and geological hazards present at Broad Beach in the city of Malibu, Los Angeles County (see Figure 1-1). The analysis focuses on issues that are relevant to the objectives and potential impacts of the proposed Broad Beach Restoration Project (Project) on public trust lands, resources, and values. As noted in Section 2, *Project Description*, the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) has identified actions to prevent, mitigate, abate and control geologic hazards at Broad Beach in order to protect homes, septic systems, and other structures from coastal erosion. The Project proposed by the BBGHAD would implement a shoreline protection plan along Broad Beach, including: (1) retention of the existing 4,100-foot-long emergency rock and geotextile sand bag revetments; (2) beach nourishment to create and maintain a wide, dry sand beach; and (3) restoration of a dune system.

The information presented here is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. Implementation of the Project by the BBGHAD is statutorily exempt from the California Environmental Quality Act (CEQA) pursuant to Public Resources Code sections 26601 and 21080, subdivision (b)(4) (see Section 1, *Introduction*). The scope of review and analysis related to coastal processes, sea level rise (SLR), or geologic hazards includes the CSLC Lease Area on Broad Beach and the broader Public Trust Impact Area (see Figures 1-1, 1-2, and 2-3 through 2-6).

The CSLC Lease Area includes approximately 40.5 acres of public trust lands held by the State (approximately 27 acres of intertidal beach and 13.5 acres of subtidal lands). The Public Trust Impact Area, which encompasses the CSLC Lease Area, extends laterally for approximately 6,200 feet from Lechuza Point to Trancas Creek Lagoon, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment. This area encompasses the approximate 46-acre beach and dune construction area, as well as the construction staging at the west end Zuma Beach Parking Lot 12, stockpiling of imported sand on Zuma Beach adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach; down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches farther south to Point Dume may be indirectly affected by changes in sand supply and distribution through littoral drift and are also within the Public Trust Impact Area.

The BBGHAD Inland Project Area lies outside the scope of the CSLC's jurisdiction for this Project and includes three quarries in inland Ventura County proposed as sand supply sources, as well as the sand transportation routes inland of Pacific Coast Highway (PCH), that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). These areas do not support public trust resources administered by the CSLC related to coastal processes, SLR, or geologic hazards and are not discussed further in this section (see Section 3.7.2, *Traffic and Parking*, for potential traffic impacts from the sand transportation routes). The quarry sites are fully permitted facilities and have been subject to past environmental review by Ventura County; therefore, impacts at these quarries are not analyzed in this APTR.

This section incorporates data and analyses from the following studies (Appendix B):

- Moffatt & Nichol (2010, 2012, 2013) studies prepared for the Applicant regarding oceanographic and coastal processes in the Public Trust Impact Area (the 2010 and 2012 studies underwent third-party review by Coastal Environments, an independent oceanographic and coastal process firm [see Appendix B]);
- Everts Coastal (2009, 2012, 2014) regarding sediment sources;
- Patsch and Griggs (2006, 2007) studies on the Santa Barbara and Santa Monica Bay littoral cells and sediment budgets, and other data and analyses from general studies on California littoral cells; and
- a 2012 analysis performed for an independent investigation of the stability of the rock revetment prepared by Clevenger Geoconsulting and Cato Geoscience.

3.1.1 Coastal and Geologic Setting Relative to the Broad Beach Area

The Southern California coast is subject to a range of climatic and coastal processes, and geologic features as discussed in more detail below. In order to help the reader better understand these processes, this section begins with a summary of key coastal and geologic processes in the Broad Beach area. Topics include:

- Littoral cells;
- Longshore transport;
- Sediment sources and sinks;
- Wave climatology;
- El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO);
- Sea Level Rise;
- Water levels;
- Shoreline positions
- Historic beach profile and shoreline measurements;
- Sediment transport measurements;
- Geologic and tectonic setting;
- Liquefaction; and
- Tsunamis.

Littoral Cells

A littoral cell is defined as a geographical area with a complete cycle of littoral sand sources, transport paths, and sinks. Littoral cells are beach compartments bounded by geographic features such as headlands or submarine canyons that limit the movement of sand between cells. Each compartment consists of sand sources (such as rivers, streams, and coastal bluff erosion), sand sinks (such as coastal dunes and submarine canyons), and beaches, which provide pathways for wave-driven sand movement within a littoral cell. For assessment purposes, littoral cells can be divided into "subcells" based on points, headlands, and other coastal geographic features.

Broad Beach lies within the Santa Monica Littoral Cell and exemplifies a typical Southern California stretch of coastline, comprising a hook-shaped sandy beach backed by coastal bluffs (Illustration 3.1-1). This hook-shaped beach is referred to as the Zuma Littoral Subcell throughout this report (Illustration 3.1-2). The Zuma Littoral Subcell encompasses approximately 4 miles of shoreline between Lechuza Point at the west end of Broad Beach south to the tip of Point Dume, two well-defined headlands that affect wave action and littoral transport along this hook-shaped segment of coast (Figure 3.1-1).

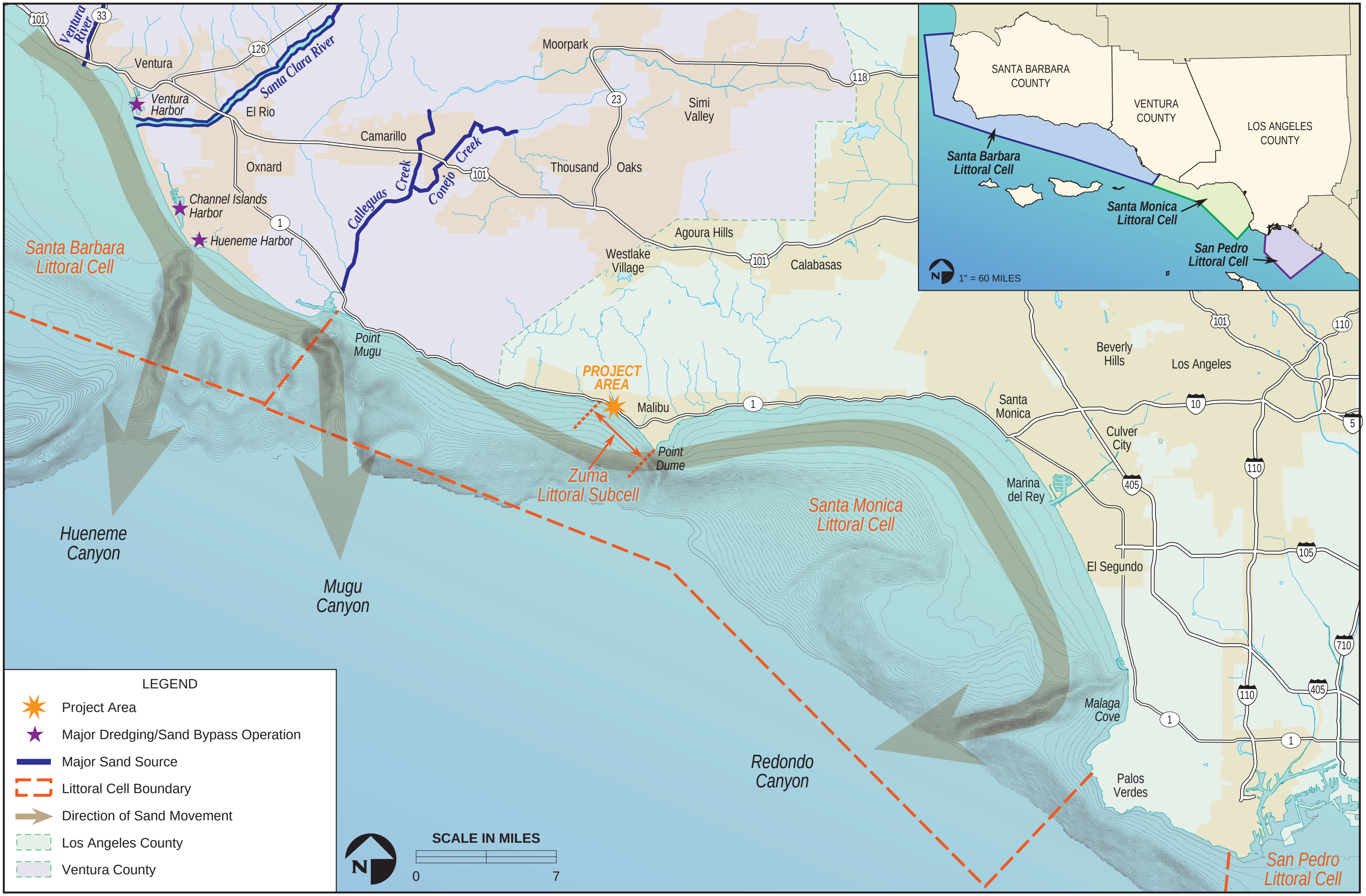
Whereas the littoral zone represents the active sand transport area along the shore, the depth of closure is the littoral cell offshore boundary at which no significant seasonal sand movement occurs either offshore or onshore. The depth of closure acts as the seaward extent to which sand may retreat and return the following season; therefore, it is a meaningful seaward limit for sand addition in beach restoration. The Zuma Littoral Subcell extends to approximately 800 feet from shore with an effective closure depth of 33 feet below mean lower low water (MLLW; the long-term average of shoreline position at lower low tide). Beach sand along the California coast occasionally breaches the depth of closure during severe winter storm events, such as El Niño, when changes in wave direction and increases in wave intensity carry sediment outside of the littoral zone. Once sand is carried outside of the depth of closure, it is lost from the system and does not generally get carried back into the littoral zone by natural forces.

Longshore Transport

Longshore transport, also referred to as littoral transport or littoral drift, is the natural movement of sand along the shoreline. In California, longshore transport generally runs from north to south. Due to the orientation of the beach in the Malibu area, this movement occurs in a generally easterly direction along this coastline, including within the Zuma Littoral Subcell. Wave direction is the primary driver of how the sand moves along the shore. Waves that travel through the Santa Barbara Channel to Malibu from the west (North Pacific swell waves) move sand alongshore from west to east. South swells arriving nearly perpendicular to the Malibu shore move sand in a cross-shore direction, either offshore to deeper water or onshore from deeper water. During winter season, waves higher than 5 feet from the west and southwest transport sand eastward and offshore; these waves are responsible for transporting most of the sand from Broad Beach to the east, but such waves do not occur very often. This pattern was noticeable between 2000 and 2008. The predominant longshore and cross-shore sand transport at Broad Beach is to the east and onshore respectively, except during large storms.

Illustration 3.1-1: *Broad Beach and immediate down coast beaches extend for approximately 4 miles along the Malibu coast. These areas include Broad Beach and its narrow low-tide, generally sandy beach backed by the emergency rock revetment (foreground), and the wide sandy beaches at Zuma Beach and Point Dume State Beach located down coast and further south and east (background).*

Illustration 3.1-2*: The Zuma Littoral Subcell encompasses the Broad Beach area and down coast area beaches and offshore areas extending for approximately 4 miles from Point Lechuza to Point Dume.*



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Regional Coastal Sand Transportation and Littoral Cells

FIGURE 3.1-1

Moffatt & Nichol (2013) estimated gross longshore sand transport to be 792,000 cubic yards per year (cy/yr) between 1946 and 1974, and 544,000 cy/yr between 1974 and 2007. Net longshore transport (subtracting sand transport in the opposite direction) was estimated to be 424,000 cy/yr from 1946 to 1974, and 280,000 cy/yr from 1974 to 2007. Moffatt & Nichol concluded that the difference in yearly longshore sand transport from the earlier to the later period resulted from a change in wave conditions, a change that led to noticeable erosion at Broad Beach between 1974 and 2007.

Sediment Sources and Sinks

Due to the wave climate and predominant longshore sand transport direction, Broad Beach depends on sand delivered from upcoast sources, including from coastal watersheds of the Santa Monica Mountains and erosion of coastal bluffs (Illustration 3.1-3). The sedimentary rocks of the Santa Monica Mountains are easily erodible and supply sediment to the adjacent drainages during wet winters. This sediment makes up a portion of the Zuma Littoral Subcell sand budget. The primary drainages in the area are Trancas Creek and Zuma Creek (east of Broad Beach), and Arroyo Sequit, Little Sycamore Creek, Deer Creek, and Big Sycamore Creek (west of Broad Beach). Sediment exiting from area creeks is transported primarily to the southeast by the wave-induced longshore current. The watersheds of these creeks appear to contribute 41,000 cy/yr of sediment to this system between Point Mugu and Point Dume (Everts Coastal 2012), with Trancas and Zuma creeks contributing an additional 8,000 cy/yr to the Zuma Littoral Subcell down coast from Broad Beach (TerraCosta 2008).

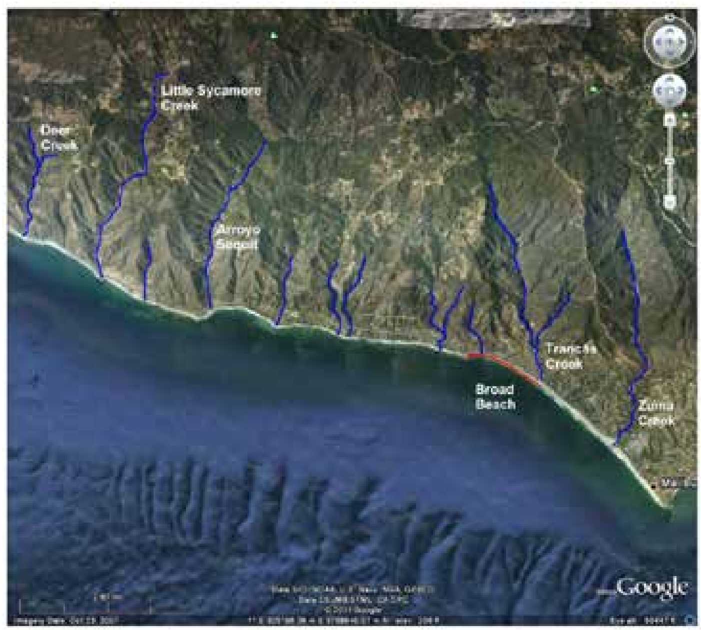


Illustration 3.1-3: *Local creeks carry sediment from the mountains to the sea, acting as a source for beach sand in the Malibu area.*

Historically, a major input of sand into this littoral cell was the construction in 1926 of PCH along the northern Malibu coast. Initial construction contributed an estimated 1.2 million cy of sand that was deposited offshore and acted as beach nourishment. Another approximately 150,000 cy of sand from maintenance of PCH entered the system from cut slopes until the armoring of PCH in the 1960s (Patsch and Griggs 2007). The historic width of Broad Beach and other Malibu beaches may have benefited from this artificial input of sediment. Sediment is also supplied to the ocean in this area through erosion of local bluffs. Bluff erosion is estimated to contribute an average of 7,000 cy/yr of sand between Point Mugu and Point Dume, a reduction of approximately 12 percent (1,000 cy/yr) from historic levels, due to armoring of approximately 3,500 feet of bluffs in this stretch of coast (Patsch and Griggs 2007).

Mugu Submarine Canyon intercepts a large proportion of the longshore sand supply moving south from the Santa Barbara Littoral Cell, and in effect, represents the upcoast limit of potential sand sources for the Santa Monica Littoral Cell. This canyon intercepts a higher portion of longshore sediment transport in its vicinity than any other submarine canyon in California. Based on a study prepared for the U.S. Army Corps of Engineers (USACE), as much as 90 percent of the longshore transport enters the canyon and is lost from a longshore transport rate of approximately 1,065,000 cy/yr (Moffatt & Nichol 2009). However, as much as 140,000 cy/yr of sand from the Santa Barbara Littoral Cell may also bypass Mugu Submarine Canyon and represent an additional sand source for the Broad Beach coast (Moffatt & Nichol 2013). Sand contribution from this source is uncertain, and debate among experts persists as to how much sand passes by Mugu Submarine Canyon and to what extent sand from the upcoast Santa Barbara Littoral Cell contributed to historically wider beach at Broad Beach. Point Dume Submarine Canyon, at the eastern edge of the Zuma Littoral Subcell, is not a major sediment sink, and longshore transport carries a large majority of sand past Point Dume. In total, Point Dume Submarine Canyon captures less than 1,000 cy/yr (Everts 2012).

Wave Climatology

Waves provide the largest source of energy to the coast of California and are responsible for sand transport and beach erosion, as well as coastal flooding and damage. As Broad Beach is sheltered from deep-ocean waves by offshore islands (including Santa Cruz, Santa Rosa, San Miguel, San Nicolas, Santa Catalina, and San Clemente) and shoals, only waves from certain directions reach the Project site. These islands block, dissipate, refract, and reflect wave energy thereby modifying the wave conditions along the mainland shoreline. The largest windows from which waves can reach the shoreline at the Project site are from the west and southwest at an angle of 265 to 220 degrees (from true north). The predominant summer wave direction is largely open from the south (from 210 to 170 degrees), as shown in Figure 3.1-2.

Ocean waves in Southern California fall into three main categories:

1. Northern Hemisphere Swell: Waves generated in the Northern Hemisphere that propagate into Southern California waters;
2. Southern Hemisphere Swell: Similar waves generated south of the equator, and
3. Local Seas: Relatively short-period waves generated within the Southern California Bight by winds.

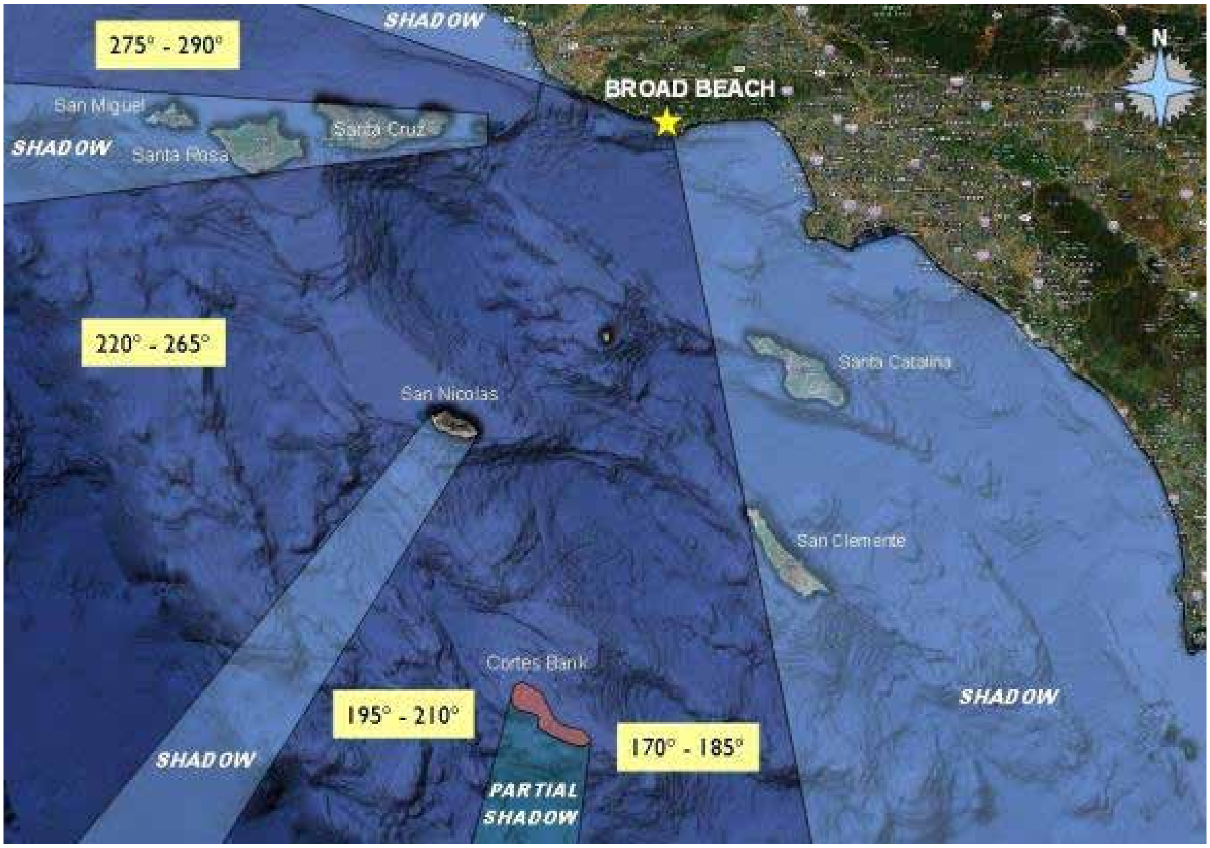


Figure 3.1-2. Wave Exposure Windows at Broad Beach

North Pacific swell events are the most significant source of extreme waves in the region. Swells from winter storms in the southern hemisphere reach California and the Public Trust Impact Area for the Project (e.g., Zuma Beach) during May through October. These swells approach Broad Beach from the southwest, south, and southeast, but are partially blocked by the Channel Islands. Additionally, the great decay distances result in waves of low heights and long periods. Swells generated from tropical storms that develop off the coast of Mexico can also generate high waves, though extreme events in Southern California are rare. Locally generated waves are predominantly from the west and southwest, except for pre-frontal wind-generated waves from the southeast, which occur in winter. Locally generated waves in this area are usually less than 6 feet in height with wave periods less than 10 seconds.

Wave climate varies with time. For example, wave events tended to be moderate between the mid-1940s and mid-1970s when La Niña (i.e., cool water temperature periods of low wave energy and low rainfall) conditions were typical. The wave climate changed during the period from 1978 to 1998 with the onset of El Niño weather conditions (i.e., periods of local warm water and corresponding large storms and high rainfall) that included an increase in the number and intensity of extreme wave events. High-energy winter waves approached the coastline from the west or southwest, while summer waves originated with hurricanes off Central America. More recently, although a combined storm and high tide in March of 2014 created a major wave event, between 2000 and the present, the wave climate has generally been mild.

O'Reilly and Flick (2008) used wave information for the California coast (available from the Coastal Data Information Program) to understand the wave climate at Broad Beach and determine the wave-related causes of the unusual erosion observed in the area during the winter and spring of 2007-2008.[1] The data consist of nearly 8 years of hourly wave height, period, and direction calculated at 330-foot intervals along the California coast, including the area off Broad Beach. O'Reilly and Flick (2008) concluded that, in general, waves at Broad Beach are mild. Most of the time, they are less than 4 feet high, with only a few wave storms having reached heights greater than 7 feet. Between 2000 and 2008, the number of hours per year that wave heights were greater than 5 feet ranged from 0 to 103, with an average of 52 hours. These waves are responsible for transporting most of the sand from Broad Beach to the east, but such waves do not occur very often. This pattern was noticeable between 2000 and 2008.

El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation Index (PDO)

Although large waves can happen in any year, historically, the most damaging extreme wave events to affect Southern California have occurred during ENSO events, which represent global-scale climatic variations that tend to occur every 2 to 7 years. During strong ENSO events, sea level along the California coast is elevated by 0.5 to 0.7 feet for up to 2 years at a time (TerraCosta 2008). During these events storms approach from a more westerly direction and typically generate larger waves with longer periods that increase the amount of energy reaching the Southern California coast. Some of the most damaging extreme wave events at Broad Beach occurred during the 1997-1998 and 2009-2010 El Niño events. El Niño conditions (e.g., elevated water levels, increased storm intensity, and westerly wave approach direction) combine to enhance sediment transport rates. As illustrated by recent ENSO events, the effect on Broad Beach is an increase in shoreline erosion and the associated potential for damage to property from wave uprush and overtopping of shoreline protection structures.

The PDO is a pattern of long-term climate variability in the Pacific Ocean that typically has shifted every 20 to 30 years and is described as being in either a warm (positive PDO) or cool (negative PDO) phase. The phases are associated with changes in sea surface temperatures that result in changes to the jet stream path. Changes in beach behavior from accretion (i.e., widening) to erosion may be related to different phases of the PDO (Revell and Griggs 2006). The PDO was negative (i.e., cool) from 1947 to 1977, corresponding to relatively calm, dry weather. The PDO reversed and was

[1] Coastal Data Information Program (CDIP) measures, analyzes, archives, and disseminates coastal environment data for use by coastal engineers, planners, and managers, as well as scientists and mariners. Available at: https://cdip.ucsd.edu/.

positive (i.e., warm) until 1999, corresponding to relatively stormy, wet weather with more intense El Niño effects. After 1999, the PDO has cycled rapidly between cool and warm phases with only 2 to 3 years separating these phases. The PDO is distinct from the ENSO, the cycle that includes El Niño and La Niña, in three ways:

- **Location**. The strongest signature of the PDO is in the North Pacific, instead of the tropical Pacific.
- **Duration**. PDO phases last much longer (typically 20 to 30 years for a single warm or cool phase) than ENSO events (6 to 18 months for a single warm [El Niño] or cold [La Niña] phase. This conclusion is based on 20th century observations and has been confirmed to a significant degree by historic analysis of tree rings (Gedalof and Mantua 2002) and geoduck clam shells (Strom 2003).
- **Cause and Predictability**. The factors contributing to ENSO events allow scientists to forecast ENSO events several seasons in advance of their onset. The causes of the PDO, on the other hand, are not well understood. Newman et al. (2003) suggest that the PDO represents direct effects of the ENSO, the re-emergence of North Pacific sea surface temperature anomalies in years after the ENSO, and random direct effects of atmospheric temperature conditions.

Part of the difficulty in understanding what triggers PDO phase shifts is the persistence of PDO events. Accurate instrumental records for the North Pacific begin around 1900; because of the relatively long 20- to 30-year duration of the PDO phases, only two complete PDO cycles have been observed in the last 110 years, making it difficult to determine the cause for, and predictability of, the PDO. MacDonald and Case (2005) reconstructed the PDO back to the year 993 using tree rings from California and Alberta. Their index showed a 50- to 70-year periodicity occurring only after 1800; a persistent negative phase occurred during medieval times (993 to 1300) which is consistent with La Niña conditions reconstructed in the tropical Pacific (Rein et al. 2004) and multi-century droughts in the southwestern U.S. (Seager et al. 2007).

Studies suggest that ENSO effects on North American climate are strongly dependent on the phase of the PDO, such that “strong” El Niño and La Niña patterns are only observed during years in which ENSO and PDO extremes are “in phase” (i.e., with warm PDO and El Niño, and cool PDO and La Niña, but not with other combinations) (Gershunov and Barnett 1998; Gershunov et al. 1999; McCabe and Dettinger 1999).

Scientists believe we may have currently entered a negative (cool) phase of the PDO (University of Washington Climate Change Impacts Group 2012; NASA 2012). Although this could result in reduced storm intensity, the effects of this cycle on Broad Beach cannot be determined, as beach erosion appears to be continuing. Although these overall patterns may indicate a calmer wave climate more conducive to reduction in erosion or limitations in storm damage, this patterns is not evident from empirical monitoring. Therefore, even if this PDO reversal has occurred, there is no observed evidence that beach accretion that historically occurred up to 1970 will return. As discussed under *Sediment Sources and Sinks* above, this may be due to regional factors such as a decline of past sediment inputs into the system from sources such as PCH construction, fires or floods or to increased interception of down coast littoral drift of sand from the upcoast Santa Monica Littoral Cell by the Mugu Submarine Canyon.

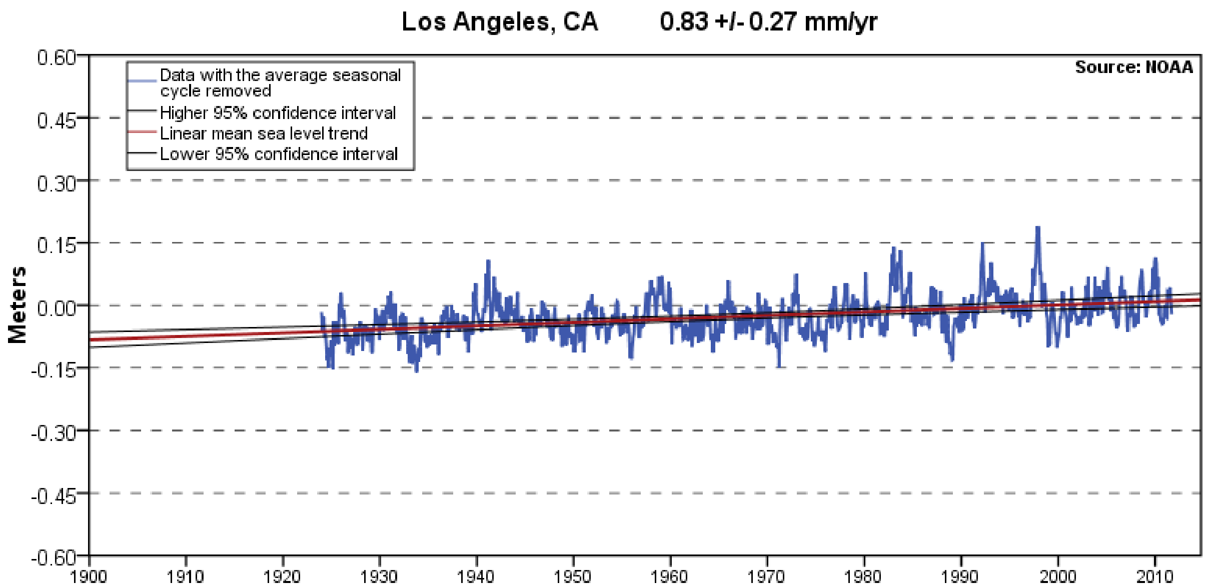
Sea Level Rise

World scientists and science institutes have a clear consensus that accelerating global climate changes are occurring. Evidence includes: increasing concentrations of carbon dioxide (CO_2) and other “greenhouse gases (GHGs)” in the atmosphere; rising average global air temperature and average ocean surface temperatures (which affect extreme weather); substantial reduction in the thickness of arctic ice sheets; and rising average sea levels (Intergovernmental Panel on Climate Change [IPCC] 2013). These changes are destabilizing climate processes, and are forecasted to create increasingly serious effects worldwide. There is also scientific consensus that these accelerated climate changes result from increasing worldwide amounts of GHGs, including CO_2, emitted into the atmosphere by human activities. These gases act like a greenhouse to trap heat in the earth’s atmosphere. They absorb radiation and release it as heat to maintain the temperature of the planet. But the balance of gases in the atmosphere is upset, and the increased GHG content causes excess heat to be retained. Past weather patterns of heating and cooling, over thousands of years, have involved atmospheric CO_2 levels ranging between 180 and 280 parts per million (ppm). The CO_2 level has increased to more than 380 ppm within just a few hundred years and continues to increase rapidly relative to historic patterns (IPCC 2013).

One of the effects of this global warming is SLR, resulting from the melting of ice caps and expansion of the water column through heating. The IPCC (2013) documented an increase in Mean Sea Level (MSL) of between 4 and 10 inches over the preceding 100 years and has predicted that sea level could rise between 7 and 23 inches over the next 100 years. The State of California has incorporated these rates of SLR into policymaking processes for purposes of calculating the potential impact of SLR on proposed coastal development (California Coastal Commission [CCC] 2013).

At a given coastal site, the rate of global SLR is of less practical importance than the local rate of SLR relative to shore. This rate is known as the *relative SLR rate* and is the net sum of the global SLR rate with addition or subtraction of local land uplift or subsidence. SLR rates at a specific location can also be influenced by shorter time-scale climatological effects such as ENSO and the PDO. In the Los Angeles area, long-term tide records (1924 to present) at the National Oceanic and Atmospheric (NOAA) Los Angeles Outer Harbor station show a water level change of 3.3 ±1.1 inches per century (see Figure 3.1-3). This is significantly less than (half) the historic average global SLR rate of 6.6 ±2 inches per century (IPCC 2013); land uplift at this location may account for the difference (3.3 inches per century). Recent State projections for the Los Angeles region identify a SLR of approximately 5.8 inches by 2030 (within a range of 1.8 to 11.8 inches), 11.2 inches by 2050 (within a range of 5.0 to 23.9), and 36.7 inches by 2100 (within a range of 17.4 to 65.6 inches) (CCC 2013, National Research Council [NRC] 2012). As global climate change progresses and the overall level of the ocean rises, increased erosion rates will further reduce public access to the public trust lands along the beach and alter beach and rocky intertidal habitats.

Figure 3.1-3. Sea Level Rise at Los Angeles Outer Harbor Buoy



SLR will likely affect public trust resources along Broad Beach through changes in sea level elevation, storm intensity and frequency, and wave direction and height. Such changes could exacerbate coastal erosion rates, which could reduce the amount of beach accessible to the public and lead to changes in intertidal and subtidal marine habitats. Past beach erosion and landward advances of the mean high tide line (MHTL) have resulted in increased areas of rocky intertidal habitats and reduced the amount of beach accessible to the public to the point where usable beach is only accessible during low tide. For example, during a modest medium tide of approximately +1.5 feet on April 7, 2014, ocean levels reached the emergency revetment that was installed in 2010, with only limited pockets of beach along the entire 4,100 feet of revetment, substantially interfering with lateral access and leaving little room for recreation (AMEC 2014). Conversely, based on a review of past beach profiles, the area of rocky intertidal habitat exposed at low tides appears to have substantially increased in comparison to sandy beach habitat. This rocky habitat remains submerged for long periods of time as most of intertidal beach is covered by even modest tides.

Water Levels

Tides, storm surges, and ENSO events influence water levels, potentially generating elevated water levels that contribute to coastal-related flooding and damage. Tidal fluctuations are superimposed on sea level. The tide is predictable and can be disaggregated into a set of constituent frequencies near one and two cycles per day, each having a given amplitude and phase at any location. Substantial fluctuations in the range of the tide occur at two cycles per month (spring and neap), two cycles per year, every 4.4 years, and every 18.6 years (tidal epoch).

The tides at the Broad Beach area are classified as mixed semidiurnal (two unequal highs and lows per day). Tide characteristics from the tide gage nearest the Broad Beach area (NOAA's Los Angeles Outer Harbor Tide Station) are shown in Table 3.1-1. Water levels and elevations on land are referenced to the MLLW datum for the 1983-2001 tidal epoch.

Table 3.1-1. Water Levels at Broad Beach Based on NOAA's Los Angeles Outer Harbor Tide Station

Water Level	Elevation to MLLW Vertical Datum
Extreme High (Observed January 10, 2005)	+7.9 feet
Mean Higher High Water (MHHW)	+5.5 feet
Mean High Water (MHW)	+4.7 feet
Mean Sea Level (MSL), 1983-2001 Epoch	+2.8 feet
National Geodetic Vertical Datum -1929 (NGVD29)	+2.6 feet
Mean Low Water (MLW)	+0.9 feet
North American Vertical Datum – 1988 (NAVD88)	+0.2 feet
Mean Lower Low Water (MLLW)	0.0 feet
Extreme Low (Observed December 17, 1933)	-2.7 feet

Source: NOAA/NOS 2008. Water elevation records were available from 1923 to 2011

The highest monthly tides in the winter and summer are higher than those tides in the spring and fall as a result of lunar and solar effects. The extreme monthly higher-high tides in the winter tend to occur in the morning. The average value for the tide range is about 6 feet. The extreme observed high tide is about 7.9 feet above MLLW and the extreme low is 2.7 feet below MLLW. The mean sea level is about 2.8 feet (1983-2001 Epoch). Seasonal sea level at the Broad Beach area, as determined from monthly mean values, tends to be highest in the fall and lowest in the spring. Local warming or cooling resulting from offshore shifts in water masses can alter the average sea level by several tenths of a foot over periods of several months (e.g., during El Niño years).

In Southern California, the highest tides of the year typically occur in the winter months. Wave overtopping and wave-related coastal damage often occurs when an extremely high tide coincides with high storm waves. A statistical analysis of extreme water elevations was developed based on recorded annual extreme high water elevations obtained from NOAA's Los Angeles Outer Harbor reference tide station. Water elevation records were available from 1923 to 2002. Table 3.1-2 shows the annual extreme high water elevation versus recurrence interval. The extreme still water levels combined with SLR projections provide the basis for estimating a design water level for coastal engineering analyses.

Table 3.1-2. Extreme Water Levels versus Recurrence Interval

Recurrence Interval (Years)	Extreme Still Water Elevation (Feet, MLLW)
5	7.4
10	7.6
25	7.7
50	7.9
100	8.0

Source: NOAA Los Angeles Outer Harbor reference tide station data

Storm surges, which result from the effects of lower atmospheric pressure and higher wind speeds during storms, increase the water level above the tide. Together, tides, storm surges, and sea level changes determine design water levels. The design water level is important for coastal processes and engineering, since it determines how high and how far shoreward the effect of breaking waves can reach. For example, if sea levels are unusually high because of a combination of factors including high tides, storms, and elevated sea levels from El Niño conditions (such as during the winters of 1982-1983, 1997-1998, and 2009-2010), large waves can be far more effective in causing flooding, structural damage, beach erosion, and cliff failure than under normal conditions. The typical storm-surge component of sea level can raise water levels a maximum of 1 foot above the tide.

Shoreline Position (Historic to 2010)

Almost all beaches are permanent features (at least over 100- to 1,000-year periods) in that they do not vanish, but experience cycles of expansion and contraction on many time scales (Everts Coastal 2009). Annual oscillations in beach size are well recognized in California. Contraction due to offshore transport happens during fall and winter storms; expansion follows in the spring and summer as sand returns landward when the wave climate is more benign. Long-term oscillations in beach size can be related to climatic events such El Niño or La Niña which may affect wave height, frequency, and direction, with associated impacts on rates and direction of sand transport. Rainfall intensity can also affect sediment input into the system. Natural events such as major wildfires, particularly when followed by heavy rains, can lead to major pulses of sediment into the littoral system with substantial changes in beach width. Changes in a beach's sediment budget through interruption of natural longshore transport, such as harbor or seawall, can also impact long-term beach width.

Beaches in the Zuma Littoral Subcell, including the Broad Beach area, appear to have experienced major oscillations in historic width over extended periods. Much of the

Zuma Littoral Subcell, including all of Broad Beach, is backed by an inactive sea cliff, with Broad Beach Road and the existing homes built on active dunes and back beach areas located at the toe of this formerly active sea cliff. This once-active feature: (1) exhibits clear evidence of past wave attack at its base and indicates the beach was much further landward of its present location sometime well before 1870; and (2) indicates that the active coastal process zone was (on average) nearly 300 feet landward of its present position, with potentially one or more intermediate headlands between Lechuza Point and Point Dume (Everts Coastal 2009).

Broad Beach has also been much wider, extending seaward from its current shoreline position by more than 100 to 200 feet. Broad Beach was a relatively wide beach from the late 1960s into the 1980s, a time period that corresponded with construction of many of the existing homes. Broad Beach reached a peak width in 1970 with a yearly average of 60 feet landward of the existing MHTL, although the beach has been receding since this time. Between 1974 and 2009, approximately 600,000 cy of sand has been lost at Broad Beach, a majority of which moved east to nourish Zuma Beach and other locations down coast (Everts Coastal 2009). The shoreline moved landward an average of 65 feet during that time period. The area of greatest beach erosion occurred close to Lechuza Point and tapered off toward Trancas Creek. Since the sand budget became negative around 1974, the Broad Beach sand loss rate has accelerated to approximately 35,000 cy/yr between 2004 and 2009 (Everts Coastal 2009) and further increased to 45,000 cy/yr between 2009 and 2012 (Everts Coastal 2014).

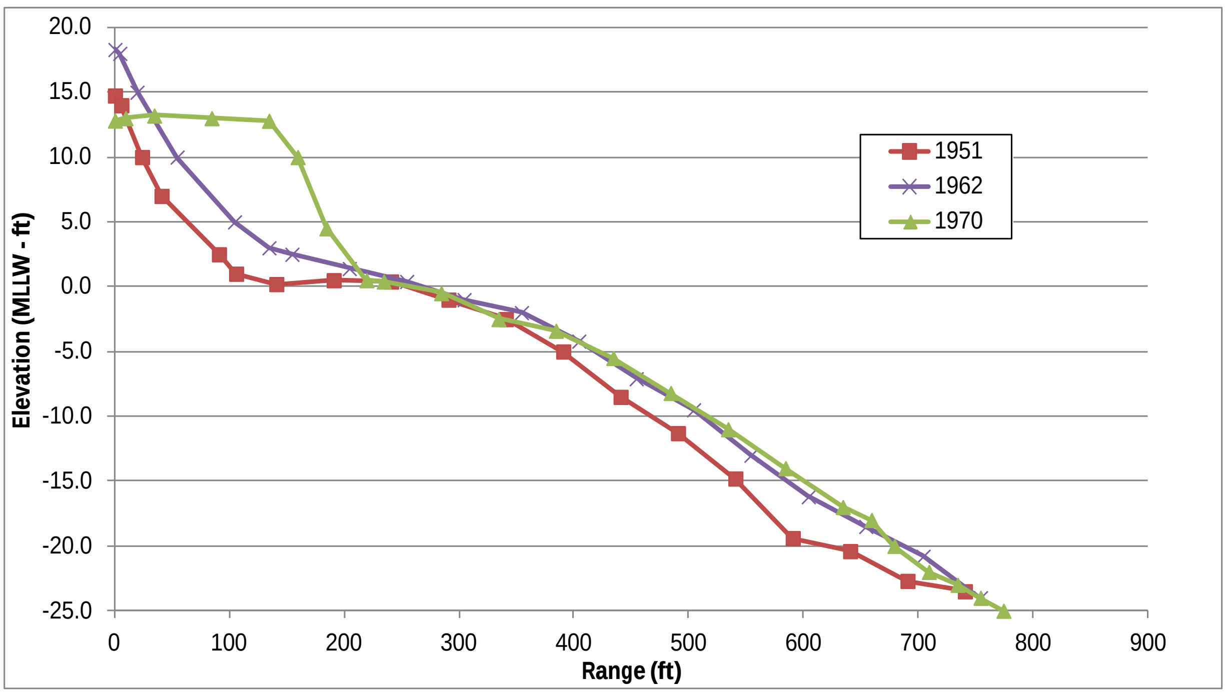
Although beach volumetric data show four minor recoveries in beach width over the last 40 years, several recent studies of the coastal region encompassing Broad Beach have identified a trend of continued erosion without major recovery in beach width since the early 1970s. The beach is narrowing due to a negative sand balance caused by a reduction in sand supply entering around Lechuza Point, and/or an increase in sand loss due to a change in the magnitude and/or direction of the wave energy that transports sand from Broad Beach. Studies conclude that this trend of erosion appears to have accelerated in the last two decades. Recent El Niño storm seasons have exacerbated the shoreline recession resulting in structural damage and further beach erosion.

The 1997-1998 El Niño storms caused considerable shoreline erosion and related storm wave damage along the California coastline. Many Broad Beach homes were threatened, causing many homeowners to construct temporary sand bag revetments to protect residential structures and leach fields. One residence suffered major structural damage, which resulted in its complete destruction. During one particularly severe storm in early February 1998, with sand bags already in place, the active beach scarp retreated more than 30 feet in the course of two days (TerraCosta, 2008). The 2007-2008 winter season, though milder than the 1997-1998 winter, also resulted in significant retreat of the beach. In December 2009, a significant narrowing of the beach occurred due to storm wave attack resulting in widespread failure of the existing temporary emergency sand bag revetments, especially at the west end of the beach. Waves and higher tides eroded portions of the historically wide dunes along the east end of Broad Beach as well.

Historic Beach Profile and Shoreline Measurements

Historic beach profile surveys carried out in 1951, 1962, and 1970 show severe erosion at the inshore and offshore part of the profile (see Figure 3.1-4). In 1962, the beaches recovered slightly. Of particular interest is the beach profile of 1970, since it likely represents a beach profile for Broad Beach when the beach was wide. Broad Beach at its widest configuration had a berm height of 12 feet above MLLW and a beach face slope of 1:6 (8 degrees). Broad Beach has a steep beach face slope, indicating that the sand grain size is coarse.

Figure 3.1-4. Historic Beach Profile Comparison (near 30870 Broad Beach Rd.)

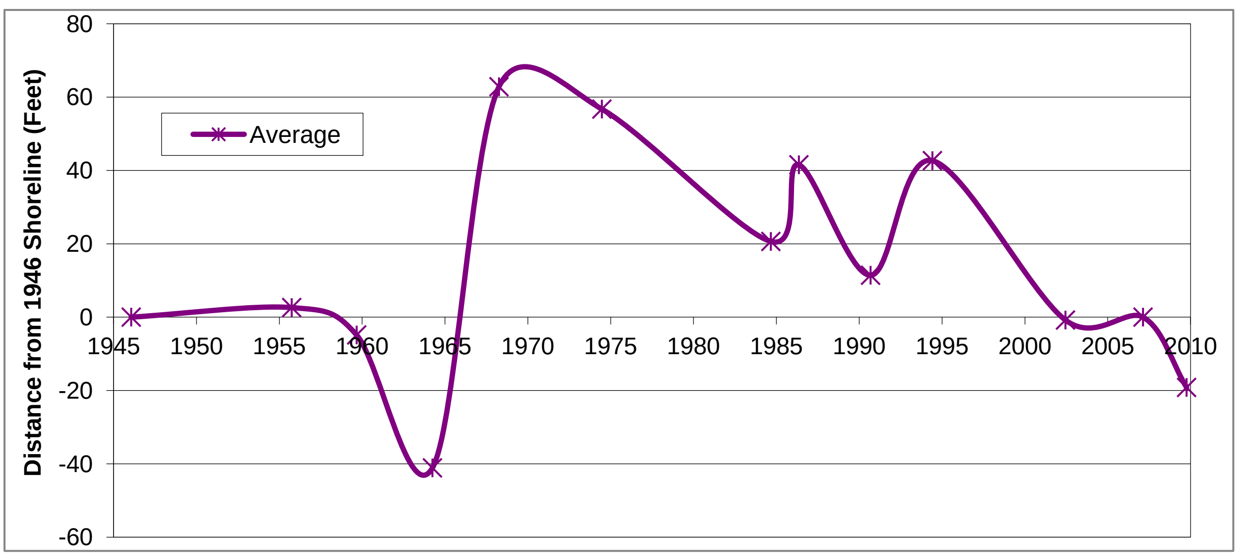


As part of a study of the California coast, the U.S. Geological Survey (USGS) developed estimates of short-term and long-term historical shoreline change for the Santa Monica Region, which includes the Broad Beach area (USGS 2006). This study evaluated shoreline trends by comparing three historical shorelines digitized to represent general shoreline position in the 1800s, 1920s-1930s, 1950s-1970s, and a recent (1998-2002) shoreline position determined using optical remote sensing technology. Long-term rates of shoreline change were calculated using all four shorelines; short-term rates were developed by comparing the two most recent shorelines. Within the Santa Monica region, Leo Carrillo Beach upcoast of Broad Beach had the highest rate of long-term erosion at -0.3 meters per year (m/yr). The maximum short-term (1998-2002) shoreline change rate of -2.2 m/yr occurred at Trancas Beach, the eastern end of Broad beach.

The technical study by Moffatt & Nichol (2012) addressed beach width changes at Broad Beach using shoreline positions extracted from historic aerial images of beaches gathered from various sources. A total of 20 historical shorelines were analyzed between 1946 and 2009. Comparisons between these shorelines were made to demonstrate graphically the changes in shoreline points from one time interval to another. The study calculated average changes in beach width, seasonal beach width change rates, and historical minimum and maximum beach widths. Estimates of volumetric changes were computed based on beach profile changes between two dates.

The study included an analysis of shoreline changes at Broad Beach from 1946 to the present, relative to the 1946 shoreline that was chosen as a reference point (distance from 1946 shoreline at 1946 is 0). Analysis of the average shoreline change across Broad Beach revealed a significant increase in the shoreline through the late 1960s, followed by significant reductions from 1970 to 2010. The average shoreline relative to 1946 is depicted in Figure 3.1-5.

Figure 3.1-5. Average Shoreline Change Relative to 1946: Broad Beach

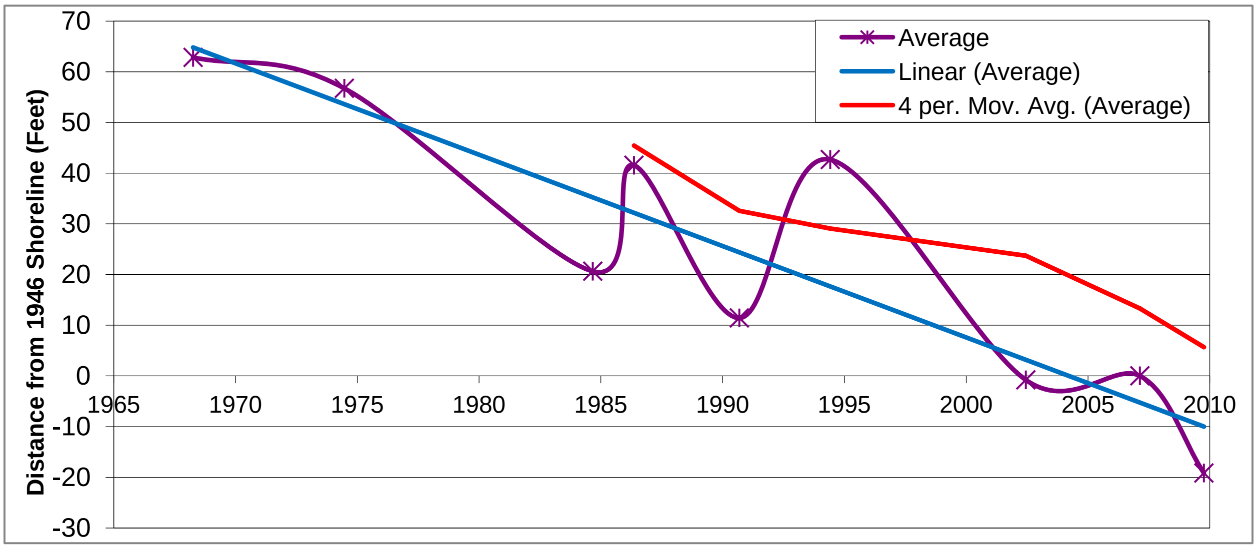


The plot of the distance from the 1946 shoreline (purple line) reveals that:

1) average beach width has varied significantly since 1946;
2) the beach at Broad Beach was at its widest in the early 1970s, and since then it has experienced variable, but declining width; and
3) variation in beach width does not appear to correspond to a uniform pattern.

Moffatt & Nichol noted that the position of the beach in 2009 is within 20 feet of its position in 1946, but the majority of the beach had been artificially prevented from retreating in 2009. To further analyze the loss of shoreline from 1970 to 2010, Moffatt & Nichol plotted the linear regression to determine the average loss over the entire period, and the moving average to determine whether the rate of change has been increasing. These plots are shown in Figure 3.1-6.

Figure 3.1-6. Average Shoreline Change for Broad Beach



The linear regression (blue line) indicates that the beach has lost width at an average rate of about 2 feet per year since 1970. The moving average line (red line) indicates that the shoreline recession has been happening at a variable rate, but appears to accelerate in the 2000s. Moffatt & Nichol also included an analysis of the shoreline change for four separate sections of Broad Beach. The four sections of Broad Beach that were considered are defined as Beach Bins 2, 3, 4, and 5. Definitions and descriptions for each of these sections are provided in Table 3.1-3. Analysis of the four beach bins revealed similar trends across the various bins, but significantly different magnitudes of change between the west end and the east end of Broad beach. These results are presented in Figure 3.1-7.

All four beach bins experienced significant increases in the shoreline for all beach bins through the late 1960s, reaching their peaks around 1970; however, from 1970 to 2010 there were significant reductions in the shoreline in Bins 2 (blue line), 3 (green line), and 4 (red line), and moderate reductions in the shoreline in Beach Bin 5 (orange line). Bin 2 represents the westernmost portion of Broad Beach near Point Lechuza, and Bin 5 represents the easternmost portion of Broad Beach near Trancas Creek. A comparison of these curves indicates that Bin 2 (West Broad Beach) eroded more quickly than Bin 3-5 and that the eroded sand is being transported to the downdrift (eastern) beaches.

Table 3.1-3. Description of the Four Beach Bins of Broad Beach

Bin		Beach Description	Length (feet)	Distance from Point Lechuza (feet [miles])
	**2**	West Broad Beach_1	1,420	1,420 [0.3]
	3	West Broad Beach_2	1,500	2,920 [0.6]
	4	East Broad Beach_1	1,450	4,370 [0.8]
	5	East Broad Beach_2	1,945	6,315 [1.2]

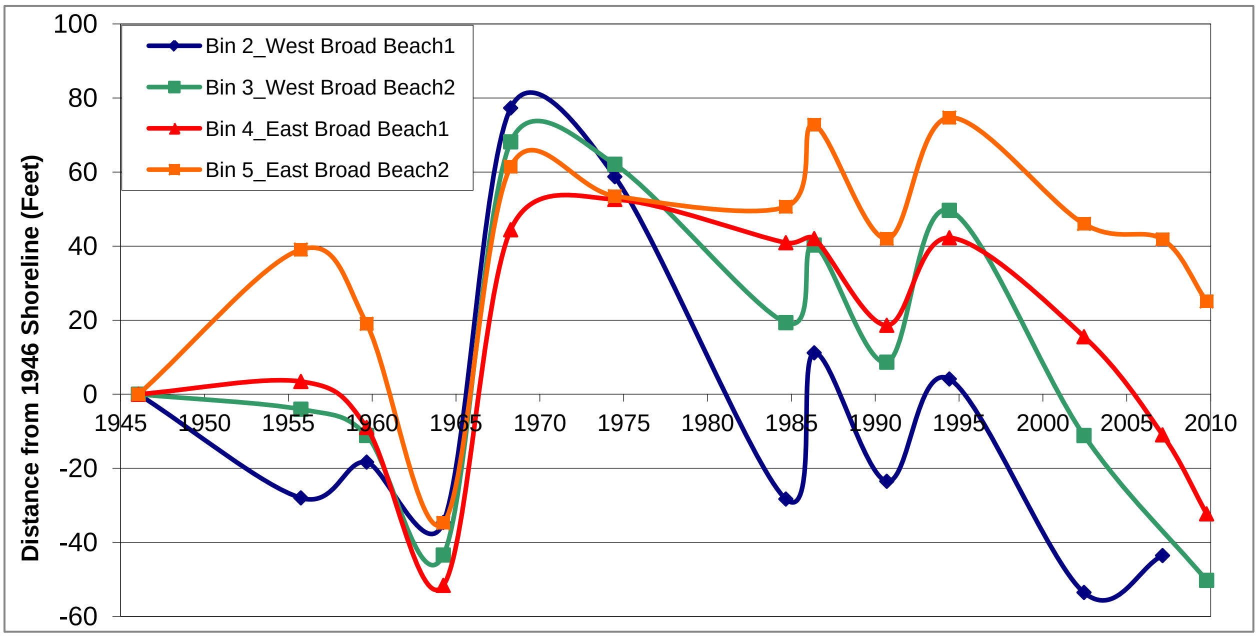


Figure 3.1-7. Shoreline Change Relative to 1946: Bins 2-5

Sediment Transport Measurements

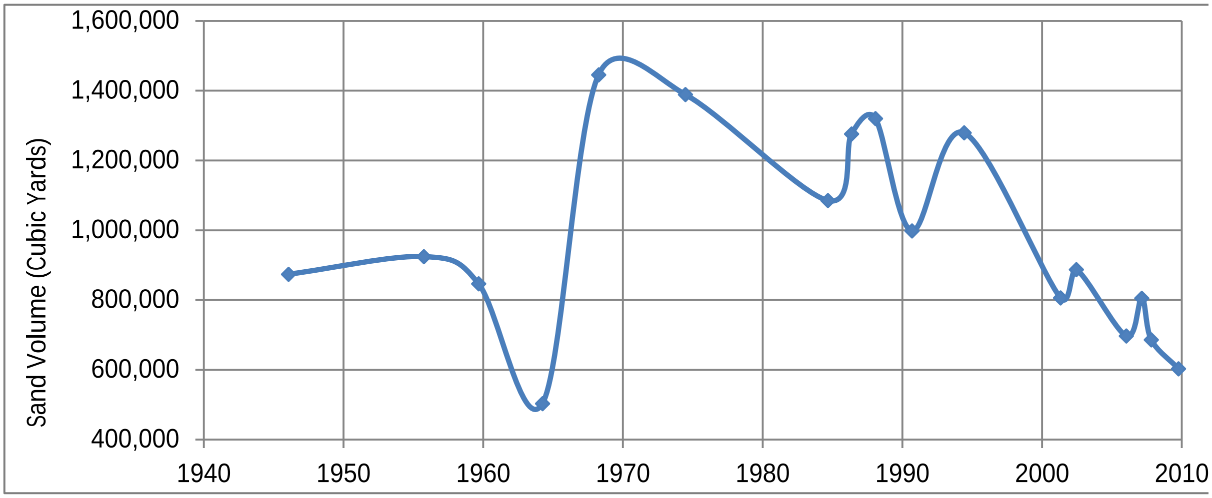
Moffatt & Nichol (2013) measured sediment transport, or the gain and loss of sand, from Broad Beach based on average shoreline measurements. According to this analysis of average beach volumes at Broad Beach, the earliest switch from rise to fall in volume appears to have occurred in the late 1960s and 1970s. Although four recoveries in beach sand volume have occurred since peak beach width around 1970, none matched or surpassed the previous peak beach width from around 1970; rather, each was smaller than the former and was followed by a progressive loss of sediment to the present (Figure 3.1-8). The study also analyzed sediment transport trends at Broad Beach across various periods and their associated sand loss rates in cy/yr. These trends indicate a continuing pattern of erosion since the 1970s, and suggest the trend of sand volume loss along Broad Beach has recently accelerated. These findings are presented in Table 3.1-4.

Table 3.1-4. Sand Loss Rate from Broad Beach

Period	Years of Data	Loss Rate (cy/yr)
1968-2009	41	20,000
1986-2009	23	28,000
2001-2009	8	26,000
2006-2009	3	35,000

Source: Moffatt & Nichol 2013. Estimates were based on analyses of historic shoreline positions.

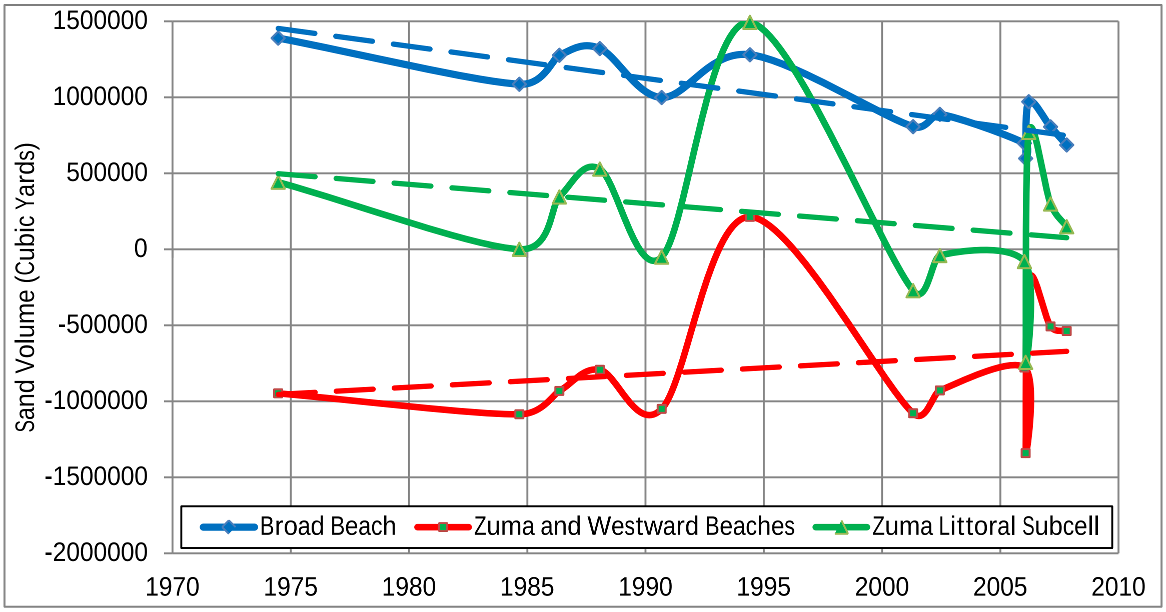
Figure 3.1-8. Volumetric Changes of Sand at Broad Beach



Sand lost from Broad Beach is carried either offshore or down coast. Therefore, a comparison of the historical behavior of Broad Beach with the rest of the Zuma Littoral Subcell provides useful information on the evolution of Broad Beach within the larger context of the hook-shaped bay that includes Broad Beach at its western end. This comparison may help to identify potential causes of the Broad Beach retreat, since changes in one location of a hook-shaped bay tend to correspond with changes elsewhere in the bay.

Broad Beach experienced very different trends in sediment transport through the study period than Zuma Beach and Point Dume State Beach (Westward Beaches). The volume of sand at Broad Beach increased until about 1970, and then began a decline that continues to the present. In contrast, Zuma Beach and Point Dume State Beach experienced a net accretion over the same 60-plus year interval. The large reversal to sand loss in the 1970s at Broad Beach is not evident in the two beaches down coast, suggesting the hooked bay is rotating as its shoreline retreats in the west and advances in the east. A graphical comparison of the volumetric changes in sand at Broad Beach, the combination of Zuma Beach and Point Dume State Beach (referred to as "Westward Beaches" in the figure), and the Zuma Littoral Subcell are shown in Figure 3.1-9.

Figure 3.1-9. Sand Volume Comparison (Broad Beach—Western Beaches)



The trendlines for this analysis indicate that between 1974 and late 2007, Broad Beach losses (blue line) averaged over 21,000 cy/yr of sand. During this same time period, Zuma Beach and Point Dume State Beach (red line) exhibited an average annual accretion of about 8,500 cy/yr. The combined net loss in the Zuma Littoral Subcell between 1974 and 2007 was about 12,500 cy/yr. Although eastern beaches of the Zuma Littoral Subcell have been receiving sand over the last 60 years, the Subcell has been losing sand overall and the point of sand loss versus gain has been shifting eastward. This trend is depicted in Figure 3.1-10, which shows the volumetric rate of change at Broad Beach, Zuma Beach, and Point Dume State Beach over three different time periods.

Figure 3.1-10. Volumetric Changes Along the Zuma Littoral Subcell

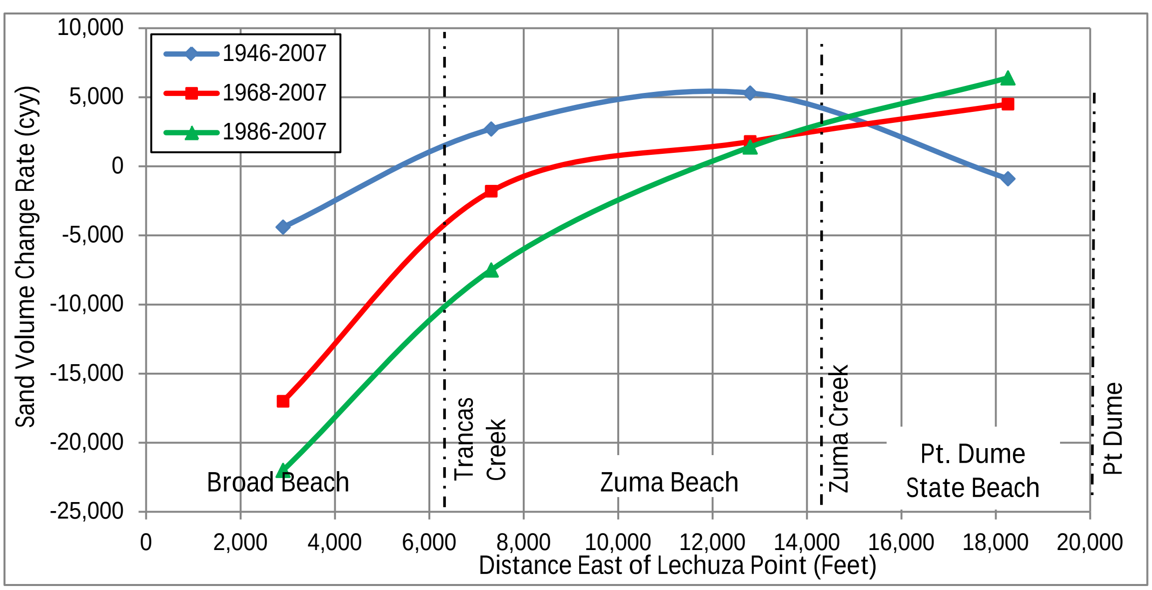


Figure 3.1-10 illustrates an increasing rate of sand loss at the Lechuza Point end of the Zuma Littoral Subcell, and a declining rate of sand loss or sand gain, from west to east in the western two-thirds of the Subcell. The rate of sand gain in the eastern third of the Subcell increased with time. The cross-over point (where sand loss turns to gain) progressively moved eastward with time (about 5,000 feet east of Lechuza Point from 1946 to 2007; about 8,000 feet east of Lechuza Point from 1968 to 2007; and about 12,000 feet east of Lechuza Point from 1986 to 2007). This evidence suggests that the beach retreat problem has spread to the west end of Zuma Beach and is progressing eastward toward Point Dume State Beach. Zuma Beach also appears to have experienced substantial narrowing from historic width during the winter of 2013-2014 compared to 2012-2013, perhaps reflective of the major storm waves of March 2, 2014.

Geologic and Tectonic Setting

The Southern California Coast is a complex, tectonically active region and is characterized as a collision coast wherein the Pacific Ocean plate subducts, or is pushed downward by the North American plate. This process manifests in the form of narrow offshore shelves cut by submarine canyons, with uplifted marine terrace and coastal mountains. Broad Beach lies atop a buried wave-cut terrace etched upon rocks of the Trancas Formation (F$^{\underline{M}}$) (Dibblee and Ehrenspeck 1993). It is comprised of medium-grained beach sand and finer-grained dune sand, both of Holocene-age (Dibblee and Ehrenspeck 1993). The modified surface of the beach and dune sands exists at elevations ranging from mean sea level (MSL) to approximately 15 feet above MSL. The beach is nestled against a wave-cut cliff that exposes fine- to coarse-grained alluvial deposits of Pleistocene age (Dibblee and Ehrenspeck 1993). The modified toe of this cliff is at an average elevation of 35 feet MSL. The top of the cliff represents a man-made surface cut into the older alluvium for placement of PCH.

The southeast end of Broad Beach is separated from Zuma Beach by fluvial deposits derived from Trancas Creek. Holocene age alluvium is deposited at the mouth of Trancas Creek, forming a low mound at the interface with the beach sand. This mound is formed by wave action pushing sand back up into the mouth of Trancas Creek, combined with overlying dune sand. Low levels of surface flow from Trancas Creek generally pond landward of this mound most of the year in Trancas Lagoon. Surface freshwater flows change to subsurface groundwater flows beneath the alluvium/beach sand mound to discharge into the sea. During the rainy season, higher surface flows in Trancas Creek tend to breach the mound and discharge directly into the ocean. Additional discussion of Trancas Lagoon can also be found in Section 3.5, *Marine Water and Sediment Quality.*

Broad Beach is not shown as affected by faulting (Jennings 1975, 1977, 1992, 1994, Jennings and Bryant 2010, Jennings et al. 2010, Dibblee and Ehrenspeck 1993, Jennings and Strand 1969, Bryant 2005, Frankel et al. 2002, USGS 2002, 2006, 2007, 2008, Los Angeles County 1990, 2008, and Malibu 1995). The area does not lie within an Alquist-Priolo Earthquake Fault Zone as defined by the State of California (Bryant and Hart 2007). The area also does not lie within a county or city Fault Hazard Zone (Los Angeles 1990, 2008, and Malibu 1995). The maximum magnitude earthquake (M_{MAX}) of faults in the Broad Beach area is determined from measurements made by the USGS (2008), Southern California Earthquake Center (2010), and Cao et al. (2003).

The Malibu Coast reverse fault lies 1,300 feet north of Broad Beach (Jennings and Strand 1969, Dibblee and Ehrenspeck 1993). The fault generally marks the break in slope along the toe of the Santa Monica Mountains, with the mountains experiencing uplift along the fault. The Santa Monica reverse fault is shown as the eastern extension of the Malibu Coast reverse fault (Jennings and Strand 1969). The city of Malibu (1995) showed the Escondido thrust fault, which lies approximately 2,000 feet northeast of Broad Beach, as offsetting rocks of Miocene age, but the city did not show the Escondido fault on the general plan fault map (City of Malibu 1995). The state of activity of the fault is not known. The eastern portion of the Escondido fault, as shown by Malibu (1995), was mapped as the Ramirez thrust fault, the western end of which is located approximately 0.5 mile southeast of Broad Beach (Dibblee and Ehrenspeck 1993). Dibblee and Ehrenspeck (1993) showed the Ramirez fault offsetting rocks of Miocene age, but as buried beneath sediments of Pleistocene age. The Ramirez fault does not appear to represent an active fault as defined by the Alquist-Priolo Act.

The Anacapa-Dume reverse fault lies off the coast approximately 6 miles south of Broad Beach (Veddar et al. 1986, Bryant 2005). Pinter (2010) considered the Anacapa-Dume fault and the Santa Cruz Island fault as primarily left-lateral faults with minor reverse components. The Anacapa-Dume fault, which marks the break in slope between the submarine slope of the Santa Monica Mountains and the floor of the San Pedro Basin, continues to the west as the Santa Cruz Island fault (Veddar et al. 1986). The Anacapa-Dume fault zone displays a slip rate of about 3 millimeter/yr (mm/yr) and is considered to be capable of generating an M_{MAX} earthquake of momentum magnitude (M_W) 7.2 (USGS 2008). The Santa Cruz Island fault is listed as capable of an M_{MAX} earthquake of M_W 7.2, with a slip rate of around 1 mm/yr (USGS 2008).

Veddar et al. (1986) showed the northwest end of the Palos Verdes fault located about 10 miles southeast of Broad Beach. The Palos Verdes fault displays evidence for both right-lateral strike slip and reverse slip movement (Fischer et al. 1987, Dibblee 1999). The Palos Verdes Hills are thought to have been uplifted by movement along the Palos Verdes fault. However, recognition of the Palos Verdes Anticlinorium reverse fault along the submarine base of the Palos Verdes Hills by Sorlien et al. (2003) appears to provide a better source fault for uplift of the entire Palos Verdes Anticlinorium, as well as the Palos Verdes Hills. The northern end of the Palos Verdes Anticlinorium fault is expected to mimic the length and trend of the higher angle Palos Verdes fault, and, therefore, lies about 10 miles southeast of Broad Beach. The Palos Verdes Anticlinorium fault may also merge with the eastern portion of the Anacapa-Dume fault. The M_{MAX} earthquake of the Palos Verdes fault is provided as M_W 7.3, with an oblique slip rate of around 3 mm/yr (USGS 2008). The M_{MAX} earthquake for the Palos Verdes Anticlinorium fault may be M_W 7.5, but the slip rate is not yet calculated (Sorlien et al. 2003).

Review of digital aerial photography available from Google Earth Pro (Google 2012), World Wind (National Aeronautic and Space Administration [NASA] 2011), and Bing 3D (Microsoft 2011) suggests that several high angle right-lateral strike-slip faults traverse the Broad Beach area. These suspected faults can be traced through alluvial materials of Pleistocene age and older rocks on the photographs. Evidence for these features to represent faulting include offset ridge lines, offset canyons and drainages, aligned canyons, offset landslides, structural control of parallel ridgelines, vertically offset terraces and alluvial fan surfaces, aligned escarpments, and tonal lineaments associated with aligned vegetation. The state of activity of these suspected faults is not known. However, the observed offset of alluvial materials mapped as Pleistocene in age, and offsets observed across landslides considered to be Pleistocene in age, would indicate that these features, if they do represent faults, would be considered potentially active faults using criteria developed by the State (Bryant and Hart 2007).

Liquefaction

The Broad Beach area is included within a potential liquefaction area on the Los Angeles County General Plan (1990) and State Seismic Hazard Zones map (California Division of Mines and Geology 2002). The Malibu General Plan (1995) does not show a map of liquefiable areas. The geologic materials underlying the revetment are mapped as beach and dune sands of Holocene age. These materials are loose and uncemented, as observed at the ground surface during the geologic reconnaissance. Although the thickness of these deposits is not known, these sands are expected to be relatively thin and non-uniformly resting upon dense rock of the Trancas $F^{\underline{M}}$. The depth to groundwater at Broad Beach was not available at the time of this study.

Tsunami

The Los Angeles County General Plan (1990) showed all of Broad Beach located within a Tsunami Inundation Zone. The county's inundation zone is based on a locally generated 100-year earthquake. The State Tsunami Inundation Map for the Point Dume 7.5-minute quadrangle also showed the entire Broad Beach area situated within a Tsunami Inundation Zone (California Geological Survey 2009). The State's Tsunami Inundation Zone is based on an earthquake generated from a distant fault source, like Japan or Alaska, and does not portray the wave run-up anticipated from a locally generated earthquake. The Malibu General Plan indicated that the Broad Beach area could expect tsunami run-up of approximately 5.1 feet during any 100-year period of time and up to 8.7 feet over a period of 500 years. This amount of run-up would be on top of the tidal height at the time of tsunami generation.

3.1.2 Geologic Hazards

In the context of this Project, geological hazards refer to the structural integrity and stability of the existing emergency rock revetment, particularly in relation to geologic processes. Structural integrity is important for long-term protection of public trust resources and values along Broad Beach, and in offshore waters that could be impacted by contamination from septic effluent and other debris from beachfront homes should the revetment fail and homes or septic systems be damaged or destroyed. This Revised APTR describes the variety of existing individual private coastal protection structures at Broad Beach, particularly those at the west end of Broad Beach, but does not include a geotechnical assessment of the stability of these existing individual structures as they are not part of the Project.

Existing Revetment Description

Storm-related erosion in 2008-2009, combined with the threat of the oncoming 2009-2010 El Niño season, prompted the construction of the emergency revetment in 2010. The CCC and city of Malibu approved a temporary emergency revetment as the minimum action necessary to protect Broad Beach, and the least environmentally damaging alternative. The temporary rock revetment design was developed to stabilize the shoreline against further erosion for the 2009-2010 El Niño season.

The emergency revetment has remained in place since its construction in 2010. Since installation of the emergency revetment, the portion of the beach that is seaward of the revetment has continued to erode, with a continued lowering of the beach profile and a loss of remaining dry sand beach berm. Additionally, the 550-foot section at the east end of Broad Beach that is not protected by the revetment and the 100-foot section where there is a gap in the revetment have experienced significant beach losses due to erosion during recent winter storms. During the 2013-2014 storm season the beach and dune system along these sections of Broad Beach eroded approximately 50 to 80 feet landward. Sakrete and sand bag revetments[2] that fronted portions of the dunes protecting the undeveloped lots and six structures on the eastern 550 feet of Broad Beach were largely destroyed by wave action, which lead to substantial landward erosion.

Geological Hazards

The existing revetment extends from 30760 Broad Beach Road, approximately 600 feet west of Trancas Creek, to 31346 Broad Beach Road, just west of the western public access point for Broad Beach and 1,500 feet east of Lechuza Point (Illustration 3.1-4).

[2] Sakrete revetments are fabric bags filled with concrete, often stacked or keyed back into a bluff or dune.

Illustration 3.1-4: *The existing revetment extends for 4,100 feet along Broad Beach fronting the majority of private properties within the area. The majority of the existing emergency revetment is generally comprised of 0.5- to 2-ton boulders, intermingled with smaller rock. The use of such smaller rock could expose the revetment to wear and damage by wave action over the long term.*

Approximately 36,000 tons of rock was used to construct the revetment in 2010. The revetment varies in width from 22 to 38 feet, and rises 12 to 15 feet above MLLW with an average crest elevation of 13 feet above MLLW.[3] Individual boulders for the majority of the revetment are between 0.5 and 2 tons in weight, although many smaller rocks were used during construction. The portion of the revetment between 31302 and 31346 Broad Beach Road was designed to be more robust and incorporated larger boulders (i.e., up to 4 tons per rock). Most of the revetment is on private land. However, portions of the seaward side of the revetment totaling approximately 0.86 acre are located on public trust lands below the Mean High Tide Line (MHTL) as surveyed by CSLC staff in January 2010; an additional 0.73 to 1.04 acre overlies Lateral Access Easements (LAEs) which were granted to the public for lateral coastal access along Broad Beach (see Section 3.2, *Recreation and Public Access*).[4]

Geological Hazard Assessment of the Temporary Revetment

A large earthquake along any of the faults listed above would result in very strong ground motion at Broad Beach. In particular, earthquakes along the nearby Malibu Coast, Anacapa-Dume, or Palos Verde faults would be expected to generate high levels of both horizontal and vertical shaking at Broad Beach. Based on peak ground accelerations measured from the 1971 San Fernando and 1994 Northridge reverse-motion earthquakes, peak accelerations over 1 g (greater than the acceleration due to gravity) should be expected to affect the Broad Beach area at some point in the future.

[3] The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch, a 19- year period established by NOAA that currently covers the period from 1983 to 2001.

[4] Disagreement exists between CSLC and the BBGHAD as to location of the MHTL; see Section 2.1.3, *State Sovereign Lands and Private Property Boundary*.

The hydraulic stability of the existing revetments armor stone was evaluated using the Hudson formula outlined in the *Coastal Engineering Manual* (Moffatt & Nichol 2012). This formula is widely used and has many years of successful application on the California coast. Most of the existing revetment was constructed with two layers of armor stone between 0.5 and 3 tons. Based on specified gradation, the median armor stone is between 1 and 2 tons of rough quarry stone with random placement. To meet the 0 to 5 percent damage criteria, the acceptable design wave for the existing revetment is 6 feet for 1-ton stone to 8 feet for 2-ton stone. Depth limited wave heights greater than 6 to 8 feet breaking in front of the existing revetment will likely result in a higher percentage of displacement of boulders and potential damage to the revetment.

The design wave heights calculated for the critical design condition of extreme tides, range from 8.9 to 9.6 feet based on the 2040 SLR scenario. For comparison, the armor stone required to meet the 0 to 5 percent damage criteria for these wave heights is 3 to 4 tons in weight. These results indicate the western portion of the existing revetment can withstand these design wave heights with minimal damage. Armor stone for the remainder of the existing revetment is under-sized and greater than 5 percent damage can be expected under critical design conditions (Moffatt & Nichol 2012). Damage to the revetment from an extreme geologic event of this type does not suggest a complete failure of the revetment. The flexible nature of a stone revetment to shift and settle is one reason it is a commonly used shore protection device. This flexibility can accommodate minor settling and even displacement of some stones without complete loss of protection. Damage from waves exceeding the design wave is usually progressive and can be repaired provided there is sufficient time between consecutive storm events. Although the existing revetment lacks the safety factor of a typical coastal revetment, the structure has performed well under direct exposure over the past several years (Moffatt & Nichol 2012).

Field inspection by AMEC geotechnical engineers substantiated many of the above-mentioned design assumptions and in-place rock revetment conditions. As reported, the western end of the rock revetment consisted of larger rock stone than that at the eastern end; the team noted a distinctive change in rock size occurred at about 31346 Broad Beach Road (i.e., the western-most beach access point). Thus, the larger stone exists along the western 490 feet (13 percent of the length) and smaller stone exists along the eastern 3,600 feet (87 percent of the length) of the revetment. The use of smaller stone, which was reportedly placed on the interior, was unable to be observed as only the exterior of the wall could be observed.

Overall, the exterior stone appeared to be stable with little evidence of movement having occurred during the 2-year performance period prior to this field inspection (2010 to 2012). In the eastern end where the smaller rock exists, the field survey team noted that individual rock pieces had been separated from the wall and were lying on the beach in front (seaward side) of the wall (Illustration 3.1-5). In these local cases, the wall appeared stable with no obvious perturbations in the overall linear shape of the wall. In these areas the geotechnical field team did not note any deflections in the top of the wall that could indicate settlement of the overall wall. At the western end of the wall where the larger rocks exist, the field survey team did not note any rock pieces that had been detached from the rock mass. The rock sizing indicates relative stability of the rock mass; however, the detached stones suggest that use of a larger size stone would be warranted. Field reconnaissance performed by AMEC staff in 2014 confirmed that the revetment remains intact with little evidence of damage (26 February 2014).

Illustration 3.1-5: *The existing revetment was constructed as an emergency measure using smaller-sized rocks that were not keyed together into bedrock or deeply set into the beach.*

The rock revetment was designed as a trapezoid that is 12 to 15 feet high and about 22 to 38 feet wide at the base. The field team's visual sitings along the top of the revetment indicated that it is approximately level and without significant variations in elevation. These observed conditions agreed with the BBGHAD's "As Built" survey and largely confirmed the placement conditions.

In traversing the beach at the upcoast toe of the rock revetment, the field team noted that the height of the wall (the vertical distance between the top of the wall and exposed toe of the rock) varies from east to west. Overall the height is lowest at the eastern end, on the order of 6 to 10 feet high and greatest at the western end where the height is on the order of 10 to 13 feet high. It is assumed that, as constructed, the top of the wall did not vary in elevation, but that the bottom of the wall rises toward the eastern end. Otherwise, this suggests that beach sand deposition has been greater at the eastern end, and thus, more of the wall has been buried in the process. This observation would be consistent with the known southerly longshore transport direction of sand that occurs along this beach. This observation is significant because wave heights of 6 to 8 feet could overtop the wall at the eastern end and adversely impact structures in this area.

Another issue regarding wall stability is the foundation condition. The rock revetment was placed as an emergency measure on the existing beach surface. This sand material is highly erodible and if the rock is left exposed the rock revetment could be undermined and destabilized. However, the thickness of this sand foundation overlying the Trancas F$^{\underline{M}}$ is approximately 4 feet in depth (Moffatt & Nichol 2012). Because the sand foundation layer is thin, the 15-foot-high revetment wall would still provide protection even if undermining and settlement occurred.

Relationship between Coastal Processes and Public Trust Resources and Values within the Broad Beach Area and Zuma Littoral Subcell

Construction of the emergency revetment in 2010 altered coastal processes at Broad Beach, resulting in changes to wave activity and sand supply in front of the revetment. Proposed beach nourishment, renourishment, and backpassing events may further impact coastal processes. The public's right to use and enjoy public trust resources may also be affected. For example, current use of portions of public trust lands to accommodate the emergency revetment impacts public access, while placement of new sand at the west end of Broad Beach could adversely affect the public's right to enjoy the rocky habitat and reefs in this location; however, creation of a newly widened beach that also covers the revetment would likely enhance access and other trust values.

Broad Beach consists of a narrow beach on its west and central ends, which widens towards the east end and which is backed by residential development. The central 4,100 feet of the beach is backed by the emergency revetment, with various types of private coastal protection structures (e.g., seawalls, timber bulkheads) on 1,500 feet of the west end; and remnant natural dunes, geotextile and Sakrete revetments on the east end. These existing revetments at the east and west ends of the beach are not a part of the Project; however, they aid in protecting septic systems and homes from damage by coastal processes. Broad Beach is rocky toward its west end in the sheltered cove inside of Lechuza Point, then widens and becomes increasingly sandy toward the east, where it terminates at Trancas Creek. Zuma Beach, located within the Zuma Littoral Cell, continues on from Trancas Creek and extends to Point Dume.

The 4,100-foot long rock and sand bag emergency revetment protects 76 of the 109 homes along Broad Beach. A larger-rock revetment design was used along the western 450 feet of revetment due to severity of the erosion, and a more than 100-foot-long break in the continuity of the revetment exists near its east end. The revetment was authorized on a temporary basis until January 25, 2013. The BBGHAD is currently proposing an extension of the life of this revetment as part of the Project.

The eroded shoreline along Broad Beach, combined with the emergency revetment, significantly limits lateral beach access in all areas except for the easternmost few 550 feet. During medium to high tides, most of the beach is submerged with waves that break onto the revetment. Generally the majority of this reach of sand beach is exposed only during low or minus tides, particularly outside of the summer months.

Many homes along the west end of Broad Beach have their base approximately 12 to 20 feet above the water level. Homes on the east end of the beach, which are set back approximately 100 to 125 feet from the beach, are generally 10 feet above water level. Five homes, four undeveloped lots, and the Malibu West Beach Club in the eastern 550 feet of beach are protected only by sand dunes, sand bag revetments, and, in some cases, recently installed Sakrete revetments. Along the western 1,500 feet of Broad

Beach, 33 homes are not protected by the emergency revetment. Substantial erosion of these dunes and damage to the structures occurred over the 2011-2012 and the 2013-2014 storm seasons. In spring of 2014, wave attack and coastal erosion were observed to have eroded these sand dunes at the eastern end of the beach 50 to 100 feet landward of the former sand bag and Sakrete protection revetments, largely destroying these structures and bring the beach to within 30 to 50 feet of these five homes and the beach club. Debris from these revetments litters the surf zone. Homes in the central and west section of the emergency revetment are generally set back from 50 to 100 feet from the revetment, with the closest home only 13 feet landward of the revetment. West of the existing rock revetment, 29 homes exist with varying degrees of permitted and unpermitted shoreline protection (Table 3.1-5).

Table 3.1-5. Western Broad Beach Area Shore Protection Device by Address

Address on Broad Beach Rd.	Revetment	Seawall	Bluff or Piling	City of Malibu CDP Permit Status
31350	No	Yes	No	Permitted
31360	No	No	Yes	--
31364	No	Yes	No	Permitted
31368	No	Yes	No	Permitted
31372	No	Yes	No	Permitted
31376	No	Yes	No	Permitted
31380	Yes	No	No	Permitted
31388	No	Yes	No	Permitted
31406	No	Yes	No	Permitted
31412	Yes	No	No	Not Permitted
31418	Yes	No	No	Not Permitted
31430	No	Yes	No	Permitted
31436	No	Yes	No	Permitted
31438	Yes	No	No	Not Permitted
31444	Yes	No	No	Not Permitted
31450	No	No	Yes	--
31454	No	No	Yes	--
31460	No	No	Yes	--
31500	No	No	Yes	--
31502	No	No	Yes	--
31504	Yes	No	No	Permitted
31506	Yes	No	No	Permitted
31508	Yes	No	No	Permitted
31516	No	No	Yes	--
31520	Yes	No	No	Not Permitted
31528	Yes	No	No	Not Permitted
31532	No	No	Yes	--
31536	No	No	Yes	--
6525	Yes	No	No	Not Permitted
Total	11	9	9	12 Permitted

Source: AMEC 2014. Table is based on CDP information provided for the BBGHAD properties by the CCC and the City of Malibu, 2009-2010, 2009-2010 aerial photos, and title data for BBGHAD properties. The 6525 Point Lechuza Drive property is subject to Lease No. PRC 6470 with the CSLC, but has not been permitted by the City of Malibu.

Existing shoreline protection devices along the west end Broad Beach include rock revetments and sea walls. Of these, 18 homes and an undeveloped parcel in this area have some kind of shoreline protection, varying from massive vertical concrete seawalls and large robust revetments to older timber bulkheads and rock revetment constructed of variable sized armor stone, areas of potentially substandard sized rock (e.g., less than 3 tons). In addition, nine homes have no shoreline protection; six are located on pilings of varying construction from massive concrete pilings to older wooden piers and three overlie unarmored sections of potentially erodible bluff.

3.1.3 Sand Resources

The source of Project sand would be one or more of the following private quarries: CEMEX, Grimes Rock, and P.W. Gillibrand. The Project would require 600,000 cubic yards (cy) of sand to be excavated and transported from the inland source(s) to Broad Beach for use as beach nourishment and dune creation. Sand at all quarries is continually excavated, stockpiled, and removed as part of ongoing quarry and aggregate sales operations. CEMEX and Grimes Rock possess the capacity to provide the full quantity of sand required for the Project, while P.W. Gillibrand can supplement the Project if additional volume is needed. If needed, P.W. Gillibrand has the ability to significantly expand operations to produce sand quantities required for the Project.

The value of sand as a resource for beach nourishment is dependent on sand particle size. Coarse grains are desirable for beach nourishment as they are more consistent with existing beach sand and are also more resistant to wave action and erosion. The mineral composition of the sand is also a factor in creating a sustainable beach profile.

Sand Particle Size and Angularity

Typical grain sizes of sand on Los Angeles County beaches range between 0.1 and 1 millimeter (mm). On Broad Beach the median grain size is 0.25 mm and 0.32 mm above the 0’ MLLW and on the dunes, respectively. The median diameter for inland sand at the quarry sources is larger than what is currently found on Broad Beach. Grimes Rock Quarry sand has a median grain size of 0.40 mm, CEMEX Quarry has a median grain size of 0.85 mm, and P.W. Gillibrand Quarry has a median grain size of 1.0 mm.

The general shape, in terms of roundness, of the sand grains from each sample was visually characterized by using a hand lens magnifier to examine the boundaries of the sand grains and note the angularity and roundness of their edges. The relative roundness of the sand grains was qualitatively compared to diagrams based on the Krumbein (1951) sand grain analysis method, which the shape of sand grains into six different types: Very angular, Angular, Sub-angular, Sub-rounded, Rounded, and Well rounded. Table 3.1-6 provides an assessment of grain angularity on Broad Beach and in the quarry sites. Figure 3.1-11 compares particle angularity quantities by site.

Figure 3.1-11. Sand Particle Comparison between Broad Beach and Source Sites

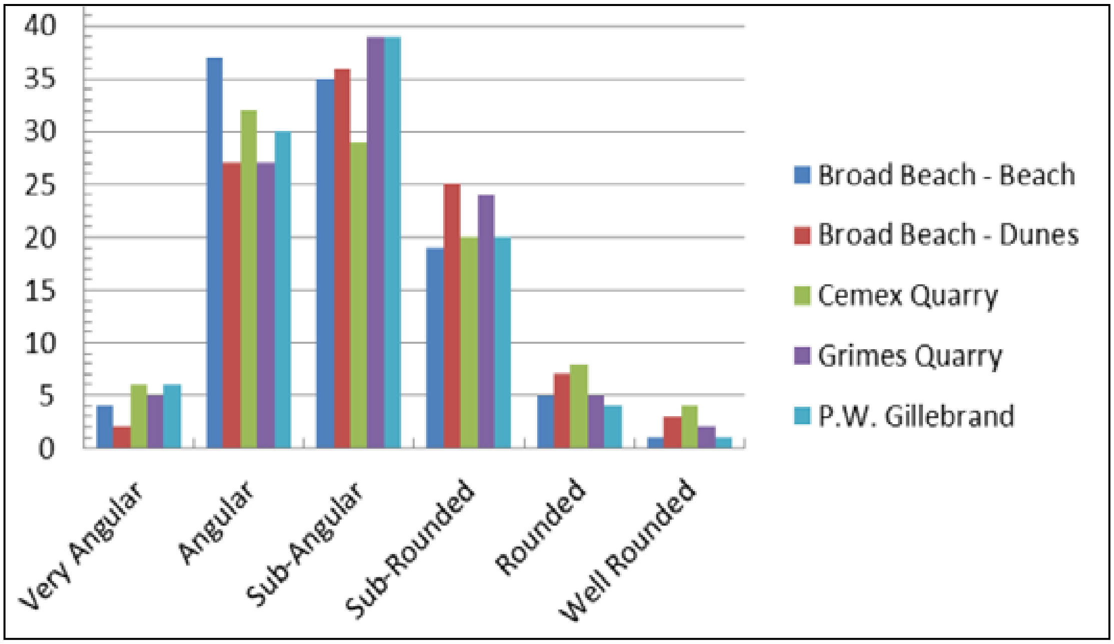


Table 3.1-6. Sand Particle Description for Broad Beach and Quarry Sites

Sample Site	Particle Description
Broad Beach – Beach	Sample is a fine grained sand that is well sorted. It has a generalized color of light gray (Munsell 10YR, 7/1), but individual grains range from very dark (black) to light (white). Individual grains are relatively clean (without coatings) and generally angular to sub-rounded in shape.
Broad Beach – Dunes	Sample is a fine grained sand that is well sorted. It has a generalized color of light gray to very pale brown (Munsell 10YR, 7/2 to 7/3), and individual grains range from very dark (black) to light (white). Individual grains of sand are relatively clean and are generally angular to sub-rounded in shape. There is a slightly higher percentage of rounding in this sample relative to the beach sample, but it is very nominal.
CEMEX Quarry	Sample is a poorly sorted, fine to coarse grained sand. It has a generalized color of very pale brown to light gray (Munsell 10YR, 7/3 to 7/2), but individual grains range from dark (gray) to light (white). The sample in general is angular to sub-rounded. There is a general relationship between the grain size and the roundness: coarse size grains tend to be sub-rounded to rounded; fine to medium size grains tend to be angular to sub-angular. Sand grains have a minor mineral coating. A minor amount of fines (silts/clays) exist in this sample.
Grimes Quarry	Sample is a poorly sorted, fine to coarse grained sand. It has a generalized color of very pale brown to yellow (Munsell 10YR, 7/4 to 7/6), but individual grains range from dark (gray) to light (white). The sample in general is angular to sub-rounded. Unlike the CEMEX Quarry sample there is not a general relationship between the grain size and the roundness, and the coarse size grains. Sand grains have a minor mineral coating. Minor fines content exists in this sample.
P.W. Gillibrand Quarry	Sample is a well-sorted, medium grained sand. It has a generalized color of light gray to white (Munsell 10YR, 7/1 to 8/1), but individual grains range from dark (gray) to light (white). The sample in general is angular to sub-rounded. Individual grains of sand are relatively clean and no significant fines are present in this sample.

Sand Composition

On many beaches, most of the sand (not including seashells) is made of the minerals quartz and feldspar. These grains ultimately came from igneous and metamorphic rocks that are typically very old. Quartz, the most common mineral, is composed of silicon dioxide, while feldspar, the second most common mineral, is made up of sodium, calcium, or potassium combined with silica. Quartz is the most common mineral in many beaches because it is hard, durable, and can survive transport by rivers to the coast and reworking by waves better than other common minerals. Quartz is chemically very stable while other minerals disappear rapidly due to chemical and mechanical destruction before they reach the beach (Pilkey 2011).

Rock and minerals that compose sand on Broad Beach originate in the Santa Monica Mountains and are fed to coastal areas through multiple creeks (Flick 1993 and USACE 2004). The composition of sand from local coastal drainages of the Santa Monica Mountains ranges from basaltic feldspatholithic to quartzofeldspathic (Critelli 2008).

The geologic setting of the proposed quarry sand sources suggests that material mined from this area would be composed of a sandstone sediment source. Large strata of sandstone are typically formed in pre-historic marine environments, suggesting that these materials are former seabed (i.e., marine sedimentary rock) (CEMEX 2013). Sandstone is a clastic (formed from broken or fragmented grains) sedimentary rock most commonly composed of 1/16-2mm sized quartz particles, though it can also contain feldspar, mica, and rock fragments.

3.1.4 Regional Sand Supply Management Efforts

The Project would occur within the context of other ongoing sand management efforts along the California coast. These efforts are described below.

Coastal Sediment Management Workgroup

The California Coastal Sediment Management Workgroup (CSMW), a consortium of State and Federal agencies and non-governmental organizations, is developing and implementing the California Coastal Sediment Master Plan to foster a regional sediment management approach for the entire State. Through this effort, region-specific issues and solutions are coordinated with local/regional partners through Coastal Regional Sediment Management (RSM) Plans designed around littoral cell management. CSMW and its partners have completed four Coastal RSM Plans, and will prepare five more in the near future, using criteria prepared by CSMW as a starting point (Table 3.1-7).

Table 3.1-7. Coastal RSM Plans

Cell	Coastal Segment	CWMW Regional Partner	RSM Plan Status*
Southern Monterey Bay Littoral Cell	Moss Landing south to Point Pinos	Association of Monterey Bay Area Governments (AMBAG)	CSMW's first Coastal RSM Plan completed in November 2008.
Santa Barbara Littoral Cell	Point Conception south to Point Mugu	Beach Erosion Authority for Clean Oceans and Nourishment (BEACON)	Completed in January 2009
San Diego County	Oceanside south to Mexico border	San Diego Association of Governments (SANDAG)	Completed in April 2009.
Orange County	Littoral cells within Orange County	Parks Department, County of Orange	Completed in June 2013
Eureka Littoral Cell	Trinidad Head south to False Cape	Humboldt Bay Harbor Recreation and Conservation District	In preparation.
Los Angeles County	Coastal area within the County	U.S. Army Corps of Engineers, Los Angeles District	August 2012 draft under review
San Francisco Central Bay	Central Bay to Golden Gate Bridge	San Francisco Bay Conservation and Development Commission (BCDC)	BCDC is currently developing a Coastal RSM Plan preparation.
San Francisco Littoral Cell	Golden Gate Bridge to Pacifica	Association of Bay Area Governments (ABAG)	ABAG is currently working to develop a RSM Plan.
Santa Cruz Littoral Cell	Santa Cruz to Moss Landing	U.S. Army Corps of Engineers, San Francisco Region.	CSMW is working to partner with Monterey Bay National Marine Sanctuary to conduct governance and outreach activities.

* CSMW is exploring the possibility of preparing Coastal RSMs for the Morro Bay Littoral Cell (San Luis Obispo County), the Crescent City Littoral Cell (Del Norte County), and littoral cells in Sonoma County.

Los Angeles County

The Los Angeles County coast fronts both the Santa Monica and San Pedro Littoral Cells. The rocky promontory of the Palos Verdes Peninsula and Redondo Canyon interrupts these two littoral cells and inhibits sand transport between them. Broad Beach is within the Santa Monica Littoral Cell. The planning region extends for approximately 74 miles of coastline from Mugu Canyon on the north to the Los Angeles County line. The USACE RSM Plan, completed in August 2012, summarizes the baseline science and relevant physical processes for the area (see Illustration 3.1-6), and identifies challenges and opportunities. Coastal sediment management solution strategies proposed in the RSM Plan for the Malibu region include: establishing an ongoing beach nourishment and erosion control program within the littoral sub-cell at the west end of the reach; removing or relocating improvements in response to the long-term natural shoreline erosion trend; allowing areas of the shoreline which are relatively sediment-limited to exist in a more natural state; and removal of Rindge Dam and economical recovery of trapped sediment behind it for beneficial use (USACE 2012).

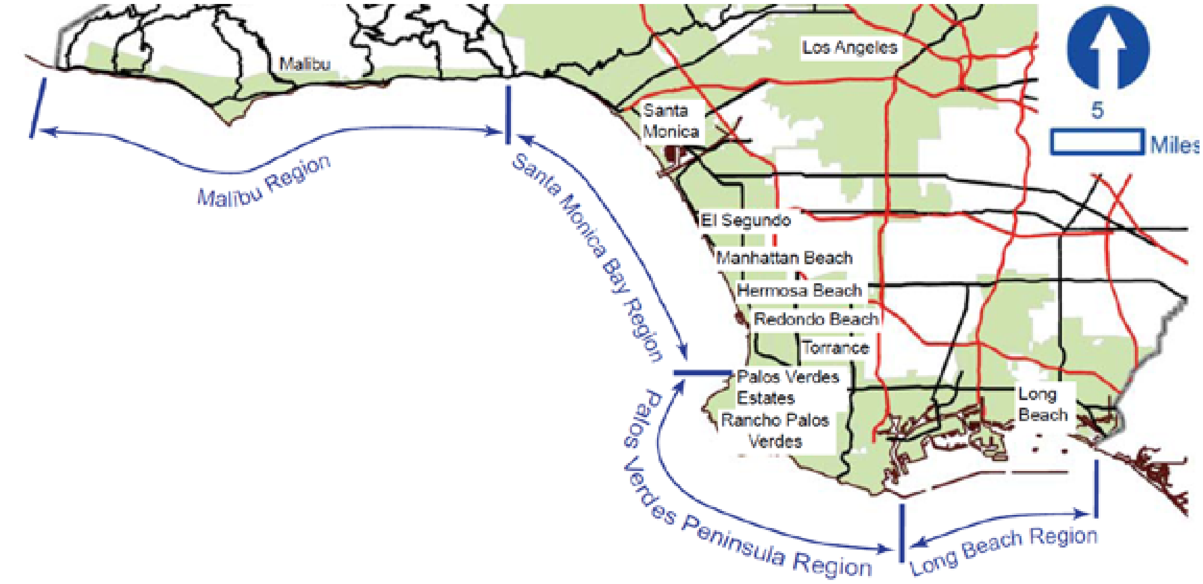


Illustration 3.1-6: *The USACE planning area of the Los Angeles County RSM plan begins west of the Project site at the border between Ventura County and Los Angeles County.*

3.1.5 Regulatory Setting Related to Beach Nourishment, Shoreline Protective Structures, Geologic Hazards, and Sand Use

Statutes related to use of sand for beach nourishment, use of revetments and shoreline armoring, and mining are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*.

3.1.6 Public Trust Impact Criteria

Impacts associated with coastal processes, SLR, and geologic hazards would be considered a major adverse effect if the Project were to result in a:

- Substantial change in wave climate (e.g., wave height, direction, and breaks).
- Disruption of existing surface and subsurface currents and sand transport.
- Substantial change in wave energy and run-up on beaches in the Public Trust Impact Area for the Project.
- Substantial increase in the rate of erosion or reduction in the rate of accretion of beach sand in the Public Trust Impact Area for the Project.
- Change in the ability of coastal protection measures to withstand oceanographic and wave action processes.
- Permanent permitting of an unstable revetment which could result in injury to individuals using the public trust resource.
- Loss of sand as a mineral resource available to naturally nourish coast beaches.

Where applicable, this impact analysis considers the Broad Beach area both in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting without the emergency revetments, characterized by a mix of different types of protective structures, as well as open beach without protective structures at the east end.

3.1.7 Public Trust Impact Analysis

This section describes direct and indirect impacts that may potentially result from the implementation of the Project. Impacts discussed below may occur in the CSLC Lease Area and/or in the Public Trust Impact Area, including down coast beaches.

Historical Coastal Process, Geological Hazards, and Sand Resources Characteristics

Prior to installation of the sand bag revetments in 2008-2009 and the 2010 emergency rock revetment, a variety of coastal protective structures and a segment of open beach without protective structures existed on Broad Beach. Many properties at the west end, beyond where the revetment is located today, had already been constructed on pilings or with timber bulkheads, concrete seawalls, rock revetments, or other protection structures. Most of the properties that are currently protected by the 2010 emergency revetment (from 31346 to 30846 Broad Beach Road) used a variety of individual coastal protection structures, including rock, timber, geotextile, and Sakrete (concrete filled bags) revetments. These individual coastal protection structures were generally not as robust as the 2010 emergency revetment (especially sand bag revetments) and were prone to failure as a result of wave action. In particular, in 2008-2009, homeowners along Broad Beach in the area roughly conterminous with the existing rock revetment installed approximately 4,100 feet of sand bag revetments. Subsequent wave attack on the sand bag revetments installed in 2008-2009, and their failure or threat of failure, was the instigation for installation of the emergency rock revetment in 2010, as there were no robust protective structures along the section of Broad Beach from 30842 Broad Beach Road to the east end of Broad Beach. AMEC field reconnaissance in February 2014 noted that a number of sand bag and Sakrete revetments present in 2012 at the currently unarmored east end of Broad Beach had been washed away and that dunes within this area appeared to have been eroded 50 or more feet landward. Given erosion and loss of beach width at Broad Beach, and the mix of protective structures that were less robust than the existing emergency revetment and the section of open beach along the east end of Broad Beach, the beach and dunes were more susceptible to erosion as a result of coastal processes than they are today.

Geological hazards and sand resources impacts to the public trust resource prior to the construction of the 2010 revetment are consistent with many of the current hazards and resources concerns described above with the exception of the geologic hazards associated with the existing rock revetment. In addition, the sand bag revetments would have been subject to the same situational hazards of being located in the same proximity to existing fault lines and on the same parent and sandy material as the rock revetment. However, the overall integrity of the sand bag revetment would be less than the rock revetment due to the increased mobility and erodibility of sand particles within the sand bags as compared to solid rock boulders. Additionally, an increased liquefaction hazard may have existed for the sand bag revetments resulting in reduced structural integrity in the event of an earthquake.

Projections of Sea Level Rise

The life span of the Project is 20 years and assumes an initial nourishment completion in 2015. In order to estimate potential SLR over the life of the Project, the projected SLR by 2040 was interpolated using linear interpolation based on the NRC's projected SLR for the Los Angeles region by 2030 and 2050 (see Table 3.1-8).

Table 3.1-8. Regional Sea Level Rise Projections for Los Angeles

Year	Projection	Range
2000 to 2030	5.8 inches	1.8 to 11.8 inches
2000 to 2040	8.5 inches	3.4 to 17.9 inches
2000 to 2050	11.2 inches	5.0 to 23.9 inches

Source: Sea Level Rise for 2030 and 2050 are from NRC (2012) (projections interpolated for year 2040), consistent with CCC Draft Sea-Level Rise Policy Guidance, October 2013: www.coastal.ca.gov/ climate/slr/guidance/CCC_Draft_SLR_Guidance_PR_10142013_AppxB.pdf, accessed July 2014.

Using linear interpolation results in a slight overestimation of SLR since the models generally predict an exponential increase. However, over the relatively short time period between 2030 and 2050 this provides a reasonable estimate to use for the Project time horizon. Using projections for a 25-year time horizon (2040), the potential range of SLR to be expected at Broad Beach over the Project life ranges from 3.4 to 17.9 inches with a projected value of 8.5 inches.

Longevity of Nourishment at Broad Beach

The longevity of the nourishment at Broad Beach is dependent on a variety of factors, including climatic cycles, wave energy and direction, longshore transport of sand in the littoral cell, sand grain size, other coastal forces and the amount and frequency of backpassing. A variety of methods have been employed to estimate the longevity of beach nourishment (Appendix B). These range from using empirical observations of the rate of historic sand loss from the beach to computer simulations of longshore transport.

The most conservative approach to evaluate nourishment longevity involved using the Generalized Model for Simulating Shoreline Change (GENESIS) numerical model (USACE 1989). The accuracy of the numerical modeling for the shoreline is limited because of the complexity of the coastal processes; however, the GENESIS program has been used in many artificial beach nourishment projects and provides some useful results. Although this model can predict the shoreline reasonably well for Broad Beach, the results should not be used to define a specific shoreline position at a specific date. Rather, the model should be used to predict general long-term shoreline trends. The model results suggest that the rate of beach loss is greatest at the west end of Broad

Beach and the nourished beach may last only 3 to 5 years near Lechuza Point while it may last up to 7 or 8 years at the east end of Broad Beach. However, these model results do not incorporate backpassing events, and identify rates of erosion for 50,000 to 100,000 cy/yr that are as much twice as high as historic erosion rates and so they are particularly conservative.[5]

Although the GENESIS model was not run to consider annual backpassing through the life of the Project, some runs were preformed to assess the benefits of backpassing in the first five years of the Project. The results of these model runs showed that the beach would maintain greater average widths for a longer period with the implementation of backpassing; however, added beach width would be somewhat short-lived at the far west end. Overall, using the worst case GENESIS modeling results, backpassing would prolong the life of the beach nourishment along the majority of Broad Beach by from 1.5 to 7 years, depending on erosion rates, which under worst case GENESIS modeling vary from 50,000 to 100,000 cy/yr. Thus the approximate overall life of beach nourishment under this scenario would range from roughly 11 to 26 years, including the effects of backpassing.

Longevity of the nourishment could also be evaluated by applying an analytical method referred to as the diffusion method. This method takes into account sediment size and breaking wave height. According to this analysis, a 500,000 cy beach nourishment with a median grain size of 0.25 mm (the existing median grain size on Broad Beach) would be expected to last 5 to 8 years. With a larger median grain size of 0.85 mm, the longevity of the nourishment is expected to be 7 to 10 years. Median grain sizes at the proposed sediment sources are 0.47 mm at Grimes Rock Quarry, 0.85 mm at CEMEX Quarry, and 1.00 at P.W. Gillibrand Quarry, so the longevity of the nourishment is expected to be in the 7- to 10-year range, depending on the sand source used. Under this scenario and accounting for one renourishment event, the Project life would range from roughly 13 to 20 years, which may extend to 19 to 28 years with backpassing.

Another approach to estimating longevity of the created beach and dunes is to review historic accelerated erosion rates over the last 2 decades where Broad Beach has been losing an estimated 35,000 to 45,000 cy/yr down coast to Zuma Beach. Under this scenario, assuming 25 percent initial losses of the nourishment sand supply, the 500,000 cy of beach sand would result in the beach lasting anywhere from 8 to 11 years until the dune system would be threatened by erosion and renourishment would be required to sustain the beach and dune systems. With the addition of 450,000 cy of

[5] Backpassing would involve return of an estimated 35,000-50,000 cy/yr of sand from the wider eastern sections of Broad Beach to the narrower western segment of Broad Beach, substantially prolonging the life of nourishment (see Section 2, *Project Description*). However, given progressive erosion of the beach, long-term average backpassing would likely be closer to 25,000 cy/yr (500,000 cy total). Accounting for a worst case post backpassing construction beach loss of 25 percent and variables of wave attack, a total of 375,000 cubic yards may be successfully placed to nourish the upcoast beach.

sand from the renourishment event, total Project life prior to dune erosion and the beginning for potential exposure of the revetment could be 16 to 20 years, with backpassing prolonging beach life by roughly an additional 6 to 8 years for a total Project life of approximately 22 to 28 years under this scenario. Although precise estimates of Project duration are not possible, this scenario is deemed the most likely scenario by both Moffatt & Nichol and Coastal Environments, and is supported by long-term empirical observations of how this beach is performing.

Impact CP/GEO-1: Structural Stability of the Rock and proposed Sand Bag Revetments

The rock revetment is subject to remobilization of boulders along with settling from liquefaction events, and proposed sand bags are subject to collapse, reducing long-term protection of onsite wastewater treatment systems (OWTS) from sea level rise (SLR), and wave action (Major Adverse Effect, Class Mj).

Impact Discussion (CP/GEO-1)

The revetment would serve a critical role as the last line of defense to maintain shoreline protection in the event beach renourishment material is entirely lost to down coast beaches. The revetment essentially protects against uncertainties associated with variability in shoreline change rates due to ongoing beach erosion, and significant short-term beach losses due to large seasonal fluctuations and/or severe erosion due to extreme wave events and potential long-term acceleration of beach erosion due to SLR.

Prior to construction of the revetment in 2010, the narrow beach and dune system were exposed to wave action and subject to erosion and substantial sand loss. The revetment was constructed as an emergency measure, with the majority of the revetment consisting of substandard-sized rocks that were not keyed together into bedrock or set deeply into the beach; the structure is not designed to resist exposure to long-term wave, tidal, SLR, tectonic, or tsunami action. The Project proposes to bury the revetment within the beach nourishment sand sources to reinforce the beach and dune system for between 10 and 20 years.

After the projected loss of the beach and dune systems – in 10 to 20 years depending on erosion rates – the revetment would begin to lose integrity as smaller rocks and boulders are detached from the revetment and scattered by surf action. Such damage may accelerate with SLR, which is projected to reach 5.8 inches by 2030 toward the end of the effective life of the proposed follow-up nourishment event. Liquefaction, seismic settlement, and lateral spreading represent likely impacts to the revetment in the event of an earthquake. A tsunami would overtop and cause severe structural damage to the revetment. Well within the economic life of the homes along Broad Beach (100 years according to Malibu's Local Coastal Program [LCP]), these coastal processes can be expected to lead to deterioration of the revetment to such an extent that high winter surf could break through gaps or overtop lowered sections, damaging septic systems and leach fields, with potentially major adverse effects to water quality This process can be expected to accelerate with SLR. Progressive deterioration of the revetment can be expected to lead to requests for additional emergency authorizations to repair the revetment or to illegal additions to the revetment, creating enforcement issues for property owners and local and State agencies; therefore, adverse impacts resulting from permanently authorizing the revetment despite its relative structural instability would be a major adverse effect.

Subsurface flow derived from the sea is expected to perennially infiltrate the beach sands underlying the revetment. Additional subsurface flow is anticipated to originate from each of the septic systems located immediately landward of the revetment. Sediments underlying the revetment are considered to be highly susceptible to liquefaction and vertical differential settlement in the event that a large earthquake occurs in the vicinity of Broad Beach. The potential for liquefaction and differential seismic settlement to affect the Broad Beach area is substantial.

Lateral spread (i.e., the horizontal movement of near-surface sediment during liquefaction) is also considered to have a high potential for occurrence in the vicinity of the revetment. The unsupported face of the beach sediments along the shore and the seaward-inclined surface of the wave-cut terrace underlying the sands would be expected to enhance the potential for lateral spread to affect the area of the revetment. The potential for lateral spread to affect the Broad Beach area in association with liquefaction is also considered a major adverse impact.

SLR would affect the nourished beach portion of the Project. With beach nourishment under the Project, the average inclination of the proposed beach in the eastern portion of Broad Beach would be 10 horizontal feet to 1 vertical foot (10:1), while the average inclination of the western portion of the beach would be 3 horizontal feet to 1 vertical foot (3:1). Though the overall size of the beach would increase with the nourishment, SLR would result in ocean encroachment onto the newly widened beach, reducing availability of public access over time.

An increase of sea level up to 8.5 inches above current levels with a potential range from 3.4 to 17.9 inches should be anticipated over the 10- to 20-year Project lifespan. Beyond the Project design life, the rates of projected SLR are expected to accelerate and the impacts to Broad Beach will become more significant. A potential acceleration of SLR will subject the revetment to a higher frequency of waves breaking on or close to the structure. This could increase the damage and wave overtopping frequency of the shore protection structure but complete failure of the revetment is unlikely. The most significant impact from a high rate of SLR would be additional maintenance and repair of the structure after a major storm event (Moffatt & Nichol 2012).

A minimum increase in sea level of 3.4 inches vertically over the next 20 years would result in the average encroachment of the sea landward by 10 inches and 3 feet in the western and eastern portions, respectively, of the nourished beach. A maximum increase in sea level of 17.9 inches vertically over the next 20 years would result in the average encroachment of the sea landward by 4.5 feet and 15 feet in the western and eastern portions, respectively, of the nourished beach. Encroachment from SLR partnered with more frequent and more intense storms would subject the revetment to increased stress and destruction over time. Based on best available science and SLR projections provided in the NRC's 2012 Report and the State's Sea-Level Rise Guidance Document, the effects of SLR would compound the overall effects of the other potential geologic hazards along Broad Beach. Additional discussions of SLR and associated impacts can be found in Section 3.2, *Recreation and Public Access*.

The permitting and retention of the rock revetment and/or its reinforcement as reviewed under Alternatives 1, 2, and 6 would not appear to contribute to or exacerbate any geologic impacts associated with the related projects. Replacement of the PCH bridge may reduce potential for seismic damage to this structure, but would not appear to affect or be affected by the revetment. Restoration of Trancas Lagoon may increase the frequency and duration of lagoon mouth breaching, but would also not appear to affect or be affected by the retention and/or reinforcement of the emergency revetment.

Finally, the Project contains a provision to install emergency sand bag revetments along the eastern 550 feet of Broad Beach not protected by the emergency rock revetment. Such sand bag revetments would be installed outside of and fronting the restored dunes only during periods of erosion, such as toward the end of the useful life of either the initial or follow-up nourishment events. Sand bags would offer interim protection during storm events and would generally not be impacted by geologic processes, but would be subject to destruction from wave attack. Their inclusion in the Project would provide periods of short-term protection for the dunes, homes, and OWTS during major events.

<u>Avoidance and Minimization Measure(s)</u>

AMM TBIO-1a (Implementation of a Comprehensive Dune Restoration Plan) would slightly reduce this impact. However, implementation of Alternatives 1, 2, and 6, which include construction of a properly engineered revetment, would improve long-term protection of OWTSs from damage associated with waves and tides and SLR.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

While the emergency revetment is structurally sound on its western end, the emergency revetment is structurally deficient in its central and eastern sections, as it would sustain over 5 percent damage under critical design conditions. Therefore, AMM TBIO-1a is necessary to ensure that the revetment does not become exposed to wave action throughout the life of the Project. Implementation of one of the alternatives that would re-engineer the revetment would reduce this impact to be negligible.

Impact CP/GEO-2: Impact of Coastal Processes on Emergency and Sand Bag Revetments

Over the long-term, after cessation of nourishment and erosion of the beach, substandard construction of the revetment would provide inadequate protection from coastal processes for septic systems, leach fields and homes (Major Adverse Effect, Class Mj).

Impact Discussion (CP/GEO-2)

The emergency revetment is intended to serve as the final defense against shoreline erosion when the beach and dunes are lost to coastal processes. However, based on computer modeling and historic erosion rates, it can be reasonably forecast that the revetment would become exposed as the beach erodes into the dunes in approximately 10 to 20 or more years, exposing the revetment to wave action and coastal processes over the long term after cessation of nourishment activities.

The revetment was constructed as an emergency measure using substandard-sized rocks over most of its reach that were not keyed together into bedrock or deeply into the beach; it is not designed to resist exposure to long-term coastal processes. After the projected loss of the beach and dune systems in 10 to 20 years, the revetment would begin to lose integrity over time as smaller rock and boulders become detached from the revetment and scattered by surf action. Well within the economic life of the homes along Broad Beach (100 years under Malibu's LCP), coastal processes can be expected to lead to deterioration of the revetment to such an extent that high winter surf and design waves could break through gaps or overtop the revetment, damaging septic systems and leach fields, resulting in potential adverse effects to water quality and the public's right to use and enjoyment of public trust resources. This process can be expected to accelerate with SLR, particularly after 2050. Progressive deterioration of the revetment can be expected to lead to requests for additional emergency permits to repair the revetment or to illegal additions to the revetment; thus, impacts related to the structural stability of the revetment would be a major adverse effect.

Sand bag revetments would offer interim protection during storm events and would generally not be impacted by geologic processes, but would be subject to destruction from wave attack. Their inclusion in the project would provide periods of short-term protection for the dunes, homes and OWTS during major events.

Avoidance and Minimization Measure(s)

AMM TBIO-1a (Implementation of a Comprehensive Dune Restoration Plan) would apply and would reduce this impact. Several Project alternatives would improve longer-term protection of septic systems and homes (with potential secondary impacts to public trust resources) from damage associated with waves and tides and to a lesser extent SLR. These would include Alternatives 1, 2, and 6 (see Section 4.0, *Alternatives*).

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Implementation of a comprehensive dune restoration plan through continued nourishment and protection of the dune system would function to reduce impacts to existing septic systems from coastal processes. Implementation of AMM TBIO-1a would reduce this impact but the impact would remain a major adverse effect. However, implementation of one of the Project alternatives identified above could potentially reduce the long-term impacts of coastal processes on the protection of septic systems, leach fields, and homes to be negligible.

Impact CP/GEO-3: Protection of Public Trust Resources, Septic Systems, and Homes from Coastal Processes and Shoreline Erosion

Beach nourishment and dune creation would provide short- to mid-term beneficial effect (10 to 20+ years) through protection of public trust resources and private property from coastal erosion (Beneficial Effect, Class B).

<u>Impact Discussion (CP/GEO-3)</u>

Over the last 20 to 30 years, coastal erosion has eliminated dry sandy beach and damaged coastal dune habitats and environmentally sensitive living resources along Broad Beach, limiting the public's potential for use and enjoyment of these resources. This erosion has also threatened septic systems and the potential release of septic effluent and debris from patios, geotextile revetments, pipes, and homes damaged by wave action and erosion. Oscillation of the width of this beach and shoreline have occurred historically and this coastal erosion appears to be related primarily to natural wave action and longshore transport, not anthropogenic causes, such as climate changed induced SLR or interruption of longshore sand transport by man-made jetties or harbors.[6] However, past and potential future damage to private property and public trust resources remains a major adverse effect.

The Project would initially create a wide sandy beach backed by a system of restored sand dunes placed over and landward of the existing emergency revetment. Although wave action would immediately begin to reshape and erode this beach, these features would substantially reduce the potential for coastal erosion and the landward migration of the shoreline over the short- to mid-term. Although the effect of wave action and natural coastal processes on this beach are difficult to forecast precisely, with one major

[6] Interruption of longshore transport from the Santa Barbara Littoral Cell to the Santa Monica Littoral Cell by landward erosion of the Point Mugu Submarine Canyon may have substantially decreased down coast transport of sand to Broad Beach and other area beaches, contributing to beach erosion.

renourishment and annual backpassing, the benefits of creation of a wide sandy beach and dune system on public access, creation of sensitive habitat, and protection of homes and septic systems are estimated to endure over 10 to 20 years depending on a variety of factors as discussed below.

The GENESIS model created by Moffatt & Nichol provides the most conservative estimates for the longevity and duration of the proposed new beach and dune system. This model indicates that wave action and longshore transport of newly placed sand would immediately begin to transport sand down coast, possibly exposing the dune system to erosion and requiring major renourishment within 5 years of the initial Project, even with annual backpassing. Based on this worst case modeling, Project benefits of beach and dune creation associated with two nourishment events and backpassing may last as little as 10 years, leading to exposure of the emergency revetment. However, Moffatt & Nichol and Coastal Environments suggest that this worst case analysis contradicts historic trends and does not account for cyclic changes in wave climate related to the PDO index (Orme et al. 2011).

Using historic erosion rates over the last 2 decades, where Broad Beach has been losing an estimated 35,000 to 45,000 cy/yr down coast to Zuma Beach, and assuming a 25 percent loss of initial nourishment and renourishment material the longshore transport and offshore areas, the total Project life prior to dune erosion and the beginning for potential exposure of the revetment could be 16 to 20 years, which could potential be extended by a further 6 to 8 years with backpassing. Under this scenario, the Project would provide benefits for the intended 20-year life of the Project as the emergency revetment would remain buried under the dune system, and the beach fronting the revetment would protect public trust resources and private property from coastal erosion and related impacts. This scenario appears to be the most likely given that it is supported by both Moffatt & Nichol and Coastal Environments and is supported by long-term empirical observations of how this beach is performing.

Backpassing could substantially extend beach life by roughly 6 to 8 years over the life of the Project if a conservative long-term average of 25,000 cy/yr is backpassed, for total of approximately 500,000 cy over the Project life. However, backpassing success could be affected by two factors. First, as with initial nourishment, a substantial portion of backpassed sand (estimated at as much as 25 percent) would be lost from the post-construction beach. Further, as beach widths decrease, it is unclear how much sand would be available for each event. In early post-nourishment years, the full Applicant-proposed 25,000 to 35,000 cy may be available, which would likely decline toward the end of the useful life of each nourishment event. Further, wave action, climate, and SLR toward the end of the period may affect success. While this makes estimating added years of beach life associated with backpassing difficult, based on an overall sand mass of 500,000 cy backpassed and observed erosion rates of up to 45,000 cy/yr, an estimate of roughly 6 to 8 years appears reasonable.

Although the above scenarios attempt to predict the longevity of beach nourishment, precise estimates are not possible. As is typical of other locations along California's shoreline, Broad Beach has historically undergone long-term oscillations in beach width. Evidence exists that this shoreline location has varied from as far landward as the currently inactive sea cliff 300 feet landward of the current beach, to the much wider sandy beach of the 1970s. Without intervention, current trends in erosion could lead to elimination of the historic back beach, dune complex, homes, and other improvements constructed upon these relatively recent coastal features. However, the potential also exists for changing climactic weather patterns and associated changes in the direction and intensity of incoming swells, sand supply, and associated longshore transport to shift to the pattern that occurred in the 1960s and 1970s, with accretion of sediment aiding in longer retention of the beach and dunes created by the Project.

In summary, the Project would create beneficial effects associated with limiting coastal erosion and landward migration of the shoreline and considerably minimize any possible impacts of destruction of septic systems, homes and other improvements on public trust resources and the public use and enjoyment of such resources. These benefits would endure for the duration of the nourishment, currently estimated to last approximately 10 to 20 years or more, with backpassing extending beach life further. Renourishment after this period is unknown, with potential shoreline retreat if nourishment does not continue or keep pace with erosion. Without future renourishment events, the emergency revetment would potentially become exposed resulting in substantial coastal erosion impacts over the longer term. In addition, sand bag revetments would offer interim protection during storm events and would generally not be impacted by geologic processes, but would be subject to destruction from wave attack. Their inclusion in the project would provide periods of short-term protection for the dunes, homes and OWTS during major events. However, the impacts from limiting coastal erosion and landward migration of the shoreline over the life of the Project are considered to be a beneficial effect over the timeframe that they endure.

Impact CP/GEO-4: Sand Size and Angularity Compatibility of Inland Sand Sources with Existing Sand on Broad Beach

Quarry sand being used as beach fill on Broad Beach is similar to existing sand on Broad Beach in size composition, color, and particle angularity. (Negligible Effect, Class N).

Impact Discussion (CP/GEO-4)

Studies conducted in August (URS) and November (Moffatt & Nichol) of 2013 assessed the angularity and size of sand particles from Broad Beach and the Local Inland Sand Sources. Particle angularity is a measure of particle roundness and sphericity. The angularity of beach particles relates to the mobility of the particles with more angular particles having less mobility. Less angular particles are rounder and smoother and are more likely to be eroded by coastal processes.

The grain size of beach sediments are an important factor in beach stability and the retention of sand on a particular beach. In general, coarse-grained sand is less easily mobilized by wave action and transported off or down coast of a beach than fined-grained sand or sediment. Projects using larger particles for beach fill in the San Diego Area have been monitored to observe how the supplemental sand changes overtime (BBGHAD 2013). Based on observations from previous projects using coarser than native sand as beach fill, it is expected that a beach consisting of grains sizes seen at the Local Inland Sources would be wide, with a steeper upper beach profile slope that what would be seen east of Broad Beach, along Zuma Beach. This condition will be more pronounced immediately after construction and for approximately the first post-nourishment year as the new sand temporarily dominates the surface condition. The beach will then gradually revert toward a pre-construction condition as the new sand disperses and mixes with finer sand reaching the beach from updrift via littoral processes, and the beach profile equilibrates. As the sand disperses and mixes over time, the condition of the beach will continue to trend toward pre-project conditions and ultimately will revert to that state within approximately a decade prior to any renourishment. Backpassing may not significantly change this trend due to the relatively small quantity of material to be moved compared to the total volume of sand placed as nourishment (BBGHAD 2013).

The assessments determined that overall angularity of the sand is not appreciably different between the Local Inland Sand Source Sites and the receiving beach and dunes; therefore, the impact related to sand angularity would be negligible.

Local Inland Sources are slightly larger than native particles on the beach. This would result in a slightly steeper beach and a longer residence time for fill material on Broad Beach. Impacts from coarser-than-native beach fill would be negligible.

Impact CP/GEO-5: Impacts of Beach Nourishment and Dune Creation on Coastal Processes

Nourishment of the beach would have insignificant effects on wave height, wave direction, tides and currents (Negligible Effect, Class N).

<u>Impact Discussion (CP/GEO-5)</u>

Placing sand on Broad Beach would not change the general wave climate in the area. Waves are generated a distance away from Broad Beach in deep water and propagate to the coast. Waves break when the wave height exceeds 0.78 times the water depth, and then they propagate as a bore. After the fill is completed and the beach has reached its equilibrium, the beach slope would be gentler than it is at present. As a result, waves would break farther seaward from the existing shoreline; currently they are breaking at the toe of the revetment. The wave breaker height would be less than the height of waves currently approaching the revetment due to the gentler slope of the placed sand. There would be no noticeable changes in the wave characteristics (i.e., height, period, direction) offshore of the surf zone.

Impacts to surf conditions at Broad Beach would likely be positive. Most beach breaks in Southern California are made of sandbars, which become altered and sometimes improved when nourishments increase sand volumes. The dynamics of sandbars, which include increased sand volumes of similar grain size and wider beach widths, contribute to a more tidally dependent surf zone. This creates multiple variations in the nearshore bathymetry and improves the sandbars and wave shape quality for surfers. Broad Beach fill will likely improve surfing conditions at Broad Beach and Zuma Beach because of the increased size of the sand bars at both beaches due to the import of 600,000 cy of beach sand. Surf breaks at or west of Lechuza Point will not be affected since the predominant longshore transport is to the east (see also Impact REC-4).

Broad Beach has a mixed semidiurnal (daily) tide with two high tides and two low tides, of different magnitude, every 24 hours and 50 minutes. The range between mean high and low water is approximately 3.7 feet and the diurnal range is approximately 5.4 feet. Tidal characteristics in the Broad Beach vicinity range from a lowest observed tide of 2.7 feet below MLLW to a highest observed tide of 7.8 feet above MLLW.

Coastal currents have two components: alongshore and cross-shore. These currents are present outside the surf zone (offshore of wave breaking points) and controlled by large weather systems, winds, and tides; therefore, the Project would not have impacts on the magnitude or directions of these currents. Longshore currents are generated by energy dissipation in the breaking waves inside the surf zone. These currents flow parallel to the shore. The flow is caused by an oblique angle of the wave (angle between wave approach and shoreline normal) and an alongshore variation in wave height. Longshore currents are responsible for transporting sand along the coast. Their magnitude is sensitive to any changes in the angle between wave approach and shoreline direction. Longshore currents are also randomly variable and there are changes in their magnitude and direction seasonally, annually, and inter-annually. The proposed fill would result in changes to the magnitude and direction of the longshore currents; however, these changes will be within the natural variability of their values.

Impact CP/GEO-6: Impacts of Beach Nourishment and Dune Creation on Wave Run-Up

Nourishment of the beach would have beneficial effects on wave run-up (Beneficial Effect, Class B).

Impact Discussion (CP/GEO-6)

Wave run-up is defined as the rush of water up a beach or coastal structure that is caused by or associated with wave-breaking. The run-up elevation is the maximum vertical height above MLLW that the run-up will reach. If the run-up elevation is higher than the beach berm, the excess represents overtopping. Run-up depends on the incident wave characteristics, beach slope and porosity, and if a structure is present, that structure's shape, slope roughness, permeability, and water depth at the toe.

Moffatt & Nichol (2013) estimated predicted run-up and overtopping for extreme wave and water level events under existing conditions at Broad Beach, incorporating predicted SLR for the year 2040. Predicted run-up ranges from 15 to 16 feet above the design still water level, resulting in run-up elevations of 23 to 25 feet above MLLW. These potential run-up elevations are higher than the crest height of the existing revetment, which is 12 to 15 feet MLLW, meaning waves would overtop the revetment during extreme wave and water level events. These run-up elevations represent the current condition in which there is little to no beach fronting the revetment.

After the beach fill, wave run-up values would be less than those values presented by Moffatt & Nichol for the same wave conditions because: 1) waves would break farther away from the shoreline; and 2) as the broken wave propagates along the beach slope, waves would lose a considerable part of their energy. Reduced wave run-up would reduce potential impacts to public trust resources, as well as private septic systems and residences. Therefore, reduced wave run-up as a result of the Project would produce a beneficial impact for as long as the effects of nourishment persist (10 to 20 years). Upon erosion of the beach and cessation of nourishment, wave run up would again reach and potentially overtop the revetment as discussed in Impact CP/GEO-7 below.

Prior to installation of the emergency revetment there was a variety of different individual coastal protection structures, including rock, timber, geotextile, and Sakrete revetments. Given that these structures were smaller than the emergency revetment and the wave environment is the same, these structures were subject to even greater and more frequent overtopping than the emergency revetment. Therefore, implementation of the Project would provide even greater benefit to protection of public trust resources and private septic systems and residences when compared to the pre-revetment condition, than when compared to the existing condition.

Impact CP/GEO-7: Change in Sediment Transport to Down Coast Beaches

Nourishment of Broad Beach will increase down shore sediment transport to Zuma Beach, Westward Beach, Point Dume, and other down coast beaches in the Public Trust Impact Area (Beneficial Effect, Class B).

Impact Discussion (CP/GEO-7)

Sand placed at Broad Beach would be distributed along the coast by longshore currents. Net transport down coast toward Zuma Beach, Westward Beach, and Point Dume State Beach is estimated at 35,000 to 45,000 cy/yr. Effects of the longshore currents on nourishment and renourishment of sand in the short- to mid-term include both erosion of sand from Broad Beach and accretion of sand at down coast beaches and possibly offshore.

The average sand volume changes at Broad Beach between 1946 through 2007 were about 21,000 cy/yr; the estimated volume change in the beach after beach fill is completed would be from 35,000 to 45,000 cy/yr. Therefore, the increase in the rate of sand gain from west to east would range from approximately 14,000 cy/yr to 19,000 cy/yr, which would have positive impacts on Zuma Beach, Westward Beach, and Point Dume State Beach, as well as other down coast beaches, as longshore transport carries the sand west through the Zuma Littoral Subcell, past Point Dume, and eastward through the Santa Monica Littoral Cell. Therefore, this impact is beneficial to public trust resources. Please see Section 3.3, *Marine Biological Resources*, Impact MB-2 for a discussion of potential impacts to down coast rocky intertidal habitats.

A variety of different individual coastal protection structures, including rock, timber, geotextile, and Sakrete revetments existed before the emergency revetment was installed. These structures were less robust than the emergency revetment and were subject to potential failure during large wave events and additional erosion. If the emergency revetment were to fail, the subsequent erosion would move sand from Broad Beach into the littoral cell and down coast. With Project implementation, 500,000 cy of sand would be used to construct the new beach berm. This sand would be subject to littoral processes and would contribute sand to the littoral zone without resulting in erosion landward of the existing emergency revetment where there are currently septic systems and residences that could be damaged. Therefore, the Project would allow for continued sediment transport to down coast beaches without subjecting public trust resources and private property to substantial erosion and associated damage.

The related Trancas Creek restoration and Caltrans bridge construction projects may also mobilize sediment into the littoral zone and contribute sediment to down coast beaches. Deposition of 600,000 cy of sand onto Broad Beach and its gradual erosion and contribution to littoral drift would potentially alter the frequency and duration of breaching of the Trancas Creek Lagoon though widening of the beach berm. (See

Impacts T-BIO-5, MB-7 and MWQ-1.) These impacts would be limited to the duration of the construction activities and to the first storms following construction that may carry this sediment to the ocean. These impacts would be short-term and incremental.

Impact CP/GEO-8: Impacts of Sea Level Rise

Sea level rise would incrementally contribute to erosion of the proposed new beach over the 10- to 20-year Project life span (Negligible Effect, Class N).

Impact Discussion (CP/GEO-8)

SLR will incrementally contribute to the erosion rate for the Project's widened beach over the Project's 20-year life through 2034. Sea-level rise over the short- to mid-term Project horizon (e.g., 10 to 20 years) is projected to accelerate to approximately 5.8 inches by 2030 and 8.5 inches by 2040. Moffatt & Nichol (2013) estimate that under these projections, SLR over the next 20 years would contribute to approximately 3 to 15 feet of beach erosion along most of Broad Beach where the slope is expected to be 10 horizontal feet to each vertical foot (10:1) and approximately 1 to 4.5 feet of erosion at the west end of Broad Beach where the slope is expected to be 3:1. Since the Project would increase beach widths by 90 to 230 feet seaward of the new dune system after initial nourishment and renourishment, the 1 to 15 feet of erosion attributable to SLR over the Project life would comprise a small portion of the erosion along Broad Beach. Therefore, this impact is negligible over the 20-year Project life. However, higher sea levels which are projected to accelerate after 2050 may substantially accelerate coastal erosion, potentially exposing the restored dunes, emergency revetment, homes, and septic systems with possible direct and secondary effects on public trust resources.

3.1.8 Summary of Coastal Processes, Sea Level Rise, and Geologic Hazards Impacts and AMMs

Impact	Class	AMM
CP/GEO-1: Structural Stability of the Rock and proposed Sand Bag Revetments	**Mj**	**AMM TBIO-1a.** Implementation of a Comprehensive Dune Restoration Plan.
CP/GEO-2: Impact of Coastal Processes on Emergency and Sand Bag Revetments	**Mj**	**AMM TBIO-1a.** Implementation of a Comprehensive Dune Restoration Plan.
CP/GEO-3: Protection of Public Trust Resources, Septic Systems, and Homes from Coastal Processes and Shoreline Erosion	**N**	No AMMs recommended
CP/GEO-4: Sand Size and Angularity Compatibility of Inland Sand Sources with Existing Sand on Broad Beach	**N**	No AMMs recommended
CP/GEO-5: Impacts of Beach Nourishment and Dune Creation on Coastal Processes	**N**	No AMMs recommended
CP/GEO-6: Impacts of Beach Nourishment and Dune Creation on Wave Run-Up	**B**	No AMMs recommended
CP/GEO-7: Change in Sediment Transport to Down Coast Beaches	**B**	No AMMs recommended
CP/GEO-8: Impacts of Sea Level Rise	**N**	No AMMs recommended

3.2 RECREATION AND PUBLIC ACCESS

This section of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR) describes recreation and public coastal access in the vicinity of the proposed Broad Beach Restoration Project (Project), and potential effects of Project-generated use and access conflicts on Public Trust Resources and Values. The information presented in this section is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. As noted in Section 1, *Introduction*, implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) (pursuant to Pub. Resources Code §§ 26601 and 21080, subd. (b)(4)). This statutory exemption precludes the CSLC from conducting a review pursuant to CEQA. Therefore, this Revised APTR serves solely as an informational document to assist the CSLC in deciding whether to issue a lease for the portion of the Project within its jurisdiction.

3.2.1 Environmental Setting Pertaining to the Public Trust

<u>CSLC Lease Area and Public Trust Impact Area</u>

The CSLC Lease Area and Public Trust Impact Area include Broad Beach and the western portions of Zuma Beach, with proposed beach and dune restoration extending laterally for approximately 6,200 feet from Lechuza Point on the west to Trancas Creek Lagoon on the east (refer to Figure 1-1). Beach and dune restoration activities would encompass 46 acres of public and private land on Broad Beach. The CSLC lease area includes approximately 40.5 acres of public trust lands held by the State, including approximately 27 acres of intertidal beach and 13.5 acres of subtidal lands. These public lands area bordered by adjacent privately owned upland parcels that support single family residential homes and the Malibu West Beach Club, portions of which would also be subject to dune restoration (Illustrations 3.2-1a and -1b). Portions of these privately owned parcels are also encumbered with existing public lateral access easements (LAEs) held by the State or recorded as deed restrictions.

The Public Trust Impact Area also includes the west end of Zuma Beach, including Parking Lot 12 located east of Trancas Creek, which would accommodate construction equipment and materials staging, as well as approximately 1,000 feet of Zuma Beach south of this parking lot, which would be used for short-term sand storage and construction equipment transportation between the staging area and Broad Beach. Broad Beach Road and areas along the Pacific Coast Highway (PCH) that provide public coastal access are also included within the Public Trust Impact Area. Down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches located farther south to Point Dume may be indirectly affected by changes in sand supply and distribution through littoral drift and are also within the Public Trust

Illustration 3.2-1a. *Approximately 27 acres of public trust intertidal lands are located seaward of the ordinary high water mark at Broad Beach. These public trust lands, which include the intertidal beach, are proposed to accommodate the majority of the beach restoration project.*

Illustration 3.2-1b. *Broad Beach supported a wide sandy beach berm in the 1970s and 1980s. However, coastal erosion and loss of sand has reduced the beach area to a generally intertidal beach, which limits coastal access opportunities to low- to mid-tides.*

Impact Area. See Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*, for further analysis of impacts to these down coast areas.

<u>BBGHAD Inland Project Area</u>

The BBGHAD Inland Project Area includes three quarries proposed as sand supply sources and the sand transportation routes inland of PCH that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). These areas do not support public trust resources administered by the CSLC related to coastal access and recreation and are not discussed further in this section.

<u>Relationship between Recreation and Public Access and Public Trust Resources and Values</u>

Recreation and public access to the shoreline are key components of the public's ability to use and enjoy public trust resources. In the Public Trust Impact Area, these resources include Broad Beach and the waters offshore, as well as Zuma Beach, Point Dume State Beach, other beaches upcoast and down coast adjacent to PCH along the proposed sand transportation routes, and state tidelands and waters offshore of these beaches. The beaches and offshore waters of the Public Trust Impact Area provide high recreational value. Changes to the continued use of or access to these areas would affect the public's use of public trust resources. The California Supreme Court in *National Audubon Society v. Superior Court (1981) 685 P.2d 709* states that the "core of the public trust doctrine is the state's authority as sovereign to exercise a continuous supervision and control over" the lands, waters and underlying intertidal lands of the State to protect ecological and recreational values, including the use and enjoyment of these lands. California's Constitution also establishes the right of the public to access and use public trust lands (Cal. Const. Article X, Section 4; Cal. Const. Article I, Section 25).

<u>Definitions</u>

Existing adopted management plans and land use regulations materially affect the public's use and enjoyment of Public Trust Resources along the coast. Plans and policies most applicable to the public's use and enjoyment of public trust resources in the Broad Beach area and along the shoreline up and downcoast are provided in the city of Malibu's Local Coastal Program (LCP), which is derived from the California Coastal Act. The Malibu LCP consists of two subparts, the Land Use Plan (LUP) and the Local Implementation Plan (LIP). The Malibu LCP policies are contained within the LUP, while the purpose of the LIP is to implement and carry out the policies of the LUP.[1]

Public trust lands directly affected by the Project include state sovereign lands under the CSLC's jurisdiction along and offshore of Broad Beach. The boundary between public trust lands and private uplands is the ordinary high water mark (OHWM). Generally, the OHWM is measured by the mean high tide line (MHTL) prior to fill or artificial accretions (refer to Section 2, *Project Description*). Beaches both up and down coast also support public trust lands. Easements on private land which are held by the State or other agencies that facilitate public coastal access and recreation, also represent a public trust resource. Private lands are located landward of the OHWM.

Recreation is defined as an activity or pastime that promotes the refreshment of health or spirit through relaxation or enjoyment (California State Parks 2004). Recreation, as applied to the Project, can be either consumptive or non-consumptive. Consumptive activities include hook-and-line fishing, spear fishing, lobster diving and the collecting of other types of sea life. Non-consumptive recreation includes activities which do not entail the harvest of sea life, such as beach going, swimming, surfing, sailing, boating, kayaking, bird and whale watching, tide pooling, and scuba diving.

Coastal access is generally defined as a location or area—including lateral access (access along a beach), vertical access (access from an upland street, parking area, public park, or bluff down to the beach), and coastal bluff top and upland trails—that lead to the shore or traverses inland parklands in the coastal zone. Coastal access also includes secondary factors, such as parking near coastal access points, support facilities (e.g., restrooms and picnic areas), addressing user demands and conflicts, and maintenance of a diversity of coastal recreation experiences. Public access and use of

[1] All references within this section to the Malibu LCP refer to the combined LUP and LIP, which comprise the Malibu LCP (e.g., reference to policies of the Malibu LCP refers to policies contained within the LUP). Appendix P contains policies from the Coastal Act, Malibu LCP and California Public Resources Code relevant to the Project.

the shoreline is a right guaranteed to all citizens by the California Constitution. The CSLC, California Coastal Commission (CCC), State Coastal Conservancy, local governments, and non-profit organizations all play a role in assuring this access and use.

<u>Broad Beach Area Public Access</u>

A portion of Broad Beach is located seaward of the OHWM on public trust lands which are owned by CSLC.[2] Any use of these lands requires authorization in the form of a lease from CSLC. Broad Beach is also located in the coastal zone, and recreation and public coastal access in this area is governed by the provisions of the Coastal Act, as well as the Malibu LCP. Among other agencies, jurisdiction over Broad Beach is shared by the CCC and city of Malibu (Illustration 3.2-2). The portion of Broad Beach located seaward of the OHWM (including portions of the emergency revetment) is under the original permit jurisdiction of the CCC, while portions of Broad Beach located landward of the OHWM (including remaining portions of the revetment) are under the jurisdiction of the city of Malibu, and within the coastal appeals jurisdiction of the CCC.

Illustration 3.2-2. *The CCC retains permit authority over public intertidal lands, which are located seaward of and in places overlain by the existing emergency revetment. The city of Malibu retains permit jurisdiction over predominantly private lands located landward of the revetment, although this area lies within the coastal appeals jurisdiction of the CCC.*

The area offshore Broad Beach also falls within the Point Dume State Marine Conservation Area (SMCA) managed by the California Department of Fish and Wildlife (CDFW), where it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource for commercial or recreational purposes, or a combination of commercial and recreational purposes unless otherwise specified. However, while prohibiting the recreational take of most marine features, the Point Dume SMCA allows for spear fishing for pelagic finfish, including Pacific bonito and white seabass (subsection 632[b], Areas and Special Regulations for Use [CDFW 2012]).

The LCP contains extensive policies for the provision of public vertical access to and lateral access along the beach. However, many Malibu beaches remain deficient in public access points, including Broad Beach (CCC 2002). For example, Policy 2.64 of

[2] In accordance with Public Resources Code section 6301, the CSLC "has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State…The Commission shall exclusively administer and control all such lands, and may lease or otherwise dispose of such lands, as provided by law, upon such terms and for such consideration, if any, as are determined by it."

the Malibu LCP requires dedication of a LAE for new development that causes public access impacts. The placement of a revetment or shoreline protective structure on the beach can result in both a loss of recreational beach area, as well as present an impediment to lateral public access (CCC 1999). Policy 2.86(d) of the Malibu LCP requires that vertical access be provided approximately every 1,000 feet along Broad Beach, which would require a total of approximately 5 access points (CCC 2002).

Existing Public Access Availability

Both vertical and lateral access exists at Broad Beach (Illustrations 3.2-3a and -3b). Public vertical access to Broad Beach is currently provided via two public access easements, which consist of pathways that connect Broad Beach Road and adjacent informal road shoulder parking areas to the shoreline (refer to Figure 2-2). These access ways are owned and managed by the Los Angeles County Department of Beaches and Harbors, and are fenced and gated with time restrictions for access (e.g., open from dawn to dusk). As part of the 2010 construction of the emergency revetment, these public vertical access points now also include concrete walkways and stairways across and over the revetment to the beach. However, these public access points do not include coastal access signs along Broad Beach Road; rather, signs are posted on the gates, but can be difficult to see when driving by. Similarly, the Broad Beach public access points are not signed along nearby PCH.

Vertical access to Lechuza Point is also available at the far west end of the Broad Beach area via Sea Level Drive; this access point is also time restricted. Lateral access is also available to Broad Beach from Zuma Beach and its large public parking lots,

Illustration 3.2-3a. *Vertical access to Broad Beach is provided at two locations along Broad Beach and one to Lechuza Point. Although the city of Malibu's LCP proposes 5 additional access points (approximately every 1,000 feet), most parcels along the beach are already developed.*

Illustration 3.2-3b. *Lateral access to Broad Beach is available from Zuma Beach to the east; however, medium and high tides frequently submerge all or most of Broad Beach. In addition, the existing revetment constrains lateral access to some public lands and existing access easements.*

although the beach is generally passable only during low to moderate tides. Lateral access from beaches to the west (e.g., El Matador State Beach) is limited by the rocky headland of Lechuza Point; access across the point is available only during lower tides and requires walking or wading through a rocky sea arch or scrambling up and over the rocky point itself.

Informal parking near the existing Broad Beach and Lechuza Point vertical access points is available along the north side of Broad Beach Road. The predominantly unpaved shoulder of Broad Beach Road provides an estimated 320 informal parking spaces over its 1.5-mile length with dozens of informal spaces within walking distance of the access points.[3] While construction worker and resident parking, as well as encroachment by informal landscape improvements limits availability of some of these spaces, parking is generally available to the public (AMEC 2012; King 2013).[4] Further, because parking areas are unsigned along Broad Beach Road, neither parking areas nor the access points may be noticed by beachgoers unfamiliar with the area. Additionally, informal road shoulder parking is also available in places along PCH on the bluff overlooking Broad Beach. Public transportation in the vicinity of Broad Beach includes a Metro 534 bus stop located at the intersection of Trancas Canyon and PCH. This stop is proximate to Trancas Creek and Zuma Beach, but is 0.6 mile from the nearest Broad Beach Road vertical access point. In addition, hundreds of public parking spaces exist at Zuma Beach, located within walking distance of Broad Beach.

Maintenance and improvement of public coastal access is a fundamental goal of the California Constitution and the Coastal Act, and loss of or impairment of public access is a statewide concern. Development over the past 25 years has adversely impacted the availability of public access and coastal recreation in Malibu (CCC 2002). As the coastline became increasingly developed, areas that had previously provided public access became constrained or were eliminated. For example, at Broad Beach the two existing vertical access points were dedicated when the tract map was recorded in the 1940s and no other vertical access was contemplated. As the development of Broad Beach continued, opportunities for additional vertical access points were lost. Public access has also been impacted by natural coastal erosion, sea level rise, the physical configuration of the beach, grading and the installation of emergency geotextile sand bags and rock revetments, all of which give rise to conflicts over lateral access.

As the beach eroded the ambulatory public-private boundary, as measured by the MHTL, has shifted landward. Uncertainties over the location of public beach versus private property have resulted in diminished public access along the beach. In addition, inconsistent LAEs recorded to permit the public to pass and recreate across individual

[3] A stretch measuring approximately 6,400 linear feet on the north side of Broad Beach Road contains a wide shoulder available for public parking. Individual parking spaces typically average 20 feet in length.

[4] AMEC staff has visited Broad Beach on six separate occasions at different times of day and seasons; road shoulder parking has been available each time.

properties resulted in variable reference points, with no easily definable boundary for the public or homeowners to estimate the location of the easements at any given time. These factors prompted the CCC to provide a report that sought to depict existing lateral easements (CCC 2004). In addition, Broad Beach homeowners maintain private security officers who patrol the beach for the purpose of limiting public trespass on private property. The beach is also seasonally patrolled by up to 4 private security guards, with daily patrol occurring during the busiest summer months, reduced to weekend patrol during the less busy early summer and early fall periods, and no patrol occurring during winter months.

The historically wide sand beach on Broad Beach provided ample lateral access from Zuma Beach, and Broad Beach acted as a continuation of and spillover area for recreational activities at Zuma Beach. However, the reduction in beach width over the past 40 years has resulted in impediments to lateral access, particularly under fall/ winter/spring conditions when even a moderate high tide of 3 to 4 feet may submerge all or most of the sandy beach. Under such conditions, the existing emergency revetment presents a physical barrier to lateral access and many recreational opportunities for beachgoers, as incoming tides frequently submerge all or most of the sandy beach.

Existing Public Lands and Access Rights

Under the California Constitution and the Public Trust Doctrine, the public has the legal right to access and recreate on public trust lands. In general, the area seaward of the OHWM is tidal and submerged lands, and is thus open for public use and enjoyment. Furthermore, over the course of the last 30+ years, the public has acquired numerous LAEs or deed restrictions, on adjoining private property, as a result of permit conditions included in Coastal Development Permits issued by the CCC and city of Malibu.[5] These easements are typically tied to the ambulatory boundary between public and private property and extend landward. On the open coast, including Broad Beach, the ambulatory nature of the MHTL, resulting from natural coastal processes such as coastal erosion and accretion, sea level rise, and the physical configuration of the beach, creates a shifting public-private boundary. The emergency revetment presents a physical barrier to those natural coastal processes, which have historically continued to move the MHTL landward over time; thus the revetment currently impacts and displaces lateral access and is expected to continue impacting public access over time.

Notwithstanding known physical encroachments upon public trust lands and existing LAEs (further discussed below), all beach areas seaward of the OHWM are public trust lands and open to public use and enjoyment. Thus, access along the existing beach occurs on public land. However, as discussed below, this matter is further complicated as portions of the existing emergency revetment are located on public trust lands below the OHWM and existing access easements held by the State, with many such

[5] Such conditions are known as an Irrevocable Offer to Dedicate Public Lateral Access Easement (OTD).

easements also located beneath and landward of the revetment. The CSLC manages the State's property interest both where the State has ownership of the land and where the CSLC has accepted easements (i.e., LAEs). Therefore, the CSLC plays a major role in protecting public coastal access, particularly through acceptance and management of offers to dedicate lateral public easements along the beach (CCC 1999).

Broad Beach currently supports approximately 27 acres of intertidal public trust land (as measured between the MLLW and January 2010 MHTL/revetment for the length of Broad Beach) that is generally available for public use and enjoyment at lower tides, with the majority of these lands located seaward of the existing revetment. Based on a CSLC staff survey of the MHTL conducted in January 2010, approximately 0.86 acre of public land currently lies beneath the existing revetment, blocking access to these lands.[6] The accessible seaward edge of this land is defined by the MLLW, with these lower lying areas accessible only during minus tide conditions. The vast majority of these public intertidal lands consist of low tide wet sandy beach, although limited areas of dry beach berm do accrue during summer months. Several acres of rocky intertidal area also exist on these public lands toward the west end of Broad Beach.

Landward of the OHWM, public lateral access is legally available only on those properties which have deeded such access in the form of LAEs.[7] Approximately 51 of the 121 private parcels along Broad Beach have recorded easements, deed restrictions, or other legal documents providing the public with the right to lateral coastal access across the seaward edge of these private properties. The CSLC holds a total of 36 LAEs along Broad Beach; 16 are outside the revetment area (i.e., associated with properties on Broad Beach to the east or west of the revetment), and 20 are directly impacted by the revetment. The remaining accepted easements are deed restrictions or other legal documents providing lateral public access that were dedicated prior to the existing LAE program and are not held by a specific State or local agency.

LAEs vary in terms, but they mainly consist of dry sandy beach extending 25 feet inland from the "daily high water line" or the MHTL; in some cases LAEs are restricted on the landward side by set-back buffers from the residential structures. As discussed above, 20 of these LAEs are partially or entirely covered by the emergency rock revetment and frequently extend landward of the revetment (Figure 3.2-1; Table 3.2-1).

[6] CSLC staff completed a survey of the MHTL in January of 2010 that is the basis for this estimate. Moffatt and Nichol, the agent for the BBGHAD, completed a MHTL survey in 2009, which showed lesser intrusion on public land (refer to Section 2.0, *Description of Proposed Project*).

[7] Sometimes referred to as OTDs; however, OTDs are only the recorded offers of easements. The easement does not exist until the offer is accepted by a qualified government agency or a nonprofit organization. Once the OTD is accepted, the accepting entity obtains title to the easement and the easement remains a public right in perpetuity. LAEs are accepted OTDs and have been dedicated by former or current owners of land within the BBGHAD and held by various agencies including the CSLC.

East Central Broad Beach
Location of Access and Recreational Easements

FIGURE 3.2-1

Table 3.2-1. Location of Existing Revetment Relative to Public Land and LAEs

Public Lands and LAEs	Acreage
Public Land Under the Revetment	**0.86**
Total LAEs Covered or Impacted by Revetment	**0.73 to 1.04**
LAEs Under the Revetment	0.53 to 0.77
LAEs Landward of the Revetment	0.20 to 0.27
Total Public Land / LAEs Affected by the Revetment	**1.59 to 1.90**

Thus, the emergency revetment presents a physical barrier to lateral access for beachgoers who are otherwise legally entitled to use these areas for recreational purposes. Further, because the remnants of the sand bag revetments generally lie landward of the rock revetment, portions of these sand bag revetments also overlie LAEs. In total, 32 of the 51 LAEs along Broad Beach lie beneath or landward of the existing emergency revetment, with approximately 0.53 to 0.77 acre of LAEs being directly covered by the revetment and 0.20 to 0.27 acre of LAEs being located landward of the revetment. Because the precise location and condition of the sand bag revetments is unknown, it is not possible to quantify the acreage of LAEs that are overlain by the sand bag revetments; however a substantial portion of the 0.20 to 0.27 acre of LAEs landward of the rock revetment may be occupied by sand bag revetments.

The existing revetment footprint covers approximately 3.02 acres, and covers or cuts off access to approximately 1.59 to 1.90 acres of public trust land and LAEs; the sand bag revetments potentially occupy a portion of the 0.20 to 0.27 acre located landward of the revetment. Since legal public lateral access and recreational use is limited to public trust lands and these LAEs, the revetment substantially limits public lateral access and use along the shoreline at Broad Beach. Under current conditions, coastal erosion combined with installation of the existing revetment has materially diminished the area of beach available for public recreational use.

Existing Private Beach Access

Most of the 109 homes along Broad Beach have historically had relatively unrestricted access to the beach; homes with large seawalls or along steeper dunes and bluffs at the beach's west end typically employed stairways to gain access while homes along the wide low dunes at the east end often had informal paths to the beach. As coastal erosion progressed, stairways were extended and some geotextile revetments were designed with walkways. Construction of the emergency revetment, which is 12 to 15 feet tall, has impeded private access to the beach (Illustration 3.2-4). The revetment is difficult and dangerous to traverse, especially when wet. Several homeowners appear to be using a shared lateral access pathway behind the revetment which is linked to informal rock or geotextile bag stairways constructed across the revetment to the beach. These informal stairways are proposed to be removed as part of the Project.

Illustration 3.2-4. *Construction of the emergency revetment interrupted or blocked historic private vertical access to Broad Beach. In response, homeowners constructed, and appear to share, approximately15 informal rock and geotextile bag stairways across the revetment. Waves have since damaged or eroded away some stairways.*

<u>Recreation</u>

Broad Beach is located in a region that offers substantial recreational opportunities due to its natural beauty, beaches, and climate. Miles of beachfront and scenic ocean and mountain views create a highly desirable landscape for high quality recreational opportunities, which are integral to quality of life for city of Malibu residents and help to draw the city's approximately 15 million annual visitors. These visitors are served by a range of State and county beach parks and low key paths and stairways that provide access to Malibu's 27 miles of coastline, including at Zuma Beach to the east. The majority of beaches in the vicinity are rural and undeveloped in nature, although some beaches such as Zuma Beach, which is one of Los Angeles County's most heavily used beaches (Santa Monica Bay Restoration Foundation 2009), provide a variety of developed visitor-servicing amenities (Figure 3.2-2 and Table 3.2-2).

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Public Beaches and Marine Protected Areas in the Vicinity of the Project Area

FIGURE 3.2-2

Table 3.2-2. Beach Facilities in the Vicinity of Broad Beach

Beach	Facilities					
	Parking[1]	Rest-rooms	Life-guard	Shower	Picnic/ BBQ	Other
Broad Beach	Informal	-	-	-	-	
Zuma Beach County Park	Formal	ü	ü	ü	-	Volleyball court
Point Dume State Beach (SB)	Formal	-	-	-	-	Hiking trails
Robert H. Meyer Memorial SB[2]	Formal & Informal	Portables only	-	-	-	
Nicholas Canyon County Beach	Formal	ü	ü	ü	-	

[1] Formal parking areas generally include a designated parking lot to serve beachgoers. Informal parking includes roadside and neighborhood parking areas.
[2] Robert H. Meyer Memorial SB consists of several "pocket beaches" located between Leo Carrillo and Point Dume SBs, including El Pescador, La Piedra, and El Matador Beaches. El Matador Beach is located west of Lechuza Point.

To the southeast of Zuma Beach is Point Dume State Beach, which encompasses approximately 30 acres and includes the Point Dume Nature Preserve, as well as a popular surf break. Robert H. Meyer Memorial State Beach, Nicholas Canyon County

Beach and associated coastal access points are located northwest of Broad Beach and within 4 miles of the Broad Beach area.

The availability of beach amenities and ease of access at nearby beaches concentrates recreational use at these developed facilities. For example, Zuma Beach receives heavy visitation and provides 2,025 parking spaces, as well as lifeguards, restrooms, outdoor showers, seasonal food stands, and volleyball courts (Los Angeles Department of Beaches and Harbors 2012). The more isolated and undeveloped beaches, such as Broad Beach, attract visitors seeking a quieter more natural beach experience. Unlike Zuma Beach, Broad Beach is less well known, lacks comparable amenities and has limited public access. The result is that Broad Beach is primarily used by private homeowners who live along Broad Beach, and nearby Malibu residents. However, Zuma Beach visitors historically represent a substantial portion of recreational users of Broad Beach (Malibu Chamber of Commerce 2012).

The types of recreational use at Broad Beach are consistent with other regional beaches; however, use tends to be less intense than that of adjacent beaches. Due to the popularity of Zuma Beach, Broad Beach often serves as an extension or spillover area of Zuma Beach, where people can walk, jog, or engage in passive recreational activities away from more crowded beach areas (Illustration 3.2-5). The recreational use of Broad Beach consists primarily of non-consumptive uses, including walking, jogging, picnicking, sun bathing, swimming, surfing, and dog walking. Dog walking is a popular activity at Broad Beach, despite signs posted noting that the beach is off-limits to dogs (Los Angeles County Code §§ 17.12.290 and 17.12.300). Tide pooling and bird watching activities occur in the western end of Broad Beach, where rocky intertidal and surfgrass beds provide habitat to a variety of marine species. Parking is also free at Broad Beach as opposed to parking charges at Zuma and some other area beaches. Although not well signed, ample informal free on-street parking is available along the northern side of Broad Beach Road, along PCH landward of Zuma Beach, and along the bluffs overlooking Broad Beach.

Illustration 3.2-5. *Broad Beach often serves as an extension of Zuma Beach for public recreation. Recreational activities at Broad Beach primarily consist of walking, running, and beach going; surfing, swimming, and dog walking are also popular.*

Surfing along Broad Beach primarily occurs at shore breaks along the eastern portions of the beach; however, a point break near Lechuza Point can occur during certain winter swells. Broad Beach generally contains less favorable surf conditions as compared to nearby areas (e.g., Leo Carrillo and County Line). Observations of surfing at Broad Beach over time have shown it to be limited to relatively small groups of beginners that use it as an opportunity to ride whitewater. Literature sources identify a noted break at Lechuza Point, sometimes referred to as Giant Rock, which generally is described as a fast right break that is ridable when waves are from 1 to 4 feet. These literature sources (i.e., websites and surfing guidebooks) and personal site observations identify limited use of Broad Beach for surfing due to generally unfavorable conditions (Moffatt & Nichol 2013). Counts of the number of surfers at Broad Beach at any one time are less than five along the entire beach. Random informal observations have been made over several years, and through every season. In addition to surfing, typical recreational activities occurring offshore Broad Beach include stand-up paddle-boarding, kite boarding, boating, and kayaking.

An informal survey of Broad Beach users conducted on June 16, 2012, found that the majority of people recreating on Broad Beach were engaged in non-consumptive activities, particularly walking, beach going, running, and surfing (Table 3.2-3; Appendix E). During this survey, it should be noted that the beach was almost entirely submerged during the higher +2.8 to +3.0 foot high tides and was limited to an average width of 20 feet during the +2.2 foot low tide.

Table 3.2-3. Overview of Recreational Use at Broad Beach

Beach Use (listed in order of frequency)							
Walking	**Beach Going**	**Surfing**	**Running**	**Dog Walking**	**Fishing (Historic)**	**Seaglass Collecting**	**Other**
23	15	10	8	3	2	2	Windsurfing (1) Tidepooling (1) Yoga (1) Paddle-Boarding (1) Boogie Boarding (1)

Source: AMEC 2012.

Note: The informal survey was performed over a period of approximately 4 hours during a +2-foot low tide, on a partly cloudy Saturday afternoon. During the survey, tides ranged from +2.8 feet, to a minimum of +2.2-foot low tide, then rose again to +3.0 feet. Data include information provided in 35 surveys completed by beachgoers. Full survey methods and results are provided in Appendix E.

Consumptive uses, such as surf fishing, have historically been popular at Broad Beach; however, as of January 1, 2012, the waters offshore Broad Beach are included within the Point Dume SMCA, which prohibits the recreational take of marine organisms,[8] and surf fishing is no longer permitted; however, spear fishing for pelagic finfish, including Pacific bonito and white seabass, is permitted (CDFW 2012). The prohibition of fishing offshore of Broad Beach may also reduce the number of recreational boaters that have historically used the area for fishing.

[8] Take pursuant to beach nourishment and other sediment management activities is allowed inside the SMCA pursuant to required permits or as otherwise authorized by CDFW (www.dfg.ca.gov/marine/mpa/).

3.2.2 Selected Laws Applicable to Recreation and Public Access

State and other statutes related to access and recreation are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*.

3.2.3 Public Trust Impact Criteria

Recreation and public access impacts will be considered a major adverse effect if implementation of the Project would result in:

- Loss of habitat for and impacts to marine flora or fauna;
- Conflicts with planning efforts to protect recreational resources of the Project area;
- Use of public trust lands for a primarily private use;
- Termination of public access points or routes that have been established through a history of public use;
- Sustained interference with the recreational use or public enjoyment of public trust lands;
- Interference with the recreational use or public enjoyment of vertical and lateral access and recreational use easements as contemplated by the numerous OTDs recorded and accepted (LAEs) along Broad Beach;
- Substantial physical deterioration of public trust lands or other recreationally used areas;
- Loss of sand to public beaches outside of the CSLC Lease Area, such as to result in a substantial deterioration of beach area or quality; or
- Residual impacts on sensitive shoreline lands, and/or water and non-water recreation due to the deposition or removal of sand.

Where applicable, this impact analysis considers the Broad Beach area both in its existing setting, following installation of 2005 sand bag revetments and the 2010 emergency rock revetment, and in its historical setting without the emergency revetments, characterized by a narrow beach and dune habitat.

3.2.4 Public Trust Impact Analysis

<u>Historical Recreational Characteristics of Broad Beach (pre-revetment)</u>

The historically wide sand beach on Broad Beach provided ample lateral access from Zuma Beach, and Broad Beach acted as a continuation of and spillover area for recreational activities at Zuma Beach. According to communication with a number of Broad Beach users and residents, including a local surf instructor who grew up in the area, it was noted that when the beach was wider, visitation was more significant.

However, recreational use of Broad Beach also was much lower than adjacent Zuma Beach, which provides ample well-signed public parking and restrooms. Visitation is estimated to have been rarely more than 100 people on a busy day (King 2013). The relatively small number of visitors was related to limited access, the local nature of the beach, and potentially a lack of posted coastal access signs, public facilities and a past history of homeowners hiring private security to drive all-terrain vehicles on the beach to patrol use (King 2013). Over the years, particularly as the beach narrowed, members of the public and area homeowners have experienced on-going conflict over use of the beach and the location of the boundary between public lands and private property.

Impacts to Recreation Associated with the Emergency Revetment

The installation of the emergency revetment at Broad Beach artificially inhibited high tides and surf from reaching their maximum landward elevation and extent along the length of the revetment, thus inhibiting the ambulatory nature of the MHTL at these locations. The location of the OHWM at Broad Beach is important to both the public and private property owners, as it defines the boundary between public and private lands along the beach front. As such, the location of the OHWM is a key element affecting the public's right to beach access along the shoreline, as well as the privacy and rights of local property owners. Existing public lateral access is currently available as a matter of right, seaward of the OHWM, depending on seasonal sand levels and tides. However, under conditions observed in 2011, 2012, 2013, and 2014, a moderate tide of 1 to 2 feet can submerge all or most of the sandy beach, limiting both public and private lateral access along the shoreline. Under such conditions, the emergency revetment presents a physical barrier to lateral access for beachgoers as they try to dodge wave run up. Similarly, the previously installed sand bag revetments also obstructed public access in a similar manner. Impacts associated with the installation of sand bag and rock revetments on recreation are discussed below in Impact REC-1.

Proposed Project

The initial nourishment event is estimated to take approximately 8 months of active work and the subsequent renourishment, approximately 10 years after initial project implementation, is estimated to require another 6 months of work (Section 2.0). Construction equipment and materials would be staged at Zuma Beach Parking Lot 12, using approximately 1.4 to 1.9 acres of the public parking lot. Sand would be stockpiled and construction equipment would circulate along approximately 1,000 feet of Zuma Beach occupying an estimated 5 acres of dry sand beach berm. Hauling of inland quarry material to Broad Beach is expected to require 28 weeks (6.5 months). However, an additional 1 month would be required to complete hauling of sand from the stock piles up to Broad Beach to complete construction of the sand dunes.

Given the intensity of construction activities, public access to Broad Beach, the western end of Zuma Beach, and the Trancas Lagoon mouth will be limited or restricted, as required to protect human health and safety, during working construction hours (Monday through Friday, 7:00 AM to 6:00 PM) due to the equipment traffic associated with beach nourishment activities. It is estimated that closure would last for at least 140 days during initial Project construction and 120 days during the subsequent renourishment.

After initial nourishment, the new beach and dune system is expected to extend over approximately 46 acres. The new post-construction dry sand beach would extend approximately 90 to 230 feet seaward of the dunes, providing approximately 27 acres of dry sandy beach. The longevity of the nourishment at Broad Beach is dependent on a variety of factors, including climatic cycles, wave energy and direction, longshore transport of sand in the littoral cell, sand grain size and increasingly over time, and sea level rise (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards)*.

In order to prolong the longevity of the proposed beach nourishment, the Applicant would initiate backpassing of sand from the wider eastern reach of beach to the narrower western reach of beach. The timing of backpassing would be based upon monthly beach profile measurements and in accordance with objective beach nourishment triggers, but would likely occur annually (refer to Section 2.2.9, *Long-Term Beach Profile Monitoring and Beach Measurements*). Sand volumes to be backpassed would vary depending on sand availability and need, as determined by monitoring; however, backpassing is estimated to involve transporting approximately 25,000 to 35,000 cubic yards from the east to west end of the beach. The duration of sand backpassing could be up to 3 weeks. Although the Applicant would attempt to provide public access to the beach during backpassing operations, the majority of the working area below MHHW would be closed to the public during these operations (Section 2.2.10, *Future Beach Management Events*).

Even with backpassing, maintenance of the newly established beach is anticipated to require a second major renourishment event. Renourishment would involve placement of an additional 450,000 cy of sand on the beach. Timing for renourishment would be determined via monitoring triggers and is projected to occur in 10 years (Section 2.2.9, *Long-Term Beach Profile Monitoring and Beach Measurements*). On weekends and holidays, the beach would remain open for public access. As work progresses, public access to portions of the beach would be maintained during nourishment operations to the extent possible with implementation of a construction vehicle traffic management plan.

Finally, the Project also contains a provision for installation of emergency sand bag revetments along the eastern 550 feet of Broad Beach that is not protected by the emergency rock revetment and the 100-foot break in the revetment. Such sand bag revetments would be installed on private property and would only be installed during periods of erosion, such as toward the end of the useful life of either the initial or follow up nourishment events.

Impact REC-1: Initial Project Construction and Renourishment Effects on Coastal Access and Recreation

Short-term construction would interfere with recreational use and coastal access on public trust lands (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (REC-1)</u>

Disruption and interference with recreational use and access would occur during the estimated 8-month construction period for initial beach nourishment activities. Similar interference would also occur during the estimated 6-month renourishment event that is anticipated to occur after 10 years (Illustration 3.2-6). During these periods, bulldozers, heavy trucks hauling sand, and other types of heavy equipment would be traversing Broad Beach, the western 1,000 feet of Zuma Beach, and the Trancas Lagoon mouth effectively precluding access to 1.5 miles of public trust lands along the beach for 14 months over the 20-year Project life.

Illustration 3.2-6. *Project construction and renourishment would occur over approximately 180 days, during which time public access to and along Broad Beach would be constrained. In addition, the western end of the Zuma Beach parking lot would be used as a staging area, precluding its public use.*

An additional 2-month period would be required during the initial nourishment event for construction of the dune system, including deposition and movement of sand into the correct location and dimensions, planting, fencing, signage, and placement of temporary irrigation systems. Dune restoration would require more limited use of trucks along the beach to haul in materials and reduced use of heavy equipment (e.g., backhoes). Much of the work would be done by hand, reducing interference with public recreation and access. Maintenance of the dune system, particularly during the initial establishment period of roughly 3 years, would require some ongoing nuisance type interference with public recreation on the newly widened beach associated with vehicle access and noise generated by landscape maintenance equipment and crews of workers.

During the construction phase of the Project, construction equipment and materials would be staged in Parking Lot 12 at the west end of Zuma Beach, displacing an estimated 260 public parking spaces for the 6- to 8-month construction windows. An additional 42 spaces of free road shoulder public parking along PCH would be displaced through conversion to a truck lane for 6 to 8 months during both initial Project construction and the renourishment event. This truck lane and high volumes of truck traffic would also interfere with pedestrian and bike traffic along PCH. In addition, sand stockpiles would be located on 1.4 to 1.9 acres over 1,000 feet of public beach on the dry sand berm at the west end of Zuma Beach. Heavy construction equipment would use approximately 1,000 feet of intertidal beach in Zuma Beach County Park to access these sand stockpiles and to transport sand west to Broad Beach (refer to Figure 2-15).

Signs notifying the public of the dates of nourishment operations would be posted at the public access points and at other highly visible locations along the beach. Although the Applicant has stated that attempts would be made to provide ongoing public access during initial and subsequent beach nourishment, public safety concerns with beachgoers mixed with relatively high speed heavy haul trucks, scrappers and bulldozers with associated noise and fumes would preclude all or most access during nourishment events. The beach could be opened on weekends and outside of the hours of construction operation. Project construction and subsequent renourishment could also adversely affect offshore recreation and recreation at adjacent beaches (e.g., Zuma Beach) through visual and noise disturbance and increased turbidity of near shore waters (refer to discussions for Impacts N-1, SR-2, and SR-3). These effects would also extend for roughly a total of one year over the 20-year Project planning horizon.

Impacts described above are similar to those that previously occurred during construction of the rock revetment during the 2009 to 2010 winter season, where heavy equipment and large trucks traversed Broad Beach. Impacts from construction of the sand bag revetments would have been similar, but reduced, with limited truck traffic, heavy equipment use, and use of work crews to fill and erect sand bag revetments.

Although the Project would result in substantial widening of the beach for up to 20 years, 1.5 miles of public beach would be closed and/or substantially degraded for recreational use for a total of a year or more, particularly during initial and subsequent nourishment, resulting in minor adverse effects to public recreation. Closure of Parking Lot 12 and the PCH road shoulder would displace 302 public parking spaces over two 6-month periods, adversely affecting recreational access to Zuma Beach and Broad Beach. In addition, during these periods, 5 acres of dry sand beach at Zuma Beach would be unavailable for public use due to sand storage and heavy construction equipment operation. Construction would occur primarily during the fall and winter, which would reduce the number of beachgoers that would be affected; however, the presence of heavy construction equipment, large machinery, and sand stockpiles would result in a potentially major adverse effect to recreational use of Broad Beach and adjacent areas of Zuma Beach.

The loss or degradation of recreational use of Broad Beach and adjacent areas of Zuma Beach would result in adverse economic effects. The Project may have beneficial economic effects in and around the region of Broad Beach, but a specific value is difficult to quantify. It is difficult to quantify the number of people affected and the associated direct and indirect economic effects of beach closure. While the Project would provide a wide sandy beach that would enhance public coastal access, over the medium-term, the extended duration of construction and renourishment would result in a major short-term adverse effects to public access and recreation.

With implementation of the following avoidance and minimization measures (AMMs) protecting public access and safety, effects would be minor.

Avoidance and Minimization Measures

AMM REC-1: Public Access during Construction and Renourishment. At least 2 weeks prior to commencing construction and renourishment operations, the construction contractor shall post signs notifying the public of the scheduled dates of nourishment operations at the public access points and at other highly visible locations along the beach. Construction contractors shall be responsible for maintaining the beach in acceptable condition for public use outside of construction activities (e.g., weekends) to the maximum extent feasible. Lateral access along the west end of Zuma Beach and Broad Beach shall be restored as soon as possible to permit continued, safe public passage. Construction monitors shall be employed to manage public access during construction activities.

Rationale for Avoidance and Minimization Measure

Project construction and renourishment activities would interfere with public recreation and coastal access to Broad Beach, the western end of Zuma Beach, and the area offshore from each of these beaches. This interference should be minimized to the maximum extent feasible. Implementation of AMM REC-1 would ensure proper measures are taken during construction and renourishment operations to minimize effects to public beach access and use.

The 1-year total duration of initial and subsequent construction and renourishment activities would result in a minor adverse effect to public access and recreation at Broad Beach and adjacent areas of Zuma Beach. This includes loss of access to 1.5 miles of shoreline and public trust lands due to construction activities as well as degradation of nearby and offshore recreational values due to visual and noise disturbance, increased turbidity of near shore waters, and loss of 302 public coastal access parking spaces in and adjacent to western Zuma Beach. Combined, these effects are anticipated to result in increased demand at nearby beaches during the extended construction period, as typical users of western Zuma Beach and Broad Beach would likely choose other destinations for coastal recreation.

Impact REC-2: Backpassing Impacts to Recreational Users

Backpassing would interfere with recreational use and access on public lands (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (REC-2)</u>

Disruption and interference with recreational use and access would occur during backpassing, anticipated to occur approximately once per year. Construction would require a bulldozer and 3 scrapers to move sand from the east end of Broad Beach to eroded areas further to the west over a period of up to 3 weeks. Construction equipment and materials would be staged at the west end of Zuma Beach Parking Lot 12, precluding recreational parking on approximately 0.25 acre of the 1.93-acre public parking lot. Given the parking lot contains approximately 260 spaces, this would result in the temporary loss of approximately 34 parking spaces. Beach access would likely be impacted as heavy equipment enters and leaves the Zuma Beach parking lot staging area.

During backpassing events, the contractor would establish measures to maintain public access to the maximum extent feasible, while ensuring public safety, including fencing or signs to control public access to the work site, as well a designated access points through the work zone. However, large scrapers excavating soil and moving it west for almost 5,000 feet across Broad Beach could substantially impede public use and enjoyment of the shoreline and beach during these periods. Minimal effects to offshore recreation and recreation at adjacent beaches would occur during backpassing. Visual and noise disturbance from construction would potentially degrade the recreational experience for users of Zuma Beach over the 3-week period; however, backpassing activities would be scheduled either during fall or spring, to avoid the busiest summer months. Under a worst-case scenario, a full 3 week beach closure per backpassing event, backpassing could result in 420 days of beach closure over the 20-year Project duration. While public access would be maintained to the greatest degree possible, backpassing would result in the cumulative loss of recreational access for a major period of time; however, with implementation of AMMs to ensure public access and safety, effects would be minor.

<u>Avoidance and Minimization Measure(s)</u>

AMM REC-2: Public Access during Backpassing. At least 2 weeks prior to commencing backpassing operations, the construction contractor shall post signs notifying the public of the scheduled dates of backpassing at the public access points and at other highly visible locations along the beach. The construction contractors shall be responsible for maintaining lateral beach access to the maximum extent feasible to permit safe public passage (e.g., designated public access points, flagman, and construction vehicle management).

<u>Rationale for Avoidance and Minimization Measures</u>

Project backpassing has the potential to interfere with public lateral access to Broad Beach, which should be minimized to the maximum extent feasible. This would ensure proper measures are taken during backpassing operations to minimize effects to public beach access. When combined with the 1-year duration of construction and renourishment activities, backpassing would result in the closure, constructive closure (due to heavy equipment) or unsuitability for public access to Broad Beach and the west end of Zuma Beach.[9] However, a new wider sandy beach at Broad Beach is expected to remain available for public use during the majority of the 20-year project duration.

Impact REC-3: Medium- and Short-Term Effects to Recreational Use

Project construction and maintenance of a widened beach and restored dune system would enhance public recreation opportunities through provision of a wide sandy beach berm and increased lateral access (Beneficial Effect, Class B).

<u>Impact Discussion (REC-3)</u>

A substantial beneficial effect to recreation would occur during the life of the Project, with these benefits anticipated to last up to 20 years depending on the rate of coastal erosion and success of beach restoration activities. Current conditions primarily limit public beach access to low tides, with up to 27 acres of intertidal beach available at minus tides for public recreational uses compatible with a low-tide beach (e.g., walking, jogging, swimming, etc.). However, this beach is generally submerged during medium and high tides, and during these tides lateral access is largely blocked by the revetment and high water, limiting the amount of time that the public can use and enjoy these public trust lands. The Project would include burying the revetment beneath the new sand dune system and restoring the historically wide dry sandy beach berm, permitting public recreation and lateral access on public trust lands tides that are currently submerged during medium and high tides (Illustration 3.2-7). The Project would also provide a wide dry sandy beach berm for sunning and other activities, which is now almost wholly absent, even during summer months.

Illustration 3.2-7. *Project implementation would result in a dry sand beach berm, such as those currently found at the eastern end of the Broad Beach area, covering 27 acres and expanding the recreational opportunities on Broad Beach and increasing the time the public is able to access and use the beach.*

[9] The initial nourishment program, requiring approximately 1 year of construction, a subsequent renourishment event, requiring approximately 120 to 140 days for construction, and 420 days of beach closure during backpassing would result in approximately 905 to 925 total construction days over the 20-year Project life; this would leave the newly widened Broad Beach and western end of Zuma Beach closed to or unsuitable for public access about 12.5 percent of the days over the coming 20 years.

Over the short- to mid-term, the Project would expand the time that Broad Beach could be accessed by the public and increase the type of recreational activities that could be accommodated to include those that typically occur on dry sand beach berms (e.g., sun bathing, picnics, etc.). The post-construction restored beach and dune system (as measured from the landward side of the dune to the post-Project MHTL) would range in approximate width from 150 feet in the western portions near Lechuza Point to 280 feet near Trancas Lagoon at the eastern end. The beach and dune would be approximately 250 feet wide along the majority of the beach. This would result in a net increase of approximately 27.4 acres of dry sand beach berm. This increase would occur initially after construction and renourishment; however, the constructed beach would likely undergo immediate reworking by waves and tides that distribute the sand both offshore and alongshore (i.e., equilibration erosion). This equilibration erosion is anticipated to reduce the total beach and dune area by approximately 30 percent after the first year to a total dry beach area of approximately 19 acres (Appendix B).

The dune system would not be open to public recreation and access; however, public vertical access across the dunes would remain at the 2 existing vertical access points. The dune system could preclude public use over approximately 2.58 acres of public trust land and 0.97 acre of LAEs. Sand placement along Broad Beach would also increase the volume of sand in the beach profile. Increased sand volume at the beach would widen and raise the beach profile, and make more sand available for sand bar formation. Sand tends to fill in the protected area shoreward of Lechuza Point in winter, buries small rocks, and creates a bathymetric condition conducive to producing ridable surf on northwest swells. Theoretically, increased sand volume throughout the surf zone should lead to more and larger sand bars forming at the placement site compared to the present condition. The surf zone should move farther offshore from the beach and become more like that along Zuma Beach, as compared to present Broad Beach. With waves breaking farther from shore and shoaling over more and larger sand bars than presently exist, the surf at Broad Beach may improve (Moffatt & Nichol 2013). Thus, the project may improve surfing conditions at Broad Beach compared to existing conditions.

The increase in dry sand beach width and potential for improved surf conditions would result in a substantially enhanced and expanded public recreation area, backed by a scenic dune system, as compared to current conditions. These benefits would be major but also ephemeral. Based on historic trends, erosion of the beach area would likely continue, despite backpassing. These benefits may remain for up to 20 years; however, worst-case-scenario modeling projects a potential for a return to near existing conditions within 5 years of initial nourishment, particularly at the beach's west end. This could result in coastal erosion eliminating the dry sandy beach and with potential for exposure of the revetment, and associated adverse effects of blocking public access to public trust lands and LAEs (refer to Impact REC-4 below; Appendix E).

Because of this potential erosion, the timing of renourishment is critical to extending these beneficial effects. The Project Applicant currently proposes that renourishment be triggered when the nourished beach is in deficit (i.e., the point in time when the western beach width is 50 feet or less for 12 consecutive months and the eastern beach width is less than 25 feet wide over the same period), provided 10 years have passed. Given the potential for the beach to return to near existing conditions within 5 years, the public benefit provided by the Project could be eliminated prior to the stipulated 10 years for renourishment, eliminating this benefit.

The erosion of sand from Project nourishment and renourishment would likely result in direct benefits to beaches down coast, including Zuma Beach and Point Dume, due to an influx of sand to the immediate littoral cell; this would contribute to incrementally wider beaches with associated coastal access and recreational benefits. Although a small portion of this sand would be lost to the Point Dume submarine canyon, these benefits would also incrementally extend to beaches further down coast.

<u>Avoidance and Minimization Measures</u>

AMM REC-3: Beach Profile Reporting. The Applicant shall submit quarterly monitoring reports prepared by an approved third party monitor to the CSLC. Monitoring reports shall provide beach profile information obtained during that period, consistent with monitoring procedures outlined in Section 2.2.9, *Long-Term Beach Profile Monitoring and Beach Measurements,* of California State Lands Commission's *Analysis of Public Trust Resources and Values*. In addition to the spring and fall full beach profile measurements, a third full beach profile measurement shall be taken immediately after any backpassing event. Monitoring reports shall identify action items for subsequent periods, including but not limited to the initiation of backpassing or renourishment.

<u>Rationale for Avoidance and Minimization Measures</u>

The majority of the Project would be constructed on public trust land under the jurisdiction of the CSLC. Quarterly monitoring reports would ensure CSLC is current on the status of the beach profile and need for proposed backpassing or renourishment.

Impact REC-4: Long-Term Effects to Recreational Use

Exposure of the revetment though coastal erosion after cessation of beach nourishment would adversely affect recreational beach use and access by blocking public access to public trust lands and LAEs (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (REC-4)</u>

A beneficial effect to recreation would occur during the projected 20-year life of the Project due to creation of a wide sandy beach. However, after both the initial and second nourishment event, these benefits would diminish as coastal processes cause the beach to retreat back to current conditions, eroding portions of the dune system and eventually re-exposing the revetment which would block public access to public trust lands and LAEs. The Applicant has proposed, at its discretion, the option to provide further nourishment events beyond the life of the Project; however, because the Applicant has not committed to such future nourishment, and such nourishment would occur beyond the requested 20-year lease term, this analysis assumes no additional renourishment events would occur. If no future renourishment was to occur after implementation of the second follow up renourishment, natural processes are anticipated to erode the Project's beach and restored dune system within 20 years – and potentially as soon as within 5 years – resulting in the loss of recreational benefits.

Construction of the existing emergency revetment in its existing location with portions overlying public trust lands was never authorized by the CSLC. The erosion of the proposed beach and dune would eventually result in exposure of the revetment, which would substantially inhibit public lateral beach access, which is an anticipated benefit of the Project. The Applicant is proposing that the existing emergency revetment, which was previously not authorized by the CSLC, be included in the lease as an authorized structure as part of the Project for the 20-year term.

Since the revetment overlies or is seaward of 1.59 to 1.90 acres of LAEs and public trust lands, the revetment as proposed by the Applicant would prohibit public use of these public trust lands and access easements. Additionally, public lateral access would again be impeded by the revetment following termination of Project renourishment activities, as is the case under existing conditions. The long-term loss of public access to 1.59 to 1.90 acres of public trust land and LAEs would be a major adverse effect. Therefore, the beach renourishment aspect of this Project ("soft solution") is a critical component as it offsets the adverse effects created by the installation of the revetment, which serves as both a physical impediment to usable beach area (i.e., LAEs), as well as an impediment to lateral public access in places where the beach would otherwise be accessible only at low tide. Continued maintenance of a wide sandy beach berm to offset adverse revetment impacts is a critical to minimize long-term effects to recreational use.

Long-term effects of sea level rise on the Project would also potentially be adverse. The CSLC *Report on Sea Level Rise Preparedness* notes that sea level rise in combination with increased storm intensity may lead to the loss of sandy beaches in some areas, which, coupled with the potential increase in shoreline protective devices, could reduce or eliminate public access along the coastline (CSLC 2009). According to tide data maintained by the National Oceanic and Atmospheric Administration (NOAA), the California coast is experiencing differing rates of sea level rise, or fall, with the magnitude and direction of change specific to certain regions along the coast. In the Los Angeles area, long-term tide records (1924 to present) at the NOAA Los Angeles Outer

Harbor station indicates a water level change of 3.3 ±1.1 inches per century. Sea-level rise over the term of the Project horizon (e.g., 10 to 20 years) is projected to be approximately 8.5 inches with a possible range from 3.4 to 17.9 inches under the reasonable worst case (Appendix B). Under these projections, sea level rise would contribute between 3 to 15 feet of erosion along most of Broad Beach over the next 10 to 20 years (refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). Therefore, the impact of sea level rise on the Project over its 10 to 20 year life would be insignificant. Over the long term, particularly after 2050, sea level rise is projected to accelerate. Higher sea levels after 2050 would be expected to substantially accelerate coastal erosion, potentially exposing the restored dunes, emergency revetment, and homes and septic systems to damage from coastal processes with potentially major direct and secondary effects on public trust resources.

CSLC sea level guidance recommends: "Where appropriate, staff should recommend project modifications that would eliminate or reduce potentially adverse impacts from sea level rise, including adverse impacts on public access" (CSLC 2009). As proposed by the Applicant, the Project would result keeping the revetment in a location that could impede public access to public trust lands over the long term as the shoreline and MHTL shift landwards. Therefore, a long-term lease for the revetment would be potentially inconsistent with the recommendations of the State of California and CSLC guidance related to sea level rise.

<u>Avoidance and Minimization Measures</u>

AMM REC-4a: Requirement of Additional Nourishment. Additional nourishment events beyond those proposed by the Applicant may be required within the 20-year Project lifetime or the public benefits associated with the Project may be lost.

AMM REC-4b: Sea Level Rise Effects. The effects of sea level rise on Broad Beach shall be analyzed towards the end of the Project life (20 years) and reported to the California State Lands Commission (CSLC). This would include, but not be limited to, analysis of potential changes in property boundaries from the resultant changes in the elevation of the mean high tide line and the effects of increased erosion rates on the need for beach nourishment. Where changes in property boundaries occur that result in additional public trust lands being impeded from public use in the Broad Beach area, the CSLC shall determine appropriate Project measures to ensure no net loss of public trust lands available for public use in the Broad Beach area.

<u>Rationale for Avoidance and Minimization Measures</u>

The incorporation of AMMs would reduce major adverse effects by ensuring that the permitting of the revetment for the 20-year life of the Project would entail sustained renourishment and maintenance of a public beach and dune system. Additionally, the incorporation of sea level rise effects into future AMMs would ensure that the Project can be adjusted to account for the effects of sea level rise as future conditions require. However, the certainty of timing for any subsequent renourishment event is unknown and entirely dependent on natural coastal processes that can vary greatly from year to year. Additional nourishment beyond the single event proposed by the Applicant (no sooner than in year 10 of the Project) may be required to ensure that the Project's public benefits are not lost if sand loss exceeds anticipated levels and additional renourishment is required but not conducted at any point during the Project life.

Based on current site conditions and available data, cessation of beach nourishment near the expiration date of the proposed CSLC lease and erosion of the beach would likely have an adverse impact on public coastal access and recreation. Since future site conditions cannot be predicted with any degree of accuracy, the CSLC would review and reconsider provisions of the lease at that time based on then-current data. The proposed lease includes an end-of-lease provision that would require the BBGHAD to submit to the CSLC no later than 2 years prior to the end of the lease term an application requesting a new lease, or a plan to restore the lease area. At that time, the CSLC would consider the potential for continuation of nourishment activities and/or the disposition of the revetment and other improvements that overlie or block access to public lands or LAEs.

Secondary Impacts of Additional Beach Nourishment

The potential for additional beach nourishment event(s) beyond the single event proposed by the Applicant would benefit beach-oriented access and recreation. However, such an additional renourishment event would create major and minor secondary impacts to public trust resources and other areas, including burial of rocky intertidal and subtidal habitats, additional trucking and related public access, and safety, air quality, and noise impacts and potential water quality concerns similar to the Project.

3.2.5 Summary of Recreation and Public Access Impacts and AMMs

Impact	Class	Avoidance and Minimization Measures
REC-1: Initial Project Construction and Renourishment Effects on Coastal Access and Recreation	**Mi**	**AMM REC-1**: Public Access during Construction and Renourishment
REC-2: Backpassing Impacts to Recreational Users	**Mi**	**AMM REC-2:** Public Access during Backpassing
REC-3: Medium- and Short-Term Effects to Recreational Use	**B**	**AMM REC-3:** Beach Profile Reporting
REC-4: Long-Term Effects to Recreational Use	**Mi**	**AMM REC-4a:** Requirement of Additional Nourishment **AMM REC-4b:** Sea Level Rise Effects

3.3 MARINE BIOLOGICAL RESOURCES

This section of the Revised Analysis of Public Trust Resources (APTR) describes the marine biological resources (i.e., the intertidal, subtidal and open water habitats) with the potential to be impacted by the Broad Beach Restoration Project (Project). Marine biological resources include local habitat types, biological communities, and common as well as sensitive species. This section describes environmental and regulatory settings related to the offshore biological resources in the Broad Beach Restoration Area, and potential effects of this beach replenishment and dune restoration project on public trust resources and values. The information presented in this section is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. Implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) pursuant to Public Resources Code sections 26601 and 21080, subdivision (b)(4) (see Section 1, *Introduction*). Therefore:

- The public trust scope of review and analysis provided here is limited only to those areas where impacts to public trust resources and values may occur. These areas of the Project include the CSLC Lease Area and the broader Public Trust Impact Area (refer to Section 1 and Figure 1-2);
- Areas outside the Public Trust Impact Area are evaluated qualitatively for non-public trust affected resources, and include the three existing permitted quarries in inland Ventura County from which the BBGHAD proposes to obtain sand for the Project, and the inland sand transportation routes between these sites and the inland stretch of Pacific Coast Highway (PCH), including sections of the coastline stretch of PCH to Zuma Beach Parking Lot 12. These sites are fully permitted quarries and have been subject to past environmental review by Ventura County for impacts to biological resources.

Analysis in this section focuses on marine biological resources at both Broad Beach and the west end of Zuma Beach that may be affected directly or indirectly by any of the primary Project components. This analysis builds upon surveys and analysis performed by Chambers Group, Inc., analysis performed by AMEC Environment & Infrastructure, Inc. (AMEC), and information provided by State and Federal resource agencies. Information used to prepare this section includes the following sources:

- A Survey of Marine Biological Resources of Broad Beach, Malibu, California (Chambers Group 2012a);
- 2012 Summer Kelp Canopy Map (Moffatt & Nichol 2013a);

- Broad Beach Intertidal Sampling for the Broad Beach Shore Protection Project (Chambers Group 2012b);
- Subtidal Reef Survey, December 2012 (Chambers Group 2012c);
- Broad Beach June Intertidal Sampling for the Broad Beach Shore Protection Project, Los Angeles County, California (Chambers Group 2013a);
- Mapping of Eelgrass off Broad Beach in Malibu for the Broad Beach Restoration Project (Chambers Group 2013b);
- Comment letters from the California Department of Fish and Wildlife (CDFW; December 18, 2012), National Marine Fisheries Services (NMFS; December 21, 2012), other public agencies, environmental organizations, and individuals; and
- Supplemental Marine Habitat Survey and Mapping for the Broad Beach Restoration Project (Moffatt & Nichol 2014).

Intertidal and subtidal habitats at Broad Beach have been subject to relatively comprehensive surveys over the last several years. On June 25, 2013, The Chambers Group conducted intertidal surveys along belt transects parallel to the shoreline at various tidal levels ranging from a low tide of -1.5 feet to a high tide of +4.5 feet. Subtidal reef and eelgrass surveys were performed over 5 days in 2012 and 2013 using both divers and sonar from a survey vessel. These surveys provided detail regarding character and aerial extent of rocky intertidal and subtidal habitats, including the extent of surfgrass and eelgrass beds. However, the NMFS expressed concern: (1) about the adequacy of these studies and whether they comprehensively disclose the acreage and quality of habitats likely to be impacted; and (2) that sand transport modeling may not accurately characterize the extent and duration of potential sand coverage of rocky and intertidal and subtidal habitats, with particular concerns regarding possible impacts to surfgrass (letter dated March 31, 2014). In order to address at least some of these issues the Applicant funded supplemental marine habitat surveys and mapping for Broad Beach, which was conducted in May and June 2014. These surveys included a side scan sonar survey to characterize habitat as well as associated subtidal dive transect surveys to characterize subtidal benthic structure and associated biological communities (Moffatt & Nichol 2014). These surveys and the associated results are described in more detail in Section 3.3.4, *Public Trust Impact Analysis*.

3.3.1 Environmental Setting Pertaining to the Public Trust

<u>CSLC Lease Area and Public Trust Impact Area</u>

Broad Beach is located in the city of Malibu, which lies along the coast in the northwestern portion of Los Angeles County. The CSLC Lease Area and Public Trust Impact Area (refer to Figures 1-2, and 2-3 through 2-6) extend laterally for approximately 6,200 feet from Lechuza Point to Trancas Creek Lagoon, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment. This area encompasses the approximate 46-acre beach and dune construction area, including approximately 27 acres of existing intertidal habitats and 13.5 acres of subtidal habitats. Construction staging at the west end of Zuma Beach Parking Lot 12, stockpiling of imported sand on Zuma Beach adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach are also included in this area.

The Public Trust Impact Area also includes intertidal and subtidal areas off down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches, and shoreline marine biological resources farther south, which may be indirectly affected by changes in sand supply and distribution through littoral drift. Refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*, for further analysis of these impacts. Longshore transport moves sand supply from Broad Beach to down coast beaches, such as Puerco Beach, Amarillo Beach, and Big Rock Beach, within the Santa Monica Littoral Cell (Figure 3.1-1). These down coast areas vary from sandy beaches to rocky headlands. The coastline comprises sensitive rocky intertidal and subtidal habitat areas.

<u>BBGHAD Inland Project Area</u>

The BBGHAD Inland Project Area includes three operating quarries proposed as sand supply sources, as well as the sand transportation routes inland of PCH, that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). The quarries are fully permitted by the State and Ventura County. These areas also do not support public trust resources administered by the CSLC related to marine biology and are not discussed further in this section.

<u>Relationship between Marine Biological Resources and Public Trust Resources</u>

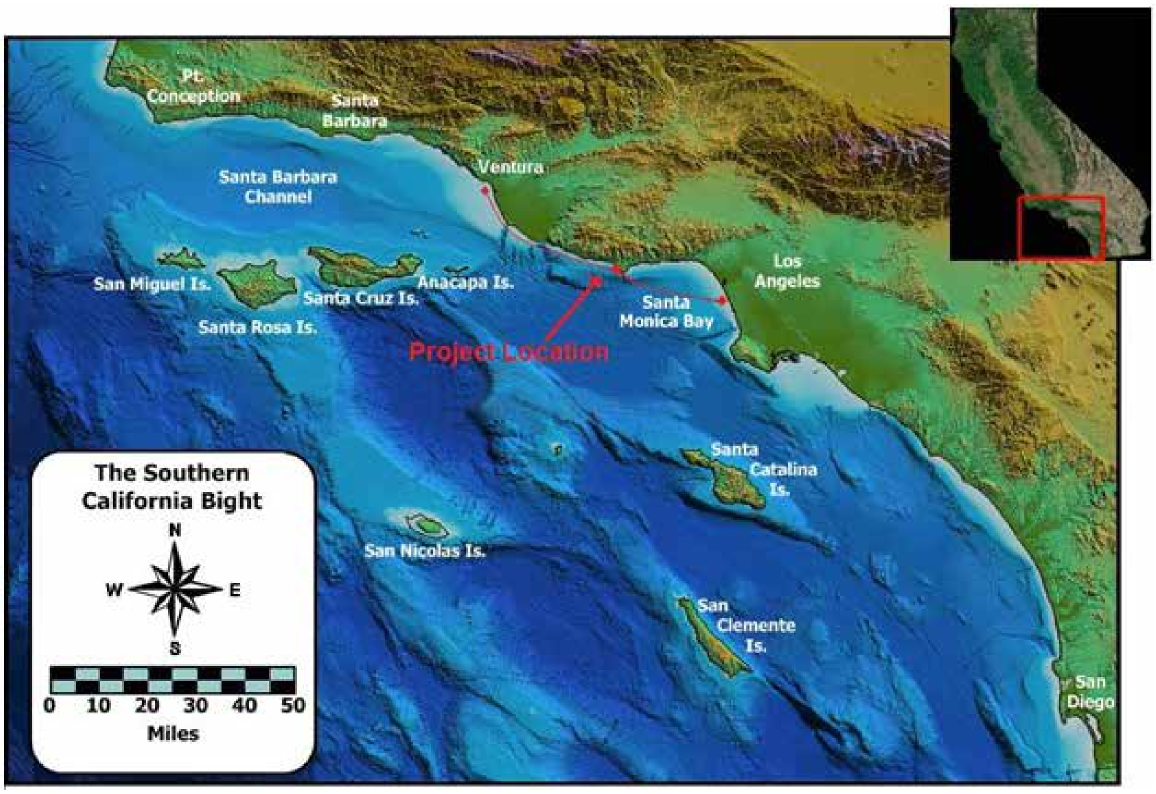
Intertidal and offshore lands and waters of the State and marine biological resources are key public trust resources, supporting intrinsic wildlife values and the public's right to commercial and recreational use and enjoyment of these resources. In the immediate Broad Beach area, these include the intertidal zone along Broad Beach and the waters offshore. Similarly, on beaches down coast from Broad Beach, public trust resources include offshore waters and State tidelands.

The beaches and offshore waters of the Public Trust Impact Area provide significant public resources, any changes to which could affect the public's interest in and ability to use these public resources. The California Supreme Court in *National Audubon Society v. Superior Court (1981) 685 P.2d 709* stated that the "core of the public trust doctrine is the State's authority as sovereign to exercise a continuous supervision and control over" the lands, waters and underlying intertidal lands of the State to protect ecological and recreational values, including the use and enjoyment of these lands. California's Constitution also establishes the right of the public to access and use public trust lands (Cal. Const. Article X, Section 4; Cal. Const. Article I, Section 25).

Broad Beach Area Overview

Broad Beach and its intertidal zone, as well as offshore waters and submerged lands, are located within a geographic region commonly known as the Southern California Bight (SCB), where the north-south trending coastline found off much of western North America experiences a significant curvature or indentation south of Point Conception. The SCB includes coastal Southern California, the Channel Islands, and the local portion of the Pacific Ocean (see Figure 3.3-1).

Figure 3.3-1. Project Location within the Southern California Bight



The portion of the Pacific Ocean that occupies this region, from Point Conception in the north to just past San Diego in the south and extending offshore of San Nicolas Island, is characterized by complex current circulation patterns and a diverse range of marine habitats. The mainland coast and offshore islands contain rocky shores, long stretches of sandy beach, and numerous embayments. A series of submarine canyons, ridges, and basins that exceed depths of several thousand feet lies between the mainland and islands. The variety of habitats found in the SCB allows rich and varied marine life.

Marine biological resources in the vicinity of Broad Beach can be described in terms of three major habitat areas: open ocean, subtidal (soft-bottom and hard-bottom seafloor), and intertidal shoreline. Within the SCB, each of these three biological habitats is exceptionally diverse and productive. For example, many of the more than 600 fish species reported along the Pacific Outer Continental Shelf (OCS) region occur within the SCB. Eelgrass (*Zostera* spp.) beds, considered to be one of the most productive habitat types found on soft-bottom substrate, occur along the protected shoreline of the SCB, while rocky nearshore substrates often support dense stands of kelp (*Macrocystis* spp.) (see Figure 3.3-4). Additionally, every year more than 27 species of whales and dolphins visit or inhabit the region, including blue whales (*Balaenoptera musculus*), humpback whales (*Megaptera novaeangliae*), and gray whales (*Eschrichtius robustus*). Several species of marine mammals and numerous seabird species preferentially use the shores of the nearby Channel Islands and rocky outcroppings along the mainland coast as haul-outs and rookeries. The following discussion summarizes the various habitats, marine flora, and fauna, rare and endangered species, and other protected species that exist in the vicinity of Broad Beach. This section discusses marine biological resources in the context of their associated habitat, and is organized into the following sections: open-ocean, subtidal (soft-bottomed and hard-bottomed seafloor), and intertidal shoreline. Following the sections regarding habitats and associated biota, there is a discussion of Marine Managed Areas (MMAs).

<u>Open-Ocean Habitat and Biota</u>

Open-ocean, or pelagic, habitat refers to the coastal and open-ocean regions of water above the benthos and away from the shoreline. Organisms using resources in this zone often spend most, if not all, of their lives in a three-dimensional matrix of water, rarely encountering any substrate on which to attach or subsist. This section describes the organisms that are found in the open ocean offshore Broad Beach.

Plankton

Plankton are aquatic organisms that have either limited or no swimming ability and therefore drift or float with the ocean currents. Plankton include both phytoplankton (plants) and zooplankton (animals). Phytoplankton, or plant plankton, form the base of the marine food web by photosynthesizing organic matter from water, carbon dioxide, and light. Phytoplankton are usually unicellular or colonial algae and provide a food source for zooplankton and fish. Through their decay, phytoplankton also support large quantities of marine bacteria. Zooplankton, or animal plankton, are the primary link between phytoplankton and larger organisms in marine food webs. Zooplankton include a wide array of organisms that may spend all or only a portion of their life cycle as plankton. All zooplankton, including the larval stages of larger organisms, consume other organisms or organic material.

Plankton distribution in California waters tends to be patchy and is characterized by high seasonal and inter-annual variability. Generally, plankton distribution, abundance, and productivity are dependent on light, nutrients, water quality, terrestrial runoff, and upwelling. Data from several studies (e.g., Bolin and Abbott 1963, Allen 1945) have indicated that the phytoplankton community is similar in species composition along the entire coast of California. Dinoflagellates are usually dominant in the water column; however, diatoms may dominate the community under certain circumstances, such as during upwelling conditions or after intense rainstorms (MBC Applied Environmental Sciences [MBC] 1994).

Fish

Fish are generally separated into two major groups based on whether they have a bony skeleton (Class Osteichthyes) or rely on cartilage for support (Class Chondrichthyes), (e.g., sharks and rays). The dominant pelagic bony fish species in the area are comprised of Pacific or chub mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), northern anchovy, and Pacific sardine. These species are also the primary targets of the Southern California commercial fishing industry. Meanwhile, sharks are the dominant cartilaginous fish in the pelagic environment throughout the region, although their abundance has declined in recent decades.

Epipelagic Fish

Epipelagic fish reside in the open ocean down to depths of approximately 655 feet, where waters are well mixed and support photosynthetic algal communities (i.e., they are well lit). Many epipelagic species within the SCB, including large predators (e.g., tuna, sharks, swordfish, and forage fish) such as northern anchovy, Pacific sardine, Pacific saury (*Cololabis saira*), and Pacific hake (*Merluccius productus*), are widely distributed along the California coast. Some species, such as albacore tuna and salmon, are known to migrate extensively over vast areas of the Pacific. Pelagic sport fish such as yellowtail (*Seriola lalandi*) and Pacific barracuda (*Sphyraena argentea*) are migratory species that move northward in the spring and summer and are often particularly abundant off the coast during El Niño years. In contrast, other species, such as rockfish (Scorpaenidae), may live out their entire lives around the offshore oil platforms and natural reefs within the region.

Other species found in Santa Monica Bay include queenfish, jacksmelt (*Atherinopsis californiensis*), and topsmelt (*Atherinops affinis*) in shallow depths, and rockfish (*Sebastes* spp.) along the outer shelf. White croaker and white seaperch (*Phanerodon furcatus*) school in the water column but feed on the bottom. Vermillion rockfish (*Sebastes miniatus*), bocaccio (*Sebastes paucispinis*), and sablefish (*Anoplopoma fimbria*) feed in the water column at night but remain associated with the bottom during the day (MBC 1993).

At least 40 species of sharks and rays are known to occur in the greater SCB region. Some large sharks may inhabit the SCB during seasonal migrations, while others may permanently reside in the area. Many smaller sharks and rays are permanent residents of the nearshore coastal areas. Leopard sharks (*Triakis semifasciata*), for example, are one of the most common sharks in California bays and estuaries and along Southern

California beaches. They are a popular sport fish in nearshore waters, where they are commonly caught from piers and jetties. Historically, the most abundant sharks in the region include blue sharks (*Prionace glauca*), thresher sharks (*Alopias vulpinus*), and basking sharks (*Cetorhinus maximus*). Shark species also support several important regional commercial fisheries, most notably thresher, mako (*Isurus* spp.), and blue sharks. Large great white sharks (*Carcharodon carcharias*) are uncommon in Southern California; however, several of the juvenile white sharks displayed at the Monterey Bay Aquarium in the past decade were captured from the waters in or near Santa Monica Bay. White sharks are thought to give birth in Southern California waters, and use inshore waters as a nursery area. Great white sharks feed on fish, rays, and small sharks.

Demersal Fish

The extensive soft-bottom habitats within Santa Monica Bay support an abundant and diverse assemblage of more than 100 species of demersal (living on or just above the bottom) fish. Flatfish (Families Pleuronectidae, Paralichthyidae, Cynoglossidae, and Bothidae), rockfish (Family Scorpaenidae), sculpins (Family Cottidae), combfish (Family Zaniolepididae), and eelpouts (Family Zoarcidae) make up most of the soft-bottom fish fauna in the Bay (MBC 1993). The inner shelf assemblage is dominated by speckled sanddab (*Citharichthys stigmaeus*), the middle shelf by stripetail rockfish (*Sebastes saxicola*), and the outer shelf by slender sole (*Lyopsetta exilis*) (Allen 1982).

Dominant species collected in otter trawl surveys along the 20-, 40-, and 60–foot isobaths near Scattergood and El Segundo Generating Stations in 1988 included white croaker, queenfish, speckled sanddab, spotted turbot (*Pleuronichthys ritteri*), and California halibut (Orange County Sanitation District [OCSD] 1989). The following year, 1989, otter trawl surveys near the Hyperion Treatment Plant distinguished five demersal fish assemblages in the area. The dominant species found nearshore included horneyhead turbot (*P. verticalis*), speckled sanddab, California tonguefish (*Symphurus atricauda*), white croaker, and California halibut.

Protected Fish Species

California Grunion. The California grunion, is the subject of a unique recreational fishery in the region and is protected under the Malibu General Plan, which recognizes their spawning grounds as a sensitive marine resources. Additionally, although grunion are not listed as threatened or endangered, NMFS requires that their eggs be protected from disturbance. This small inshore fish is endemic to Southern California, and serves as a significant food source for larger nearshore fish. The species is unusual because it comes ashore on sandy beaches to spawn. Female grunion can spawn as many as six times during a season, laying between 1,600 and 3,600 eggs each time, with larger females producing more eggs.

Spawning generally occurs from March through August, peaking from April through June, and coincides with the peak of the high tide during and just after high spring tides (tides of highest magnitude during new and full moons). During these high tides, spawning females come ashore and use their tails to dig in to the moist sand high up in the intertidal zone to lay their eggs. A number of males then curl around the embedded female and attempt to fertilize the eggs. The adult fish leave on succeeding waves while the eggs remain. The grunion eggs incubate in the sand during the lower tide levels, kept moist by residual water in the sand. There, they are safe from the disturbance of wave action until the next spring tides, approximately 10 days to 2 weeks later. During these high tides, as water agitates and inundates the eggs, they hatch and the larvae are carried out to sea. Grunion are harvested by hand as they come ashore to spawn.

Grunion runs were monitored at Broad Beach between March and August 2010 (Buena 2010). While no grunion were observed in the Broad Beach area due to the lack of a beach during spring tides, grunion were observed to spawn just east of Broad Beach on Zuma Beach near Trancas Creek (Buena 2010).

Marine and Coastal Birds

The SCB supports a rich population of seabirds (Baird 1993), providing a major foraging area for both residents and migrants. Much of the taxonomic diversity in the region arises because the SCB acts as the transition zone between two zoogeographic provinces. The northern portions of the SCB (i.e., the Santa Barbara Channel), support boreal seabird populations, such as Cassin's auklets, that are more characteristic of colder regions as far north as the Gulf of Alaska. Conversely, the Channel Islands also harbor important nesting colonies for subtropical seabirds, such as those found in the Gulf of California. The latter include California's entire nesting populations of both the recently delisted California brown pelican (*Pelecanus occidentalis californicus*), and the State-threatened Xantus's murrelet (*Synthliboramphus hypoleucus*). Both species have southern breeding distributions and also nest on islands off Baja California. As such, the distribution of the various seabird taxa within the region exhibits substantial seasonal and spatial variation (Pierson et al. 1999, Marine Mammal Center 2001).

Seabirds can be segregated into two main groups, coastal and pelagic. Coastal seabirds feed in the pelagic realm but tend to remain within approximately 5 miles of the mainland shore. Common coastal seabirds include Western and Clark's grebes, surf scoters (*Melanitta perspicillata*), cormorants (*Phalacrocorax* spp.), loons (*Gavia* spp.), California brown pelicans, and gulls (Subfamily Laridae). The highest coastal seabird densities occur in the SCB during winter months. However, California brown pelican populations generally peak in the summer months when birds from larger Mexican colonies migrate northward.

In contrast, pelagic seabirds spend most of their time farther from shore. As with coastal seabirds, they spend much of their time on the sea surface or diving into the water column to feed. Some of the most common offshore birds in the region include: shearwaters (*Puffinus* spp.), northern fulmars (*Fulmarus glacialis*), phalaropes (*Phalaropus* spp.), jaegers (*Stercorarius* spp.), and common murres (*Uria aalge*). Storm-petrels (*Oceanodroma* spp.), puffins (*Fratercula* spp.), and auklets (Family Alcidae) also frequent the offshore waters of Broad Beach. Seasonal population peaks vary among the taxa, but pelagic seabirds, as a group, are comparatively stable (Marine Mammal Center 2001). Most seabird rookeries in the region are located on offshore islands, predominately the northern Channel Islands; few, if any, seabirds nest on the mainland coast of the SCB (Carter et al. 1992).

Feeding strategies vary among seabirds, with California brown pelicans and terns, including the endangered California least tern (*Sterna antillarum browni*), diving into the water from the air to catch fish, while cormorants (*Phalacrocorax* spp.), murres, puffins, and auklets dive from the sea surface in pursuit of fish and zooplankton. Red-necked phalaropes (*Phalaropus lobatus*) feed at the sea surface using a characteristic spinning pattern that causes fish eggs and other planktonic species to accumulate immediately underneath them.

In October 2012 and June 2013, bird transects were conducted along Broad Beach (Chambers Group 2012b, 2013a). During the two surveys, 19 bird species were observed on Broad Beach either offshore or flying over the site. The most abundant species observed during the 2012 bird transects was black-bellied plover, followed by western gulls and Heermann's gulls (Chambers Group 2012b). Three marine bird species—ring-billed gull (*Larus delawarensis*), snowy egret (*Egretta thula*) and willet (*Catophorus semipalmtus*)—were observed on Broad Beach after the transects had been completed (Chambers Group 2012b). During the 2013 survey the most abundant species was western gull followed by brown pelican (Chambers Group 2013a). Table 3.3-1 lists the bird species found at Broad Beach during these transect surveys.

During the 2012 and 2013 surveys at Broad Beach, additional bird transect surveys were carried out at El Matador State Beach transects, located approximately 0.75 miles west of the Broad Beach area. A total of 11 bird taxa were observed at El Matador State Beach during the 2012 survey. The majority of these species were the same bird species observed during the survey at Broad Beach and listed in Table 3.3-1. However, spotted sandpiper, black-crowned night heron, western grebe, marbled godwit, and royal tern were not observed at El Matador during either survey. Additionally, Forster's tern (*Sterna forsteri*), ring-billed gull (*Larus delawarensis*), snowy egret (*Egretta thula*) and an unidentified tern (*Sterna* sp.) were found at El Matador and not at Broad Beach (Chambers Group 2012b, 2013a). The most numerous bird species observed during the El Matador surveys was Brandt's cormorant in 2012 (Chambers Group 2012b) and Heermann's gull in 2013 (Chambers Group 2013a).

Table 3.3-1. Bird Species Observed at Broad Beach during 2012 and 2013 Transect Surveys

Common Name	Scientific Name	Observed in 2012	Observed in 2013
American crow	*Corvus brachyrhynchos*		ü
Black-bellied plover	*Pluvialis squatarola*	ü	
Black-crowned night heron	*Nycticorax nycticorax*	ü	ü
Black phoebe	*Sayornis nigricans*		ü
Brandt's cormorant	*Phalacrocorax pencillatus*	ü	ü
Brown pelican	*Pelecanus occidentalis*	ü	ü
Cliff swallow	*Petrochelidon pyrrhonota*		ü
Double-crested cormorant	*Phalacrocorax auritus*		ü
Great egret	*Casmerodius albus*	ü	
Gull	*Larus* sp.		ü
Heermann's gull	*Larus heermanni*	ü	ü
Marbled godwit	*Limosa fedoa*	ü	
Northern rough-winged swallow	*Stelgidopteryx serripennis*		ü
Parrot	*Amazona* sp.		ü
Royal tern	*Sterna maxima*	ü	
Spotted sandpiper	*Actitis macularia*	ü	
Western grebe	*Aechmophorus occidentalis*	ü	ü
Western gull	*Larus occidentalis*	ü	ü
Whimbrel	*Numenius phaeopus*	ü	

Sources: Chambers Group 2012b, 2013a.

Protected Marine Bird Species

Descriptions are provided below for the special status marine bird species that are reasonably likely to be encountered offshore Broad Beach. Seabird species occurring in the Project vicinity that are protected under either the State or Federal Endangered Species Acts (ESA) include the State threatened Xantus's murrelet (*Synthliboramphus hypoleucus*), and the State endangered bald eagle (*Haliaeetus leucocephalus*). Table 3.3-2 includes several additional seabirds classified as species of concern by CDFW.

Table 3.3-2. Special Status Seabirds Occurring in the Broad Beach Area

Common Name	Scientific Name	Status
Bald eagle	*Haliaeetus leucocephalus*	State Endangered, SFPS, BGEPA [1]
Xantus's murrelet	*Synthliboramphus hypoleucus*	State Threatened
California brown pelican	*Pelecanus occidentalis californicus*	SFPS[1]

Notes: SSC = State Species of Special Concern; SFPS = State Fully Protected Species; BGEPA = Bald and Golden Eagle Protection Act

[1] Delisted from the Federal ESA in 2007.

[2] Delisted from the Federal ESA in 2009.

Finally, although the California brown pelican was delisted from both the Federal and State endangered species lists in 2009, it remains a State Fully Protected Species (SFPS) under the California Fish and Game Code. Special status shorebirds, such as the western snowy plover and California least tern, are addressed in Section 3.4, *Terrestrial Biological Resources*.

Bald Eagle. The bald eagle is generally found in coastal areas in California or near large inland lakes or rivers that have abundant fish. Coastal bald eagles nest near the shoreline, and hunt for food over the water using their talons to capture aquatic prey. Until 2007, the bald eagle was a listed species protected under the Federal ESA; however, it currently remains listed as an endangered species in California. Additionally, bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). While bald eagle population precipitously declined earlier this century, this species has now successfully nested on four of the Channel Islands, Catalina, Santa Cruz, Anacapa, and Santa Rosa. The population of bald eagles on the Channel Islands is currently believed to number between 60 and 70 birds. Bald eagles range widely throughout the year, with many of the island residents making forays or extended visits to the mainland, including in the vicinity of the Broad Beach area.

Xantus's Murrelet. The Xantus's murrelet is a small diving bird of the family Alcidae, which includes puffins and murres. It is listed as threatened by the State of California, and is currently a candidate for listing under the Federal ESA because of its limited breeding range, small and declining global population size, and vulnerability to multiple threats, including predation, oil spills, and loss of habitat (Wolf et al. 2005). The murrelet breeds on islands between Point Conception, California, and Punta Abreojos in Baja California. The entire global population is currently estimated between 5,000 and 10,000 breeding pairs, while approximately 3,000 birds breed on the Channel Islands, primarily Santa Barbara Island.

Murrelets subsist on zooplankton and small fish including northern anchovies, sardines, rockfish, Pacific sauries, and crustaceans. They spend most of their lives at sea, far from the mainland, and come ashore only to breed. Their nesting period extends from February through July, but may vary depending on food supplies. During the nesting season, they forage in the immediate vicinity of the colony. Nests are located in natural rock crevices or under shrubs, especially along or near cliffs.

Current threats to the population of Xantus's murrelet include native and non-native predators and competitors, oil pollution, changes in oceanography and prey availability, and by-catch in fisheries. Recently, concerns have also arisen over the effects of artificial light pollution from fishing and other vessels that overnight near the island colonies, potentially attracting birds to their death by collision or contamination aboard ship.

California Brown Pelican. California brown pelicans are large, fish-eating birds commonly seen foraging in the nearshore waters from British Columbia to southwest Mexico. Nesting colonies of brown pelicans are located from the Channel Islands south to the islands off Nayarit, Mexico. While the majority of nesting takes place in Baja California, some occurs on the Channel Islands (Garrett and Dunn 1981, U.S. Fish and Wildlife Service [USFWS] 2008).

Estimates of the U.S. breeding population size for the brown pelican were approximately 6,000 pairs in 1991 (Carter et al. 1992). However, in 2006 approximately 11,695 breeding pairs were documented at ten locations throughout the SCB (USFWS 2008). The Channel Islands are known to support a range of 5,000 to 12,000 nesting pairs during 2004-2006 (National Park Service [NPS] 2008).

A formally listed species, the pelican was delisted, but retains Federal protection under the Migratory Bird Treaty Act (MBTA) and is a fully protected species under California Fish and Game Code section 3511.

Marine Turtles

Though uncommon in the region, four species of marine turtles are known to inhabit the waters off the northeastern Pacific Ocean off the coast of California, all of which are protected under the Federal ESA (see Table 3.3-3). The leatherback is the most frequently encountered turtle offshore of California, followed by the green, loggerhead, and olive ridley sea turtles (Stinson 1984); however, most leatherback sightings are concentrated north of Point Conception. Within the central and southern portions of the SCB, including the Project vicinity, green and loggerhead turtles are the most commonly encountered species. Marine turtles in the SCB generally occur in greatest abundance from July through September.

Table 3.3-3. Marine Turtle Species in Southern California Waters

Common Name	Scientific Name	Occurrence in SCB	Likelihood at Site	Protected Status
Green turtle	*Chelonia mydas*	Uncommon	Possible	Federal Threatened. Breeding populations in Mexico are listed as Federal Endangered
Loggerhead turtle	*Caretta caretta*	Uncommon	Possible	Federal Endangered
Olive ridley turtle	*Lepidochelys olivacea*	Uncommon	Possible	Federal Threatened. Breeding populations in Mexico are listed as Federal Endangered
Leatherback turtle	*Dermochelys coriacea*	Uncommon	Unlikely	Federal Endangered

Sources: National Oceanic and Atmospheric Administration (NOAA) 2007, Caretta et al. 2005.

Green Turtle (*Chelonia mydas*). Green turtles are the most commonly observed marine turtle along the Southern California coast. Although there are no nesting beaches on the west coast of the U.S., two permanent colonies of turtles are currently known to exist in the region. One colony of 60 to 100 turtles resides in San Diego Bay, while another group of approximately 30 turtles is now recognized as residing where warm water is discharged into the brackish mouth of the San Gabriel River from a Long Beach power plant (the Los Angeles Department of Water and Power’s Haynes Generating Station). Green sea turtles are also occasionally seen elsewhere along the California coast, usually in El Niño years when the ocean temperature is higher than normal.

Loggerhead Turtle (*Caretta caretta*). Loggerhead turtles, so named for their relatively large heads, are a cosmopolitan species, found in temperate waters and inhabiting pelagic waters, continental shelves, bays, estuaries, and lagoons worldwide. California sightings of loggerhead turtles generally consist of juveniles that have crossed the Pacific Ocean after hatching on beaches in southern Japan (Stebbins 2003). Sightings off Southern California are typically confined to the summer months, peaking from July to September. However, sightings may occur throughout much of the year during El Niño events when ocean temperatures rise.

Olive Ridley Sea Turtle (*Lepidochelys olivacea*). The olive ridley sea turtle is considered the most abundant sea turtle in the world, with an estimated 800,000 nesting females annually (National Oceanic and Atmospheric Administration [NOAA] 2013b). The olive ridley sea turtle gets its name from the olive coloration of its heart-shaped top shell. This species is mainly pelagic, but has been known to inhabit coastal areas, including bays and estuaries (NOAA 2013b). Olive ridleys are globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. In the Eastern Pacific, they occur from Southern California to Northern Chile (NOAA 2013b).

Leatherback Sea Turtle (*Dermochelys coriacea*). Similar to olive ridley sea turtles, leatherback sea turtles are commonly known found in pelagic waters, but they also forage in coastal waters. Leatherback sea turtles are the most migratory and wide ranging of sea turtle species. Found mostly in tropical waters, they move into temperate waters during the summer. They have been recorded from cold waters in Norway, Iceland, and Alaska. Leatherbacks in the Pacific Ocean are generally smaller in size than leatherbacks in the Atlantic Ocean (NOAA 2013a). Leatherback sea turtles can occur almost anywhere on the coast of California, but most sightings are not documented. Most sightings in California occur from boats out at sea. Locations where leatherback sea turtles have been observed in California include areas as far south as San Diego County and as far north as Marin County (California Herps 2014). The Broad Beach area is located in federally designated critical habitat for leatherback sea turtles; however, this species is not likely to occur within the immediate vicinity of Broad Beach.

Marine Mammals

Because of its transitional location between the cooler (Oregonian) zoogeographic province to the north of Point Conception and the subtropical (San Diegan) province to that comprises most of Southern California's waters, the Project vicinity supports a variety of marine mammals. Marine mammals reported within the area are represented by more than 40 species, all of which are protected under the Marine Mammal Protection Act (MMPA). These include 34 species of cetaceans (whales, dolphins and porpoises) and six species of pinnipeds (seals and sea lions) (Carretta et al. 2005, Leatherwood et al. 1982 and 1987, Leatherwood and Reeves 1983). The southern sea otter (*Enhydra lutris nereis*), a representative of the weasel family, Mustelidae, is also found in the region. Six species of cetaceans are federally listed as endangered, while two species of pinnipeds and the southern sea otter are listed as threatened under the Federal ESA.

Marine mammal species in the SCB can be classified into three categories: (1) migrants that pass through the area on their way to calving or feeding grounds; (2) seasonal visitors that remain for a limited time; and (3) residents that remain much or all of the year. Five whale species transit waters offshore Broad Beach during annual migrations, while all but one of the dolphin species have resident populations within the area. Since no Project activities beyond the beach nourishment footprint would occur offshore, descriptions of whale and dolphin species present in the SCB are not provided.

California sea lions are the most abundant pinnipeds offshore Southern California and are the most commonly sighted pinniped in the Project vicinity. California sea lions maintain rookeries on the offshore islands, including San Miguel Island, and frequently rest on nearshore rocks and navigation buoys. Harbor seals are also very common along the Southern California coast and may come into bays and harbors, but do not exhibit the overt social behavior of sea lions. Along the outer coast, both species haul out on offshore rocks or may rest on sand bars at low tide. Unlike the wider-ranging sea lions, however, harbor seals forage relatively close to shore, with 75 percent remaining within 6.2 miles of the shoreline (Marine Mammal Center 2001). Harbor seal rookeries are mostly located in central and northern California, with the nearest established rookeries located on the Channel Islands, at Carpinteria, and near San Diego.

Broad Beach is located near the geographic middle of the SCB. As such, marine mammal species whose extreme range limit is the SCB, such as the northern fur seal, northern elephant seal, and Steller sea lion, are not likely to be encountered.

<u>Subtidal Habitats and Biota</u>

As discussed in Section 3.5, *Marine Water Quality*, most of the deep seafloor within Santa Monica Bay consists of unconsolidated (soft) sediments (various mixtures of sand, silt, and clay) overlying a moderately sloping bottom, while the nearshore areas consist of sandy and soft-bottom sediments. The Santa Monica Bay has two major rocky headlands, Malibu and the Palos Verdes Peninsula (Claisse et al. 2008). Cobble and gravel substrates are restricted to the innermost shelf south of El Segundo and limited parts of the shelf edge. Patches of sand and gravel are interspersed with rocky substrates on the high-relief marginal plateau and along parts of the shelf break just offshore Malibu (Edwards et al. 2003). Limited regions of hard-bottom substrate and kelp beds exist at the periphery of Santa Monica Bay, including near Broad Beach at Lechuza Point (Allen 1982, Terry et al. 1956) (see Figure 3.3-2).

Small percentages (1 to 5 percent) of the total area of each of the MPAs designated in the vicinity of Broad Beach contain the shallow rocky reef habitat (Table 3.3-4). While this critical habitat makes up only a few percent of the newly designated MPAs in the region, it supports substantial regional fisheries (Claisse et al. 2008).

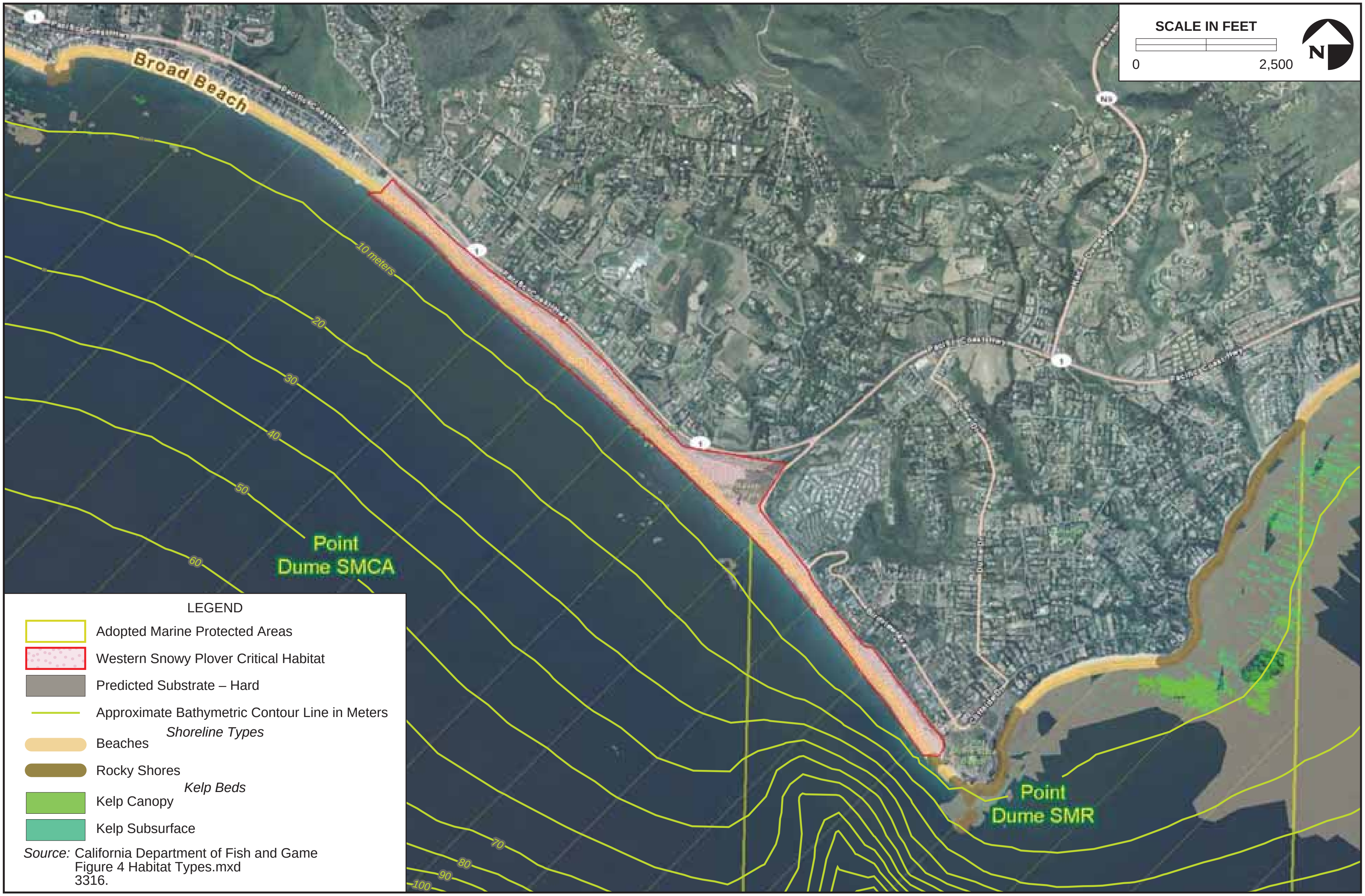
Table 3.3-4. Rocky Reef Habitat within MPAs in the Vicinity of Broad Bach

MPA	Rocky Reef Area (acres)	Percent of MPA Area	Percent of Regional Mapped Habitat
Point Dume SMCA	39.3	1.0%	1.7%
Point Dume SMR	95.7	4.9%	4.3%

Source: Claisse et al. 2008.

The subtidal habitat areas offshore Broad Beach were determined using aerial photography analysis, dive transect surveys, and sonar surveys, occurring primarily in 2012, 2013, and 2014. Marine habitat coverage in this area, particularly with regards to intertidal and shallow subtidal habitats, is highly dependent on storm cycles, wave action, and sand coverage. As longshore sand transport varies on daily, seasonal, annual, and decadal cycles, coverage of various marine habitats in these areas also varies on these timescales. For example, exposure of rocky intertidal habitats in Lechuza Cove varies substantially between seasons with this area sometimes dominated by sand. Additionally, the extent of kelp forest is known to vary considerably over time, due largely to major storms, which can dislodge kelp hold-fasts, and climatic factors, such as El Niño cycles, which vary water temperatures and storm intensity. As such, habitat surveys in dynamic intertidal and shallow subtidal areas should be considered snapshots that can be affected over time by the factors described above.

Differences in survey techniques can also artificially result in variability in mapped habitat at Broad Beach. For example, subtidal reef habitat was estimated using transect surveys in 2012. While kelp canopy offshore Broad Beach was previously estimated by aerial photography (CDFW 2009), side scan sonar surveys in 2014 revealed the presence of kelp at a higher resolution, contributing to the increase in kelp observed since 2012. While there was likely some increase in subtidal reef habitat due to natural scouring of subtidal sand offshore, the increased resolution provided by side scan sonar surveys may have resulted in the observed increase in habitat between 2012 and 2014.



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Shoreline Habitats near the Project Site

FIGURE 3.3-2

Soft-bottom Habitats

The soft-bottom habitat of the region supports a diverse and abundant infauna (animals that live in the substrate), with as many as 1,200 infaunal species having been reported from Santa Monica Bay (Dorsey 1988). The abundance and distribution of infauna varies seasonally and interannually; however, infauna at Broad Beach are usually dominated, in both number of species and individuals, by polychaete worms. Other important infaunal groups in the region include crustaceans, mollusks, and echinoderms (Phylum Echinodermata).

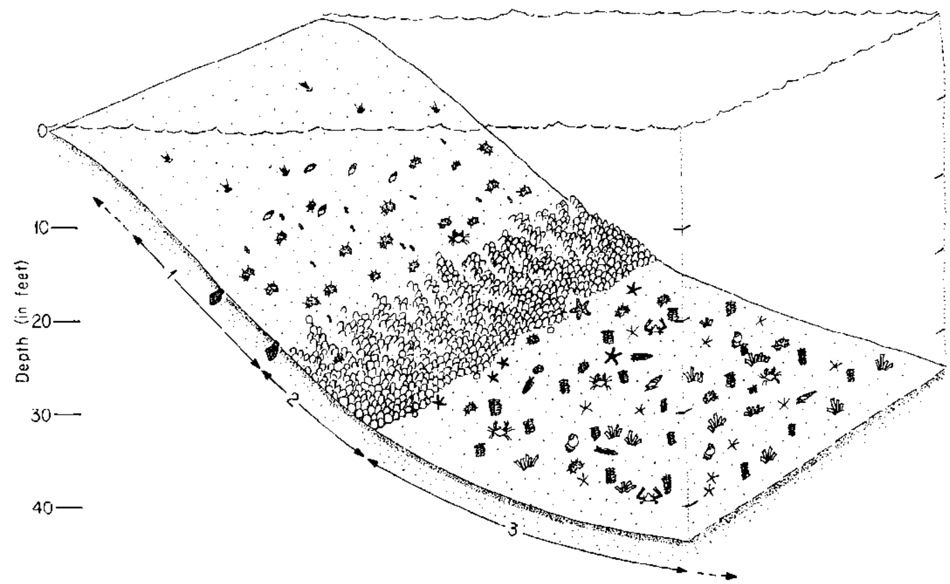
Most polychaetes either feed on the bottom by engulfing sediments and digesting the attached bacteria, filter feed on bits of organic detritus in the water, or prey on other infauna (Morris et al. 1980). For example, the blood worm (*Glycera dibranchiata*) is an infaunal polychaete that feeds on bacteria, microalgae, and smaller invertebrates beneath the sand. Polychaetes play an important role in reworking the sediments and are important constituents in the diet of many demersal fish.

Epibenthic (living on the bottom) invertebrates of the Bay include sea stars, sea cucumbers, sand dollars (*Dendraster excentricus*), sea urchins, crabs, snails, and sea slugs. These organisms are larger than infaunal species, generally less common and, therefore, spaced further apart. However, sand dollars and sea urchins often occur in very dense, single-species patches that limit the abundance of other species. Historically, the area offshore Zuma Beach east of the Broad Beach area, has supported nearshore populations of sand dollar beds, Pismo clam beds and a biological zonation of the supporting habitat that varies with both depth and wave action (see Figure 3.3-3; Morin et al. 1985, 1988).

During a 2010 subtidal survey of Broad Beach (Chambers Group 2012c), sand dollar beds were observed at depths of between 10 and 14 feet along the eastern half of the site. Other characteristic organisms observed in this sand bottom habitat were tube worms (*Diopatra ornata*), sea pens (*Stylatula elongate*), sea pansies (*Renilla kollikeri*) and several species of crabs (*Cancer gracilis, Randallia ornata,* and *Heterocrypta occidentalis*). These species were also observed during subtidal dive surveys conducted in June 2014 (Moffatt & Nichol 2014).

Bivalves in the region include the aforementioned Pismo clams (*Tivela stultorum*), along with Pacific littleneck clams (*Leukoma staminea*), and Gould bean clams (*Donax gouldi*). Pismo clams have occurred historically in the shallow sand bottom habitats off the eastern end of Broad Beach and are most common at depths of 10 to 20 feet, while the Pacific littleneck clam, is found in coarse sand and gravel near rocky areas (Morin and Harrington 1979, Blunt 1980). Pismo clams are an important invertebrate species that once supported a significant commercial fishery, along with an extremely popular recreational fishery that still exists today.

Figure 3.3-3.
Biological Zonation of Nearshore Sandy Bottom Habitat near Broad Beach



Species	Zone
Spiny Sand Crab (Blepharipoda occidentalis)	1
Purple Olive Snail (Olivella biplicata)	1
Pismo Clam (Tivela stultorum) [side view]	1
Pismo Clam (Tivela stultorum) [surface view]	1
Sea Pansy (Renilla kollikeri)	1,3
Purple Crab (Cancer gracilis)	1-3
Sand Dollars (Dendraster excentricus)	2
Pink Star (Pisaster brevispinas)	2

Species	Zone
Shallow Sand Star (Astropecten armatus)	2,3
Deep Sand Star (Astropecten verrilli)	3
Carpenter's Turrid (Megasurcula carpenteriana)	3
High Moon Snail (Polinices altus)	3
Pansy Nudibranch (Armina californica)	3
Sea Pen (Stylatula elongata)	3
Gray Tube Worm (Diopatra ornata)	3
Elbow Crab (Hetero crypta occidentalis)	3

Primarily as a result of overharvesting and habitat degradation, declines in abundance have occurred in all three clam species (Shaw and Hassler 1989, Chew and Ma 1987, CDFW 2006). Although no live Pismo clams were observed during the 2010 or 2014 dive surveys conducted at Broad Beach by Chambers Group (Chambers Group 2010, Moffatt & Nichol 2014), empty shells were observed suggesting that this species may still be present in the area.

The most obvious sandy intertidal crustacean in the area is the sand crab (*Emerita analoga*), which is collected commercially for fishing bait and is also an important food source for fishes that live in the surf zone. Individuals of this species burrow in the wave swash zone of high-energy sandy beaches where they often occur in dense aggregations (many thousands per square yard). Sand crabs are prey for a number of shorebirds and several species of fish including California corbina (*Menticirrhus undulatus*), barred surfperch (*Amphisticus argenteus*), and black croaker (*Cheilotrema saturnum*).

Most of the variability in infaunal populations is natural and is difficult to separate from variability associated with human impacts (Reish et al. 1980). However, any disturbance of the sediments or oceanographic change is likely to affect benthic soft-bottom invertebrate populations. For example, severe storms during the El Niño period in 1983 may have been responsible for changes in the invertebrate assemblage of the SCB, including areas off the Palos Verdes Peninsula (Swartz et al. 1986).

Hard-bottom Habitats

Extensive reefs are known to occur off Lechuza Point, with the reefs becoming increasingly scattered proceeding east from Lechuza Point. Based on the December 2012 subtidal reef survey, approximately 4.6 acres of subtidal reef occur adjacent to the Broad Beach area (Chambers Group 2012c). However, seasonal, annual, decadal coastal processes at Broad Beach are constantly shifting and scouring sand offshore, resulting in periodic increases in rocky subtidal habitat exposure. During the side scan sonar survey conducted in May 2014, approximately 20.2 acres of rocky subtidal habitat was documented, representing a variability of 15.6 acres in this habitat type over the course of 2 years. Variability in habitat area between these survey events is likely due to some combination of differences in survey techniques, as well as variable sand coverage. The reefs adjacent to the Broad Beach area are indurated rock reefs notable for the general physical heterogeneity created by large igneous bed rock protrusions, which produce cliffs, overhangs, cracks and crevices. The major reef blocks usually run parallel to shore and are interspersed with large sand flats (Chambers Group 2012a).

Rocky reefs are important to algal, invertebrate, and fishery species. While rocky reefs are a relatively rare benthic habitat, such habitats support groundfish populations. Key habitats associated with the rocky substrate include kelp forests and associated algal communities which are key elements of the ecosystem and provide important groundfish habitat. Kelp forest is known as a nursery, feeding ground, and shelter for a range of groundfish species and their prey (Ebeling et al. 1980, Feder et al. 1974). Giant kelp communities are known as highly productive habitats as compared to wetlands and areas with sandy substrate. Such habitats are net primary producers contributing to energy flow within food webs. Foster and Schiel (1985) reported that the net primary productivity of kelp beds may be the highest of any marine community.

Hard-bottom habitats host a diverse and abundant assemblage of organisms that are often unique to their habitat (MBC 1993). These areas provide substrate suitable for attachment of a variety of plants and sessile (immobile) invertebrates, as well as shelter and forage for more motile organisms (organisms that move spontaneously and actively, consuming energy in the process). Sessile species using hard-bottom substrate include mussels, rock scallops (Family Pectinidae), barnacles, sponges, sea anenomes, sea fans (Order Gorgonacea), feather duster worms (Family Serpulidae), wormsnails (Family Vermetidae), and sea squirts (Order Ascidiacea). Most of these sessile invertebrates feed by filtering plankton and detritus from the water column. Motile invertebrates, including crabs, octopuses, and shrimp hide in crevices or are protectively colored. Invertebrates associated with hard bottom substrates are frequently a food source for birds (in the exposed intertidal zone) and fish (in the subtidal zone).

At the western portions of Broad Beach, shallow water rocks and reefs, which are the most likely to be affected by beach sand, occur from the intertidal zone to about 15 feet water depth. These low reefs and isolated boulders are close to shore and are strongly affected by swell, longshore currents, sanding in, high turbidity and scour, by local runoff from the land, and even by lowered salinity from rain storms (Morin and Harrington 1979). Biological communities on these shallow rocks are often characterized by rapid turnover of species. Long-lived, sand-tolerant species typical of nearshore rocks at this depth include aggregate anemones, surfgrass, feather boa kelp and California mussels.

Nearshore reefs at depths between 15 feet and 30 feet represent a transition between shallow water reefs and offshore reefs. The most prominent species on the tops of these reefs tend to be the shrub-like intermediate-height brown kelps, such as sea palms (*Eisenia arborea* and *Pterygophora californica*) and bladder kelp (*Cystoseira osmundacea*). The sides of the reefs generally support a rich encrusting fauna of sponges, tunicates and bryozoans. Giant kelp also occurs on these nearshore reefs, and sea urchins (*Strongylocentrotus purpuratus* and *S. franciscaus*) may be abundant.

Nearshore reefs also provide substrate for giant kelp (*Macrocystis pyrifera*), feather boa kelp (*Egregia menziesii*), and palm kelp (*Pterogophora californica*), which provide additional habitat for a multitude of organisms. Since most hard bottom habitats in the Broad Beach area are of low relief, the presence of kelp often lends a vertical element to the habitat that is otherwise lacking. A shallow subtidal survey was conducted within the Broad Beach area, which identified surfgrass, eelgrass (*Zostera pacifica*), giant kelp (*Macrocystis pyrifera*), feather boa kelp (*Egregia menziesii*), southern palm kelp (*Eisenia arborea*), palm kelp (*Pterygophora californica*), and gorgonians (*Muricea californica* and *M. fruticosa*). These species are considered indicator species because they add important structure to the environment and increase the value of the habitat when they are present (Chambers Group 2012a). Similar species were also identified during targeted dive surveys conducted in June 2014 (Moffatt & Nichol 2014).

Because rocky reefs are diverse and have an abundance of unique organisms, they are typically important sites for recreational diving and fishing; California spiny lobster (*Panulirus interruptus*), yellow and Pacific rock crabs (*Cancer* spp.), red and purple sea urchins (*Strongylocentrotus franciscanus* and *S. purpuratus*, respectively), and spot shrimp/prawn (*Pandalus platyceros*) are fished recreationally in the Project region

(MBC 1993). Abalone was also fished both recreationally and commercially in the area until the 1990s.

Although spiny lobsters usually are found in rocky habitat, where they take shelter in holes and crevices, a large portion of the population migrates annually in response to changes in water temperature. During winter months, lobsters are typically found offshore at depths of 50 feet or more; however, in spring, lobsters move into warmer nearshore waters of less than 30 feet in depth. The higher temperatures in the nearshore waters shorten the development time for lobster eggs. Nearshore waters also have a more plentiful supply of food. Lobsters move back offshore during fall and early winter in response to storms that cause increased wave action in shallow water.

Over hard-bottom substrates, fish assemblages generally differ in composition relative to depth. Common shallow-water families include sea basses (Family Serranidae), surfperches, rockfishes, kelpfishes (Family Clinidae), sculpins, damselfishes (Family Pomacentridae), and wrasses (Family Labridae). In deeper waters, vermilion rockfish, bocaccio, cowcod (*Sebastes levis*), and flag rockfish (*Sebastes rubrivinctus*) dominate (Allen et al. 1976, Moore and Mearns 1980). Over 25 different fish species were observed within subtidal reef habitat offshore of Broad Beach during the June 2014 targeted dive surveys (Moffatt & Nichol 2014).

Kelp Beds

Rocky subtidal habitats in the vicinity of Broad Beach, and throughout much of the SCB, are vegetated with a variety of red and brown algae (MBC 1993). Red algae generally form a low turf or understory of coralline, foliose, and filamentous forms from shore to the edge of the photic zone. Brown algae are generally larger and form an overstory; locally, feather-boa kelp is dominant nearshore, while giant kelp dominates deeper areas of reefs, forming large beds at depths of 20 to 120 feet (CDFW 2001, Quast 1968).

Giant kelp is a large, fast-growing, perennial algae that thrives in protected nearshore waters from Baja California to Santa Cruz (Druehl 1970). Kelp usually attaches to rock outcrops or large cobbles to stay in place; however, under calm conditions kelp plants have occasionally established themselves successfully in sandy subtidal regions as well, generally by attaching themselves to worm tubes (North 1971, Chambers Group 1991).

Giant kelp beds form an important and distinct marine habitat along the rocky coastal reaches of the SCB. The rocky bottoms found offshore Leo

Key Terms

Kelp: Attaches to hard substrata and provides vertical heterogeneity important for invertebrates and fish.

Eelgrass: Found on muddy or sandy bottoms. Act as protective nursery grounds for many fish species.

Surfgrass: Found in the intertidal and subtidal zones. Surfgrass provides shelter, foraging, primary productivity, and substrate for a variety of species and can act to dissipate wave energy, providing refuge and protection for resident and transient species.

Carrillo State Beach, the Malibu coast, and along the Palos Verdes Shelf support the majority of the kelp stands within Santa Monica Bay, although individual plants occasionally manage to gain a foothold on temporarily exposed rocks along the sandy, central portions of the Bay (MBC 1993). In 2012, kelp coverage offshore Broad Beach was estimated at approximately 9.5 acres (Chambers Group 2012a). However, surveys in May 2014 estimated that approximately 15.1 acres of bedrock were characterized by attached kelp (Moffatt & Nichol 2014). Additionally, Moffatt & Nichol (2014) estimated the kelp canopy at 23.1 acres. The variability in these kelp coverage estimates is likely due to some combination of increased resolution from side scan sonar survey techniques as well as increased hard substrata available for kelp attachment. However, it should be noted that the availability of hard substrata fluctuates on seasonal, annual, and decadal time scales associated with coastal processes, including longshore sand transport.

Giant kelp beds create a vertically structured habitat that extends from the seafloor up to the sea surface, providing food, shelter, and nursery areas for a variety of invertebrates and fishes. Kelp bass, black perch, rubberlip seaperch, opaleye, kelp rockfish, and olive rockfish (*Sebastes serranoides*) are all commonly encountered in kelp beds. Topsmelt, kelp pipefish (*Syngnathus californiensis*), kelp perch (*Brachyistius frenatus*), giant kelpfish (*Heterostichus rostratus*), kelp clingfish (*Rimicola muscarum*), and kelp gunnel (*Apodichthys* [=*Ulvicola*] *sanctaerosae*) are fishes known to frequent the canopy, or upper reaches of the kelp forest (MBC 1993). Lower down in the water column, where the leafy canopy is not as dense, yellowtail, white sea bass (*Atractoscion* [=*Cynoscion*] *nobilis*), rubberlip seaperch, halfmoon (*Medialuna californiensis*), and halfblind goby (*Lethops connectens*) can be found. Several of these species are important commercial and recreational fishery species. Giant kelp has historically been harvested commercially within the region for a variety of purposes.

As previously described, almost all kelp forests occur on hard substrata. Important environmental factors influencing kelp communities include light, substrata, sedimentation, nutrients, water motion, salinity, and temperature Sedimentation and scour are highly detrimental to kelp plants. In most cases their effects are most severe on spores, gametophytes, and young plants (Dayton 1985). Due to their small size, *Macrocystis* gametophytes and embryonic sporophytes are highly vulnerable to sand scour and smothering by sediments (Graham et al. 2007).

Seagrass Beds

Seagrass beds are regarded worldwide as some of the most productive marine habitats. Not only do these beds act as protective nursery grounds for many finfish and shellfish, but they also act as substrate for epiphytic algae and micro-invertebrates, and serve as an important food source for waterbirds. Two types of seagrass are found along the Southern California coast, eelgrass and surfgrass. Although these two plants look similar superficially, they are adapted for very different types of habitat. Surfgrass generally grows on rocky substrates and is found in high-energy near-shore environments, such as tidepools and the surf zone. Wider-bladed eelgrass typically grows in sandy, sheltered areas, where there is adequate protection from waves and storms. Seagrasses are used in studies as a marker of the upper limit of the lower tidal zone, and for their sensitivity to pollution. They are also important for sediment deposition and substrate stabilization.

Eelgrass. Pacific eelgrass has long, bright green, ribbon-like leaves, with short stems. It grows submerged or partially floating in the marine environment and is found in estuaries and along protected coastlines, on muddy and sandy bottoms, from the low intertidal to a depth of approximately 65 feet. Eelgrass beds grow rapidly in the spring and summer, then decay in the fall and winter with dead eelgrass blades often washing up on the beach where their decay adds crucial nutrients to coastal environments.

During surveys in 2010, 2012, 2013, and 2014 a substantial Pacific eelgrass bed (thought to be *Zostera pacifica*, though nearshore species may be different from those farther offshore) was documented offshore Broad Beach at depths of approximately 21 to 40 feet (Chambers Group 2013b; Moffatt & Nichol 2014) (see Figure 3.3-4). Additionally, a September 2010 reconnaissance survey of marine biological resources confirmed the presence of surfgrass (*Phyllospadix* spp.) at the west end of Broad Beach, primarily off Lechuza Point, which becomes more scattered and patchy along the beach to the east (Chambers Group 2012a) (see Figure 3.3-4). Dive surveys of eelgrass off Broad Beach were performed on October 23 and November 1, 2012, and a sonar survey was performed in 2013 (Chambers Group 2013b). During these surveys, an eelgrass bed approximately 8.75 acres in size (1,104 feet long by about 456 feet wide at its widest point near its eastern edge) was documented extending from a water depth of about 21 feet below MLLW to about 40 feet below MLLW (Chambers Group 2013b) (see Figure 3.3-4). Additional side scan sonar surveys were conducted in this area in May 2014 and additional targeted dive surveys were conducted in June 2014 (Moffatt & Nichol 2014). These surveys identified approximately 7.1 acres of eelgrass, similar in size to that documented in 2013 (Moffat & Nichol 2014). The discrete portion of the bed is fairly dense in places, although the bed contains sand patches within the bed and the edges of the bed are patchy. Reefs were observed along the western edge of the bed and the bed curved around the reefs. A list of the organisms observed in the eelgrass bed during the October and November 2012 dives, as well as the June 2014 targeted dives, is provided in Table 3.3-5. The majority of these organisms are considered common shallow water sand bottom species; however, a greater number of fishes (both individuals and species) were observed in the eelgrass bed than is typical of unvegetated sand bottoms. Further, the eelgrass bed appeared to be providing shelter to spiny lobsters and the fishes.

Table 3.3-5. Organisms Observed in Eelgrass Bed

Scientific Name		Common Name
Anthophyta	*Zostera pacifica*	Eelgrass
Cnidaria	*Harenactis attenuata*	Burrowing anemone
	Stylatula elongata	White sea pen
Mollusca	*Aplysia californica*	Sea hare
	Kelletia kelletii	Kellet's whelk
	Nassarius fossatus	Channeled basket whelk
Annelida	*Diopatra ornata*	Ornate tube worm
Arthropoda	*Cancer antennarius*	Rock crab
	Cancer gracillis	Slender caner crab
	Heterocrypta occidentalis	Elbow crab
	Loxorhynchus gradis	Sheep crab
	Panulirus interruptus	California spiny lobster
Echinodermata	*Astropecten armatus*	Spiny sand star
Vertebrata	*Damalichthys vacca*	Pile perch
	Citharichthys stigmaeus	Speckled sanddab
	Embiotica jacksoni	Black perch
	Heterodontus francisci	Horn shark
	Oxyjulis californica	Seniorita
	Paralabrax clathratus	Kelp bass
	Paralabrax nebulifer	Sand Bass
	Synodus lucioceps	California lizardfish
	Urooophus halleri	Round stingray

Source: Chambers Group 2012a; Moffatt & Nichol 2014.

Similar to kelp beds, eelgrass beds are also sensitive to substantial increases in turbidity and sedimentation. Mills and Fonseca (2011), experimentally buried eelgrass to 0, 25, 50, 75 and 100 percent of its average aboveground height in an existing bed. Increasing percentages of plant burial significantly increased mortality and decreased productivity. Survival and productivity of eelgrass were substantially reduced when only 25 percent of the plant height was buried. Plants buried 75 percent or more of their height were characterized by survival and productivity measures of 0 (Mills and Fonseca 2011). Additionally, a major indirect factor responsible for the decline of seagrasses, including eelgrass, is lower light level reaching sandy substrata. Light is one of the primary factors determining the limits of eelgrass growth. A potential factor decreasing water clarity is sedimentation (Newell and Koch 2004). Not only can burial cause direct mortality of the plant, but suspension of sediments can have a negative impact on the growth of surrounding eelgrass plants, even if they are not directly buried.

Surfgrass

Surfgrasses (*Phyllospadix* sp.) (Illustration 3.3-1) grow in large clumps or beds exposed during low tide and submerged at high tide and are found attached to rocks ranging from the middle to low intertidal zones to a depth of about 40 to 50 feet. The bright green leaves of surfgrass are typically narrow (0.04 to 0.15 inch), but can range up to 10 feet in length depending on the species. Surfgrasses bloom in late fall, then release tiny seeds shaped like horseshoes with sharp, barbed ends that can latch onto branches of coralline red algae, anchoring the young seedlings against winter storm waves. Surfgrass seeds typically sprout between January and March, with the plants growing rapidly once sunlight and nutrients are plentiful.

Illustration 3.3-1: *Surfgrass occurs in the rocky intertidal habitats off of Lechuza Point and provides critical habitat for many intertidal species.*

Surfgrass provides shelter, foraging, primary productivity, and substrate for a variety of species and can act to dissipate wave energy, providing refuge and protection for resident and transient species. Surfgrass provides a key nursery habitat for a variety of invertebrates, such as California spiny lobster (Engle 1979), and also provides habitat for algae (Stewart and Myers 1980). Shaw (1986) suggests that the importance of surfgrass as a nursery for juvenile lobsters in Southern California is clearly apparent. Surfgrasses also exhibit late successional traits, recover very slowly from disturbance, require facilitation from algae before settling, and are strong competitors (Turner 1985). Removal of surfgrass from a rocky reef community has profound impacts to community structure (Turner 1985). Therefore, surfgrass habitat is largely determined by patterns of disturbance.

During surveys in 2010 and 2012, surfgrass was observed and mapped in subtidal and intertidal habitat off of Lechuza Point and down coast. A shallow subtidal reconnaissance survey was conducted on September 29, 2010, during which divers swam transects parallel to the shore between Lechuza Point and Trancas Creek, documenting surfgrass, eelgrass, and kelp stands. The first intertidal survey on October 7, 2010 consisted of biologists walking the beach between Lechuza Point and Trancas Creek during a -0.5 feet low tide. The location of rocky intertidal habitat, boulders, and surfgrass were noted and surfgrass was mapped during this survey. A second intertidal survey was performed on April 10, 2012 during a -0.8 feet low tide. The purpose of the second survey was to map surfgrass and rocky habitat along the western portion of

Broad Beach in order to compare seasonal levels of sand exposure of these resources. Frequent patches of surfgrass were observed during the April 2012 survey in the vicinity of Lechuza Point in approximately the same location they were observed in the October 2010 survey. However, the rocky area near Lechuza Point observed in October 2010, had experienced considerable sand inundation. Additionally, during this survey, the outer edge of the surfgrass was conservatively extrapolated based on the presence of rocky habitat and the occasional glimpse of surfgrass on the top of rocks when waves receded (Chambers Group 2012a). The size of the surfgrass patches (observed and extrapolated) documented during these surveys is approximately 2 acres (see Figure 3.3-4). However, as observed during the 2012 survey the patch sizes are subject to fluctuation based on sand inundation (Chambers Group 2012a). Surfgrass was not specifically mapped or targeted as a part of the 2014 surveys and the bed observed in 2012 was assumed to be similar in size (Moffatt & Nichol 2014).

Similar to other seagrasses, surfgrass can also be adversely affected by turbidity impacts. Surfgrasses are likely to be impacted by beach nourishment and shoreline protection projects that place sand either directly or indirectly onto surf grass beds. Since the roots and rhizomes of *Phyllospadix* spp. attached to rocks are normally exposed, their responses to sediment burial may differ from other seagrasses whose roots and rhizomes are normally covered with sediments. Craig et al. (2008) found that that short-term burial results in shoot mortality, decreased shoot counts, and reduced growth of *Phyllospadix* species. Disturbances that result in long-term (or permanent) burial of the hard substrate in an area will preclude recovery. No amount of elapsed time since disturbance will compensate for destruction or covering of the necessary hard substrate for *Phyllospadix* spp. (Reed et al. 1999).

Marine Invertebrates

Abalone. Abalone are large marine snails associated with rocky intertidal and subtidal areas where they cling to rocks, feeding on kelp and other algae that they scrape off the substrate. For a time during the 1970s to 1990s, they comprised a highly valuable fishery in Southern California. Surveys of the Broad Beach intertidal and subtidal areas did not indicate the presence of any abalone species (Chambers Group 2011, 2012b, Moffatt & Nichol 2014). Of the seven abalone species historically found in the waters along the Southern California coast near the Broad Beach area, two are currently listed as federally endangered and two are currently recognized as Federal species of concern (see Table 3.3-6). The primary factors contributing to the decline of these species are over-harvesting, illegal harvesting and trade, predation, disease, and El Niño events. Illegal poaching and disease, and reproductive constraints currently constitute the biggest threats to the continued survival and recovery of these species. None of these species are likely to occur in the Broad Beach area.

Table 3.3-6. Abalone Species of Southern California

Common Name	Species Name	Likelihood at Site	Protected Status	Preferred Depth[1]
Black Abalone[2]	*Haliotis cracheirodii*	Unlikely	Federal Endangered	Intertidal to 20 ft
Green Abalone	*Haliotis fulgens*	Unlikely	Species of Concern[3]	Intertidal to ≥30 ft
Pink Abalone	*Haliotis corrugate*	Unlikely	Species of Concern	20 ft to ≥120 ft
White Abalone	*Haliotis sorenseni*	Unlikely	Federal Endangered	Subtidal to ≥200 ft
Red Abalone	*Haliotis refescens*	Unlikely	None	Subtidal to ≥100 ft
Threaded Abalone	*Haliotis assimilis*	Unlikely	None	20 ft to ≥80 ft
Flat Abalone[2]	*Haliotis walallensis*	Unlikely	None	20 ft to ≥70 ft

[1] ft = feet
[2] Flat and Black abalone are no longer found south of Point Conception (Owen 2006, NMFS 2011).
[3] Federal species of concern

<u>Intertidal Shoreline Habitat and Biota</u>

Habitats within the intertidal zone include rocky and sandy intertidal habitat (Illustration 3.3-2). Similar to offshore marine habitat, intertidal habitat areas at Broad Beach were determined using a combination of transect surveys and sonar surveys, occurring primarily in 2012 and 2014. Similar to offshore habitats, intertidal habitats (e.g., rocky intertidal areas) are highly dependent on sand coverage. As longshore sand transport varies on seasonal, annual, and decadal cycles, exposed intertidal rocky substrata also varies on these timescales. This is demonstrated by the wide sandy beaches present at Broad Beach and other California Beaches in the mid to late 1970s (e.g., University of California, Santa Barbara [UCSB] and Goleta Beaches) and by the narrower rocky beaches present at Broad Beach and many other area beaches over the last decade or more.

Additionally, differences in survey techniques may also result in artificially increased variability in mapped habitat at Broad Beach. For example, while rocky intertidal areas at Broad Beach were previously estimated by transect surveys, side scan sonar surveys in 2014 revealed the presence of rocky intertidal habitat at a higher resolution, contributing at least in part to the increase in this habitat type observed since 2012 (see Figure 3.3-4).

Illustration 3.3-2: *Rocky intertidal habitat within Lechuza Cove provides habitat for a number of intertidal species.*

Rocky Intertidal

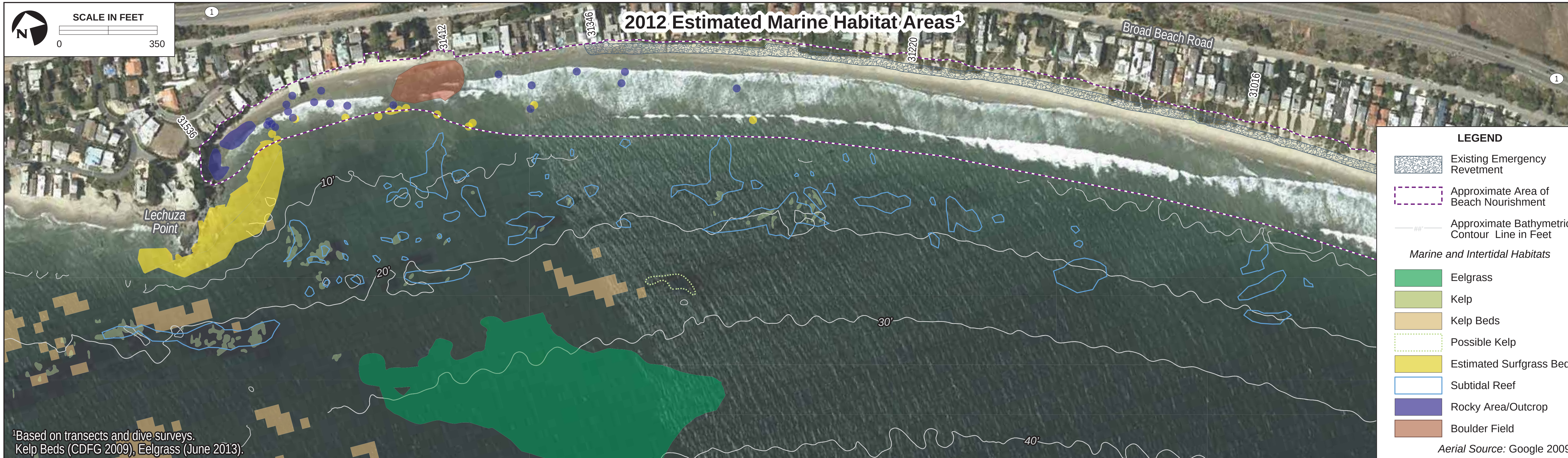
Rocky intertidal (shoreline) habitats within Santa Monica Bay are generally limited to the extreme northern (Malibu) and southern (Palos Verdes Peninsula) areas. The western end of Broad Beach is bounded by the rocky headland of Lechuza Point (see Figure 3.3-4), and to the east the promontory of Point Dume also contains rocky shoreline habitat.

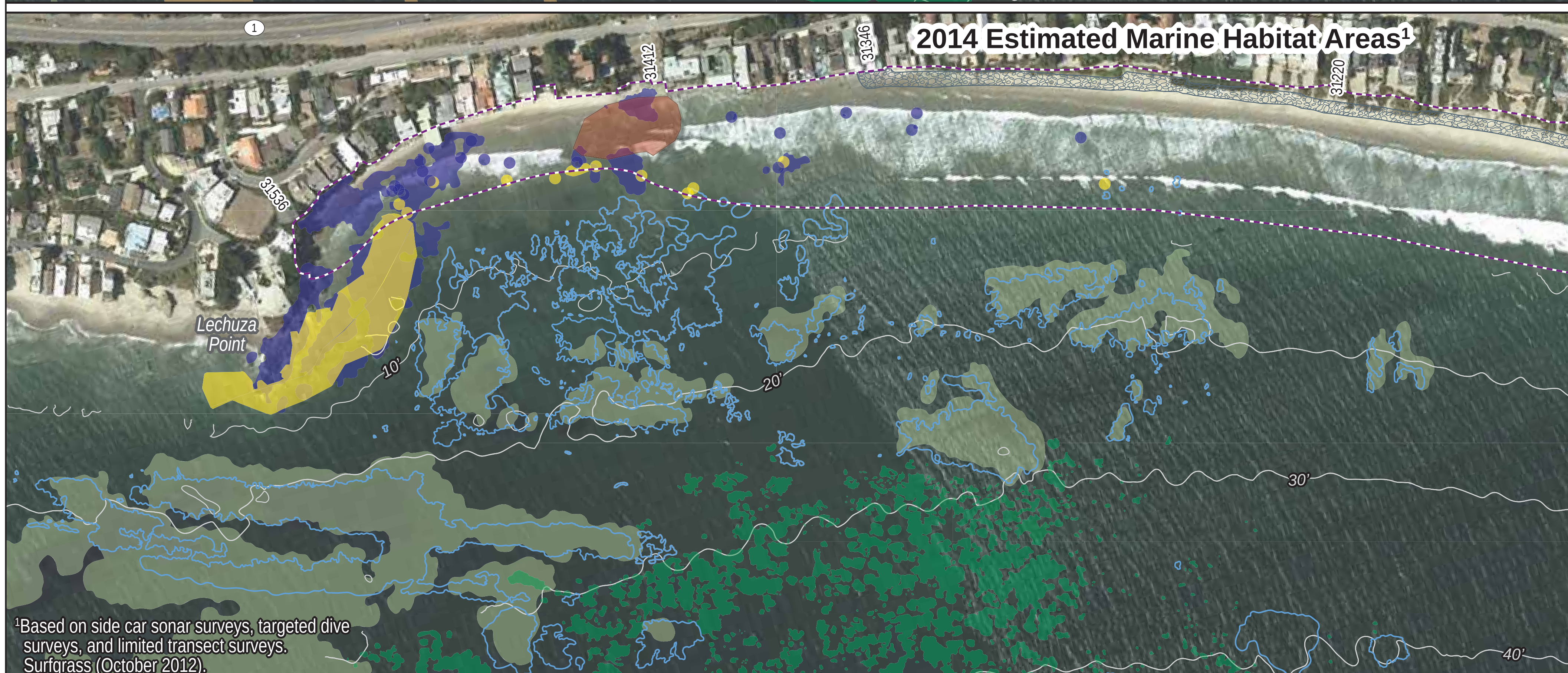
Low relief areas of rocky substrate and cobble also occur in several patches throughout the western portion of Broad Beach. However, these lower relief areas are intermittently covered by sand (Chambers Group 2012a). As discussed previously, Broad Beach is subject to substantial fluctuations in sand levels and sand levels have varied over time, with these fluctuations occurring seasonally and over multi-years. The higher relief intertidal community at Lechuza Point is also characteristic of a sand-influenced site with intermittent emergent rock (Raimondi et al. 2012).

Plants in the rocky intertidal habitats typically display vertical zonation, with distinct species assemblages at different tidal levels, although the patterns may be disrupted by grazing by marine animals. Lichens dominate the splash zone (highest zone), whereas the upper intertidal (below the splash zone) flora includes green algae (Subphylum Chlorophyta) such as sea felt (*Enteromorpha* spp.) and sea lettuce (*Ulva* spp.), brown algae (Subphylum Phaeophyta) such as rockweeds (*Selvetia* spp.), and various red algae (Subphylum Rhodophyta). The middle intertidal includes a more diverse algal assemblage with red and brown algae. The lower intertidal consists of red and brown algae as well as surfgrass (*Phyllospadix* spp.) (Hedgepeth and Hinton 1961, Dawson 1966).

Table 3.3-7 lists the marine organisms present in the rocky intertidal habitats. Invertebrates that live in the highest intertidal zones are typically shelled species able to tolerate exposure to the air for long periods of time. In the upper intertidal zone, species diversity increases. The middle intertidal is marked by filter feeders and deposit feeders. The lower intertidal is similar to the rocky subtidal, with abundant invertebrates (Hedgepeth and Hinton 1961).

In October 2012, the intertidal biological communities at Broad Beach, including rocky intertidal habitat in Lechuza Cove and the boulder field down coast from Lechuza Cove were sampled to obtain baseline information on intertidal organisms that may be affected by the Project (Chambers Group 2012b, 2013a). During the October 2012 survey, Broad Beach was narrow. Large organisms counted on the belt transects included one striped shore crab (*Pachygrapsus crassipes*) and one surfgrass plant (*Phyllospadix torreyi*) in the low intertidal. Unvegetated bedrock, boulder and cobble were the predominant substrate types in the high and middle intertidal. In the low intertidal the cover of red algal turf increased (Chambers Group 2012b). Additional transects were identified in the west end of the Broad Beach area and surveyed for the first time in spring 2013 (Chambers Group 2013a).





Habitat Type	Habitat Area 2012 (acres)	Habitat Area 2014 (acres)	Variability (acres)
Rocky Intertidal	1.0	4.4	+3.4
Low Intertidal/ Surfgrass	2.0	2.0	0
Subtidal Reef*	4.6	20.2	+15.6
Kelp‡	9.5	23.1	+13.6
Eelgrass	8.75	7.1	-1.65

Notes: Differences in habitat area can be attributed to different survey techniques as well as differences in sand coverage resulting from seasonal and decadal variability in coastal processes.

*Surfgrass overlies rocky intertidal habitat within Lechuza Point.

‡Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.

Sources: Chambers Group 2012a and 2013b; Moffatt & Nichol 2014.

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Marine Biological Resources at Broad Beach

FIGURE 3.3-4

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Table 3.3-7. Organisms in Rocky Intertidal Habitat

Common Name	Classification	Common Name	Classification
High Intertidal Zone		**Upper Intertidal Zone**	
periwinkles	*Littorina* spp.	Snails	Class Gastropoda
barnacles	*Balanus* and *Chthamalus* spp.	bivalves (attached)	Class Bivalvia
limpets	Family Acmaeidae	chitons	Class Polyplacophora
rock lice	*Ligia* spp.	hermit crabs	Tribe Paguridea
		striped shore crabs	*Pachygrapsus crassipes*
Middle Intertidal Zone		**Lower Intertidal Zone**	
California mussels	*Mytilus californianus*	sponges	Class Demospongiae
gooseneck barnacles	*Lepas* spp.	sea anemones	Order Actiniaria
sea anemones	Order Actiniaria	snails	Class Gastropoda
snails	Class Gastropoda	sea slugs	Class Opisthobranchia
sea slugs	Class Opisthobranchia	bivalves (attached)	Class Bivalvia
octopus	*Octopus* spp.	octopus	*Octopus* spp.
polychaetes	Class Polychaeta	bryozoans	Phylum Ectoprocta
barnacles	*Balanus* and *Chthamalus* spp.	amphipods	Order Ampipoda
isopods	Order Decapoda	isopods	Order Decapoda
crabs	Order Decapoda	shrimp	Order Decapoda
shrimp	Order Decapoda	hermit crabs	Tribe Paguridea
brittle stars	Class Ophiuroidea	crabs	Order Decapoda
		sea stars	Class Asteroidea

In the high intertidal, bare rock and the barnacles *Chthamalus* and *Balanus* accounted for most of the percent cover. In the middle intertidal the cover of red algae increased. Red algae that were abundant in the middle intertidal included *Gracilaria andersonii*, *Ceramium* sp. and *Mazaella leptorhynchos*. In the low intertidal red algae and the feather boa kelp *Egregia menziesii* were dominant. Red algae in the low intertidal included *Gastroclonium subarticulatum* and *Ceramium* sp. On October 16, 2012, most of the boulder field was covered with a thin layer of sand (Chambers Group 2012, 2013a). In the mid and low intertidal feather boa kelp, red algae and surfgrass protruded above the sand layer. A total of 30 ochre sea stars (*Pisaster ochraceus*) were counted on a transect in the middle intertidal. In the low intertidal, 13 ochre sea stars and one octopus were counted on a transect and 16 ochre sea stars were counted on belt transect. Table 3.3-8 lists the indicator species that were present in the Lechuza Cove intertidal sampling areas on October 16, 2012.

During these survey efforts rocky intertidal areas within Lechuza Cove were estimated at 0.28 acre. Additionally, down coast scattered rocky intertidal areas as well as a boulder area approximately 500 feet to the east added an additional 0.71 acre of habitat, totaling approximately 1 acre of rocky intertidal within the Broad Beach area (Chambers Group 2012a). However, as previously described, these habitat areas are subject to change with sand inundation (Chambers Group 2012a). Side scan sonar surveys conducted in May 2014 estimated total rocky intertidal habitat at approximately 4.4 acres, representing a variability of approximately 3.4 acres in over the course of 2 years. While some of this variation is likely due to differences in sampling techniques, seasonal and decadal differences in sand coverage are the primary influences on rocky intertidal habitat exposure.

Table 3.3-8. Indicator Species Observed Within Lechuza Cove Intertidal Habitat

Common Name	Classification
Intertidal	
barnacles	*Balanus/Chthamalus* spp.
sea lettuce	*Ulva/Enteromorpha* spp.
sea anemone	*Anthopleura* spp.
algae	*Egregia* spp.
limpets	*Patella* spp.
red algae	*Chondracanthus canaliculata*
surfgrass	*Phyllospadix* spp.
red algae	*Gelidium/Pterocladiella* spp.
red algae	*Mastocarpus papillatus*
Swash Zone	
sand crabs	*Blepharipoda occidentalis*
polychaete worm	*Nephtys* sp.
baetic olive snail	*Olivella baetica*
sand crabs	*Emerita analoga*
Pismo clam	*Tivela stultorum*

Sources: Chambers Group 2012b, 2013a.
Notes: Red and green algae were also observed.

Sandy Intertidal

Broad Beach and adjacent Zuma Beach support large areas of sandy intertidal beach habitat, with Broad Beach estimated to support just under 30 acres of intertidal beach (Moffatt & Nichol 2014), primarily with sandy substrate. Sandy beach habitats can help sustain fishery resources as they can support high densities of filter-feeding, benthic macroinvertebrates. These invertebrates are a valuable link to upper level predators such as fishes and shorebirds (Leber 1982). Recreational fish including barred surfperch, white seabass, queenfish, spotfin croaker, California halibut, jacksmelt and California grunion use this habitat for foraging (Allen and Pondella 2006). In addition, leopard shark (*Triakus semifasicata*), managed under the Pacific Groundfish Fishery Management Plan, use shallow coastal waters as pupping and feeding/rearing grounds. Neonate pups occur in and just beyond the surf zone in areas of Southern California.

During 2012 intertidal surveys, swash zone samples were taken to collect larger sandy intertidal invertebrates that might not be well represented in the core samples. Five taxa were collected in the swash zone samples at Broad Beach. The sand crabs *Blepharipoda occidentalis* and *Emerita analoga* and an unidentified polychaete worm (*Nephtys* sp.) were the most abundant taxa. Two baetic olive snails (*Olivella baetica*) and one Pismo clam (*Tivella stultorum*) were also collected. The presence of the Pismo clam is noteworthy; Pismo clams were common at Broad Beach and Zuma Beach prior to the 1982/1983 El Niño but are now rare (Chambers Group 2012b, 2013a).

A total of 66 macroinvertebrates comprised of 14 taxa were collected in 45 Broad Beach macroinvertebrate samples taken in October 2012. Table 3.3-9 lists the 14 taxa found.

Table 3.3-9. Macroinvertebrate Taxa Observed within Lechuza Cove Intertidal Habitat

Habitat Zone	Species Name
High Intertidal	*Emerita analoga*
	Nephtys californiensis
Middle Intertidal	*Nephtys californiensis*
	Donax gouldii
	Emerita analoga
	Exosphaeroma inornata
	Oligochaeta
	Cerithidea californica (juv)
	Eohaustorius sawyeri
	Nephtys californiensis
	Americhelidium sp. (juv)
	Scolelepis sp. (juv)
Low Intertidal	*Nephtys californiensis*
	Donax gouldii
	Emerita analoga
	Eohaustorius sawyeri
	Gibberosus myersi
	Rhepoxynius homocuspidatus
	Nephtys sp. (pf)
	Scoloplos acmeceps
	Spionidae (pf)
	Rhepoxynius menziesi

Sources: Chambers Group 2012b, 2013a.

The polychaete worm *Nephtys californiensis* was the most abundant species with 17 total individuals. The fewest number of individuals and taxa were collected in the high intertidal and the highest abundance and number of taxa were found in the low intertidal. The sand crab *Emirita analoga* and the polychaete worm *Nephtys californiensis* were the only species collected in the high intertidal. These species are characteristic of the middle and low intertidal zones and indicate the lack of a true upper intertidal zone at Broad Beach in October, 2012 (Chambers Group 2012b, 2013a).

A total of 286 macroinvertebrates comprised of 10 taxa were collected in the 45 Broad Beach core samples in June 2013 (Chambers Group 2013a). In contrast, only 66 organisms were collected in the 45 core samples taken in October 2012. The high abundance in the June cores was due to large numbers of small sand crabs *Emerita analoga* that were collected in the high intertidal. The abundance of small sand crabs likely reflects the start of the summer recruitment period. The large numbers were seen in the high intertidal samples. *Emerita* is a characteristic species of the middle and low intertidal zone of sand beaches. Because of the narrow beach width at Broad Beach, a true high intertidal zone is lacking.

El Matador State Beach Surveys

Similar intertidal surveys were also conducted at El Matador State Beach, on October 17, 2012 and more recently in 2013. El Matador State Beach is located approximately 0.75 miles west of Broad Beach and was sampled as a control site because of its proximity to Broad Beach and because it is a bluff backed beach that appears to have experienced erosion. Further, because this beach has no revetments or seawalls, it was considered useful for delineating changes caused by natural processes. El Matador State Beach has more rocky habitat than Broad Beach, although it also has areas of sandy intertidal habitat.

In October 2012, both Broad Beach and El Matador State Beach had a short beach with lack of a true high intertidal zone (Chambers Group 2012b, 2013a). El Matador State Beach did not have any shore protection structures and erosion of the bluffs resulted in pocket coves where wrack accumulated. The rocky intertidal at Lechuza Cove at the west end of Broad Beach had a low amount of sand cover at the time of the sampling although sand inundation in this area was observed previously in April 2012. The rocky intertidal at El Matador State Beach and the boulder field at Broad Beach both had a high amount of sand cover in October 2012. In addition to differences in sand cover, there were differences in rock substrate between the rocky intertidal habitats at the two beaches. Broad Beach was a combination of bedrock and boulders while El Matador State Beach was all bedrock (Chambers Group 2012b).

During the field survey, the beach was narrow and the cover in the sampled areas in the high and middle intertidal areas was primarily sand. Rocks in the high intertidal were sparsely vegetated with barnacles (*Balanus/Chthamalus*) and red and green algae. Diversity of cover on the rocks increased in the middle intertidal and included red algae (primarily *Gastroclonium subarticulatum*), anemones (*Anthopleura* spp.) and the sand tube worm *Phragmatopoma californica*. In the low intertidal, sand cover decreased and the cover and diversity of red algae (*Gastroclonium subarticulatum, Chondracanthus* *canaliculata,* articulated corallines*, Mastocarpus papillatus, Mazzaella affinis*) on the rocks increased. The sand tube worm also accounted for significant cover in several sampled areas in the low intertidal and surfgrass was found in half of the sampled areas. For comparative purposes, the swash zone samples at El Matador State Beach were dominated by the sand crab *Emerita analoga.* One nemertean worm and three *Nephtys* sp. were also collected.

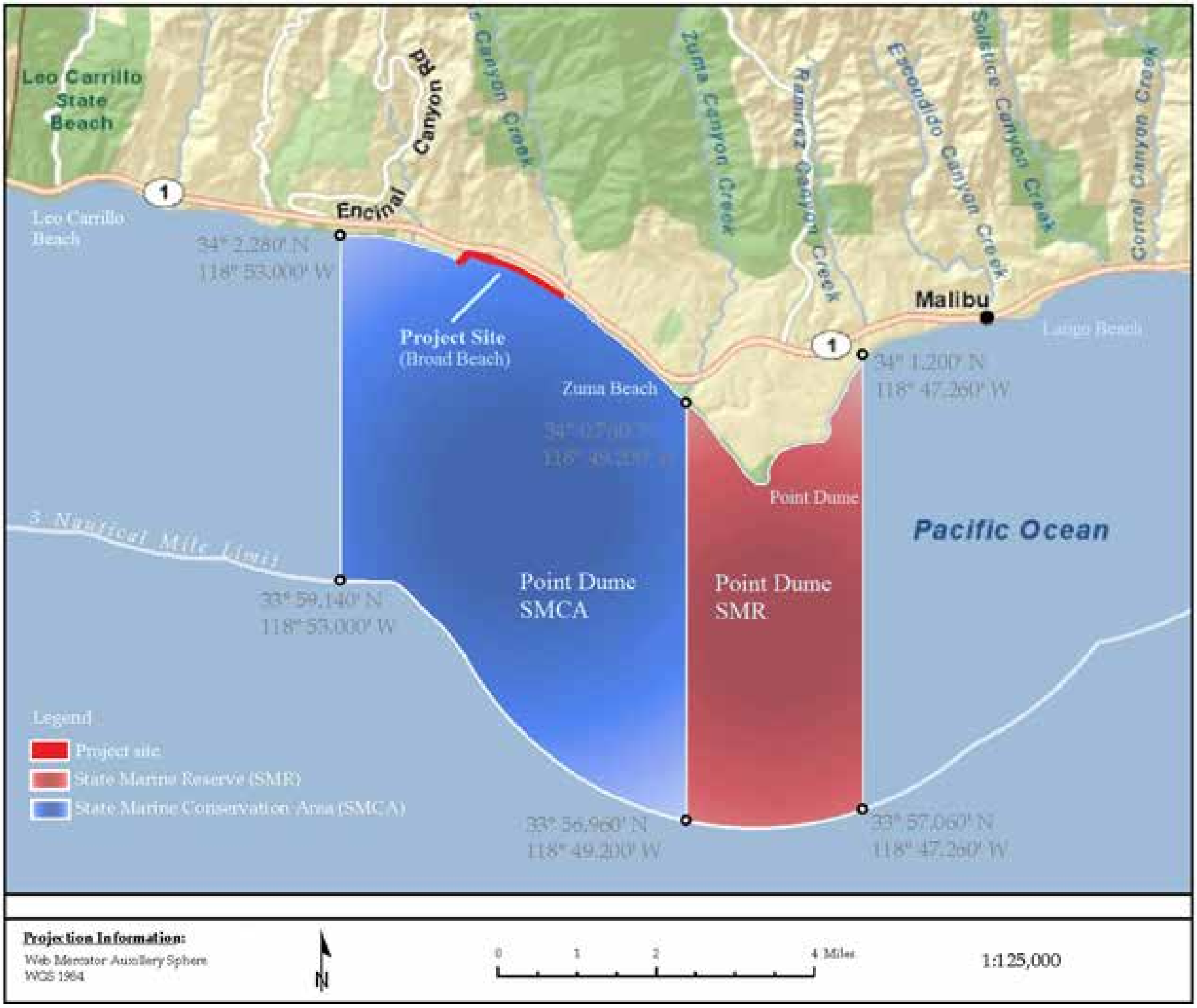
A total of 328 macroinvertebrates comprised of 10 taxa were collected in the 30 macroinvertebrate samples at El Matador State Beach in 2013. As was true in October 2012, the sand crab Emerita analoga was by far the most abundant species. The total number of sand crabs in the 2013 samples was 308 compared to 125 in October 2012. Therefore, the sand crab recruitment observed at Broad Beach also occurred at El Matador, but the sand crabs recruited in greater numbers at El Matador. In addition, at El Matador the sand crabs were collected in the mid and low intertidal; but at Broad Beach sand crabs were collected in the high intertidal as well. The presence of sand crabs in samples taken as high as possible on Broad Beach, indicates the beach is truncated by erosion and no true high intertidal exists. In contrast, the high intertidal samples at El Matador were taken at the visible wrack line; and insects, which associate with wrack, were collected (Chambers Group 2013a).

<u>Marine Managed Areas, Marine Sanctuaries, Parks, and Reserves</u>

A wide array of Federal and State managed marine areas lie off the coast of Southern California. Efforts to integrate some of these areas under a uniform system of management and oversight include the California Marine Life Protection Act (MLPA) of 1999, which required the evaluation of existing data for some 220,000 square miles (mi^2) of submerged State lands. The following year, the California Marine Managed Areas Improvement Act of 2000 extended the State's management jurisdiction into the marine environment. The purpose of both acts was to establish an integrated system of MMAs, both existing and new, up and down the California coast that would ensure the long-term ecological viability and biological productivity of marine and estuarine ecosystems and preserve cultural resources for future generations. There are six categories of MMA: State Marine Reserves (SMR), State Marine Parks, State Marine Conservation Areas (SMCA), State Marine Cultural Preservation Areas, State Marine Recreational Management Areas, and Areas of Special Biological Significance (ASBS).

The Broad Beach area lies within a Marine Protected Area (MPA): the Point Dume SMCA, which extends from Encinal Canyon in the north to Westward Beach in the south and is adjacent to the Point Dume SMR, which begins at Westward Beach, and continues around Point Dume to the west end of Paradise Cove (see Figure 3.3-5). These adjoining MPAs became effective on January 1, 2012.

Figure 3.3-5. Marine Protected Areas



Source: Adapted from CDFW 2011.

The Point Dume SMR incorporates an area of offshore reefs, a submarine canyon (Dume Canyon), and a kelp forest that is popular with kayak fishers and the diving community. Although access to the entire Point Dume area will remain open to scuba diving, boating and other recreational activities, the take of all living marine resources within this area is prohibited.[1] This area is described as "rare and vitally important habitat" and was one of the MLPA Science Advisory Teams top preservation priorities.

Within the Point Dume SMCA, fishing activities are also restricted, but not banned entirely; the recreational taking of pelagic finfish (i.e., thresher sharks, barracuda, dolphinfish) is allowed, as well as the take of white sea bass, and Pacific bonito by spear fishing. Limited commercial fishing of coastal pelagic fish (like squid) is permitted

[1] Beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required agency permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632).

in the SMCA but is restricted to capture by round-haul net. Round-haul fishing is a smaller operation than purse-seine boats or other methods. Commercial fishing of swordfish by harpoon is also allowed.

Other nearby MPAs include several around the Channel Islands. In October 2002, the California Fish and Game Commission approved a comprehensive marine zoning network in the State waters of the Channel Islands National Marine Sanctuary (CINMS). The State implemented part of the marine zones in 2003, under the California Fish and Game regulations. Fishing and other extractive uses in the 10 marine reserves and two conservation areas created within the CINMS were restricted in 2006 to provide protection to the seafloor and groundfish (CDFW and CINMS 2001, CDFW 2002). The NMFS designated the Federal water portions offshore of the State marine zones as habitat areas of particular concern and prohibited bottom fishing under the Magnuson-Stevens Fishery Conservation and Management Act.

Additionally, on July 29, 2007, NMFS finalized a plan that added approximately 20 mi^2 of no-fish zone just off the southeastern coast of Santa Cruz Island and expanded the borders of several of the existing marine reserve areas. In total, the plan created 146.3 mi^2 of strict no-fishing marine reserves and 2.3 mi^2 of limited take marine conservancy zones. When taken in concert with the existing SMRs in the nearshore waters of the sanctuary, the combined sea life protection network totals nearly 215 mi^2 of fishing-restricted ocean waters (refer to Figure 3.3-5).

<u>Areas of Special Biological Significance</u>

In the 1970s, California designated 34 regions along the coast as ASBS in an effort to preserve biologically unique and sensitive marine ecosystems for future generations. ASBS are designated by the State Water Resources Control Board (SWRCB) to protect species or biological communities from undesirable alterations in natural water quality (McArdle 1997). This designation recognizes that certain biological communities, because of their fragility or value, deserve special protection. Under the California Ocean Plan (COP), the discharge of wastes to ocean waters in these areas is generally prohibited. The COP states: “Waste shall be discharged a sufficient distance from areas designated as being of special biological significance to assure maintenance of natural water quality conditions in these areas” (State Water Board 1972).

One ASBS in Southern California encompasses Broad Beach. It extends offshore to 100 feet in depth for most of the 24 miles along the coast from just north of Mugu Lagoon in Ventura County to Latigo Point in the south. The Mugu-Latigo ASBS is the largest of the mainland ASBS in Southern California, encompassing 18.5 mi^2 of marine waters.

The Mugu-Latigo ASBS was set aside, “not because of any single unique component or habitat, but because of the multiplicity of distinct habitats and organisms in a relatively healthy state, which collectively make the area unique.” Specific organisms which were considered especially unique components of the ASBS at the time of its incorporation include: giant kelp, surfgrass, sand dollars, Pismo clams, tube worms, sea urchins, and California halibut. These organisms were recognized for their ecological dominance within the community structure, and/or their contribution as recreational or commercially important species.

Commercial and Recreational Fisheries

Commercial and recreational fishing activities occur at various locations within the Project region that could potentially be impacted by activities associated with the Project. Most of the region's commercial and recreational fisheries occur within the open-ocean habitat. Important recreational species in Santa Monica Bay include kelp bass (*Paralabrax clathratus*), brown rockfish (*Sebastes auriculatus*), pile perch (*Damalichthys vacca*), black perch (*Embiotoca jacksoni*), white seaperch (*Phanerodon furcatus*), rubberlip seaperch (*Rhacochilus toxotes*), señorita (*Oxyjulis californica*), and opaleye (Carlisle et al. 1964, Stephens et al. 1984b, MBC 1993).

A variety of additional finfish and shellfish species are harvested in the Project region, while kelp is harvested in specific beds managed by the CDFW. An analysis of fishery and kelp data collected around the Broad Beach area for the 10-year period from 2001 to 2010 forms the basis for the summary of commercial and recreational fishing that is included in Appendix D.

3.3.2 Selected Regulations Pertaining to Marine Biological Resources

State and other statutes related to marine biological resources are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. The USFWS and the NMFS are the Federal agencies directly responsible for protecting biological resources in the Project vicinity, including coastal estuaries and marshlands. The U.S. Environmental Protection Agency (USEPA) is also concerned with protecting marine and estuarine life through water quality standards. The CDFW is the lead agency responsible for protecting biological resources at the State level. The CDFW is obligated to protect species that are officially listed as threatened or endangered by the State, candidates for listing as threatened or endangered, and California Species of Special Concern. The CDFW also administers the California Oil Spill Prevention and Response Act (OSPRA). The SWRCB sets water quality standards for the protection of aquatic life. The Los Angeles Regional Water Quality Control Board (LARWQCB) supervises these standards locally.

3.3.3 Public Trust Impact Criteria

This section describes criteria for evaluating the significance of Project-related activities or incidents that may result in impacts to marine biological resources. In general, the persistence, extent, and amplitude of such impacts dictate their significance. The significance of impacts to specific living resources can largely be determined from existing laws and regulations, such as the MMPA or the Federal ESA or CESA. The location of the impact, for example, if it occurs within a sensitive habitat such as a wetland or marine sanctuary, can also determine its significance.

Impacts to marine biological resources would be considered a major adverse effect if the Project results in:

- Potential for any part of the population of a threatened, endangered, or candidate species to be directly affected, or if its habitat is lost or disturbed;
- Any "take" of a Federal- or State-listed endangered, threatened, regulated, fully protected, or sensitive species;
- Destruction or prolonged disturbance to sensitive habit (e.g., burial by at least 1 foot of sand for 1 or more years), [2] or substantial take of a species that is recognized as biologically or economically significant in local, State, or Federal policies, statutes, or regulations;
- Conflict with an adopted habitat conservation plan or result in a net loss in the functional habitat value of: a sensitive biological habitat, including salt, freshwater, or brackish marsh; marine mammal haul-out or breeding area; eelgrass; river mouth; coastal lagoon or estuary; seabird rookery; ASBS; MMAs, or EFH;
- Permanent change in the community composition or ecosystem relationships among species that are recognized for scientific, recreational, ecological, or commercial importance;
- Permanent alteration or destruction of habitat that precludes re-establishment of native biological populations;
- Potential for the movement or migration of fish or wildlife to be impeded; or
- A substantial loss in the population or habitat of any native fish, wildlife, or vegetation, or if there is an overall loss of biological diversity. Substantial is defined as any change that could be detected over natural variability.

An impact to commercial and sport fisheries would be considered a major adverse effect if the Project would result in:

- Activities that would temporarily reduce any fishery in the vicinity by 10 percent or more during a season, or reduce any fishery by five percent or more for more than one season;

[2] Permanent impact acreage for marine habitats is defined as the area of each habitat predicted to be buried by 12 inches or more of sand at 1 year following placement. This depth of coverage is based on model predictions and is identical to other large scale beach nourishment projects, RBSP I and II, and USACE Feasibility Studies (Moffatt & Nichol 2014).

- Activities that would affect kelp and aquaculture harvest areas by 5 percent or more;
- Loss or damage to commercial fishing or kelp harvesting equipment; or
- Harvesting time lost due to harbor closures, impacts on living marine resources and habitat, and equipment or vessel loss, damage, or subsequent replacement.

Where applicable, this impact analysis considers the Broad Beach area both in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting in 2005 prior to the installation of the emergency revetments when Broad Beach was characterized by a narrow beach and dune habitat.

3.3.4 Public Trust Impact Analysis

The Project could result in adverse impacts on public trust marine biological resources (i.e., biotic communities of the public trust tide and submerged lands) through authorization of the revetment, beach nourishment, and backpassing. Changes in long-term sand transport down drift from Broad Beach may also have adverse impacts to marine biological resources outside of the immediate Broad Beach area. Impact analysis relied on the following resources:

- An analysis of habitat impacts associated with the construction, formation, and placement of plastic sand bags including sand sculpting activities provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- An analysis of the long-term marine habitat impacts associated with permanent authorization of the 2010 revetment, unpermitted sand bags, and unpermitted revetment provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- A table summarizing the type, location and acreage of habitats estimated to be impacted by the Project and by Project alternatives provided as in *Broad Beach Project Habitat Impacts* (Chambers Group 2014).
- Depth of burial analysis for existing and new transects provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- Impact of coarse grained sand on sandy intertidal invertebrate community provided in Upland Sand Source Coarser-than-Native Grain Size Impact Analysis (Moffatt & Nichol 2013b).
- Supplemental Marine Habitat Survey and Mapping for the Broad Beach Restoration Project (Moffatt & Nichol 2014).
- Scientific studies including: *Using GIS Mapping of the Extent of Nearshore Rocky*

Reefs to Estimate the Abundance and Reproductive Output of Important Fishery Species (Claisse et al. 2012), *Short-Term Sediment Burial Effects on the Seagrass Phyllospadix scouleri* (Craig et al. 2008), and *Mortality and Productivity of Eelgrass Zostera marina under Conditions of Experimental Burial with Two Sediment Types* (Mills and Fonseca 2003).

Habitat impact analysis incorporates survey data from 2010, 2012, 2013, and 2014; however, the quantitative analysis relies most heavily on side scan sonar surveys conducted in May 2014 and target dive surveys conducted in June 2014. These surveys give the most recent picture of the intertidal and marine habitats at Broad Beach. However, it should be noted that sand coverage in the nearshore and offshore environment at Broad Beach is dependent on a number of characteristics and properties, includes seasonal, annual, and decadal shifts in wave action and longshore sand transport. Consequently, habitat coverage as determined by the most recent side scan sonar surveys and targeted dive surveys should be considered as a snapshot estimate of habitats rather than a long-term average.

The side scan sonar survey collected data using an interferometric wide-swath sonar system. Parallel survey track lines were navigated through the survey area until the entire survey footprint was covered. Rocky outcroppings with greater complexity (e.g., increased relief) and sand waves have greater variation in terms of high signal intensity mixed with low signal return in the areas that lie in the shadows of the reef or sand wave. Habitats were classified according to the USFWS Classification of Wetlands and Deepwater Habitats of the U.S. However, in order to compare to past transect surveys these habitat classifications were grouped into terms more commonly understood by the public (Table 3.3-10).

Table 3.3-10. Side Scan Sonar Survey Habitat Groupings

Previous Survey Designations	Sonar Designations
Boulder Field	Boulder Field
Rocky Area/Outcrop	Rocky Outcrops
	Bedrock, Marine: Intertidal: Rock Bottom
	Rubble/Cobble, Marine: Intertidal: Rock Bottom
Surfgrass	Observed Surfgrass Points
	Observed Surfgrass
	Extrapolated Surfgrass
Subtidal Reef	Bedrock with Kelp, Marine: Subtidal: Rock Bottom
	Bedrock, Marine: Subtidal: Rock Bottom
	Rubble/Cobble, Marine: Subtidal: Rock Bottom
Sand	Sand, Marine: Intertidal: Unconsolidated Bottom
	Sand, marine: Subtidal: Unconsolidated Bottom
	Shell Hash, Marine: Subtidal: Unconsolidated Bottom
Kelp	Kelp Canopy
Eelgrass	Eelgrass

Source: Moffatt & Nichol 2014.

Habitat area is dependent on sand coverage offshore Broad Beach. Longshore sand transport varies on seasonal, annual, and decal cycles. It is known that fires, floods, and climatic variation significantly affect sand supply and beach width. For examples, studies of Goleta Beach in Santa Barbara County north of Broad Beach show beach width closely tracking Pacific Decadal Oscillation on roughly a 20 to 30 year cycle and varying by hundreds of feet in width over these cycles. Consequently, the habitat areas surveyed in 2012 and 2014 should be considered snapshots of habitat coverage rather than a long-term average. Impacts discussed below are based on the 2014 side scan sonar survey because coverage of each habitat type was greatest during this survey. Therefore, by using the 2014 survey areas as a baseline, the analysis below provides a conservative estimate of impacts to marine habitat offshore Broad Beach (Table 3.3-11).

Table 3.3-11. Marine Habitat Coverage at Broad Beach in 2012 and 2014

Habitat Type	Estimated Habitat Area 2012 (acres)	Estimated Habitat Area 2014 (acres)	Variability (acres)
Rocky Intertidal	1.0	4.4	+3.4
Low Intertidal/Surfgrass	2.0	2.0	0
Subtidal Reef*	4.6	20.2	+15.6
Kelp Canopy†	9.5	23.1	+13.6
Eelgrass	8.75	7.1	-1.65

Sources: Chambers Group 2012a, 2012c; Chambers Group 2013b; Moffatt & Nichol 2014.

Notes: Differences in habitat area can be attributed to different survey techniques as well as differences in sand coverage resulting from seasonal and decadal variability in coastal processes.

*Surfgrass overlies rocky intertidal habitat within Lechuza Point.

† Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.

<u>Historical Marine Biological Resource Characteristics</u>

Broad Beach has been characterized by gradually eroding beach width over the last 3 to 4 decades. Beach width and sand depth appears to have reached a peak in the early- to mid-1970s, with large areas of currently rocky intertidal habitat in Lechuza Cove buried under sand, at least during the summer months. It is unclear if this wide sandy beach was a historical condition or the result of a single or unusual pulse of sediment into the system. It has been noted that construction of Pacific Coast Highway in the late 1920s resulted in the deposition of well over a million cubic yards (cy) of sediment into the littoral cell upcoast of Broad Beach, which may have resulted in a substantial widening of beaches along this area of shoreline. Further, a former source of sediment input from major rivers in the upcoast Santa Barbara littoral cell may have been interrupted by the landward migration of the Mugu Submarine Canyon, decreasing sediment supply to the system over time. The wide sandy beaches of the 1970s may also reflect large scale sediment input from the major winter storms of 1969. However, regardless of cause, over time the formerly wide sandy beach present at Broad Beach has eroded landward, regularly exposing rocky substrate. This shift from a wide sandy beach to a largely intertidal beach, has resulted in this area supporting rocky intertidal habitat and surf grass beds which are regularly extant along the west end of the beach, particularly within Lechuza Cove. Please refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards,* for a more complete discussion of current and historic coastal process.

Prior to the construction of the sand bag revetments and the installation of the emergency temporary rock revetment, the beach was likely characterized by limited high intertidal habitat, but largely lacking a dry sand beach berm. However, at the time of the revetment construction, the beach was eroded and had no high intertidal or dry sand beach berm. As such, the Broad Beach area likely supported little or no beach wrack. The majority of Broad Beach at this time was characterized by lower or middle intertidal habitat, a portion of which would have been impacted by the installation of sand bags and the emergency rock revetment in 2010, as described below in Impact MB-1.

<u>Impacts Associated with Future Projects in the Vicinity of Broad Beach</u>

Related projects occurring in the vicinity of Broad Beach include the Regional Water Quality Control Board Basin Plan Amendment, PCH bridge replacement project, and the Trancas Creek restoration project, as described in Section 1, *Introduction.* These related projects would have indirect and direct impacts that would be generally confined to terrestrial and high intertidal habitats within the Trancas Lagoon. In particular, although the Trancas Lagoon project is not yet designed, potential for improved tidal interchange could increase the frequency and duration of the opening of this Lagoon to tidal interchange with associated increases in sediment outflow from this creek, incrementally contributing to increasing transport of sediment down coast. In addition, sediment may be potentially removed from the Trancas Lagoon to improve tidal prism and increase the area of wetland habitat. If such sediment were disposed of on the beach, it could also temporally increase down coast sediment transport. These changes could incrementally contribute to changes in longshore transport with associated effects on down coast habitats as discussed below.

Impact MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms

Installation of sand bag and rock revetments from 2008 to 2010 resulted in loss of intertidal habitat and disturbance and mortality of intertidal species. (Minor, Class Mi).

<u>Impact Discussion (MB-1)</u>

Beginning in 2008 at the time of sand bag revetment construction and later during the emergency rock revetment construction, Broad Beach was eroded and had no areas of high intertidal habitat or beach wrack (i.e., seaweed washed up and stranded onshore).[3] Consequently, impacts to intertidal habitat resulting from the installation of these shoreline protection structures were primarily to the middle intertidal. Characteristic organisms of this habitat include blood worms (*Euzonus* sp.), polychaete worms (*Nephtys* sp.), and the sand crab *Emerita analoga*.

Installation of the sand bags resulted in the permanent loss of approximately 0.46 acre of intertidal habitat. Further, as the sand used to fill the sand bags was taken from the areas seaward of the escarpment (WRA, Inc. 2013), temporary additional impacts resulted to approximately 0.92 acre of intertidal sand habitat. Organisms in the sand scooped into bags or covered by the placement of bags would be expected to have died, resulting in a potential corresponding loss of prey for shorebirds.

Installation of the emergency rock revetment in 2010 resulted in the permanent loss of approximately 1.79 acres of sandy middle intertidal habitat (Chambers Group 2014). Based on surveys in October 2012 and June 2013 (Chambers Group 2013a), this represents a loss of approximately 805,982 intertidal organisms. In addition, approximately 0.93 acre was affected by sand sculpting (landward of sand bags) during revetment construction. Many of the organisms in sand moved by equipment would be expected to have died; however, sand habitat not covered by revetment or sand bags would potentially be re-colonized in the spring (Greene 2002). Staging was located in the Zuma Beach parking lot and did not impact natural habitat. However, some temporary impacts to middle intertidal sandy beach invertebrates may have occurred from the movement of equipment from the Zuma Beach parking lot to the construction site. The path of the vehicles was approximately 10 feet wide, and the trucks followed essentially the same path each time. Assuming a travel distance of approximately 5,000 feet from the Zuma parking lot to the westernmost extent of revetment construction activities (including truck turnarounds) across a 10-foot-wide strip of beach, an estimated 1.15 acres of intertidal habitat were impacted by trucking activities along the foot of the revetment. This 1.15 acres of mid- intertidal habitat (in the 2009 condition) was temporarily disturbed by vehicles in addition to the 1.79 acres permanently covered by the revetment. However, as discussed in previous submittals to the California Coastal Commission, biological monitors were present to ensure that construction activities did not disturb potential foraging or roosting western snowy plovers. In addition, no disturbance to other shorebirds was observed by the monitors during construction. One minor pollution incident occurred during revetment construction when an excavator leaked hydraulic fluid near the base of the revetment. The spill was cleaned up before any oil entered the water. Therefore, no impacts occurred to any habitat except the mid-intertidal where the spill occurred. The area affected by the spill was not quantified, but it was no more than a few square feet.

[3] The year 2005 was selected as an accurate pre-project condition, as this year predates the placement of the sandbag revetments (Chambers Group 2013c).

Areas impacted by sand excavation or trucking would be expected to recover (Greene 2002); however, areas covered by the sand bag and subsequent rock revetment, some of which lay on Public Trust Land, would not be available to support high intertidal habitat. Although the precise configuration of the sand bag and rock revetments is unknown, together these structures may cover more than 2 acres of mid elevation intertidal beach habitat. This would constitute a long-term or permanent loss of such habitat.

The loss of such habitat would be offset by the beach restoration project would expand high intertidal and middle intertidal habitat, substantially expanding these habitats over the estimated 20-year life of the project. Although coarse sand may function differently than finer sand as an environment for plant and wildlife species, the coarse sand grain size could be potentially less optimal for certain macroinvertebrates due to roughness, but is not prohibitive. Sand grain size may change conditions for existing invertebrate habitat on-site, but not necessarily adversely. The total sand volume added and the area affected is a relatively small portion of the entire existing sandy intertidal habitat area in the region and the overall impact is negligible. In contrast, the benefits of creating lost high intertidal habitat are significant (Moffatt & Nichol 2013b).

Although portions of these habitats would be subject to disturbance through backpassing, a more diverse set of sandy beach habitats would be supported, including high intertidal with associated beach wrack. However, with erosion of the beach over time, these benefits would cease and the sand bag and rock revetments would again displace then limited intertidal beach habitat.

Avoidance and Minimization Measure(s)

> **AMM TBIO-3a** (Biologist and Biological Monitors for Backpassing Activities) would address impacts of sand placement to marine biological resources. **AMM TBIO-3b** (Avoidance of Sensitive Resource Zones and Vegetation) would address marine biological resources. **AMM TBIO-3c** (Sensitive Biological Resources Report) would apply to this impact would address marine biological resources. **AMM REC-4a** (Requirement of Additional Nourishment) would address foreseeable future impacts to biological resources from long-term erosion of the restored sandy beach and dune system.

Rationale for Avoidance and Minimization Measure(s)

Incorporation of AMM TBIO-3a, -3b, and -3c would address impacts to sensitive sandy beach habitat as these AMMs would require a qualified and approved Project biologist to conduct preconstruction surveys of the sandy beach and dune habitats, identifying sensitive biological resources, including the presence of dense areas of beach wrack. The Project biologist would clearly designate these areas as sensitive resources zones to be avoided during backpassing. Additionally, impacts resulting from the long-term erosion of the sandy beach would be addressed by the incorporation of AMM REC-4a.

Impact MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms

Sand placement from Project construction and one renourishment event would result in direct and indirect burial as well as disturbance of sensitive rocky intertidal habitats within Lechuza Cove. (Major Adverse Effect, Class Mj).

Impact Discussion (MB-2)

The habitats and species found within the marine habitats of Broad Beach lie within the jurisdiction of the Mugu to Point Dume ASBS and the Point Dume SMCA, and the coastal waters offshore the Project are designated as Essential Fish Habitat (EFH) under section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act, and an ESHA under the Malibu LCP. In the 1970s before sand within the Broad Beach area was lost to extensive erosion, Lechuza Cove appears to have supported limited rocky intertidal habitat aside from that associated with the rocky outcrop of Lechuza Point (see Figure 3.3-6). However, regardless of the natural historic sand conditions at Broad Beach and in Lechuza Cove in particular, rocky intertidal habitats appear to have been a dominant habitat in Lechuza Cove for the last 20 or more years. Due to the sand erosion trend since the 1970s, rocky intertidal habitat has become more extensive over the years.

The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the direct burial of existing sensitive rocky intertidal areas near Lechuza Point. Burial from the initial nourishment event would occur in two phases: initial direct burial by placement of sand from trucks on the upper beach area and its distribution by bulldozers, and subsequent burial of lower intertidal areas as the sand is redistributed by wave action down the beach profile. Based on the surveys conducted in 2012 and 2014, direct burial impacts to rocky intertidal habitat could range from 0.94 acre (2012) to 1.96 acres (2014), depending on sand coverage in Lechuza Cove at the time of sand deposition. As previously described, in order to provide a more conservative analysis of impacts to this habitat type, the habitat area surveyed in 2014 has been used as a baseline.

Additionally, when accounting for long-term indirect burial (e.g., more than 1 foot of sand for more than 1 year) due to redistribution of beach sand, a total of approximately 4.01 acres of rocky intertidal habitat would be lost over the long-term depending on coastal processes, including longshore sand transport (Moffatt & Nichol 2014). Such habitats become uncovered incrementally as sand is carried down coast, but would be partially buried again during backpassing and upon renourishment.

Figure 3.3-6. Chronology of Intertidal Conditions Within Lechuza Cove

Further, the proposed Project would result in the direct burial of 0.96 acre of surfgrass, which occurs in the lower intertidal zone, with long-term indirect burial also occurring in this area over the long-term (Moffatt & Nichol 2014). As demonstrated by Craig et al. (2008), indirect placement can occur when sand placed onto beaches near the surfgrass beds subsequently moves onto the surfgrass beds, resulting in either partial or total burial of the beds. The results of this study suggest that short-term burial results in shoot mortality, decreased shoot counts, and reduced growth of surfgrass. Further, as previously described disturbances that result in long-term (or permanent) burial of the hard substrate in an area will preclude recovery as long as the rocky substrate remains buried. Even when such rocky areas become uncovered, the eventual potential for recovery of surf grass is difficult to project and would likely require extended periods of time.

In the first several months to a year following beach nourishment, sand levels in the intertidal areas are predicted to be about 2 to 3 feet deeper than average seasonal levels. The deeper cover means that fewer rocks will be exposed in spring when sand levels are seasonally low, and burial during the fall when sand levels typically are high will be greater than under the existing condition.

Extension of the beach profile in this area would result in 100 percent mortality to the intertidal and subtidal organisms that are currently located within areas planned for the dunes and beach berm footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate these species. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly.

Additionally, the placement of sand would result in temporary increases in nearshore turbidity; however, the larger grain size of the sand may reduce the severity of these impacts. Nevertheless, increases in nearshore turbidity would likely result in the smothering or burial of additional organisms and habitat beyond the actual footprint of beach nourishment. Areas of rocky intertidal habitat anticipated to be buried by more than 1 foot of sand for more than 1 year include approximately 4.01 acres of rocky intertidal habitat and 0.96 acre of surfgrass. Project design would somewhat limit impacts to the natural rocky intertidal habitat and surfgrass habitats that exist at the west end of Broad Beach near Lechuza Point.[4] Project design in this area restricts sand placement to the upper beach only and narrows beach fill to 150 feet or less. This area within Lechuza Cove would also have higher beach berms and a steeper slope, ranging from 14 to 17 feet above MLLW at a 3:1 slope. However, areas of the shoreline below the Mean High Tide Line (MHTL) in Lechuza Cove extending seaward for approximately 150 feet that support rocky intertidal habitat would be directly buried.

As previously described, based on conservative area measurements of rocky intertidal habitat from side sonar surveys conducted in May 2014, approximately 1.96 acres of rocky intertidal habitat would be directly impacted by initial Project construction, with 4.01 acres impacted by direct and indirect burial over the long-term. This would primarily consist of contiguous rocky intertidal habitat in Lechuza Cove as well as

[4] Surfgrass occurs both in the intertidal zone as well as in shallow subtidal zone. Consequently, impacts to surfgrass are also discussed in Impact MB-4.

isolated rock outcrops and the boulder fields further east. Similarly, an estimated 0.96 acre of surfgrass supported by lower rocky intertidal habitat would be directly impacted by the placement of fill as well as short-term and long-term indirect burial. This includes stands off of Lechuza Point that have been extrapolated to be present, but not comprehensively mapped in Applicant prepared surveys.

The duration and degree of impacts to intertidal habitats is difficult to estimate as various models and analytical analyses exist for projecting the duration of beach nourishment efforts (refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). The severity of such impacts is strongly correlated to the rate of longshore transport and cross beach distribution of sand, which distribute sand along the coast and into offshore areas. While all of these intertidal habitats are adapted to periodic burial by sand, long-term burial (e.g., more than 1 foot of sand for more than 1 year) would result in high mortality and slow recovery rates. Lower intertidal areas near Lechuza Point could become uncovered again in 1 to 2 years, while mid to upper intertidal habitats would be buried under beach berm and dunes over a 4 to 10 year period after initial nourishment. However, the impacts of burial of such habitats would be extended and exacerbated by backpassing, repeatedly impacting the rocky intertidal habitat (see Impact MB-5) and would also be repeated in an estimated 10 years with the single planned major renourishment event.

The deposition and placement of sand on the beach during both initial nourishment and a single major renourishment event would involve the repeated transit of heavy construction equipment (e.g., dozers, skiploaders) along the beach from the staging area located at the western end of Zuma Beach. Depending on how equipment is operated at the western end of the beach, this would result in additional disturbance and degradation to the rocky intertidal habitats along Broad Beach, directly affecting invertebrate species such as sand crabs. Further, as described in Impact MB-5, backpassing would be conducted based on an evaluation of beach width measurements, beach profile monitoring results, sand volume calculations, visual observations, and with respect to minimizing impacts to biological resources. Backpassing events would occur annually as needed with up to 20 backpassing events during the Project life to maintain beach width on a proportionate basis. This would also result in potential adverse impacts to intertidal habitats.

As discussed previously, the Point Dume SMCA includes a provision that beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required agency permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632). However, through personal communications, public comment with the 2012 Draft APTR, and interagency meetings, the CDFW has communicated that the regulations that were established for the Point Dume SMCA were not intended to allow for major adverse impacts to sensitive marine resources and would not allow for construction of new, enhanced or restored habitat within this area. Further, the MLPA laws and regulations do not include provisions for the construction of artificial reefs to minimize impacts to habitats located within an MPA (Fish & G. Code, § 2857, subd. (c)]. See Appendix N for 2012 CDFW comment letter.

The following AMMs attempt to reduce Project impacts to rocky intertidal habitats, but are not expected to reduce impacts to a minor adverse level. Impacts are expected to remain a major adverse effect.

Avoidance and Minimization Measure(s)

AMM MB-2a: Compliance with Existing Laws. Prior to commencement of construction activities, the Applicant shall provide California State Lands Commission (CSLC) staff copies of permits or other applicable written approvals from the California Coastal Commission (CCC), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and U.S. Army Corps of Engineers (USACE) that placement of fill west of the existing rock revetment is not inconsistent with the California Coastal Act (CCA), California Marine Life Protection Act (MLPA), Magnuson-Stevens Fishery Conservation and Management Act, and Federal Rivers and Harbors Act, respectively.

AMM MB-2b: Multi-Agency Collaboration for Sensitive Marine Habitat Impacts. Prior to commencement of construction activities, the Applicant shall work with jurisdictional marine habitat protection agencies, including CCC, CDFW, NMFS, USACE, and CSLC for review and endorsement of all marine habitat baseline surveys, impact analyses, and appropriate monitoring and any compensation for impacts to sensitive marine habitats and species. Prior to commencement of construction activities, the Applicant shall provide to CSLC staff any resultant surveys, impact analyses, and monitoring and compensation protocols determined through the multi-agency process and required by jurisdictional agencies.

AMM MB-2c: Sand Placement Footprint Limitation. If the Applicant receives agency approvals for placement of fill west of the existing rock revetment and if supported by the multi-agency coordination process of AMM MB-2b, construction contracts shall specify that all initial sand deposits during nourishment events shall be placed on the upper beach west of the existing revetment at Broad Beach area near Point Lechuza. Sand placement and mechanical distribution will be limited to areas falling within 120 feet of the bluffs and existing homes. To maximize sand dispersion over time and reduce the depth of burial of lower intertidal rocky habitat, sand to the west of the existing revetment shall be placed in two separate intervals so that only half the total amount of sand is placed at one time. The intervals shall be at the beginning of the placement, and then at the last stage of placement to allow the maximum time span between placements.

Rationale for Avoidance and Minimization Measure(s)

Burial of sensitive intertidal habitat, increased subtidal turbidity, and potential disturbance of sensitive species during Project construction would be minimized to the maximum extent feasible via the avoidance and minimization measures (AMMs). However, even with implementation of AMMs, impacts to rocky intertidal habitats and organisms are expected to have a major adverse effect. Replacing the loss of intertidal habitats is difficult and in particular, replanting or replacement of surfgrass has proved particularly difficult and problematic, as discussed further in AMEC's 2014 *Review of Subtidal and Intertidal Habitat Compensatory Mitigation Approaches* (see Appendix D). Initial sand losses after placement are expected to be approximately 25 percent. Therefore, with regard to AMM MB-2c, placing sand in two phases (at the beginning and near the end of beach construction) would allow for some of the initial losses to occur prior to depositing the full amount. This phased approach could allow some species to adjust to the new conditions, as they would occur more gradually.

However, sand burial and coverage of rocky intertidal and subtidal habitat would likely substantially increase under the Project and endure for up to 10 to 20 years. Restoration (re-establishment or rehabilitation), establishment (creation), or enhancement of rocky intertidal habitat and lower intertidal habitat may face technical challenges, especially related to the longevity of establishment/creation of such habitat in the coastal process zone. While surfgrass restoration or transplanting has had some limited success, it too faces substantial challenges. Protection, restoration, or enhancement of local subtidal and intertidal habitats may be a preferred option to at least partially offset Project impacts. Compensatory actions are generally recognized by State and Federal agencies as the restoration, establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts, which remain after all appropriate and practicable avoidance and minimization has been achieved. Compensation for unavoidable impacts to resources that are difficult to replace, such as surfgrass, is often provided through in-kind rehabilitation, enhancement, or preservation.

Burial of intertidal habitat would still occur with AMMs. Although burial of much of this habitat occurred historically in this area and currently occurs on an intermittent basis within areas, initial beach and dune habitat construction is expected to bury sensitive habitats at a greater depth and duration following the first and second renourishment events than has occurred naturally under historic conditions. The Project would also extend the duration and increase the frequency of burial during the time that Project-deposited sand remains within the Broad Beach area.

Impact MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms

Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive sandy intertidal habitats along Broad Beach. (Minor Adverse Effect, Class Mi).

Impact Discussion (MB-3)

The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the burial of existing sandy intertidal habitats that are recognized as being sensitive. Approximately up to 22.75 acres of sandy bottom intertidal would be impacted by direct fill (Moffatt & Nichol 2014). As a result of direct fill extension of the beach profile would result in 100 percent mortality to the intertidal organisms that are currently located within areas planned for the dunes and beach berm footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate species or individuals that do not relocate vertically or laterally to suitable locations. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly.

The upper beach area proposed for dune and upper beach berm creation would be buried under 17 to 22 feet of sand depth tapering down to 1 to 2 feet deep on the seaward edge of the beach face. However, although substantial mortality of intertidal species would occur during initial nourishment and the single planned renourishment event, all of these intertidal habitats are adapted to periodic burial by sand. Organisms would potentially re-colonize the new beach within one to two seasons (Greene 2002), including both lower and upper intertidal areas. Beach habitats would be diversified as new mid to upper intertidal beach would support beach wrack, while lower intertidal areas would support habitat seaward of the new dry sand beach berm. However, impacts of disturbance to and burial of such habitats would be repeated by backpassing (see Impact MB-5) and would be generally repeated in an estimated 10 years with the single planned major renourishment event.

The deposition and placement of sand on the beach during both initial nourishment and a single major renourishment event would involve the repeated transit of heavy construction equipment (e.g., dozers, skiploaders) along the beach from the staging area located at the western end of Zuma Beach. This would result in additional disturbance and degradation to the sandy shoreline habitats along Broad Beach and the west end of Zuma Beach, directly affecting invertebrate species, such as sand crabs.

Although beach nourishment has the potential to restore ecosystem functions of sandy beach communities, persistent disturbances may preclude natural recovery. Revell et al. (2011) evaluated the recovery rate of beach ecological metrics following a major El-Niño event on nearby beaches. Recovery of wrack abundance and shorebirds to pre-El Niño levels took 3 years. Reductions in biomass and mean size of invertebrates were still detected 2 years after the event. The loss of larger and older cohorts of intertidal invertebrates (e.g., sand crabs, *Emerita analoga*, and pismo clams, *Tivela stultorum*) may take 1 to 10 years for recovery. For these invertebrate communities to recover, appropriate grain size and beach slopes must be available to allow successful recruitment. It is unclear whether the proposed nourishment and backpassing would provide adequate conditions for full uniform recovery along the entire beach. In addition, although the coarseness of sand may be similar to beach sands, other physical characteristics, such as angularity, may differ and can affect biological communities. Compound this chronic, anthropogenic placement and movement of sediment with natural impacts associated with major storm events and the result may be a beach in a persistently degraded state. Following nourishment, the coarse sand grain size from inland quarry sites could be potentially less optimal for certain macroinvertebrates due to roughness, but would not be prohibitive. Sand grain size may change conditions for existing invertebrate habitat on-site but not necessarily adversely. The total sand volume added and the area affected is a relatively small portion of the entire existing sandy intertidal habitat area in the region and the overall impact would be minimal (Moffatt & Nichol 2013b).

Sandy intertidal areas also provide key foraging, nesting and overwintering habitat for a variety of coastal seabirds and shorebirds, including the federally threatened western snowy plover and federally threatened California least tern. No western snowy plover nesting occurs on Broad Beach or Zuma Beach, although the far eastern end of the Broad Beach area and adjacent Zuma Beach are federally designated as critical habitat for this species (Chambers Group 2012a). During the initial beach nourishment Project, heavy equipment operation could disturb foraging by such species over the 6-month construction period while burial, disturbance and reduction of food sources over the 6 months to 1 year following beach restoration could incrementally impact such species. The potential for impacts to breeding western snowy plovers or California least terns are considered of very low probability given absence of suitable existing nesting habitat on Broad Beach and lack of past breeding activities. In addition, the newly widened beach and dune system would provide a greater diversity of beach habitats than currently exists as exposed sandy beach is generally limited to lower tides, limiting this beaches' availability for shorebird foraging.

Additionally, sandy intertidal habitat provides spawning areas for species like the California grunion. Grunion spawning grounds are considered sensitive habitat under the Malibu Local Coastal Program (LCP) because the continued success of the species depends on the availability of spawning habitat. Broad Beach is currently a low tide beach with little or no sandy beach berm or persistent beach face which severely limits its potential as California grunion spawning habitat. This beach is backed by a variety of coastal protection structures, including the emergency revetment, which further limit suitable spawning habitat through displacement and potential for increased wave reflection back across the existing low tide beach. Further, although grunion have been observed spawning at the western end of Zuma Beach, they are not known to spawn on Broad Beach and their potential to use this beach for spawning under existing conditions is considered low.

Although sensitive species, such as the western snowy plover and California grunion, are not anticipated to use Broad Beach for nesting or spawning under existing conditions, successful restoration of Broad Beach and the adjacent dune system would greatly increase the suitability of this beach for nesting and spawning activities by these species. While the potential for successful reuse of Broad Beach by these species cannot be definitively forecast, the renourishment event has the potential to create substantial effects upon these species should successful nesting and spawning occur. Therefore, the Project would potentially create and maintain habitat for nesting and spawning by these sensitive species, but could also potentially impact the newly created habitat via renourishment activities.

<u>Avoidance and Minimization Measure(s)</u>

AMM MB-3: Monitoring for Grunion. If possible, construction activities shall be conducted outside the spawning season for grunion (March through August). If construction cannot be avoided during this period, pre-construction biological surveys for spawning grunion shall be conducted by a certified biologist. If spawning is observed, construction will halt in that area, and the spawning area plus a 250-foot buffer to each side of the spawning area will be protected from Project activities until after the next spring tides (approximately 10 days to 2 weeks).

AMM MB-5a (Backpassing Management Plan) would apply to sand placement impacts to marine biological resources.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Re-colonization of the newly widened beach with invertebrate species would be expected to occur naturally, though the timing would be less predictable. AMM MB-5a, described under Impact MB-5, would limit impacts from backpassing and would slightly increase the recovery time for affected sandy intertidal habitat. Monitoring for grunion spawning, as required by AMM MB-3, would ensure that if grunion begin to use Broad Beach in the future, they would be protected from the effects of sand placement until after their eggs have hatched and the larvae have been washed out to sea.

Impact MB-4: Sand Placement Impacts to Subtidal Habitats and Organisms

Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive subtidal habitats offshore of Broad Beach. (Major Adverse Effect, Class Mj).

Impact Discussion (MB-4)

The habitats and species found within the marine habitats of Broad Beach lie within the jurisdiction of the Mugu to Point Dume ASBS and the Point Dume SMCA, and the coastal waters offshore the Project are designated as Essential Fish Habitat (EFH) under section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act, and an ESHA under the Malibu LCP. Because California's system of MPAs have been explicitly designed to function as a network, any impacts to the Point Dume SMCA may also affect the overall function of MPAs in a broader area. Impacts to subtidal areas would therefore potentially be inconsistent with several sections of the MLPA and MPA/SMCA/ASBS regulations, as well as Section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act. The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the burial of existing intertidal habitats, discussed in Impacts MB-2 and Impact MB-3, as well as subtidal habitats. This would affect sensitive rocky and sandy bottom subtidal areas along the western portions of Broad Beach, including kelp and surfgrass beds, the latter of which occur in the intertidal as well as the shallow subtidal zones.

As discussed previously, the Point Dume SMCA includes a provision that beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required Federal, State, and local permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632). However, through personal communications, public comment with the 2012 DAPTR, and interagency meetings, the CDFW has communicated that the regulations that were established for the Point Dume SMCA were not intended to allow for major adverse impacts to sensitive marine resources and would not allow for construction of new, enhanced or restored habitat within this area. Further, the MLPA laws and regulations do not include provisions for the construction of artificial reefs to minimize any impacts to habitats located within an MPA (Fish & G. Code, § 2857, subd. (c)]. See Appendix N for 2012 CDFW comment letter.

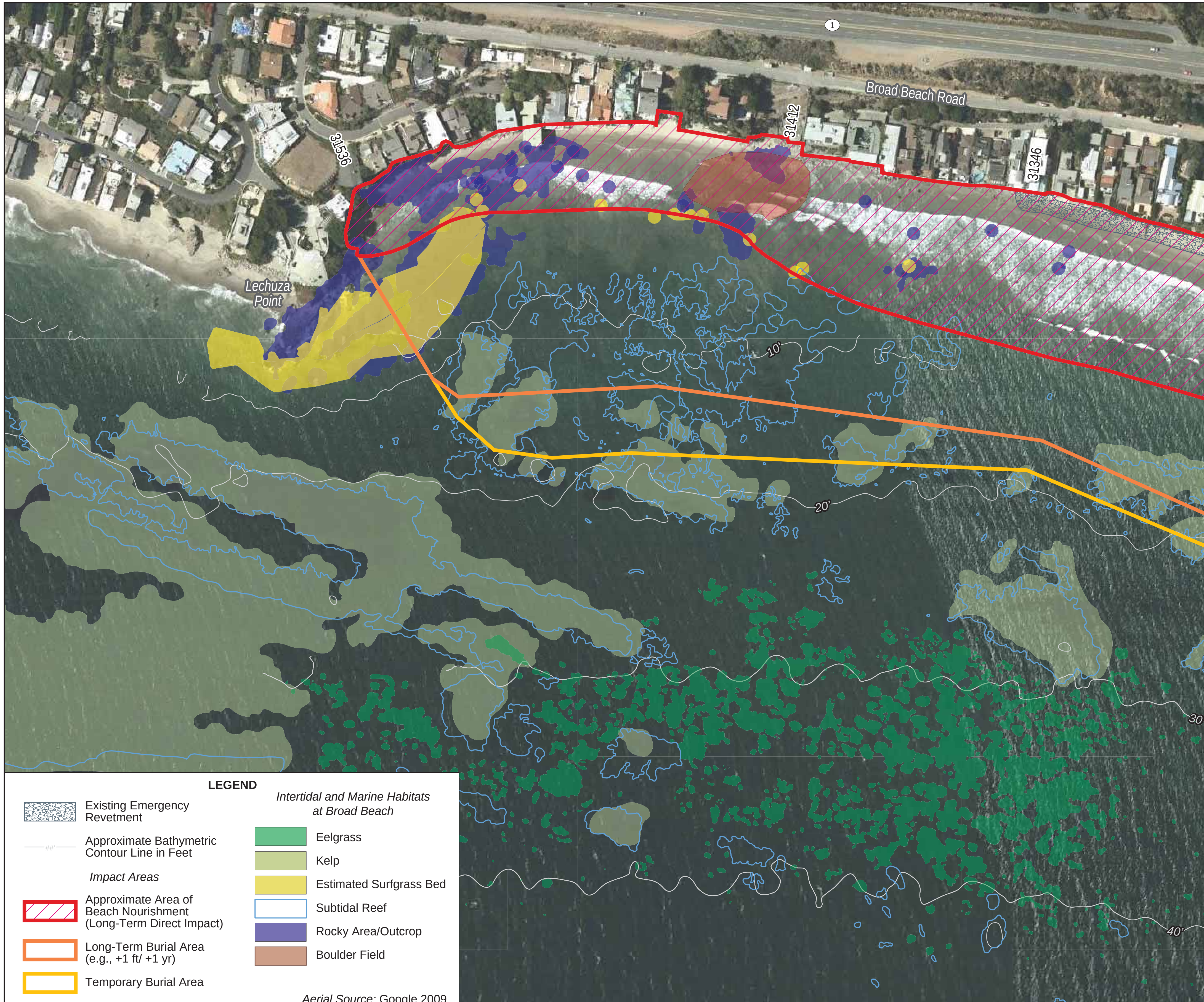
The Project is projected to have direct impacts to approximately 0.06 acre of shallow subtidal reefs located offshore of the Broad Beach area; however, the Project would result in direct and indirect long-term burial (e.g., more than 1 foot for sand for more than 1 year) of approximately 2.68 acres. Additionally, while the Project would not result in the direct fill of kelp beds, it would result in the indirect long-term burial of approximately 2.58 acres of kelp habitat and indirect short-term burial of approximately 2.96 acres (Moffatt & Nichol 2014; see Figure 3.3-7).

The organisms that live on these shallow reefs are adapted to sand movement. These species include rapid colonizers such as sea lettuce (*Ulva* spp.) and sand tube worms (*Phragmatopoma* spp.) as well as sand-tolerant species such as aggregate anemones (*Anthopleura* spp.) and surfgrass. These organisms are adapted to the seasonal cycles of sand movement, but it is unknown whether the greater predicted burials in the year following beach construction would be beyond their tolerance levels.

Surveys from the 1970s, when the beach at Broad Beach was much wider than today (and similar to the Project condition that is based on replicating historic shoreline widths), observed surfgrass and other rocky intertidal organisms in the lee of Lechuza Point (Morin and Harrington 1979) indicating that these species existed at Broad Beach during a period when the system had a greater amount of sand. Young surfgrass plants are frequently buried by as much as 30 to 40 centimeters of sand for periods up to several months (Reed et al. 1999). Thus, the Project may incrementally affect species diversity and richness of near shore subtidal rocky reef habitats. As previously described, the Project aims to limit impacts to the natural rocky habitat and surfgrass habitats that exist offshore Lechuza Point by nourishing a narrower portion of beach, thus limiting erosion in that area to only those times of greater wave run-up.

Extension of the beach profile would result in 100 percent mortality to the subtidal organisms that are currently located within the proposed beach footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate these species. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly. Additionally, the placement of sand would result in temporary increases in nearshore turbidity, resulting in the smothering or burial of additional organisms and habitat beyond the actual footprint of the expansion.

The proposed deposition of sand at Broad Beach in two nourishment events could incrementally increase sand coverage of, and turbidity impacts to, shallow subtidal rocky reefs located off of Lechuza Point and the west end of Broad Beach. These habitats could be impacted by an increased duration of sand burial. However, while modeling indicates that added sand to the system would not affect offshore areas deeper than 15 to 17 feet that support eelgrass, shallow reefs that extend from these subtidal areas shoreward into lower intertidal areas could suffer increased sand coverage (Moffatt & Nichol 2014; Chambers Group 2012b). Although many species on such shallow subtidal reefs are adapted to periodic sand coverage, it is unknown whether the greater predicted burials in the initial years following beach construction would be beyond their tolerance levels.



Habitat Type	Habitat impacts (2014 Sonar and Targeted Dive Surveys)		
	Direct Fill	Indirect Burial	
	Long-Term (acres)	Long-Term > +1 ft/ +1 yr (acres)	Temporary (acres)
Rocky Intertidal	1.96	4.01	0
Lower Intertidal/ Surfgrass*	0.96	0.96	0.96
Kelp‡	0	2.58	5.80
Eelgrass	0	0	0
Subtidal Reef	0.06	2.68	2.96
Total	**2.98**	**10.23**	**9.72**

Notes: Estimated area of indirect impact includes area within and beyond the nourishment footprint.
*Includes surveyed and estimated extent of surfgrass. Surfgrass overlies rocky intertidal habitat within Lechuza Point.
‡Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.
Source: Moffatt & Nichol 2014.

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Impacts to Marine Habitats at Broad Beach

FIGURE 3.3-7

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Benthic fauna at the beach site will be killed by burial following nourishment unless an organism is capable of burrowing through the overburden of sand (Greene 2002). Several factors determine survival of beach invertebrate fauna, including the ability for vertical migration through the sand overburden and the recruitment potential of larvae, juveniles, and adult organisms from adjacent areas (Greene 2002). Peterson et al. (2000) found an 86 to 99 percent reduction in the abundance of dominant species of beach macroinvertebrates ten weeks after nourishment on a North Carolina beach. These observations were made between the months of June and July, when the abundances of beach macro-invertebrates are typically at their maximum and providing the important ecosystem service of feeding abundant surf fishes and ghost crabs (Peterson et al. 2000).

Results of studies assessing the recovery of organisms at nourished beaches are highly variable (Greene 2002). While some studies conclude that beach infauna populations may recover to previous levels between two to seven months, other studies suggest recovery times are much longer (Greene 2002). Peterson et al. (2000) found a large reduction in prey abundance and body size of benthic macroinvertebrates at a nourished intertidal beach that likely translated to trophic level impacts on surf zone fishes and shorebirds.

Sandy subtidal areas, which are the most common habitat types located offshore Broad Beach, provide valuable habitat for key invertebrate species including sand dollars, crabs and potentially Pismo clams, as well as foraging areas for various demersal fishes. Under the Project approximately 13.5 acres of sandy bottom subtidal habitat would be directly impacted by fill; however, approximately 52 acres of this habitat type would be affected by short-term indirect burial (Moffatt & Nichol 2014). Based on modeling conducted by Moffatt & Nichol, the beach fill was predicted to add approximately 2 to 4 feet of sand to shallow sandy subtidal in this area compared to the average fall profile. However, because the increased sedimentation would be by gradual erosion of sand placed on the beach via wave action, the increased sedimentation would not be expected to persist over the long-term (e.g., more than 1 foot of sand for more than 1 year) and would not be have an adverse effect on shallow subtidal sand bottom organisms, which are adapted to sand movement.

The aerial extent and depth of increased sand cover is based on detailed modeling; however key estimates for longshore transport vary. Using available modeling information, increased sand cover is predicted to occur out to a depth of -20 feet. Approximately one year after beach construction, the total predicted sand cover in the low intertidal and shallow subtidal would be 1 to 5 feet. Additional sand cover beyond the average spring profile is projected to extend to about -18 feet. By the second fall following beach construction, sand levels between -2 and -20 feet MLLW would be 1 to 4.5 feet greater than the average fall profile. In the second spring two years after placement, sand cover above normal spring profiles would range from about 1 to 3 feet above average seasonal levels; and increased sedimentation would extend out to -14 feet. At 2.5 years after beach fill, sedimentation above the average fall profile would be 1 to 3 feet. By year 3, increased spring sand cover would be 1 to 2 feet out to a water depth of about -10 feet. By year 3.5, the increase above the average fall profile would be 6 to 18 inches. Between years 4 and 5, the increases over the average seasonal profiles are about 1 foot to 18 inches. By 5.5 years after the fill, increases in sand cover over existing profiles are minimal. However, although impacts would be much less severe, backpassing could prolong such burial, particularly of habitats in closer proximity to the shoreline.

The following AMMs attempt to reduce Project impacts to rocky subtidal habitats and species, but impacts are expected to remain a major adverse effect.

Avoidance and Minimization Measure(s)

> **AMM MB-2a** and **AMM MB-2b** would apply and shall be completed prior to commencement of construction to demonstrate agency authorization of marine habitat and species impacts and to determine multi-agency endorsement of marine habitat protection measures.

Rationale for Avoidance and Minimization Measure(s)

Unlike intertidal habitats, California has an extensive although variable history of subtidal reef creation; although creation of such habitats is feasible, substantial debate continues over whether such artificial reefs can fully replicate the functioning of natural reefs, and even if successful, constitute creation of new biomass as opposed to relocation of species. While a number of more recent reef creation projects have met many but not all of their success criteria, increases in fish biomass, reestablishment of kelp forest and algal cover have all shown promise. These issues are discussed in detail in AMEC's 2014 *Review of Subtidal and Intertidal Habitat Compensatory Mitigation Approaches* (see Appendix D). However, regardless of potential for success, opportunities for restoration, preservation or enhancement should be prioritized and may be available to offset Project impacts. Further, conducting shallow subtidal reef establishment or creation may also be a valuable exercise and, if results could be used to develop effective strategies for rocky reef establishment and restoration, could potentially result in benefits across many locations.

Long-term monitoring of the shallow subtidal reefs would allow for adaptive management of Broad Beach, providing a feedback that could result in changes in timing, area, or extent of future nourishment or backpassing. Such monitoring would also provide important data to be used by regulatory agencies when considering nourishment projects at other beaches with shallow subtidal reefs. However, even with implementation of AMMs and the potential for success of subtidal reef creation, impacts of the proposed Project to rocky subtidal habitats and organisms are expected to have a major adverse effect.

Impact MB-5: Backpassing Impacts to Marine Resources

Annual or biannual backpassing would prolong disturbance of both rocky and sandy intertidal habitats impacting intertidal species diversity and abundance (Minor Adverse Effect, Class Mi).

Impact Discussion (MB-5)

Backpassing would be conducted based on an evaluation of beach width measurements, beach profile monitoring results, sand volume calculations, visual observations, and with respect to minimizing impacts to biological resources. Backpassing events would occur annually as needed with up to 20 backpassing events during the Project life to maintain beach width on a proportionate basis. The full beach profile measurements at transects 408, 409, 410, 411, and 412 as measured one (1) year following completion of initial project construction, or following any subsequent renourishment episode when the beach area reaches an equilibrium state, would be used for a baseline comparison to establish beach proportions. Backpassing, as currently proposed, would disturb significant areas of the beach over the long-term, with heavy equipment excavating approximately 3 to 8 acres along 2,200 to 2,700 feet along the eastern end of Broad Beach to a depth of 5 feet and transporting this sand for 1,000 to 3,000 feet east along Broad Beach via heavy scrapper or haul truck for deposition on the west end of the beach. The receiver or fill site would be approximately 100 feet wide and extend along 2,600 feet occupying approximately 6 acres. A total of 25,000 to 50,000 cy of sand would be moved during each backpassing event. Therefore, the amount of sandy beach habitat that would be affected by backpassing from the eastern reach to the western reach is estimated to be approximately 9 to 14 acres of intertidal sand beach, or up to approximately 30 percent, of the 46-acre Broad Beach area. Maintenance activities would not occur below MLLW (Chambers Group 2013c). The direct and indirect impacts (e.g., burial) of each backpassing event are expected to be similar to those of the initial beach nourishment within the affected area. Additional impacts would occur within the transit zones, which would be located in intertidal areas.

Backpassing on this scale is typically practiced at highly managed and/or artificially created beaches, such as those in Long Beach Harbor or Newport Beach. Such beaches are largely recreationally oriented and may lack the existing intact natural systems and habitats that remain present at Broad Beach, at least in intertidal and subtidal areas. The high intertidal zone of mainland Southern California beaches supports a diverse and important macroinvertebrate community with macrophyte wrack as a food base (Dugan et al. 2008). The high intertidal macroinvertebrate communities provide a food base for foraging gulls and shorebirds, including western snowy plover. High intertidal habitats (e.g., beach strand) and macroinvertebrate sand beach community in Southern California mainland beaches has been lost or impacted by a variety of factors including coastal armoring, beach grooming, and sea level rise (Chambers Group 2012a).

Annual backpassing would transform existing subtidal and intertidal habitats along Broad Beach that currently functions as a largely natural, although often submerged, beach into a highly managed beach. Repeated disturbances of large areas of Broad Beach would prevent full recovery of intertidal and high intertidal species, particularly in the areas designated as borrow and fill sites. Transit corridors, particularly the intertidal beach, would also be impacted. While species in these habitats are accustomed to disturbance and are known to recover quickly, the resiliency of these habitats to repeated longer term disturbances of this scale is not well understood. Effects may be similar to repeated beach grooming, where species begin to recover from major nourishment or the most recent backpassing, only to be disturbed again. Over the 20-year Project life, the level of backpassing proposed would result in the transformation of the currently functioning largely natural sandy and rocky intertidal habitats, into a more managed beach environment, with consequent loss of natural species richness and diversity. Opportunities for this beach to develop and evolve into a more diverse and natural functioning intertidal and high intertidal beach habitat in place of existing habitats may be substantially curtailed by the extent and frequency of disturbance associated with backpassing.

In addition, a newly restored Broad Beach would have all the attributes of a grunion spawning beach. While creation or restoration of a grunion spawning beach would be a beneficial effect of the initial nourishment, backpassing during the grunion spawning season could adversely impact spawning grunion.

<u>Avoidance and Minimization Measure(s)</u>

AMM MB-5a: Backpassing Management Plan. The Applicant shall retain a qualified biologist to prepare an initial backpassing management plan, with input from project engineers, to guide backpassing over the life of the project. This plan shall be designed to protect undisturbed beach habitat areas while also achieving the Project objectives for ongoing beach nourishment. This plan shall be prepared and submitted for review and approval to the California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), and the California Coastal Commission (CCC) prior to commencement of Project construction activities. The plan shall have the following goals and standards:

- Protection of sandy beach habitat during backpassing events.
- Minimizing the aerial extent of beach disturbance (i.e., areas of excavation or fill) while maximizing sand availability for backpassing consistent with this goal and maintaining an acceptable beach profile and proportionate beach width.

- Protection of contiguous areas of macro-invertebrate habitat, particularly within the lower, mid and upper intertidal zones.
- Protection and retention of areas of beach wrack
- Prior to backpassing, relocation of all beach wrack from areas proposed for excavation or fill to areas that will remain undisturbed using hand crews or light equipment only.
- Retention of areas of undisturbed connectivity between portions of the dune habitat and the intertidal zone.
- Avoidance of backpassing in spring and early summer to avoid periods of high macro-invertebrate productivity.
- Consistent with approved nourishment plans, sand transported from backpassing will be placed high on the beach profile to minimize loss to coastal processes and impacts to rocky intertidal habitat
- Backpassing vehicle corridors shall be clearly defined and limited to minimize beach disturbance
- Backpassing will be limited to a maximum of one 3-week period annually

In no case shall more than 50 percent of the total dry sand and intertidal beach area be subject to disturbance by either excavation or fill.

AMM MB-5b: Annual Backpassing Plans. The Applicant shall retain a qualified biologist to prepare brief annual backpassing plans, with input from project engineers, to guide each backpassing event over the life of the Project. Each annual backpassing plan shall achieve the goals of the Backpassing Management Plan (AMM MB-1a). Each plan shall be prepared and submitted for review and approval to California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC) a minimum of three months prior to initiation of backpassing. The annual backpassing plan shall be designed to build upon the goals, standards and analysis within the initial backpassing management plan and be tailored to account for changing circumstance over time.

AMM MB-5c: Beach Habitat Management Plan. Prior to commencement of construction activities, the Applicant shall prepare and submit to CSLC staff a Beach Habitat Management Plan (BHMP). The BHMP will set forth measures to minimize the impacts of backpassing and maintain biological productivity of intertidal and high intertidal habitats, including but not limited to prohibition of grooming, creation and maintenance of areas of beach wrack and beach strand habitat on areas of the berm outside of backpassing borrow and deposition zones.

AMM MB-3 (Monitoring for Grunion) would also apply to backpassing impacts.

Rationale for Avoidance and Minimization Measure(s)

Limitations on the extent of beach disturbance associated with and the frequency of backpassing operations would permit more time and recovery of intertidal and high intertidal species and limit disturbance of these species. Preparation of a BHMP would permit enhancement of some additional areas along the beach to offset long-term disturbances. The newly created beach, once at equilibrium, would include a similar area of intact intertidal habitat as currently exists. Impacts to the sensitive intertidal and high intertidal beach habitats and species would be reduced through application of AMMs. Monitoring for grunion spawning would ensure that if grunion begin to use Broad Beach in the future, they would be protected from the effects of backpassing until after their larvae have hatched and been washed out to sea.

Backpassing is a key component of the Project to ensure longevity of beach nourishment activities to improve shoreline protection, dune restoration, and public coastal access and recreation. However, unregulated backpassing has the potential to create damage to sandy beach and intertidal habitats, lowering the biological productivity of the beach. AMM MB-5a to AMM MB-5c are designed to balance these competing interests and uses of the beach to maximize protection of undisturbed beach while also achieving the Project objectives (Section 2, *Project Description*).

Impact MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release

The increased vehicle traffic and equipment use associated with the Project would result in an increased risk of oil or fuel release as a consequence of onshore spillage (Minor Adverse Effect, Class Mi).

Impact Discussion (MB-6)

As discussed in Section 3.5, *Marine Water Quality,* the Project would involve increased traffic from vehicles and diesel-fueled equipment on Broad Beach during beach construction activities, increasing the chances of potential fuel or oil spills. If not quickly contained, a spill of fuel or oil from Project vehicles would potentially impact a variety of marine biological resources. Fuel and oil are physical and chemical hazards, and intertidal organisms are especially vulnerable to the physical effects of oil (Percy 1982). Sessile species, such as barnacles, may be smothered, while mobile animals, such as amphipods, may be immobilized and glued to the substrate or trapped in surface slicks in tidepools. It has been hypothesized (Hancock 1977) that organisms in the upper intertidal areas where the oil dries rapidly are more apt to be affected by physical effects of fuel oil, such as smothering, whereas organisms in the lower intertidal areas are more exposed to the chemical toxic effect of the liquid petroleum.

Plankton populations on the open coast are expected to have low vulnerability to a Project-related fuel or oil spill, as a spill of oil from a vehicle on the beach would not result in a large quantity of oil entering the ocean. Even if a large number of individual organisms contacted the fuel or oil, rapid replacement by individuals from adjacent waters is expected. In addition, the regeneration time of phytoplankton cells is rapid (9 to 12 hours) and zooplankton organisms are characterized by wide distributions, large numbers, short generation times, and high fecundity (National Research Council [NRC] 1985).

Open coast sandy beaches, like those generally located in the Broad Beach area would not be expected to suffer long-term damage from a Project-related fuel oil spill. Once the fuel or oil has been removed, recolonization by sandy beach organisms tends to be rapid (Aspen Environmental Group 2005).

Avoidance and Minimization Measure(s)

AMM TBIO-4a (Emergency Action Plan Measures Regarding Protection of Biological Resources) would apply fuel release impacts.

Rationale for Avoidance and Minimization Measure(s)

Prevention of fuel oil spills and minimization of spread of spills that do occur would reduce any potential impact to marine biological resources.

Impact MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources

The deposition of sand supply on Broad Beach would contribute additional sand sources to down coast intertidal habitat through longshore transport within the Santa Monica Littoral Cell (Negligible Effect, Class N).

Impact Discussion (MB-7)

Down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches, intertidal habitat areas, and shoreline marine biological resources farther south may be indirectly affected by changes in sand supply and distribution through littoral drift. Longshore transport moves sand supply from Broad Beach to down coast beaches, such as Puerco Beach, Amarillo Beach, and Big Rock Beach, within the Santa Monica Littoral Cell (refer to Figure 3.1-1). These down coast areas vary from sandy beaches to rocky headlands. The coastline comprises sensitive rocky intertidal habitat areas that would constitute ESHA.

The Project involves deposition of 600,000 cy of inland sand supply on Broad Beach during the initial nourishment event, followed by a supplemental nourishment of 450,000 cy 10 years after the initial event. Erosion of a newly widened beach would increase longshore transport down coast, incrementally contributing to increased sand supply effects within rocky intertidal habitats (e.g., burial of rocky intertidal areas). Average annual longshore drift is 280,000 cy per year. Over 20 years, an estimated 5.6 million cy of sand would be gradually and non-uniformly transported down coast (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). Barring the restored dune areas, approximately 950,000 cy of sand would be added to the coastline over the life of the Project. Gradually, this sand would erode into the Santa Monica littoral system. This represents a 17 percent increase in sand supply contribution over roughly 26 miles of coastline between the Broad Beach area and the breakwaters of Marina Del Rey.

Sand does not move uniformly under normal marine conditions. There are enumerable pocket beaches that may catch and hold sand before longshore transport occurs. Additionally, the increased supply may contribute to indirect nourishment of sand starved beaches down coast from the Broad Beach area. Over the long-term and under shifting seasonal coastal processes, sand deposition at Broad Beach may incrementally increase the volume of sand within existing rocky intertidal areas down coast. However, the 17 percent increase in sand supply at Broad Beach is expected to mimic the existing natural cycle, where ebbs and flows would pulse sand down coast gradually, rather than suddenly and en masse. Unlike the initial and follow-up nourishment activities, which involve a massive of sand deposition event within beach and intertidal areas that may bury marine biological resources at unsustainable depths, the transport of sand down coast would only potentially bury intertidal at shallow and nominal depths where marine biological resources would adapt to the gradual change. Additionally, the addition of sand to Broad Beach may reflect past conditions when more sand was available for transport to down coast beaches. As such, this gradual increase would be minor and the resulting impact would negligible.

Impact MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies

Project impacts to ESHAs, relative to public access and use of public trust lands, would potentially conflict with the California Coastal Act policies (Major Adverse Effect, Class Mj).

<u>Impact Discussion (MB-8)</u>

Policy 3.3 of the Malibu LCP defines any State MPA as an Environmentally Sensitive Habitat Area (ESHA); therefore, the waters offshore Broad Beach are considered ESHAs. ESHAs include habitat areas that are recognized as rare and/or important to wildlife, particularly to sensitive species. Within the Public Trust Impact Area, the sand dune habitat and the Trancas Lagoon are categorized as ESHAs. Based on a review of Coastal Act policies, Project implementation would potentially be in conflict with several provisions of the Coastal Act, for the reasons listed below.

Initially, Project implementation would be consistent with Coastal Act and LCP goals and policies regarding public access; however, after both the initial and subsequent proposed nourishment event, these benefits would immediately begin to diminish as coastal processes cause the beach to retreat. Long-term benefits would be eliminated without continued major renourishment, and public access on public trust lands and easements along the shoreline would be again severely impeded by the emergency revetment.

The offshore ESHA could also be adversely affected as sensitive marine biological resources within the Public Trust Impact Area, including surfgrass beds and rocky intertidal habitat, would be smothered or could be adversely affected by imported sand. Project construction is conservatively estimated to result in direct burial of approximately 5 acres of rocky intertidal habitat, including approximately 1 acre of surfgrass supported by lower intertidal rocky habitat that may be directly or indirectly impacted by sand placement in Lechuza Cove. Further, the Project may also affect more than 3 acres of subtidal rock reef habitat. Impacts of burial of such habitats would be extended and exacerbated by backpassing and would be generally repeated in an estimated 10 years with the single planned major renourishment event. Rocky intertidal and surfgrass potentially impacted are located within the SMCA and are therefore considered ESHA.

Avoidance and Minimization Measures

The following AMMs would apply to this impact:

AMM MB-2b Multi-Agency Collaboration for Sensitive Marine Habitat Impacts.

AMM MB-2c Sand Placement Footprint Limitation.

AMM MB-3 Monitoring for Grunion.

AMM MB-5a Backpassing Management Plan.

AMM MB-5c Beach Habitat Management Plan.

Rationale for Avoidance and Minimization Measures

Implementation of these measures would minimize impacts to existing marine biological resources and offset unavoidable impacts associated with the project to the maximum extent feasible.

1
3.3.5 Summary of Marine Biological Resource Impacts

Impact	Class	AMMs
MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms	Mi	**AMM TBIO-3a:** Biologist and Biological Monitors for Backpassing Activities **AMM TBIO-3b:** Avoidance of Sensitive Resource Zones and Vegetation **AMM TBIO-3c:** Sensitive Biological Resources Report **AMM REC-4a:** Requirement of Additional Nourishment
MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation
MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms	Mi	**AMM MB-3:** Monitoring for Grunion **AMM MB-5a:** Backpassing Management Plan
MB-4: Sand Placement Impacts to Subtidal Habitats and Organisms	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB 2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts
MB-5: Backpassing Impacts to Marine Resources	Mi	**AMM MB-5a:** Backpassing Management Plan **AMM MB-5b:** Annual Backpassing Plans **AMM MB-5c:** Beach Habitat Management Plan **AMM MB-3:** Monitoring for Grunion
MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release	Mi	**AAM TBIO-4a:** Emergency Action Plan Measures Regarding Protection of Biological Resources
MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources	N	No AMMs recommended
MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies	Mj	**AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation **AMM MB-3:** Monitoring for Grunion **AMM MB-5a:** Backpassing Management Plan **AMM MB-5c:** Beach Habitat Management Plan

3.4 TERRESTRIAL BIOLOGICAL RESOURCES

This section of the Revised Analysis of Public Trust Resources (APTR) describes the terrestrial biological resources (i.e., onshore above the tidal zone, including freshwater habitats) with the potential to be impacted by the Broad Beach Restoration Project (Project). Terrestrial biological resources include local habitat types, biological communities, and sensitive species, as well as invasive species. This section also evaluates the impacts that Project implementation may have on these resources. Analysis in this section focuses on terrestrial biological resources at both the CSLC Lease Area and the Public Trust Impact Areas that may be affected directly or indirectly by any of the primary Project components. This analysis is based on information from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB), U.S. Fish and Wildlife Service (USFWS) critical habitat map portal, Applicant-funded biological reports pertaining to Broad Beach and down coast areas, and reconnaissance-level field surveys of Broad Beach and immediate vicinity performed by AMEC Environment & Infrastructure, Inc. (AMEC).

The information presented here is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. Implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) pursuant to Public Resources Code sections 26601 and 21080, subdivision (b)(4) (see Section 1, *Introduction*). Therefore:

- The scope of review and analysis is limited only to those areas where impacts to public trust resources and values within the CSLC's jurisdiction may occur as well as other public trust areas, such as Zuma Beach;
- Areas outside the scope of the CSLC's jurisdiction for this Project include the three existing permitted quarries in inland Ventura County from which the BBGHAD proposes to obtain sand for the Project, and the sand transportation routes between these sites and Broad Beach (see Section 3.7.2, *Traffic and Parking*, for potential traffic impacts from the sand transportation routes). The quarry sites are fully permitted facilities and have been subject to past environmental review by Ventura County for impacts to terrestrial biological resources; therefore, terrestrial biological resources at these quarries are not analyzed in this APTR.

The 2012 Draft APTR relied on a *Protocol-level Special Status Plant and Natural Communities Survey* prepared by WRA, Inc. (2011) as the primary source of information regarding vegetation communities in the Broad Beach vicinity. As part of this survey effort, WRA conducted a background search for potential special-status plant species, as well as three floristic surveys and one reconnaissance site visit conducted between November 2010 and September 2011. These protocol-level surveys, which covered 2.46 acres, corresponded to the peak blooming or vegetative period for accurately identifying plant species in coastal dune habitats in Los Angeles County. The field surveys were limited in that they occurred after installation of the emergency rock revetment, which was constructed in 2010. Additionally, the surveys did not include coverage of the dune habitat that is located between the residences and the emergency rock revetment, an area that is considered an environmentally sensitive habitat area (ESHA), as defined by the Malibu Local Coastal Program (LCP). Additional biological reports cited in the 2012 Draft APTR comprise various biological assessments, including habitat assessments, specific to individual properties on Broad Beach Road. A number of reports, one of which pertained specifically to the globose dune beetle (*Coelus globosus*), a California Special Animal, were prepared to address the property located at 30732 Pacific Coast Highway. These reports were used to characterize the habitat and the potential wildlife present along Broad Beach.

Following publication of the 2012 Draft ATPR, additional studies have been performed to update the description of the existing setting at Broad Beach (Appendix D). Four overall foredune habitat surveys were conducted along Broad Beach, including recent summertime vegetation and wildlife surveys (WRA, Inc. 2010, 2011, 2012, 2013). These surveys included a larger study area intended to capture habitat conditions in all areas that may be directly affected by the Project (WRA, Inc. 2013). These studies include:

- *Summer Foredune Biological Survey Report* (WRA, Inc. 2013);
- *Broad Beach Foredune Impact Analysis* (WRA, Inc. 2012);
- *Upland Sand Source Coarser-than-Native Grain Size Impact Analysis* (Moffatt & Nichol 2013); and

Potential Impacts to Trancas Lagoon by Equipment Crossing for Broad Beach Restoration Project (Chambers Group 2013).

It should be noted that these studies were generally completed prior to the winter of 2013-2014. This winter season was characterized as a relatively active surf season, including a 25-year storm event on March 2, which caused damage along areas of the coast, including substantial erosion of remaining dune habitat at the east end of Broad Beach. The loss of dune habitat is not reflected in the baseline biological studies described above, but is discussed programmatically below.

3.4.1 Environmental Setting Pertaining to the Public Trust

<u>CSLC Lease Area and Public Trust Impact Area</u>

The CSLC Lease Area and Public Trust Impact Area (refer to Figure 1-2) includes Broad Beach and the western portions of Zuma Beach, with proposed beach and dune restoration extending laterally for approximately 6,200 feet from Lechuza Point to

Trancas Creek Lagoon, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment (refer to Figure 1-1). The area encompasses the approximate 46-acre beach and dune construction area, as well as the construction staging at the west end Zuma Beach parking lot, stockpiling of imported sand on Zuma Beach adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach. The CSLC lease area includes approximately 40.5 acres of public trust tidal and subtidal lands held by the State. These public lands are bordered by adjacent privately owned upland parcels that support residual dune habitats, single family residential homes, and the Malibu West Beach Club, portions of which would also be subject to proposed dune restoration.

Approximately 109 residences, varying in size and location relative to the beach, are located along Broad Beach. The undeveloped space located between this development and the Pacific Ocean supports 4,100 feet of emergency rock and sandbag revetment, a degraded coastal dune system, and a wet sandy beach, which generally occurs only during lower tides. Existing terrestrial habitats at Broad Beach are located roughly between the seaward side of existing homes and the mean high tide line (MHTL), consisting primarily of open sand, landscaped dune areas, the revetment, and limited dune habitat. Broad Beach historically supported a wider beach and dune habitat assemblage. As development proceeded and the beach narrowed due to coastal erosion over the last 30 years, both the acreage and quality of dune habitats were reduced. Most recently, from 2008 to 2010, homeowners responded to issues associated with the eroding beach by installing of a series of large sand bag revetments and then by constructing the existing rock revetment in 2010. Large sand bag revetments appear to have been installed along 4,000 feet or more of beach and such revetments may currently extend inland behind the existing rock revetment.

The Public Trust Impact Area also includes the west end of Zuma Beach, including Trancas Creek Lagoon and adjacent beach areas and those down coast, which can support special status wildlife species. While upcoast areas along the Pacific Coast Highway (PCH) are also included within the Public Trust Impact Area, terrestrial habitats in these regions would not be directly affected by the Project activities and, accordingly, this area not further discussed in this section. Down coast beaches, including Zuma Beach and Point Dume State Beach may be indirectly affected by the Project and are discussed as appropriate.

<u>BBGHAD Inland Project Area</u>

The BBGHAD Inland Project Area includes three quarries proposed as sand supply sources, as well as the sand transportation routes inland of PCH, that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). These areas do not support public trust resources administered by the CSLC related to terrestrial biology, were previous assessed and approved for mining by Ventura County and are not discussed further in this section.

Baseline Environmental Setting Description

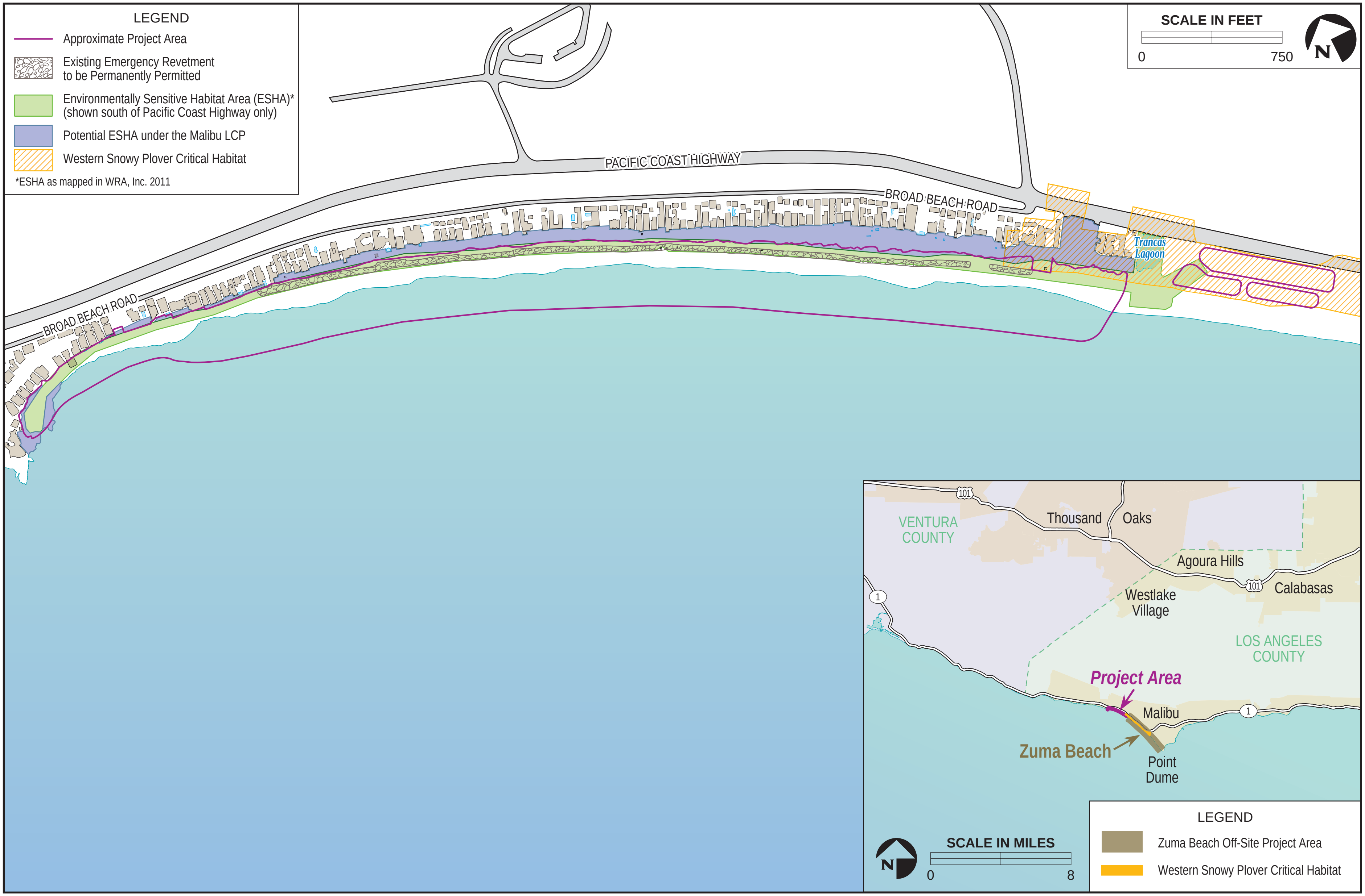
Although both of these emergency actions affected beach and dune habitats through short-term disturbance and direct removal or covering of habitat, such impacts are not well documented, as these actions occurred under emergency permits. However, WRA, Inc. (2012) prepared an analysis based on aerial surveys to estimate the impacts to the foredunes resulting from the installation of these stabilization materials.

The sand bag revetments appear to be six to 12 feet in width at the base and 10 to 12 feet in height. Construction appears to have involved keying these structures into the beach and laying them back into the existing disturbed dune habitat. Therefore, installation likely led to disturbance, removal, and covering of both beach and dune habitat (Illustration 3.4-1). This disturbance had potential additional impacts on any sensitive species that may have been present in the vicinity, including globose dune beetle, a California Special Animal, and red sand-verbena (*Abronia maritima*), a California Rare Plant Rank (CRPR) 4.2. These species, both of which have been documented at Broad Beach, may have been more widespread at the site in 2005 when a relatively larger area of foredune containing native dune mat vegetation likely existed and thus could have been disturbed through sand bag revetment installation in 2008-2009.

Illustration 3.4-1. *Initial construction and installation of sand bag revetments along Broad Beach included limited disturbance of degraded dune habitat along large sections of Broad Beach for laying back these revetments.*

According to estimates made by WRA, Inc. (2012), from false infrared aerial imagery there were approximately 12.23 acres of remnant foredune habitat in 2005, prior to the construction of the sand bag revetments. A maximum of approximately 2.05 acres of remnant foredune habitat could have been permanently impacted by the installation of these shoreline stabilization materials.[1] However, much of this habitat may have been lost to shoreline erosion prior to sand bag revetment installation. The lack of detailed records associated with the installation of the pre-2010 shoreline stabilization materials

[1] The assessment is based on the assumption that the landward location of the sand bags and other materials represents the inland extent of impacts associated with their installation. This also assumes that all habitat between the 2005 beach/foredune escarpment line and the shoreline stabilization materials was impacted by the installation of the pre-2010 rock revetment sand bags.



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Terrestrial Biological Resources along Broad Beach and West Zuma Beach

FIGURE 3.4-1

makes it difficult to accurately determine what portion of the 2.05-acre loss of foredune habitat was due to installation of the sand bag revetments and which may have been related to shoreline erosion (WRA, Inc. 2012).

Illustration 3.4-2. *Emergency construction of 4,100 feet of rock revetment on Broad Beach involved operation of heavy equipment on and placement of more than 36,000 tons of boulders over more than 3 acres of beach and degraded dune habitat.*

The existing emergency rock revetment is located between the existing dunes and the wet sandy beach. The installation of a 4,100-foot-long, 31-foot-wide, and 13-foot-high rock revetment in 2010 entailed placement of approximately 36,000 tons of rock, leading to the disturbance to and covering of beach and dune habitat (Illustration 3.4-2). Consequently, portions of this structure likely affected the disturbed dune system, which is identified as an ESHA under the Malibu LCP. It is unclear how much of the emergency rock revetment was installed abutting the pre-2010 sand bag revetments and how much may have been installed adjacent to or on remainder foredune habitat. As such, impacts to foredune habitat associated with the installation of the rock revetment in 2010 would have been limited to those areas within or adjacent to the revetment where 1) sand bag revetment materials were not located or 2) where the 2010 revetment footprint extended inland of the sand bag revetments or 3) where sand bag revetments had been destroyed by wave action. Based on analysis of false infrared aerial imagery, WRA, Inc. (2012) estimated disturbed areas at approximately 1.57 acres.[2] Consequently, installation of the sand bag and rock revetments is estimated to have resulted in the direct removal of approximately 3.62 acres of foredune habitat. However, additional temporary impacts to foredune habitat associated with the installation of the emergency rock revetment may have occurred where equipment and/or materials were staged at the seaward edge of foredune habitat.

The 2012 Draft APTR analyzed a number of off-site areas that would have the potential to be impacted by the Project. These areas included the 3 miles of beach down coast from Broad Beach between Trancas Creek and Point Dume, as well as the beaches adjacent to and down coast of formerly proposed sand sources in the Ventura Harbor sand trap and offshore of Dockweiler State Beach. Terrestrial biological resources in these off-site areas, including sandy beach and wetland habitats, were analyzed for potential indirect effects resulting from proposed dredging activities or changes in

[2] WRA estimate account for only 1 and 2 above; it remains unclear to what extent sand bag revetments had been destroyed or removed by wave action by rock revetment installation in 2010.

longshore sand transport resulting from the proposed addition to or withdrawal of sand from these littoral cells. However, the use of offshore sand sources (Ventura Harbor, Dockweiler State Beach, and Offshore Trancas) is not a part of the currently proposed Project.

Relationship between Terrestrial Biological Resources and Public Trust Resources and Values

Two Supreme Court cases provide the basis of the wildlife trust doctrine, a branch of the broader public trust doctrine that deals specifically with wildlife. In *Martin v. Waddell* (1842), the court applied English common law to reject a landowner's claim to an oyster fishery located under the public waters of the State of New Jersey. Additionally, the same logic was applied to terrestrial wildlife in *Geer v. Connecticut* (1896). In this case, the court held that wildlife was public property. These cases set the stage for modern wildlife management by State agencies, in which States act as trustees, managing and conserving wildlife resources on behalf of their citizens (Bruskotter et al. 2011). Historical cases that have upheld the wildlife trust doctrine include *People v. Stafford Packing Co.* (1925) 195 Cal. 548 and *California Trout, Inc. v. State Water Resources Control Bd.* (1989) 207 Cal.App.3d 585. A more recent case handed down by the California Supreme Court, *Environmental Protection and Information Center v. California Dept. of Forestry & Fire Protection* (2008) 44 Cal.App.4th 459, also upheld the notion that the public trust doctrine can be used to protect wildlife and is not limited to waterways and water resources. Consequently, impacts to terrestrial biological resources resulting from the Project inherently have the potential to affect public trust resources, as well as the public's use and enjoyment thereof.

Habitat Types within the CLSC Lease Area and the Public Trust Impact Area

The CSLC Lease Area and the Public Trust Impact Area support three primary terrestrial habitat types, including sandy beach, coastal dunes, and estuary. Both the sandy beach and the degraded dune system are important coastal habitat types that often support a number of State-listed threatened or endangered plant and wildlife species. However, native beach and dune vegetation communities at Broad Beach are restricted to remnant, disturbed elements of a native community, and are typically interspersed with invasive or landscape species, such as ice plant as well as open sand (WRA, Inc. 2011). The degraded dune system at Broad Beach is identified as an ESHA under the Malibu LCP. These dunes are a remnant of a more widespread system that historically occurred along parts of the Malibu coastline and elsewhere in Southern California. Additionally, Trancas Lagoon and Zuma Wetlands, both of which are identified as an ESHA under the Malibu LCP, drain portions of the Santa Monica Mountains National Recreation Area, located north of Broad Beach. These habitats, in addition to those in the Zuma Beach area are discussed in more detail below.

A total of 84 plant taxa have been identified at Broad Beach during surveys conducted by WRA in 2010, 2011, and 2013 (WRA, Inc. 2013). Table 3.3-1 shows the acreages associated with each vegetation type observed in Broad Beach's foredune habitat.

Table 3.3-1. Vegetation Community Types at Broad Beach

Community Type	Area (Acreage)*
Developed (including revetment)	8.06
Dune mat	0.10
Invasive	2.89
Landscaped	4.27
Open sand	10.38
Total Study Area	**25.70**

Source: WRA, Inc. 2013.

* Acreages may not account for erosion that occurred in winter 2013-2014.

Native dune mat vegetation was observed in approximately three discrete locations totaling about 0.10 acre. Additional areas containing one or more species typical of native dune mat communities were observed; however, these areas contained ice plant at greater than 50 percent cover, and as such, were identified as invasive communities. In general, the vegetation at the site is highly degraded, with a predominance of invasive ice plant and non-native ornamental species. As discussed above, these figures may not fully represent recent conditions where portions of existing dunes at the east end of Broad Beach were washed away during the winter of 2013-2014. Beach and Dune Habitats

With the exception of a limited beach berm and remnant dunes near Broad Beach's east end, Broad Beach has been reduced to an almost entirely low-tide, wet-sand intertidal beach, lacking coastal strand habitat and associated areas, with beach wrack and colonizing plant species. However, as discussed below, the Zuma Beach public trust area supports a significantly wider beach as well as dune habitats.

Dune systems typically consist of a foredune, dune crest, and back dune areas with plant species composition and cover varying by area. Southern foredune habitat generally consists of perennial herbs and low-growing shrubs that occupy wind-blown beach sand and receive salt spray from steady onshore sea breezes. This habitat type occurs along the immediate coast and intergrades with open beach sand on the ocean side, and coastal scrub on the coastal bluffs or often wetlands landward. Southern foredune habitats within the CSLC Lease Area and Zuma Beach area are typically dominated by invasive non-native plant species (e.g., European searocket [*Cakile maritima*] and ice plant [*Carpobrotus edulis*]) with interspersed native dune species, including red sand-verbena, beach bursage (*Ambrosia chamissonis*) and beach primrose (*Camissoniopsis cheiranthifolia* ssp. *cheiranthifolia*).

Open bare sand habitats occur in the CSLC Lease Area and Zuma Beach area along the beaches generally directly adjacent to the ocean. Open sand is subject to tidal action, and is mostly devoid of vegetation due to the frequent movement of substrates. Sandy beaches typically interface with the sandy intertidal, rocky intertidal and seasonally rocky intertidal marine and estuarine habitats (refer to Section 3.3, *Marine Biological Resources*).

Existing dunes at Broad Beach have been substantially altered by historic residential development, coastal erosion, and the installation of both sand bag and rock revetments, with the majority of foredune and dune crest having been eliminated and the majority of back dune areas converted to bare ground or landscaped yard space. The exception is the eastern 550 feet of Broad Beach east of the existing rock revetment, where remnant dune formations, though reinforced by sand bag revetments in places, retain a semblance of natural dune formations (approximately 0.10 acre, see Table 3.3-1). These areas support a mix of native, naturalized, landscaped species, and invasive plant species as discussed below. A portion of this area may have been damaged by coastal erosion in winter 2013-2014.

Beach and dune habitats within the Zuma Beach area have not been surveyed recently; however, site visit reconnaissance and aerial photography suggests that this area is dominated by sandy beach habitat that is relatively devoid of vegetation, and is heavily affected by human use. However, dune habitat, as described above, can be found in some areas of Zuma Beach, specifically those located to the southeast of the Zuma Wetlands (City of Malibu 1995).

Wetland and Estuarine Habitats

Coastal wetlands in the Public Trust Impact Area potentially affected by the Project include brackish and freshwater estuaries. Wetland and estuarine habitat adjacent to Broad Beach is limited to the Trancas Lagoon, located immediately east of Broad Beach. However, Zuma Beach supports a more extensive wetland and estuarine area, the Zuma Wetlands, located approximately 1.6 miles down coast. Both the Trancas Lagoon and the Zuma Wetlands provide habitat for wildlife and plant species held under public trust by the CDFW.

Coastal wetlands include a number of natural communities that share the combination of aquatic, semi-aquatic, and terrestrial habitats that result from periodic flooding by tidal waters, rainfall, or runoff. Wetlands provide habitat for a vast array of organisms, including many special-status species. During peak annual migration periods, hundreds of thousands of birds migrating along the Pacific Flyway descend upon these coastal wetlands in search of refuge and food. Coastal wetlands provide a vital link between land and open sea, exporting nutrients and organic material to ocean waters, and harboring juveniles of numerous aquatic species. Water flow in these highly productive communities circulates food, nutrients, and waste products throughout the system.

Open lagoons and estuaries in Southern California typically support southern coastal salt, brackish, and freshwater marsh habitats. These wetlands are exposed to marine tidal influences during the winter months, but are isolated during other times of the year as stream flows decline and the sand berm develops. Dominant salt marsh native species include pickleweed (*Salicornia virginica*), saltgrass (*Distichilis spicata*), alkali heath (*Frankenia grandifolia*), spearleaved saltbush (*Atriplex patula*), and alkali weed (*Cressa truxillensis*). Other common species include California bulrush (*Schoenoplectus californicus*), narrowleaved cattail (*Typha angustifolia*), umbrella sedge (*Cyperus eragrostis*), and rushes (*Juncus* ssp.). Non-native species often include brass buttons (*Cotula coronopifolia*), curly dock (*Rumex crispus*), and rabbit's-foot grass (*Polypogon monspeliensis*).

Illustration 3.4-3. *Trancas Lagoon lies at the east end of Broad Beach. Water levels vary seasonally, with approximately 0.50 acre of open water, salt and brackish marsh vegetation on the seaward side of PCH adjacent to the Project area; the lagoon is open to the ocean only intermittently.*

Adjacent to the eastern end of Broad Beach, Trancas Lagoon supports a mix of southern coastal salt marsh and brackish and freshwater marsh habitats (Illustration 3.4-3). Trancas Lagoon itself measures approximately 10 acres in area, with approximately 0.50 acre located seaward of PCH. This lagoon is created by a sand berm, which limits tidal exchanges and causes the creek to pond during high seasonal flows or during times of tidal inundation or wave run-up. A jurisdictional wetland delineation was completed for the Trancas Lagoon in 2002 and identified 0.92 acre and 450 linear feet of federal jurisdictional wetlands and waters of the U.S. The lagoon supports native species, such as California bulrush, pickleweed and alkali heath; non-native species, such as brass buttons and tamarisk (*Tamarix* spp.); and substantial areas of open water. Wildlife species known to use the lagoon and the sandy beach in the immediate vicinity include common waterfowl, such as mallard (*Anas platyrhynchos*), as well as a number of shorebirds, such as double-crested cormorant (*Phalacrocorax aurilus*) and gulls (*Laridae* spp.). Additionally, western snowy plover, a federally threatened species and a CDFW species of special concern, has federally designated critical overwintering and foraging habitat in the immediate vicinity of the lagoon and construction staging area (see Figure 3.4-2). However, the lagoon is not known to support any federally or State-listed fish, such as the tidewater goby (*Eucyclogobius newberryi*) or southern steelhead *(Oncorhynchus mykiss)*, both federally endangered species (Chambers Group 2013).

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Vegetation Communities at Trancas Creek with Staging Area and Beach Stockpile Areas

FIGURE 3.4-2

The Chambers Group (2013) conducted a biological survey at Trancas Creek, including a literature review and site visit, to assess the potential impacts to Trancas Lagoon by heavy equipment associated with the Project crossing the lagoon. During this survey, Chambers Group inventoried and mapped vegetation surrounding the lagoon. A small amount of Southern Foredunes habitat (i.e., 0.01 acre) was mapped south of the PCH bridge adjacent to a large patch of non-native ice plant. Native plant species typical of this vegetation community that were documented included: beach sand verbena (*Abronia maritima*), beach evening primrose (*Camissoniopsis cheiranthifolia*), and beach-bur (*Ambrosia chamissonis*). Additionally, native Southern Coastal Salt Marsh habitat was mapped (approximately 0.34 acre) and included fleshy jaumea (*Jaumea carnosa*), which was abundant in this area, saltgrass (*Distichlis spicata*), small amounts of beach-bur, salt heliotrope (*Heliotropium curassavicum* var. *oculatum*), spearscale (*Atriplex prostrata*), small amounts of Parish's pickleweed (*Arthrocnemum subterminale*), and Utah arrow grass (*Triglochin concinna*). Coastal Brackish Marsh habitat (approximately 0.02 acre) was also mapped south of the PCH bridge and included native California bulrush (*Schoenoplectus californicus*) and spearscale, as well as non-native annual beard grass (*Polypogon monspeliensis*).

The south coast branching phacelia (*Phacelia ramosissima* var. *austrolitoralis*), a CRPR 3.2 species, is the only sensitive plant species that has potential to occur in the lagoon south of the PCH bridge (Chambers Group 2013). This perennial herb grows in chaparral, coastal dunes, coastal scrub, and within coastal salt marshes and swamps on sandy or sometimes rocky soils. This species flowers between March and August and would have been conspicuous and identifiable during the biological survey. Neither south coast branching phacelia nor any other sensitive plant species was observed during the survey and therefore can be considered absent from the lagoon mouth (Chambers Group 2013).

Los Angeles County Parks and Recreation Department, under oversight of the CDFW, performs limited breaching of the Trancas Lagoon sand berm to prevent flooding, generally on an annual basis. The lagoon has been impacted by urban development and trash and pollutants from the nearby parking lot are routinely deposited into the lagoon (California Resources Agency 1997). However, the Santa Monica Bay Restoration Commission (formerly known as the Santa Monica Bay Restoration Company) recently approved funding for the acquisition and restoration of Trancas Creek and Trancas Lagoon, in order to restore and maintain a wildlife corridor between upland and sandy beach habitats (Santa Monica Bay Restoration Company 2010). This restoration project is in the early planning stages, including preparation of hydrologic, wetland delineations and other foundations studies. Initial objectives to be addressed in restoration design will include: 1) provide essential habitat and passage improvement for numerous coastal fish species, including endangered tidewater gobies and southern steelhead trout; 2) reduce sedimentation and erosion; 3) reduce water quality problems related to nutrient loading; 4) restore wetland and riparian vegetation and remove invasive exotics; 5) restore transitional upland and coastal sage scrub vegetation; and 6) provide opportunities for public access, trail connections to the upper watershed and educational outreach opportunities.

Additionally, Trancas Canyon has been identified as potential southern steelhead (*Oncorhynchus mykiss irideus*) habitat by the National Park Service (NPS), as Trancas Creek is a perennial stream with healthy riparian habitat and a connection to the marine environment. The hydrologic and geo-morphologic conditions of Trancas Creek were evaluated for fish passage constraints in 2004 as part of the Santa Monica Mountains Steelhead Habitat Assessment Report (CalTrout 2006). The NPS is developing a conceptual design plan for restoring Trancas Lagoon and the fish passage function of the upstream 1,000- to 2,000-foot-long trapezoidal concrete culverts.

Within the Zuma Beach area, Zuma Creek, located approximately 1.6 miles southeast of Trancas Creek supports a 6-acre freshwater estuary, including associated wetland vegetation (CSLC 2010). Despite seasonal influences of salt water, the Zuma Wetlands are predominately characterized as freshwater wetland habitat (City of Malibu 1995). Although the creek mouth is currently heavily impacted by urban development, the Zuma Wetlands have historically served as a wildlife corridor and nesting site for a variety of birds and small mammals (Tiszler et al. 1998). In 1997, the Zuma Wetlands underwent restoration, including freshwater marsh, riparian woodland, saltgrass terrace, and locally rare foredune habitats (Tiszler et al. 1998). Additional restoration completed in 2001 included removal of several exotic species, grading, and planting of more than 6,000 native plants (Information Center for the Environment [ICE] 2011). Zuma Creek was recently ranked in the Santa Monica Mountains Steelhead Assessment as being of high importance in the conservation of southern steelhead (Harrison et al. 2005). Consequently, future restoration is planned along Zuma Creek within Zuma Canyon (Los Angeles County Flood District 2006).

Landscaped Communities

In addition to restricted elements of dune mat vegetation, several parcels at Broad Beach support planted native landscape species including field sedge (*Carex praegracilis*), yarrow (*Achillea millefolium*), salt grass (*Distichlis spicata*), beach strawberry (*Fragaria chiloensis*), and dune grass (*Elymus* sp.) (refer to Table 3.3-1). The majority of parcels have been planted with non-native landscape species, including calla lily (*Zantedeschia aethiopica*), American century plant (*Agave americana*), lion's tail (*Agave attenuate*), Krantz' aloe (*Aloe arborescens*), shrubby daisybush (*Dimorphotheca fruticosa*), pride-of-Madeira (*Echium candicans*), New Zealand hebe (*Hebe speciosa*), and New Zealand flax (*Phormium tenax*).

Invasive Communities

The majority of the vegetated areas at Broad Beach are dominated by ice plant, a low-growing prostrate perennial herb that has been widely planted for soil stabilization and landscaping in coastal habitats throughout California. The ice plant mat vegetation alliance is dominated by ice plant and occasionally occurs with pampas grass (*Cortaderia* sp.) (Sawyer et al. 2009). Ice plant (Illustration 3.4-4) and pampas grass are non-native invasive species ranked as high in terms of negative ecological impact by the California Invasive Plant Council (Cal-IPC) (Cal-IPC 2012). Pampas grass is a large perennial grass that favors dunes, bluffs, and disturbed areas (Cal-IPC 2012). Additional invasive plant species occurring within this vegetation alliance include calla lily, cape ivy (*Delairea odorata*), and Bermuda buttercup (*Oxalis pes-caprae*) (Sawyer et al. 2009 and WRA, Inc. 2011, 2013).

Illustration 3.4-4. *Ice plant is the dominant vegetation in the Project area.*

Non-native species that have been observed at Broad Beach include those listed in Table 3.4-2 below. In addition to the species listed in Table 3.4-2, invasive species occurring in the Zuma Beach area, specifically in the vicinity of the Zuma Wetlands, include Bermuda grass (*Cynodon dactylon*), bristly ox-tongue (*Helminthotheca echioides*), castor bean (*Ricinus communis*), crystalline ice plant (*Mesembryantheme crystallinum*), curly dock (*Rumex crispus*), Lamb's quarters (*Chenopodium album*), and rip gut brome grass (*Bromus diandrus*) (ICE 2011).

Special-Status Species and Invasive Species

Special-status species data were collected from a variety of sources, including the CNDDB, California Native Plant Society's (CNPS's) Inventory of Rare and Endangered Plants of California, Applicant-prepared biological surveys, and other available literature including information on the presence and distribution of federally or State-listed special status species.

Special Status Plant Species

No State-listed threatened or endangered plant species are known to occur at Broad Beach (Chambers Group 2013). Seven sensitive plant species listed by CNPS are known or have either moderate or high potential to occur in the Project vicinity; however, only red sand-verbena has been documented (WRA, Inc. 2011, 2013) (see Table 3.4-3). Red sand-verbena was identified in limited patches of native dune mat vegetation along the length of the Study Area, primarily in association with undeveloped parcels at the site.

Table 3.4-2. Non-Native Plants Known to Occur in the Broad Beach Vicinity

Species Name	Common Name	Cal-IPC inventory Ranking[1]
Agave americana	American century plant	-
Agave attenuate	Lion's tail	-
Aira caryophyllea	silver hairgrass	-
Aloe arborescens	Krantz' aloe	-
Aloe sp.	aloe	-
Anagallis arvensis	pimpernel	-
Atriplex semibaccata	Australian salt bush	Moderate
Bromus madritensis ssp. *madritensis*	foxtail chess	High
Cakile maritima	European sea rocket	Limited
Carpobrotus eduilis	ice plant	High
Cortaderia sp.	pampas grass	High
Delairea odorata	Cape ivy	High
Dimorphotheca fruticosa	shrubby daisy-bush	-
Echium candicans	pride-of-Madeira	Limited
Erodium cicutarium	redstem filaree	Limited
Euphorbia peplus	petty spurge	-
Foeniculum vulgare	fennel	High
Hebe speciosa	New Zealand hebe	-
Helminthotheca echioides	bristly ox-tongue	Limited
Limonium perezii	Perez's sea lavender	-
Medicago polymorpha	bur medic	Limited
Oxalis pes-caprae	Bermuda buttercup	Moderate
Phoenix canariensis	Canary Island date palm	Limited
Phormium tenax	New Zealand flax	-
Pittosporum undulatum	Victorian box	-
Pseudognaphalium luteoalbum	everlasting cudweed	-
Rhaphiolepis indica	Indian hawthorn	-
Sonchus asper ssp. *asper*	prickly sow thistle	-
Sonchus oleraceus	common sow thistle	-
Zantedeschia aethiopica	calla lily	Limited

Sources: Cal-IPC 2012; WRA, Inc. 2011.

Notes: These species were documented at Broad Beach within the 2.46-acre area surveyed by WRA, Inc. (2011); additional non-native species may be present in other areas of Broad Beach, which were not surveyed by WRA, Inc.

[1]Cal-IPC categorizes plants as High, Moderate, or Limited, reflecting the level of each species' negative ecological impact in California

Table 3.4-3. Sensitive Plants Known or Having the Potential to Occur within the CSLC Lease Area and Zuma Beach Area

Species	Status	Notes/Occurrence
Project Area – Broad Beach[1]		
Abronia maritima red sand-verbena	CRPR 4.2	Present. This species has a high potential to occur within the southern foredune habitat and was observed during the protocol-level rare plant survey.
Atriplex coulteri Coulter's saltbush	CRPR 1B.2	Not Observed. This species has a moderate potential to occur at Broad Beach due to the presence of coastal dune habitat; however, Coulter's saltbush was not observed during the 2010 or 2011 protocol-level rare plant surveys or during the 2013 biological survey.
Camissoniopsis lewisii Lewis' evening-primrose	CRPR 3	Not Observed. This species has a high potential to occur within the southern foredune habitat; however, it was not observed during the protocol-level rare plant surveys in 2010 and 2011, nor was it observed during the 2013 biological survey.
Chaenactis glabriuscula var. *orcuttiana* Orcutt's pincushion	CRPR 1B.1	Not Observed. Though this species has a high potential to occur within the southern foredune habitat, it was not observed during the protocol-level rare plant surveys in 2010 and 2011, nor was it observed during the 2013 biological survey.
Dlphinium parryi spp. *Blochmaniae* dune larkspur	CRPR 1B.2	Not Observed. This species has a moderate potential to occur at Broad Beach due to the presence of coastal dune habitat; however, it was not observed during the 2010 or 2011 protocol-level rare plant surveys or during the 2013 biological survey.
Hordeum intercedens vernal barley	CRPR 3	Not Observed. This species has a moderate potential to occur at Broad Beach due to the presence of coastal dune habitat; however, it was not observed during the 2010 or 2011 protocol-level rare plant surveys or during the 2013 biological survey.
Phacelia ramosissima var. *austrolitoralis* south coast branching phacelia	CRPR 3.2	Not Observed. This species has a moderate potential to occur at Broad Beach due to the presence of coastal dune habitat; however, it was not observed during the 2010 or 2011 protocol-level rare plant surveys or during the 2013 biological survey.
Off-site Project Area – Zuma Beach[2]		
Abronia maritima red sand-verbena	CRPR 4.2	Present. This species was reintroduced as a part of the Zuma Beach Restoration Plan (1997).

Sources: [1]WRA, Inc. 2011, 2013; [2]Psomas and Associates 1997; CNPS 2014.
Notes:
CNPS California Rare Plant Rank (CRPR)
- 1A - Presumed extinct in California
- 1B - Rare, threatened, or endangered in California and elsewhere
- 3 - Plants about which CNPS needs additional information.
- 4 - Plants of limited distribution
- 0.1 - Seriously threatened in California (>80% of occurrences threatened)
- 0.2 - Fairly threatened in California (20 to 80% of occurrences threatened)

0.3 - Not very threatened in California (<20% of occurrences threatened)

Illustration 3.4-5. *Red sand-verbena is a sensitive plant species documented in the Project area; past revetment construction as well as creation of a new dune system may impact individuals of this species. Photograph courtesy of Calflora.*

Red sand-verbena. Red sand-verbena (Illustration 3.4-5) is a trailing succulent found mostly on coastal strand from San Luis Obispo County south to Baja California, and blooms between February and November (Hickman 1993). The plant is part of the single dune mat vegetation association (comprised of beach bur, red sand-verbena, and sea); this vegetation community is located entirely near the ocean edge and is dominated by red sand-verbena and beach bur, with a subdominant presence of sea rocket and beach evening primrose (*Camissoniopsis cheiranthifolia* spp. *cheiranthifolia*) (WRA, Inc. 2011). However, the cover of this vegetation alliance at Broad Beach is minimal and primarily limited to the eastern end of Broad Beach (WRA, Inc. 2011, 2013). Red sand-verbena is also known to occur at Zuma Beach.

Special Status Wildlife Species

Several wildlife species inhabit the Malibu coastline and may occur at Broad Beach or down coast beaches such as Zuma Beach. The federally threatened western snowy plover, CDFW fully protected California brown pelican (*Pelecanus occidentalis californicus*), and California Special Animal globose dune beetle have recently been documented at Broad Beach (Chambers Group 2010 and Sandoval 2008). Allen's hummingbird (*Selasphorus sasin*), a USFWS Bird of Conservation Concern, was detected in point count surveys conducted by WRA, Inc. (2013). California least tern (*Sterna antillarum browni*), which may forage off Broad Beach, may also occur at Broad Beach (Forde Biological Consultants 2005) along with the silvery legless lizard (*Anniella pulchra pulchra*) and sandy beach tiger beetle (*Cicindela hirticollis gravida*); however, none of these species was identified in recent biological surveys (WRA, Inc. 2013).

Illustration 3.4-6. *The eastern end of the Project area and Zuma Beach support critical overwintering habitat for the western snowy plover. Photograph courtesy of USFWS.*

Western snowy plover. The western snowy plover was listed as federally threatened in 1993 and is also a CDFW species of special concern (Illustration 3.4-6). This species, which includes a coastal and an interior population, breeds on the Pacific coast from southern Washington to southern Baja California, Mexico, as well as in interior areas. The Pacific coast population of the western snowy plover has not been found to have distinct genetic differences from western snowy plovers that breed in the interior (USFWS 2007a); however, they are geographically isolated from one another due to a lack of dispersal among the two populations. The Pacific coast population is defined as those individuals that nest adjacent to or near tidal waters, and includes all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays, and estuaries (USFWS 2007a). The coastal population of the species consists of both resident and migratory birds (Warriner et al. 1986). Although some individuals overwinter in the same areas used for breeding, migratory coastal western snowy plovers travel either north or south within their coastal range (USFWS 2007a).

The western snowy plover forages primarily in wet sand at the beach-surf interface and feeds on marine worms, small crustaceans, and insects (USFWS 2007a). This species is most likely to nest in shallow depressions on undisturbed, flat areas with loose substrate, such as sandy beaches and dried mudflats along the California coast. Typically, two to three eggs are laid by each female, and are incubated by both sexes. These eggs hatch in 25 to 30 days and nestlings fledge (i.e., are able to fly) after approximately 1 month (USFWS 2007a). The nesting season for this species can extend from early March through early September, but generally occurs up to 2 to 4 weeks earlier in Southern California (USFWS 2007a).

The decline in the western snowy plover population is primarily attributed to human disturbance, urban development, introduced European beachgrass (*Ammophila arenaria*), and expanding predator populations (USFWS 2007a).

Western snowy plovers are known to occur within both the CSLC Lease Area and the Zuma Beach area, along the sandy beach extending from just west of the Trancas Lagoon to Point Dume, where they have federally designated critical habitat (refer to Figure 3.3-1). The essential habitat features in these areas include stretches of sandy beach, generally barren to sparsely vegetated, located both above and below the high tide line terrain (USFWS 2005). In addition to providing habitat conducive to predator avoidance, these features also provide individuals with occasional surf-cast wrack supporting small invertebrates for foraging. Western snowy plovers do not nest near Trancas Lagoon; however, Zuma Beach is listed as federally designated critical habitat because it is an important wintering area with up to 213 western snowy plovers recorded during a single season over the last seven years (WRA, Inc. 2013). Zuma Beach supports the largest wintering population of snowy plovers in Los Angeles County. During construction of the emergency revetment in 2010, biological monitors observed snowy plovers on the sand bar at the mouth of Trancas Lagoon (WRA, Inc. 2013). This critical habitat unit extends about 3 miles north along the coast from the north side of Point Dume to the base of Trancas Canyon. This unit includes the following physical or biological features essential to the conservation of the species: areas of sandy beach above and below the high-tide line with occasional surf-cast wrack supporting small invertebrates and generally barren to sparsely vegetated terrain (Federal Register 2012).

California brown pelican. The California brown pelican (Illustration 3.4-7) was recently delisted under the California Endangered Species Act (CESA) due to increasing populations and increased nesting; however, its classification as a fully protected species by CDFW remains. Pursuant to the Fish and Game Code, fully protected species may not be taken or possessed at any time and no permits or licenses can be issued to take any fully protected species, except in the instance of take resulting from recovery activities for State-listed species. Like any bird in the pelican family (i.e., Pelecanidae), the California brown pelican is easily identified by its large body, long bill, webbed feet, and large gular pouch; this particular species is differentiated by its dark plumage (Burkett et al. 2007). The species occurs along most of the Pacific coast, preferring warm coastal marine and estuarine environments. California brown pelicans are chiefly diurnal, and primarily forage in shallow coastal waters or inland seas (Burkett et al. 2007). Roosting occurs during the day, in groups on sand bars or jetties, or on man-made structures such as piers and docks (Shields 2002). During the most recent biological survey, flocks of brown pelicans were observed flying offshore adjacent to Broad Beach, where they are likely to opportunistically forage offshore (WRA, Inc. 2013). This species was documented at Broad Beach during the construction of the emergency rock revetment (Chambers Group 2010). California brown pelican individuals in this region may be dependent on resources located in both the CLSC Lease Area and the Zuma Beach area, particularly Trancas Lagoon and the Zuma Wetlands.

Illustration 3.4-7. *California brown pelicans were documented by monitoring biologists during construction of the emergency revetment at Broad Beach in 2010. Photograph courtesy of the USFWS.*

Allen's hummingbird. Allen's hummingbird is not a federally or State-listed threatened or endangered species; however, this species a USFWS Bird of Conservation Concern (Illustration 3.4-8). Male Allen's hummingbirds have green backs and orange-red throats while females have green backs with reddish sides and tail bases. These birds take cover in trees and shrubs and nest above ground often in shaded areas. Allen's hummingbirds are known to breed in woodlands and dense scrub from mid-February to early August. Allen's hummingbirds were documented at Broad Beach during the most recent biological surveys;

Illustration 3.4-8. *Allen's hummingbird is a USFWS Bird of Conservation Concern. This species eats consumes nectar and insects and takes cover in trees and shrubs, including ornamental vegetation near the Project area. Photograph provided by Will Elder, NPS*.

however, these birds were only observed interacting with ornamental flowering plants in landscaped areas near residences and not within any areas that would be directly modified by implementation of the Project (WRA, Inc. 2013).

California least tern. The California least tern was listed as federally endangered in 1970 and State-listed as endangered in 1971 (Illustration 3.4-9). This migratory species is found along the Pacific coast of California, from San Francisco southward to Baja California (USFWS 2009). Its non-breeding range is presumed to be the Pacific coast of North America from central Mexico south to Panama, but robust evidence is lacking (USFWS 2009). Further, populations are localized and have become increasingly fragmented as coastal development continues. This species feeds exclusively on small fish caught in estuaries, bays, and near-shore marine waters (USFWS 2009). Today, nest sites are restricted to a few defined locations, some of which are artificial and most of which persist only because of strict management (USFWS 2009).

Illustration 3.4-9. *California least terns may be observed flying up and down coastal areas in search of suitable foraging locations; however, nesting within the Project area is unlikely due to the fragmented condition of the coastal dune features and proximity of coastal development and human activity. Photograph courtesy of the USFWS.*

The California least tern is the smallest of the North American terns. Individuals nest in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal action. The typical colony size is 25 pair (USFWS 2006). The California least tern generally arrives in nesting areas in mid-April to early May (USFWS 2006). Pair bonds may form before or immediately upon arrival with well-defined courtship patterns. Nest locations are usually undisturbed open sand, dirt, or dried mud close to estuaries or a dependable food supply (USFWS 2006). California least terns are colonial, creating loose aggregations of nests approximately 10 feet apart with one to four eggs laid in small depressions (USFWS 2006). Their nest is a simple scrape in the sand or shell fragments (USFWS 2009). A typical clutch is two eggs and both adults incubate and care for the young. Fall migration commences between the last week of July and the first week of August (USFWS 2006). Several weeks before the fall migration, adults and young wander along marine coastlines, congregating at prime fishing sites (USFWS 2006).

While California least tern may be observed flying over Broad Beach, moving up and down coastal areas in search of suitable foraging locations, this area is not considered to be critical habitat or recent breeding habitat, as the conspicuous presence of human activity at Broad Beach limits the potential for nesting colonies at Broad Beach (Forde Biological Consultants 2005).

Golden Eagle. While the golden eagle is not a federally or State-listed threatened or endangered species, it is fully protected in California, and federally protected by the Bald and Golden Eagle Protection Act (BGEPA), the Migratory Bird Treaty Act (MBTA), and the Lacey Act. Each of these regulations restricts activities that could have a detrimental effect on golden eagle populations Golden eagles are large dark brown raptors with golden feathers on the head and neck. Located in the Northern Hemisphere, their habitats include semi-open country, chaparral, shrubland, cliffs and bluffs. Breeding activities for the golden eagle typically occur in the spring, and their eggs are incubated by the female for 6 weeks after laying them. The golden eagle is a powerful predator that hunts many animals of medium size (USFWS 2011). While Golden Eagle may be observed flying over Broad Beach, moving up and down coastal areas in search of suitable foraging locations, individuals have not been observed during any recent surveys of Broad Beach.

Illustration 3.4-10. *While the silvery legless lizard has been documented in the Ventura Harbor sand trap and in the general locality, especially in the vicinity of McGrath Lake, it has not been documented at Broad Beach. However, this species is known to co-occur with ice plant, and has been found in similar coastal dune habitat. Photograph courtesy of California Herps.*

Silvery legless lizard. The silvery legless lizard is a CDFW species of special concern. This burrowing reptile is slender, with no legs, a shovel-shaped snout, smooth shiny scales, and a blunt tail (NatureServe 2012) (Illustration 3.4-10). This species lives mostly underground, foraging in loose sandy soil during the day and emerging to the ground surface at dusk or at night. Silvery legless lizards primarily eat larval insects, beetles, termites, and spiders, concealing themselves beneath leaf litter or substrate before ambushing their prey. This species typically inhabits sand or loose soil in a variety of habitats, including areas with sparse vegetation such as beaches, chaparral, pine-oak woodland, and riparian areas characterized by sycamores (*Plantus* spp.), cottonwoods (*Populus* spp.), and oaks (*Quercus* spp.) (NatureServe 2012). Silvery legless lizards are also found in dune habitats, specifically in areas with bush lupine (*Lupinu*s spp.) and mock heather (*Ericameria ericoides*), which are habitat indicators for this species (NatureServe 2012). They are often present in greater densities in areas where soil moisture is greater and in lower densities where soils are disturbed and ice plant mats occur (Kuhnz et al. 2005). Silvery legless lizards have not been recently documented in the Broad Beach or Zuma Beach areas. No individuals were encountered in pit-fall traps included during the most recent biological survey at Broad Beach (WRA, Inc. 2013). However, this species is found within similar coastal backdune habitat and may occur within other areas along the Malibu coastline (Broughton et al. 2006).

Southwestern pond turtle. The southwestern pond turtle (*Emys marmorata pallida*), a CDFW species of special concern, is a genetically distinct sub-species of the western pond turtle (*Emys marmorata*), and is found south of San Francisco Bay (Lovich 1998) (Illustration 3.4-11). Historically, this subspecies had a relatively continuous range along the Pacific slope drainages from southern Washington to Baja California (Lovich 1998). Habitat requirements for this species include still or slow-moving water and the availability of aerial and aquatic basking sites. The reproductive biology of the species is poorly known (Lovich 1998). Courtship and mating have been observed in the field during most of the year except December and January, while nesting extends from late April through August with a peak in late May and early July (Lovich 1998). Southwestern pond turtles eat a variety of food items including algae, plants, snails, crustaceans, isopods, insects, fish, and frogs (Lovich 1998).

Illustration 3.4-11. *The southwestern pond turtle has been documented in Trancas Canyon just north of Trancas Lagoon. Photograph courtesy of the Bureau of Land Management.*

The greatest single threat to this species is habitat destruction. Over 90 percent of the wetland habitats within its historic range in California have been eliminated due to agricultural development, flood control, water diversion projects, and urban development (Lovich 1998). The southwestern pond turtle has not been observed atat Broad Beach; however, this species has historically been documented in Trancas Canyon, upstream of the lagoon. This species would be highly unlikely in the lagoon seaward of the PCH bridge, but they can occur in brackish water and could occur just upstream of the bridge (Chambers Group 2013).

Tidewater goby. The tidewater goby was listed as a federally endangered species in 1994 and is a CDFW species of special concern (Illustration 3.4-12). The tidewater goby is a small estuarine fish reaching only 2 inches in length. Preferred habitat for this species includes lagoons, marshes, and tributaries with tidal influence between Del Norte County and San Diego County, California (USFWS 2007b). The tidewater goby resides in coastal streams within 2 miles of

Illustration 3.4-12. *While the tidewater goby has not been documented at Trancas Lagoon, proposed federally designated critical habitat for the species is located at Zuma Wetlands. Photograph courtesy of USFWS.*

the ocean and characterized by slow, shallow, brackish water (USFWS 2007b). They usually inhabit water bodies with a salinity content less than 12 parts per thousand (ppt); however, they can tolerate salinities up to 28 ppt (Swift et al. 1989). This species feeds on small aquatic invertebrates and insect larvae (USFWS 2007b). The majority of tidewater gobies live only one year, making this species highly sensitive to adverse environmental conditions during the breeding season (USFWS 2007b).

Although this species has not been documented in Trancas Lagoon or the Zuma Wetlands, it has been documented in the nearby Malibu Lagoon. New proposed critical habitat for this species includes the Zuma Wetlands, which may provide habitat for dispersal of tidewater goby individuals. Additionally, the Zuma Wetlands are identified in the tidewater goby recovery plan as a potential introduction site, as this water body could provide habitat for maintaining the tidewater goby metapopulation in the region.

Southern steelhead. The southern steelhead *(Oncorhynchus mykiss)* was listed as federally endangered in 1998 and is a CDFW species of special concern (Illustration 3.4-13). Most steelhead populations within the Southern California steelhead distinct population segment (DPS) have been severely reduced, particularly near the southern extent of their range in the vicinity of the Santa Monica Mountains (National Oceanic and Atmospheric Administration [NOAA] 2011). Land use in these watersheds is highly variable; however, typically the lower reaches along the coast are highly urbanized and are characterized by a loss of estuarine habitat. Trancas Creek not federally-designated critical habitat for southern steelhead.

***Illustration 3.4-13.** Although southern steel head does not occur in the Project area, restoration efforts in Trancas and Zuma Canyons have focused on bringing southern steelhead runs back to these creeks. Photograph courtesy of NOAA.*

The southern steelhead is an anadromous salmonid species, which can live up to six years (NatureServe 2012). In freshwater systems, these fish feed primarily on insects and fish; however, in the ocean their diet consists primarily of fish and crustaceans (NatureServe 2012). Southern steelheads are capable of adapting to a wide range of environmental conditions (NatureServe 2012). They utilize all portions of a river system, including the estuary at the mouth, and the spawning and nursery areas in the headwaters, to complete their life cycle (NOAA 2011). Consequently, southern steelheads require access between marine and freshwater environments, usually provided by a lagoon, or other estuary system.

Southern steelhead occurred historically in Trancas Creek as recently as the 1980's (Dagit et al. 2005). While southern steelhead have been recently documented in the nearby Malibu Creek, this species has not been observed since the 1980s in Trancas Creek or Zuma Creek, likely due to the barriers to fish passage, which exist in the higher reaches (Chambers Group 2013). However, both Trancas Lagoon and the Zuma Wetlands are both considered ESHAs under the Malibu LCP, and have been identified by NPS as potential southern steelhead habitat, which has led to a number of restoration efforts, particularly in the vicinity of the Zuma Wetlands. The NPS has also identified Trancas Creek for restoration efforts that would include the removal of barriers to fish passage.

Special Status Invertebrate Species

Globose dune beetle. The globose dune beetle (Illustration 3.4-14), a California Special Animal, is one of four species of dune beetles restricted to coastal sand dunes and beaches along the Pacific coast. Its distribution covers coastal dunes from Bodega head in Sonoma County to northwestern Baja California (Sandoval 2008). However, despite its large distribution, the habitat requirements of the globose dune beetle restrict this species to the narrow fringe of foredunes immediately adjacent to the ocean and immediately above the mean high tide line (Sandoval 2008). This species, similar to the other three coastal dune beetles, is strongly fossorial (i.e., burrowing). It spends nearly its entire life burrowing in loose sandy areas among common dune plants, such as sand-verbena, beach bur, and sea rocket (Broughton et al. 2006). Adults and larvae are sometimes found in open sandy areas, but more typically are found in the sand a few inches beneath the plants (Broughton et al. 2006).

Illustration 3.4-14 *The globose dune beetle, a California Special Animal, has been documented at Broad Beach and may have been impacted by past emergency revetment construction. This species may also be impacted by construction of the new dune system. Photograph courtesy of Kevin Lentz.*

Globose dune beetles occur in foredune habitats at 30732 Pacific Coast Highway, which is located at the eastern extent of Broad Beach (Sandoval 2008). Sandoval (2008) found that globose dune beetle individuals were most abundant on the front and top of the foredune ridge, specifically where native vegetation was present. Further, Sandoval (2008) found that individuals were less abundant at sites that were irrigated, and when houses were present the distribution of individuals was shifted lower on the beach.

Although pit-fall traps, one of which was installed in the aforementioned undeveloped lot at 30732 Pacific Coast Highway, failed to detect globose dune beetles during the most recent survey efforts, WRA biologists observed subterranean beetle tracks, suggesting that this species is still extant in foredune habitat at the site (WRA, Inc. 2013). It is likely that the beetle occurs in only limited areas where dune mat or other sparse vegetation occurs (WRA, Inc. 2013).

Sandy beach tiger beetle. The sandy beach tiger beetle (Illustration 3.4-15), a California Special Animal, occupies sandy beaches and coastal scrub habitats near estuaries in central and Southern California (Broughton et al. 2006). This species can be found in moist sand near the ocean, including swales behind dunes or upper beaches beyond normal high tides (Broughton et al. 2006). Adult sandy beach tiger beetles are carnivorous and feed on flies as well as other insects common in the tidal zone (NatureServe 2012). The species' range has been drastically reduced from its former reach across Southern California. Threats to this species include coastal development, exotic plants, and heavy recreation use of shore areas (NatureServe 2012). The sandy beach tiger beetle was not detected during the most recent biological survey efforts at Broad Beach, and suitable habitat for sandy beach tiger beetle was determined to be absent from Broad Beach (WRA, Inc. 2013).

Illustration 3.4-15. *Sandy beach tiger beetles have a high potential to occur within Broad Beach. Photograph courtesy of Bug Guide.*

3.4.2 Selected Regulations Pertaining to Terrestrial Biological Resources

State and other statutes related to marine biological resources are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*.

3.4.3 Public Trust Impact Criteria

Impacts to terrestrial biological resources would be considered to have a major adverse effect should Project implementation result in one or more of the following:

- Potential for any part of the population of a threatened, endangered, or candidate species to be directly or indirectly affected or disturbed, or conflict with an adopted species recovery plan;
- "Take" of a federal or state-listed endangered, threatened, regulated, fully protected, or sensitive species;
- Prolonged disturbance to or destruction of, the habitat of a species that is recognized as biologically or economically significant in local or State policies, statues, or regulations;

- Conflict with an adopted habitat conservation plan or result in a net loss in the functional habitat value of a ESHA, critical habitat for a federally listed species, southern foredune, beach, coastal lagoons or estuaries, sea bird rookeries, or other areas of special biological significance;
- Permanent change in the community composition or ecosystem relationships among species that are recognized for scientific, recreational, ecological, or commercial importance;
- Permanent alteration or destruction of habitat that precludes reestablishment of native biological populations; or
- Interference with established native resident or migratory wildlife corridors or the use of native wildlife nursery sites.

Where applicable, this impact analysis considers Broad Beach both in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting without the emergency revetments, characterized by a narrow beach and dune habitat.

3.4.4 Public Trust Impact Analysis

Historical Biological Characteristics of Broad Beach

According to estimates made by WRA, Inc. (2012) based on false infrared aerial imagery, there were approximately 12.23 acres of degraded remnant foredune habitat at Broad Beach in 2005, prior to construction of the sand bag revetments. Conditions of areas landward of the existing rock and sand bag revetments have not changed substantially over time in terms of habitat coverage and quality. However, sensitive species including globose dune beetles and red sand-verbena, both of which have been documented at Broad Beach, may have been more widespread at the site in 2005 when a relatively larger area of foredune containing native dune mat vegetation likely existed (WRA, Inc. 2013). Impacts associated with the installation of sand bag and rock revetments on such habitats are discussed below in Impact TBIO-1.

Impact TBIO-1: Impacts to Terrestrial Biological Resources Resulting from the Installation of Sand Bag and Rock Revetments

Past installation of sand bag and rock revetments resulted in direct adverse impacts to dune habitat, considered an environmentally sensitive habitat area (ESHA) under the Malibu Local Coastal Program (LCP), as well as to sensitive species such as the globose dune beetle (Major Adverse Effect, Class Mj).

Impact Discussion (TBIO-1)

Installation of sand bag revetments after 2005 followed by the installation of the temporary emergency rock revetment in 2010 created direct and indirect major adverse effects on both the sandy beach and dune environments at Broad Beach. As these sand bag and rock revetments were constructed under emergency permits, environmental analysis was not completed prior to installation, which limits the information available regarding the specific impacts on terrestrial biological resources. However, as discussed below, adverse impacts resulting from the installation of the sand bag and rock revetment may have included the potential take of sensitive wildlife and plant species, as well as the reduction in the aerial extent, foraging and functional values of sandy beach and coastal dune habitats.

The emergency sand bag and rock revetments were placed directly onto the dune system fronting the Broad Beach properties, which is considered ESHA under the Malibu LCP (refer to Figure 3.3-1). While the dune system was of variable quality due to past disturbance (e.g., installation of sand bag revetments, introduction of non-native species, construction of homes patios and walkways, etc.), it was directly and adversely affected by the installation of emergency sand bag and rock revetments. According to estimates made by WRA, Inc. (2012) based on overlays of aerial imagery, installation of the emergency sand bag and rock revetments resulted in the direct removal of approximately 3.62 acres of foredune habitat.

Operation of heavy material staging and work crew activity within and adjacent to foredune habitat may have resulted in additional trampling or destruction of native dune vegetation. Disruption of dunes may have resulted in takes of sensitive wildlife and native plant species, including globose dune beetle and red sand-verbena. Both of these species have been observed at Broad Beach and may have been more widespread at the site prior to installation of the sand bag and rock revetment in 2008 to 2009 when a relatively larger area of foredune containing native dune mat vegetation likely existed (Sandoval 2008 and WRA, Inc. 2011, 2013).

In addition, construction of the emergency revetments may have impacted the western snowy plover as this species' critical habitat extends from the east end of Broad Beach across Zuma Beach. In particular, unmonitored construction activities associated with the installation of the emergency sand bag revetments may have disturbed overwintering plovers within nearby critical habitat. However, although involving more intense construction, installation of the emergency rock revetment was subject to biological monitoring and, based on reports prepared for that monitoring effort, does not appear to have created substantial disturbance to snowy plover populations at the time.

Revetment installation also adversely affected the functional value of the coastal dune system by disrupting coastal processes, such as the natural interchange of sand between the sandy beach and dunes and dune mobility by fixing this system's seaward edge. This major alteration of existing natural coastal processes in the area interferes with the ability of the dune system to contract or expand in response to long-term natural climatic cycles, such as changes in storms and wave activity, consequently altering the natural functioning of this system over the long-term.

Avoidance and Minimization Measure(s)

AMM TBIO-1a. Implementation of a Comprehensive Dune Restoration Plan. In order of off-set past impacts to foredune habitats from installation of emergency sand bag and rock revetments, the Applicant shall prepare and implement a Comprehensive Dune Restoration Plan (Plan). The Plan shall manage and implement the creation of the proposed new coastal dune system across the length of Broad Beach (Section 2, *Project Description)*. The Plan shall include, but not be limited to, the following measures:

- Conform to any conditions of approval pursuant to the California Coastal Commission's (CCC) Coastal Development Permit for mitigation of ESHA related impacts.
- If applicable, conform to U.S. Fish and Wildlife Service (USFWS) Biological Opinion requirements for protection of federal special status species and western snowy plover critical habitat.
- In consultation with the California Department of Fish and Wildlife (CDFW) and USFWS, to the extent feasible, the Plan shall be designed and managed to support the state and federal special status species identified as impacted through installation of the emergency sand bag and rock revetments.
- The Plan shall include a landscape plan that details specific planting plans, with native vegetation specific to foredune (e.g., red sand-verbena, pink sand-verbena, beach bur, and beach morning glory), dune crest, and back dune habitats.
- The Plan shall require and outline specific measures for invasive species removal in on public and private lands in the degraded dune system (e.g., ice plant and pampas grass). It shall also outline specific measures regarding native species salvaging and revegetation, highlighting details regarding appropriate planting densities and planting methods.
- The Plan shall outline that the Applicant is responsible for long-term monitoring and maintenance activities, including monitoring and survey methods, as well as detailed monitoring and maintenance schedules.
- The Plan shall address the potential for dune habitat disturbance associated with vertical public and private access by limiting the number and frequency of walkways across the dune system. Access into the dune system shall be controlled through use of bollards, ropes, fencing, and signage. The Plan shall also address access for maintenance activities in and adjacent to the restored dune system.
- The Plan shall establish a shared walkway across the landward edge of the restored dune system with access ways across the dunes to the beach spaced not less than 300 feet.
- The Plan shall detail specific adaptive management strategies, such as additional native vegetation installation or restoration and invasive

species removal should monitoring find that restoration goals are not be met.

Additional Plan Requirements and Timing

The Plan shall be subject to review and approval by the California State Lands Commission (CSLC), the CCC, CDFW, USFWS, and the city of Malibu. The Applicant shall provide the agency approved Plan to CSLC prior to commencement of construction and staging activities. Prior to the commencement of beach and dune nourishment, the Applicant shall file a performance bond with CSLC to complete restoration and maintain plantings until pre-established performance criteria are met. Permits from other regulatory agencies (as necessary) shall also be obtained prior to Project implementation.

Monitoring

A qualified local biologist approved by CSLC shall monitor implementation of the Plan for compliance. Monitoring and maintenance shall be confirmed through site inspections. Detailed monitoring reports shall be submitted to the CSLC, the CCC, the CDFW, and the city of Malibu after completion of initial construction and on an annual basis thereafter. These reports shall address success of installation and maintenance of native plantings and dune management and management actions required to maintain and protect the dune system.

AMM TBIO-1b. If Applicable, Conform to California Coastal Commission (CCC) Coastal Development Permit for Off-Site Mitigation of ESHA. If applicable, to ensure mitigation for loss of ESHA from installation of the emergency sand bag and rock revetments, the Applicant shall conform with any CCC Coastal Development Permit conditions of approval for Off-site mitigation of ESHA. The Applicant shall provide the CCC approved Off-site ESHA mitigation plan to California State Lands Commission (CSLC) staff prior to commencement of construction and staging activities.

Rationale for Avoidance and Minimization Measure(s)

The installation of the emergency sand bag and rock revetments resulted in major adverse effects, including the displacement and covering of 3.62 acres of beach and dune habitat and the likely take of sensitive wildlife and plant species, which cannot be replaced. However, while this impact cannot be wholly offset, implementation of the Applicant's proposed dune creation and restoration proposals as part of the Project and AMM TBIO-1a would serve to substantially reduce long-term adverse impacts to the functional value of the dune system. Success of the implementation of AMM TBIO-1a would be based on the achievement of success criteria outlined in the conceptual Foredune Creation and Enhancement Plan (see Appendix C) and further defined in the Comprehensive Dune Restoration Plan.

As explained in the Conceptual Foredune Creation and Enhancement Plan, foredune creation and enhancement is primarily intended to provide a reservoir of sand for natural beach nourishment and an additional buffer of relatively stabilized sand between the ocean and the residences. A secondary goal of foredune creation and enhancement is to increase the area of high-value foredune habitat at Broad Beach. It should be recognized that the ecological factors that promote the formation and maintenance of dune systems are generally disrupted at Broad Beach. The sandy beach habitat to be created by the proposed beach nourishment will provide a source of sand that can provide short- to mid-term support of natural dune habitats following the initial foredune construction and enhancement (e.g., up to 20 years). However, the natural processes of dune formation will be limited by the residential development on the landward side of the beach, which limits the area available for dune movement. Over the long term, with erosion of the beach, reduced availability of sand from the beach may also affect natural dune functions. The limited area available for the landward movement of dunes necessitates increased levels of dune stability relative to natural dune formations, which are inherently less stable. To create increased stability, the foredune design includes a planting palette of native sub-shrubs and shrubs and a denser spacing of vegetation than might otherwise occur in natural foredune formations (WRA 2013). Additional considerations include that the proposed sand source is substantially courser than the median grain size of the existing remaining native dune sand. The existing rock revetment, when eventually exposed by future shoreline erosion, could also disrupt sand exchange between the beach and dune system. Although the Comprehensive Dune Restoration Plan would enhance and increase foredune habitat value in comparison to existing limited degraded foredune habitat areas, for the above reasons, the Plan may not result in creation of a sustainable dune system over the long-term, particularly after cessation of nourishment activities. Therefore, the CCC would need to review these factors when considering if this dune system would be recognized as ESHA to serve as in-kind replacement of previously existing foredune habitat impacted by installation of the sand bag and rock revetments. Therefore, Impact TBIO-1 would continue to have a major adverse effect over the long-term.

The Project also contains a provision for installation of emergency sand bag revetments during erosion events along the eastern 550 feet of Broad Beach that is not protected by the existing rock revetment. Such sand bag revetments would be installed outside of and fronting the restored dunes and would only be installed during periods of erosion such as toward the end of the useful life of the initial or follow-up nourishment events. Sand bags would be filled using beach sand only. This Project component would increase the longevity of the dune system at the unprotected east end of Broad Beach.

Impact TBIO-2: Short-Term Project-Generated Construction Impacts to Terrestrial Biological Resources

Construction activities associated with proposed beach nourishment and dune creation may adversely impact existing sandy beach and foredune habitats and biological resources, as well as the Trancas Lagoon (Major Adverse Effect, Class Mj)

Impact Discussion (TBIO-2)

Short-term construction associated with the proposed initial and second subsequent beach nourishment and dune restoration/creation events would involve deposition of imported inland sand onto stockpiles on up to 5 acres of Zuma Beach and hauling of sand down to and along 6,200 feet of Broad Beach. The stockpiled sand would be distributed across the CSLC Lease area with heavy earthmoving equipment (e.g., scrapers, large 40-ton capacity off-road trucks, and bulldozers) to nourish Broad Beach and create the dune system.

Two sand stockpile areas would be established for the initial nourishment event along 1,000 feet of the west end of Zuma Beach seaward of Zuma Beach Parking Lot 12. Stockpiles are proposed to be located a minimum of 100 feet east of Trancas Lagoon. Beach stockpile areas would range in size over the 8 months of initial proposed nourishment and dune construction activities, with up to 7 acres of dry sand beach berm at Zuma Beach being covered by sand stockpiles, disturbed by heavy equipment, or used for construction staging. Within this area, beach face and intertidal beach would be impacted at Broad Beach and Zuma Beach from operation of heavy equipment accessing the sand storage area and transporting the sand along the intertidal beach to the deposition areas. Equipment staging and storage for the Project would occur within Parking Lot 12 during the 8-month construction period of the proposed nourishment and dune construction activities. No construction equipment would be stored or staged on Broad Beach or Zuma Beach and further, standard best management practices would be implemented at the staging area to prevent potential impacts to the surrounding natural habitats.

Access between the Zuma Beach Parking Lot staging and sand storage areas and Broad Beach would be along a defined travel route beginning at the southern edge of Parking Lot 12 and sand storage areas and continuing west along the intertidal beach. The access route will occur seaward of any inundated portion of Trancas Lagoon, thereby minimizing potential impacts to this sensitive habitat.

However, while heavy equipment could cross the sand bar fronting Trancas Lagoon throughout the majority of the 8-month construction period, during winter, high flows in Trancas Creek and/or large winter waves may cause this sandbar to breach (Chambers Group 2013). In order to safely cross and avoid impacts to Trancas Lagoon when the sand bar is breached, construction would be halted during periods when Trancas Creek is flowing to the ocean. Further, although special status fish species (e.g., southern steelhead) are not known to currently spawn in Trancas Lagoon, this halt in construction activities during periods of breaching would avoid adverse impacts to fish passage.

Beach nourishment activities may adversely impact Trancas Lagoon, dry sand beach berm, and intertidal beach habitats due to the operation of heavy equipment and the stockpiling of sand in the immediate vicinity of this coastal wetland and its transport along the intertidal beach. Construction activities would disturb and displace roosting sea birds (e.g., seagulls, pelicans) from the dry sand beach at the west end of Zuma Beach. In addition, construction activities and sand transport would disturb or displace resident and migratory foraging shore birds and potentially sensitive species using the lagoon and intertidal beaches, including the western snowy plover, which occupies federally designated critical habitat in this area (refer to Figure 3.3-1). For example, the movement of heavy-haul trucks and equipment from the proposed staging area access point to the stockpiles within the 100-foot buffer proposed between the western edge of stockpile #1 and Trancas Lagoon would reduce the effectiveness of the buffer in reducing impacts to biological resources and habitat within the lagoon mouth areas. As proposed, the truck transport routes require a minimum of 30 feet to allow for adequate passage. As such, the truck access would encroach approximately 30 feet into the designated 100-foot buffer (Figure 3.3-2). Additionally, during construction, windblown sand from the stockpile areas could result in siltation of the lagoon. However, these impacts would be considered minor due to their short-term duration.

With shorebirds and sensitive species temporarily displaced to other adjacent beaches during stockpiling and construction activities, such species would be expected to reuse the area after cessation of construction activities. Further, these activities would not directly impact the hydrologic processes of Trancas Creek Lagoon, as no major alteration of topography would occur near the mouth of the lagoon. Compaction of sand from heavy equipment may slightly alter subservice hydrology and drainage over the short term. However, by nature, the large grain size and roughness of sand resists compaction and the beach and berm in this area are continually reworked by wave and wind action, resulting in negligible effects to the hydrology of Trancas Lagoon.

The distribution of inland sand across Broad Beach may also impact terrestrial biological resources through sand compaction and burial. These activities may also cause disturbance or take of sensitive wildlife or plant species in ESHA habitat, such as the foredune system. Sand distribution across Broad Beach using heavy equipment (e.g., bulldozers) to pile sand over the existing revetment and into existing back dune areas to create a new dune system could impact sensitive plant and wildlife species, such as red sand-verbena, globose dune beetles, and western snowy plovers, which are known to occur in the Public Trust Impact Area. Further, these activities may impact the sandy beach tiger beetles and silvery legless lizards, which, while not identified in recent biological surveys, are known to occur in similar habitats (WRA, Inc. 2013). Impacts to sensitive species would be considered to have a major adverse effect.

Mortality of sandy beach infauna species (e.g., sand crabs, blood worms), which is generally considered to be complete when burial exceeds 3 feet, is also likely to occur as a result of the Project (Beach Erosion Authority for Clean Oceans and Nourishment [BEACON] 2007). This would be expected to result in subsequent impacts to shorebird foraging that would extend beyond the 6- to 8-month construction periods for the initial and follow-up nourishment projects, especially if construction activities are conducted during the spring and summer months when sandy beach invertebrate forage production is greatest (BEACON 2007). Further, increased noise levels would also likely disturb sensitive avian species (BEACON 2007).

The Project includes placement of additional sand on Broad Beach when specified triggers for renourishment are met. The impacts of proposed renourishment would be similar to those impacts described above, except that the restored dunes system would remain generally undisturbed and construction impacts would be limited to the sandy beach, reducing, but not eliminating the potential for take of sensitive species. Impacts resulting from the distribution of sand over the beach would be similar to the Project. However, should coastal erosion encroach upon the restored dune habitat, impacts of construction to restore or nourish dunes within that newly established habitat could be much more severe than for the Project, due to the greater likelihood for the presence of sensitive species, particularly rare plant species, following the original dune restoration.

The Project may contribute to impacts to Trancas Lagoon resulting from future related projects, including the PCH bridge replacement and Trancas Creek Restoration Project. During construction, these related projects may remove wetland vegetation, cause siltation, create temporary adverse impacts to wetland habitat, and displace forging and roosting shorebirds and sensitive species. However, impacts to Trancas Lagoon resulting from the Project would be temporary, and long-term impacts associated with the related projects would be beneficial. For example, the PCH bridge replacement would result in the removal of bridge piers from the lagoon, enhancement of wetlands, and restoration efforts to restore fish passage to Trancas Creek. Further, these future projects are not anticipated to go to construction for another 3 to 5 years.

Avoidance and Minimization Measure(s)

AMM TBIO-2a. California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Construction Activities. The Applicant shall retain a Project biologist and Project monitors approved by the CSLC staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC) to supervise sand deposition and all other construction related activities. The biological monitors shall be present to ensure that damage to any sensitive habitat or sensitive species is minimized and that construction crews strictly comply with all AMMs. Prior to commencement of construction and staging activities, the Applicant shall provide to CSLC staff a Biological Monitoring and Reporting Plan demonstrating conformance with the following requirements:

- If applicable, conform with USFWS Biological Opinion requirements pertaining to construction activities and access for protection of federal special status species and western snowy plover critical habitat.
- If applicable, conform with CDFW Streambed Alteration Agreement conditions of approval for construction access across the mouth of Trancas Creek and all other construction activities.
- Conform with all project construction conditions of approval pursuant to the CCC's Coastal Development Permit.
- Prior to the commencement of construction-related activities, conduct protocol-level surveys for native plant species, with a special focus on sensitive species, in potential ESHA areas, beyond that which was surveyed by WRA, Inc. (2011, 2013).
- Prior to the commencement of construction-related activities, conduct protocol-level surveys for globose dune beetle and western snowy plover.
- Where feasible, prior to and during construction, collect and relocate sensitive plant, invertebrate, and reptile species that are likely to be impacted by the proposed nourishment and dune creation activities.
- Conduct an additional protocol level survey for western snowy plover and California least tern prior to any construction during the breeding season between March and September. Should breeding individuals be identified, all work within a 300-foot-radius of the nest shall be halted and the Applicant shall immediately contact the USFWS and CDFW. Nourishment and dune construction activities within the 300-foot-radius shall resume only with approval from these agencies and with implementation of mitigation measures provided by these agencies if applicable.
- Be present during all construction activities that may potentially cross ESHA as defined by in the Malibu Local Coastal Program, including the degraded dunes and Trancas Lagoon.
- Ensure the implementation of all measures associated with AMM TBIO-1a, including the complete implementation of the Comprehensive Dune Restoration Plan, with associated maintenance and monitoring activities. The biological monitors shall record observations and the Project biologist shall submit a weekly report regarding the implementation of and compliance with all construction-related AMMs. Additionally, this report shall include any relevant biological observations, including a list of species encountered at

Broad Beach. These reports shall eventually be incorporated into a mid-Project Sensitive Biological Resources Report (see AMM TBIO-3c).

AMM TBIO-2b. Sensitive Resources Impact Avoidance. In consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC), the Project biologist and the Project engineer shall clearly designate all ESHAs, including areas within 100 feet of the Trancas Lagoon as "sensitive resource zones" on the Project maps and construction plans. The Applicant shall provide a Sensitive Resource Impact Avoidance Map to CSLC staff for review and approval prior to commencement of Project construction and staging activities. Construction equipment and operations shall be prohibited in these zones to avoid impacts to special-status biological resources. During construction, heavy equipment shall be operated in accordance with standard best management practices as well as the following measures:

- Vehicles and construction equipment shall be confined to a pre-defined equipment access path no greater than the minimum width necessary to complete the necessary construction activities.
- In areas of high vehicle traffic on dry sandy beach, driving mats will be laid down prior to the commencement of construction-related activities in order to avoid unnecessary adverse effects to the sandy beach environment.
- The location of the sand stockpile shall be moved east toward Zuma Beach to an extent that would allow for passage of trucks and construction equipment without encroachment upon the delineated 100-foot ESHA buffer. If, given the proposed location of stockpiles and access points, trucks and construction equipment are unable to access the sand from the staging area without encroaching upon the 100-foot ESHA buffer, an alternate access point shall be selected along the eastern portion of Parking Lot 12.

AMM TBIO-2c. Protect Stockpiles of Excavated Material. Inland sand shall not be stockpiled within ESHAs or other sensitive resource zones, including federally designated western snowy plover habitat. Beach sand stockpiles should be protected to the extent feasible by synthetic impervious covers to prevent erosion by wind and/or rainfall. This notation shall be included on Project construction plans.

AMM TBIO-2d. Storage of Materials or Heavy Equipment Prohibited Outside of Staging Area. Overnight storage of materials other than sand stockpiling, or heavy equipment on the beach or outside of the construction staging area at Zuma Beach Parking Lot 12 shall be strictly prohibited. This notation shall be included on Project construction plans.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMMs TBIO-2a through TBIO-2d would reduce short-term construction related impacts on terrestrial biological resources by protecting sensitive resources along Broad Beach, at Trancas Creek Lagoon and adjacent Zuma Beach, providing for construction supervision, and requiring restoration of dune habitat. However, after implementation of AMMs TBIO-2a through TBIO-2d, impacts to terrestrial biological resources from short-term construction activities would be reduced but would still result in the potential for take of sensitive species.

Impact TBIO-3: Long-term Construction Impacts of Backpassing to Terrestrial Biological Resources

Future beach maintenance using backpassing may impact existing environmentally sensitive habitat areas (ESHAs) and/or created sensitive habitat areas, including sandy beach and foredune habitats, as well as Trancas Lagoon (Minor Adverse Effect, Class Mi).

Impact Discussion (TBIO-3)

Following completion of the initial proposed beach nourishment and dune creation, the Project would include an Adaptive Management Plan for long-term monitoring of beach width and profile and required actions to transport sand back up coast as needed through backpassing using heavy equipment (Moffatt & Nichol 2013). Monitoring as described in the Adaptive Management Plan would include: semi-annual measurement and record keeping of beach profiles at 12 locations along the beach and down coast; monthly measurements of berm width; visual observations of the conditions at Trancas Lagoon mouth; and dune geomorphic observations.

Adaptive management actions would be performed in response to data gained from long-term monitoring and would include backpassing of sand to prolong the longevity of major nourishment actions (refer to Section 2, *Project Description* and Figures 2-13 and 2-14). Backpassing of sand to maintain beach widths would involve the use of heavy equipment (e.g., scrapers and bulldozers) to excavate sand from the downdrift, eastern segment of Broad Beach for transport updrift to the eroding segment on the west end of Broad Beach. It is anticipated that backpassing will occur on an annual basis for the life of the Project. Backpassing would involve excavation of approximately 5.3 acres in a roughly rectangular area of 3,520 feet long and 75 feet wide to a maximum depth of 6 feet (see Section 2.0*, Project Description*). Up to 35,000 cy of excavated material from the eastern dry sand beach berm of Broad Beach would be transferred to approximately 5 acres of the depleted western portions. This redistribution of sand at Broad Beach would disturb approximately 10 acres of beach sand and seaward dune habitat.

Impacts to terrestrial biological resources resulting from backpassing would be similar to those listed under Impact TBIO-2, except that backpassing would be focused on dry sandy beach areas, including dry beach berm and, if needed, intertidal areas, seaward of created dune habitats. Backpassing would cause infauna species mortality due to burial or direct mortality (i.e., crushing via sand compaction), which would have subsequent adverse impacts on shorebird foraging as full infauna species recovery would require several months[i3]. Backpassing impacts to infauna would be more severe if conducted during the spring and summer months when sandy beach invertebrate forage production is greatest (BEACON 2007). Additionally, backpassing would reduce the presence of beach wrack, consequently adversely affecting the wildlife species that depend on it for habitat or foraging material (refer to discussion in Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). However, over the long-term, backpassing activities would conserve sandy beach habitat, serving to slow the erosion of newly created beach habitats at Broad Beach. Additional short-term direct adverse impacts resulting from backpassing may include the disturbance of wildlife and the potential take of CDFW species of special concern. Adverse short-term impacts would also include increases in noise levels, which would disturb shore birds and other avian species (BEACON 2007).

Beneficial effects resulting from backpassing include the long-term preservation of sandy beach and coastal dune habitats, which would otherwise be negatively affected by the subsequent erosion of Broad Beach. Conservation of these habitat types may potentially result in indirect increases in sensitive species, such as the globose dune beetle and western snowy plover, each of which depend on foredune and beach habitat. Additional beneficial effects resulting from backpassing include reducing the adverse impacts associated with longshore sand deposition (see Impact TBIO-5) in the vicinity of Trancas Lagoon and the Zuma Wetlands, both of which are designated as ESHAs under the Malibu LCP.

Adverse impacts on terrestrial biological resources resulting from backpassing would be considered minor with inclusion of AMMs. While these impacts would be adverse, backpassing activities would also result in beneficial effects including conservation of sensitive habitat areas, both in the CSLC Lease and Zuma Beach impact areas.

<u>Avoidance and Minimization Measure(s)</u>

AMM TBIO-3a. Biologist and Biological Monitors for Backpassing Activities. The Applicant shall retain a Project biologist and Project monitors approved by the California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission to

[3] Results of studies assessing the recovery of organisms at nourished beaches are highly variable (Greene 2002). Some studies conclude that beach infauna populations may recover to previous levels between two to seven months; other studies suggest recovery times are much longer (Greene 2002). Peterson et al. (2000) found a large reduction in prey abundance and body size of benthic macroinvertebrates at a nourished intertidal beach that likely translated to trophic level impacts on surf zone fishes and shorebirds.

supervise backpassing and all other construction related activities. The Project monitor shall ensure that damage to any sensitive habitat or sensitive species within or adjacent to construction zones is minimized. Prior to commencement of construction and staging activities, the Applicant shall provide to CSLC staff a Biological Monitoring and Reporting Plan demonstrating how the Project monitor will conform with the following requirements:

- If applicable, conform with USFWS Biological Opinion requirements pertaining to construction and backpassing activities for protection of federal special status species and western snowy plover critical habitat.
- If applicable, conform with CDFW Streambed Alteration Agreement conditions of approval for construction access across the mouth of Trancas Creek and all other construction activities.
- Conform with all project construction and backpassing conditions of approval pursuant to the CCC's Coastal Development Permit.
- Conduct preconstruction trainings with the construction crew leaders so they can readily identify sensitive plant and wildlife species.
- Conduct preconstruction surveys of the sandy beach and dune habitats as well as in the vicinity of Trancas Lagoon.
- Flag the toe of the dune on the seaward side of all foredune vegetation.
- Conduct a preconstruction meeting with all construction crew leaders and construction crewmembers to discuss the implementation of appropriate mitigation measures.

AMM TBIO-3b. Avoidance of Sensitive Resource Zones and Vegetation. Following the completion of pre-construction biological surveys, in consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission, the Project biologist shall clearly designate "sensitive resource zones" on the Project maps and construction plans. These zones would include any ESHAs or otherwise sensitive biological resources. Sensitive resource zones are defined as areas where construction would be limited, depending on the particular environmental conditions and construction requirements. No native vegetation shall be impacted or removed during backpassing-related activities.

Wetland areas shall be prohibited from use for disposal or temporary placement of excess sand. All equipment used in or near Trancas Lagoon shall be clean and free of leaks and/or grease. Emergency provisions shall be in place prior to the onset of construction and at all times during construction to deal with accidental spills. The Applicant shall provide a Sensitive Resource Impact Avoidance Map to the California State Lands Commission (CSLC) staff for review and approval prior to commencement of Project construction and staging activities.

AMM TBIO-3c. Sensitive Biological Resources Report. Following the third complete year of Project implementation, the Applicant shall prepare a Sensitive Biological Resources Report. The report shall include the results of past protocol-level surveys, as well as biological surveys conducted prior to each backpassing event. The report shall assess the presence of sensitive species and habitat and analyze the trends in occurrence of sensitive species or habitat. The document shall also include any biologically relevant information gathered during construction monitoring activities. This report shall be submitted to the California State Lands Commission (CSLC) staff within six months following the third complete year of Project implementation and shall be used to direct the timing of future backpassing and renourishment events in order to minimize impacts to biological resources to the maximum extent feasible.

AMM TBIO-2a. (CSLC-Approved Biologist and Biological Monitors for Construction Activities) would apply for construction activities and access pertaining to backpassing. **AMM TBIO-2b**. (Sensitive Resources Impact Avoidance) would apply for construction activities and access pertaining to backpassing.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMMs TBIO-3a, TBIO-3b, and TBIO-3c, as well as TBIO-2a and TBIO-2b, would reduce the negative impacts resulting from backpassing to onshore biological resources by protecting sensitive resources in the Public Trust Impact area, providing for construction supervision, and limiting the extent of construction activities. Implementation of these measures would reduce short-term negative impacts to the extent that the overall impact of backpassing activities would be slightly beneficial, as they would conserve the newly created beach and dune habitats.

Impact TBIO-4: Hazardous Spill Impacts to Beach, Coastal Dunes, and Coastal Wetland Biological Resources

An accidental hazardous spill and subsequent cleanup efforts would potentially result in take of special-status species, the loss or degradation of functional habitat values, or cause a substantial loss of a population or habitat of native fish, wildlife, or vegetation (Major Adverse Effect, Class Mj).

Impact Discussion (TBIO-4)

Equipment and material for the Project would be stored at the Zuma Beach Parking Lot 12, with beach access provided near the western end of the parking lot. Hazardous pollutant spills from construction equipment, including bulldozers, scrapers, and heavy haul trucks could potentially occur during initial nourishment, all renourishment events, and backpassing activities. Throughout the proposed initial 8-month nourishment and the follow up 6-month renourishment 10 years following, the potential exists for a hazardous spill to occur on the sandy beach or dune system. Potentially major impacts that may result from a hazardous spill include 1) the take of CDFW species of special concern and 2) the loss or degradation of an ESHA (including existing or created dune habitat, as well as Trancas Lagoon or any other locations that support sensitive special-status species). Small leaks or spills that would be contained and remediated quickly within at Broad Beach would likely have localized minor or negligible adverse impacts on terrestrial biological resources. The cleanup operation would result in impacts to habitat in the vicinity of the Project, with the extent of disturbance determined by the magnitude of the spill.

Hazardous spills from construction activities on or near the beach, or disturbances resulting from cleanup efforts within the sandy beach and foredune habitats have the potential to affect federally listed species, including the western snowy plover and California least tern, among other special-status invertebrate and plant species. Adverse impacts of a hazardous spill on the sandy beach or foredune environment would potentially result in direct mortality of wildlife and plant species. However, it would also likely contaminate or increase the mortality of invertebrates that are forage material for wildlife species, particularly the western snowy plover, resulting in indirect negative impacts on individuals or their breeding success.

The Project would also contribute to potential impacts to Trancas Lagoon resulting from related projects, including the PCH bridge replacement and the Trancas Creek Restoration Project. During construction of these related projects, the potential for hazardous spills within or immediately adjacent to delineated wetland habitat would increase. Impacts of hazardous pollutants on biological resources would depend on factors such as the physical and chemical properties of the pollutant, environmental conditions at the time of the spill, and species present. Vegetation recovery would potentially be slow in areas of contaminated sand, because of lingering toxicity or altered soil characteristics. Depending on the remediation method, the impacts resulting from cleanup may also be more substantial than the impacts of the spilled pollutant.

Adverse impacts resulting from a spill may potentially be substantial depending on the size of the spill and the environmental conditions at the time of the spill. Additionally, adverse impacts resulting from a potential spill may be short-term or long-term depending on the size of the spill and the method of remediation.

<u>Avoidance and Minimization Measure(s)</u>

AMM TBIO-4a. Emergency Action Plan Measures Regarding Protection of Biological Resources. Before commencement of project construction and staging activities, the Applicant shall submit to the California State Lands Commission (CSLC) staff an Emergency Action Plan (EAP) to address protection of sensitive biological resources that would potentially be disturbed during a hazardous spill or subsequent cleanup activities. At a minimum, the EAP shall include:

- Industry-standard best management practices to avoid potential spills.
- Specific measures to avoid impacts on state and federal special status species and western snowy plover critical habitat, and ESHAs, during response as well as cleanup operations.
- Identification, where feasible, of low-impact, site-specific, and species-specific remediation techniques.
- Identification of standards of a spill response personnel-training program.
- An outline of a restoration plan, including preemptive identification of access and staging points and procedures for timely reestablishment of functional habitat values.
- A contact list, coordinated with related projects, of key points of contact and emergency response agencies to be retained at all job sites during construction activities.

AMM TBIO-4b. Maintain Equipment and Adhere to Work Plan. All equipment used on-site shall be properly maintained such that no leaks of oil, fuel, or residues will occur. Provisions shall be in place to remediate any accidental spills, in both the terrestrial and marine environments. All equipment shall only be stored in the appropriate equipment staging areas.

The Applicant shall submit a work plan to the California State Lands Commission (CSLC) staff, California Coastal Commission (CCC), California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), Los Angeles Regional Water Quality Control Board, and city of Malibu for review and approval prior to the commencement of construction and staging activities. The Applicant shall also demonstrate to the approving agencies how construction personnel will be trained on the requirements of the work plan. The work plan shall include a list of all heavy equipment and shall require all equipment to be stored and fueled in the Zuma Beach Parking Lot 12, which shall be conspicuously demarcated. Heavy equipment and construction activities shall be restricted to the defined construction areas, as demarcated by the Project engineer. Additionally, vehicles and personnel shall only use existing access roads to the maximum degree feasible. The work plan shall be retained on the project site at all times during construction and staging activities.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Implementation of AMMs TBIO-4a and TBIO-4b would reduce long-term impacts to sandy beach, dune, and freshwater aquatic habitat by providing contingency responses for accidental spills occurring in both the marine and terrestrial environment. After implementation of AMMs TBIO-4a and TBIO-4b, major impacts to terrestrial biological resources from hazardous spills would be reduced, however, a spill would still result in the potential take of sensitive species.

Impact TBIO-5: Longshore Sand Transport and Down Coast Impacts to Terrestrial Biological Resources

Nourishment of Broad Beach with 600,000 cubic yards of beach sand would increase sand supply available for longshore transport down coast, potentially altering the hydrology of the Trancas Lagoon and the Zuma Wetlands ESHAs by widening the beach berm, but also increasing sand supply to beach and dune habitats down coast (Minor Adverse Effect, Class Mi).

Impact Discussion (TBIO-5)

The Project would include use of coarse grain size sand to prolong the retention of sand on the beach (Table 3.3-4).

Table 3.4-4. Sand Types at Broad Beach

Sand Identification	Median Grain Size (millimeters)
Broad Beach – Beach Sample Above 0' MLLW	0.25
Broad Beach Dunes	0.32
Zuma Beach (three Locations along its Reach)	0.40
Grimes Rock Quarry	0.47
CEMEX Quarry	0.85
P.W. Gillibrand Quarry	1.00

Use of coarse sand and annual backpassing would slow, but not eliminate longshore transport of sand toward Zuma Beach. Beach fill sand would be carried down coast by tides, waves, and currents, incrementally nourishing downdrift beaches via littoral transport (e.g., Zuma Beach). Even with use of coarse grained sand and backpassing, erosion and down coast transport of approximately 50,000 cubic yards (cy) of sand annually from Broad Beach would increase littoral drift down coast from approximately 280,000 cy to roughly 330,000 cy annually, a roughly 18 percent increase. This increased littoral transport could create both adverse and beneficial effects on down coast terrestrial biological resources as discussed below.

Increased longshore sand transport of sand from Broad Beach down coast could potentially impact Trancas Lagoon and the Zuma Wetlands through increases in beach berm width and height fronting these estuaries. Major adverse effects could result from changes in the hydrology of these estuaries due to a larger sand berm interfering with lagoon mouth opening and tidal interchange, as both estuaries area periodically open to the marine environment (City of Malibu 1995). Both estuaries are considered ESHA under the Malibu LCP, and have been identified by the NPS as potential habitat for southern steelhead. As described above, Trancas Creek is proposed for restoration to ease fish passage. Increases in longshore sand transport, as a result of the proposed beach nourishment, would increase sand transport and deposition at Trancas Lagoon and the Zuma Wetlands, potentially reducing the overall period of time these lagoons are open to the ocean. Interference with opening of these estuaries to tidal interchange may impact water quality and adversely affect restoration of southern steelhead runs or tidewater goby habitat. Further, as longshore sand transport may incrementally reduce the period of time that these lagoons are open to the marine environment, the Project may indirectly decrease the functional value of these ESHAs.

Such potential impacts would be substantial at Trancas Lagoon as it supports a relatively narrow beach berm of roughly 180 feet in width and is immediately down coast from a newly widened 200 foot-wide section of sandy beach at Broad Beach. In particular, during establishment of the post construction equilibrium beach, the berm fronting Trancas Lagoon could be substantially widened. The addition of substantial amounts of sand to this berm could materially affect frequency and duration of hydrological interchange with the ocean, reducing lagoon functionality. In contrast, such impacts would appear negligible at Zuma Wetlands, which lie 1.6 miles down coast and are fronted by a much larger beach berm, averaging approximately 360 feet in width. This distance from Broad Beach and greater average berm width would tend to diminish the proportionate contribution of increased littoral sand transport.

Use of coarse grained sand would reduce potential adverse impacts to estuary hydrology by slowing rate of littoral sand transport down coast. Additionally, proposed backpassing would somewhat reduce these impacts by retaining sand on Broad Beach. Additionally, longshore sand transport resulting in a wider beach profile at Zuma Beach may increase habitat for sensitive species that require sandy beach habitat, such as the western snowy plover (BEACON 2007). This may constitute a beneficial effect, resulting in local population increases for a number of sensitive species, including the California least tern and the western snowy plover.

<u>Avoidance and Minimization Measure(s)</u>

AMM TBIO-5a. Maintain the Hydrology of Trancas Lagoon. Prior to commencement of construction and staging activities at Broad Beach, the Applicant shall prepare a Trancas Lagoon Beach Berm Management Plan in coordination with the Santa Monica Mountains Resource Conservation District, U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and the California Coastal Commission (CCC). The Plan shall be submitted to CSLC staff, the CDFW, USFWS, USACE, and CCC for review and approval prior to commencement of construction and staging activities. The proposed Beach Berm Management Plan shall identify the anticipated rate of sand deposition in front of the mouths of these water bodies and include potential measures to maintain the connection between these wetlands and the marine environment, as determined by the approving agencies.

AMM TBIO-5b. Coordination of Backpassing and Berm Breaching. Prior to commencement of construction and staging activities, the Applicant shall coordinate with California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), the California Coastal Commission (CCC), and the Santa Monica Mountains Resource Conservation District to determine if backpassing sand should be obtained to aid in breaching of the Trancas Lagoon.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMMs TBIO-5a and TBIO-5b would reduce these long-term impacts to onshore freshwater aquatic habitat by providing for the maintenance of the connection between Trancas Lagoon and to the Pacific Ocean. Through the maintenance of this connection, this water body will continue to be a good candidate for restoration, including recovery of southern steelhead populations. After implementation of AMMs TBIO-5a and TBIO-5b, impacts to terrestrial biological resources from longshore sand transport would be minor.

Impact TBIO-6: Impacts to Terrestrial Biological Resources Resulting From Dune Restoration

The proposed dune restoration would result in potential short- to mid-term beneficial effects through enhancement of dune habitat values, as well as potentially increase populations of special-status wildlife or plant species (Beneficial Effect, Class B).

Impact Discussion (TBIO-6)

The Project includes the deposition of 600,000 cy of sand onto Broad Beach, creating a wide sandy beach backed by a system of sand dunes of up to 15 feet higher than mean lower low water (MLLW), which is the average of the lower low water height of each tidal day observed over a fixed time period (NOAA 2012). The proposed dune restoration would be expected to result in potential beneficial effects during the approximately 20-year Project horizon as dune restoration would potentially result in the direct increase of functional dune habitat value.[4] Further, dune restoration activities would also potentially result in the introduction of suitable habitat for CNPS rare plant species. Additional beneficial effects resulting from beach nourishment and dune restoration would potentially include long-term indirect increases in sensitive species, such as the globose dune beetle and western snowy plover, which would benefit from the restoration of beach and dune habitats (BEACON 2007). Finally, shoreline erosion resulting from 2014 winter storm events has substantially reduced remaining foredune habitat at the east end of Broad Beach unprotected by the rock revetment. Therefore,

[4] Estimates of how long the proposed beach nourishment will effectively create and maintain a wider sandy beach range from a low of 10 to 20 or more years.

the proposed dune system could substantially increase and potentially enhance dune habitat value at Broad Beach in comparison to the existing limited dune areas.

However, large-scale dune restoration is a difficult process and requires substantial inputs of time, funding, and ongoing maintenance, weed removal, and remedial planting beyond the initial restoration activities. It is possible that the proposed restoration activities would be less than sufficient to restore the ESHA qualities of former and existing dune habitat. This would result in major adverse effects to the existing limited remaining ESHA in the short-term, as existing foredune habitat would be temporarily affected during dune building activities. Dune enhancement may also result in the incidental take of sensitive species, such as the globose dune beetle, and/or CNPS-listed plants such as red sand-verbena, both of which may be adversely impacted by sand burial (BEACON 2007). Further, potentially adverse impacts in the mid- to long-term may also result as dune habitat degradation at Broad Beach may intensify due to the Project's disturbance of the remnant dunes.

Impact TBIO-7: Impacts to Terrestrial Biological Resources Resulting from Increased Private and Public Access

The proposed beach nourishment, including the dune habitat restoration, would occur adjacent to existing private residences. Private and public access ways to Broad Beach would interrupt the continuity of undisturbed dune habitat and may ultimately decrease the functional value of the restored dune system or result in an increase in incidental take, disturbance, and/or harassment of sensitive species (Minor Adverse Effects, Class Mi).

<u>Impact Discussion (TBIO-7)</u>

Under the Project, lateral access through the entirety of the restored dry sandy beach and dune system would be increased relative to the current conditions. The integrity of the dune system to provide viable habitat areas is related to the continuity of the system and the level and duration of disturbance that could occur from human activities, including vertical access points. As proposed, the Project may result in habitat fragmentation of the dune system caused by the creation of up to 109 private residential access ways, one private beach club access way, and two vertical public access ways approximately 5 to 8 feet in width, traversing the length of the restored dune habitat, the majority of which would extend onto public lands. These vertical access ways would traverse the dunes, and would be bordered by unobtrusive access control features in order to preserve the dune habitat restored under the Project. However, these breaks in the undisturbed dune system, especially related to the regularly spaced private access ways, would reduce the effectiveness of the proposed dune restoration.

Although foot traffic across each private access walkways is expected to be minimal, current conditions at Broad Beach indicate that foot traffic creates an adverse impact in that clear access pathways are visible from the majority of residences. Adverse impacts resulting from increased access to Broad Beach would likely be less than substantial in the short- to mid-term, as the low-key access control features, including informational signs, would reduce direct adverse impacts on the dune system Consequently, foot traffic on the proposed 112 access ways across the restored dune system would likely result in take (i.e., trampling, uprooting, etc.) of dune plants, and may ultimately substantially reduce the potential benefits of dune restoration, as these pathways would create linear unvegetated bands and corridors of disturbance through the dune habitat. Further, indirect impacts resulting from private access walkways would likely include disturbance of wildlife due to interactions with residents and/or their pets (i.e., dogs or cats). Additionally, no access management plan is currently in place; therefore, private access over public land would be largely unregulated.

Following the cessation of the additional renourishment event and backpassing, coastal erosion will again likely reduce lateral public access, prompting increased foot traffic trampling through the restored coastal dune. Consequently, adverse impacts to the restored dunes would become substantial over the long-term.

Avoidance and Minimization Measure(s)

AMM TBIO-7. Restrict Access Across the Newly Restored Dune System. Through Applicant consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), the California Coastal Commission (CCC), and California State Lands Commission (CSLC), access to and across the restored dune system shall be restricted to approved vertical access ways designated with a low-key rope and bollard fence as a means of protecting dune habitat and limiting the adverse impacts associated with increased private and public access to the restored dune system. Such a rope and bollard fence shall be placed at the toe of the dune and along all approved vertical access ways in order to restrict all access to the dunes and accomplish the goal of reducing impacts to the proposed dune habitat. The Applicant shall provide a Dune Restoration Access Plan, approved by the specified agencies to CSLC staff prior to commencement of construction and staging activities.

AMM TBIO-1a. (Implementation of a Comprehensive Dune Restoration Plan) would apply for long-term restoration of the dune system and restriction of private access paths.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMM TBIO-7 would ensure additional protection for sensitive plant and wildlife species and reduce long-term impacts to restored dune by reducing habitat breaks for private and public access. After implementation of AMM TBIO-7, impacts on terrestrial biological resources from increased public access would be minor. Access ways every 300 feet would increase habitat continuity and would provide more suitable habitat for sensitive plant and wildlife species. After implementation of AMM TBIO-1a, impacts to terrestrial biological resources from private access would be minor.

Impact TBIO-8: Long-term Degradation and Erosion of Newly Created Dune Habitat

Following cessation of the additional renourishment event and backpassing, newly restored dune habitat would gradually erode, eventually exposing the revetment and likely leading to a return to emergency measures for protection of property not protected by the revetment or impacted by the degradation of the revetment (Minor Adverse Effect, Class Mi).

Impact Discussion (TBIO-8)

As proposed, an initial nourishment event would occur followed by periodic backpassing and one future renourishment event. However, following the final backpassing activities, areas of the restored dunes seaward of or overlying the revetment would eventually be eroded exposing the revetment and potentially resulting in major adverse effects to special-status species, including the globose dune beetle and the western snowy plover, should the new dune system provide suitable habitat for these species. The erosion of the coastal dune environment would undermine all short to mid-term beneficial effects of the Project, resulting in major adverse long-term impacts. Exposure of the revetment may also see a return to emergency measures to protect private property not protected by the revetment or subject to impacts resulting from the degradation of the revetment. This may result in additional major adverse effects to the proposed dune habitat and restored habitats behind the revetment. Based on this assessment, WRA (2012) estimated that as much as 4.63 acres of created foredune habitat could be permanently lost under beach nourishment failure.

Avoidance and Minimization Measure(s)

AMM TBIO-1a (Implementation of a Comprehensive Dune Restoration Plan) would apply for long-term restoration of the dune system and restriction of private access paths.

AMM TBIO-7 (Restrict Access Across the Newly Restored Dune System) would apply for long-term protection of dune habitat.

AMM REC-4a (Requirement of Additional Nourishment) would also apply.

Rationale for Avoidance and Minimization Measure(s)

The Project would result in short- to mid-term beneficial effects to sensitive terrestrial biological resources; however, there are no plans in place regarding the protection of these public trust resources following the cessation of the Project. Implementation of AMMs TBIO-1a, TBIO-7, and REC-4a would reduce, but not necessarily eliminate, the major adverse effects associated with this long-term impact.

1 ### 3.4.5 Summary of Terrestrial Biological Resources Impacts and AMMs

Impact	Class	AMMs
TBIO-1: Impacts to Terrestrial Biological Resources Resulting from the Installation of the Emergency Rock Revetment	**Mi**	**AMM TBIO-1a**: Implementation of a Comprehensive Dune Restoration Plan **AMM TBIO-1b:** If Applicable, Conform to CCC's Coastal Development Permit for Off-Site Mitigation of ESHA
TBIO-2: Short-Term Project-Generated Construction Impacts to Terrestrial Biological Resources	**Mi**	**AMM TBIO-2a**: California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Construction Activities **AMM TBIO-2b**: Sensitive Resource Impact Avoidance **AMM TBIO-2c**: Protect Stockpiles of Excavated Material **AMM TBIO-2d**: Storage of Materials or Heavy Equipment Prohibited Outside of Staging Area
TBIO-3: Long-term Construction Impacts of Backpassing to Terrestrial Biological Resources	**Mi**	**AMM TBIO-3a**: California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Backpassing Activities **AMM TBIO-3b**: Avoidance of Sensitive Resource Zones and Vegetation **AMM TBIO-3c**: Sensitive Biological Resources Report **AMM TBIO-2a**: California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Construction Activities **AMM TBIO-2b**: Sensitive Resource Impact Avoidance
TBIO-4: Hazardous Spill Impacts to Beach, Coastal Dune, and Coastal Wetland Biological Resources	**Mi**	**AMM TBIO-4a**: EAP Measures Regarding Protection of Terrestrial Biological Resources **AMM TBIO-4b**: Maintain Equipment and Adhere to Work Plan
TBIO-5: Longshore Sand Transport and Down coast Impacts to Terrestrial Biological Resources	**Mi**	**AMM TBIO-5a**: Maintain the Hydrology of Trancas Lagoon and the Zuma Wetlands **AMM TBIO-5b**: Coordination of Backpassing and Berm Breaching
TBIO-6: Impacts to Terrestrial Biological Resources Resulting From Dune Restoration	**B**	No AMMs Recommended
TBIO-7: Impacts to Terrestrial Biological Resources Resulting from Increased Private and Public Access	**Mi**	**AMM TBIO-7**: Restrict Access Across the Newly Restored Dune System **AMM TBIO-1a**: Implementation of a Comprehensive Dune Restoration Plan
TBIO-8: Long-term degradation and erosion of newly created ESHA	**Mi**	**AMM TBIO-1a**: Implementation of a Comprehensive Dune Restoration Plan **AMM TBIO-7**: Restrict Access Across the Newly Restored Dune System **AMM REC-4a**: Requirement of Additional Nourishment.

3.5 MARINE WATER QUALITY

This section of the Revised Analysis of Public Trust Resources (APTR) describes the environmental setting related to marine water quality offshore and down coast of the Broad Beach Restoration Project (Project) area, including within the Point Dume State Marine Conservation Area, and reviews potential effects of the beach nourishment and dune restoration project on public trust resources and values. The information presented in this section is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. As noted in Section 1, *Introduction*, because implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) (pursuant to Pub. Resources Code, §§ 26601 and 21080, subd. (b)(4)), the scope of review and analysis provided here is limited to those areas where impacts to public trust resources and values may occur.

As defined in Section 13050 of the California Water Code, water-quality inputs of concern include discharges that create pollution, contamination, or nuisance; or that release toxic substances deleterious to humans, fish, bird, or plant life. The significance of many water-quality impacts is inextricably linked to adverse effects on marine and estuarine species and habitats (see Section 3.3, *Marine Biological Resources*). Consideration of impact significance would also include affects on public trust uses such as swimming and surfing. Marine water quality in the Broad Beach vicinity is most directly influenced by discharge from onsite wastewater treatment systems (OWTS), drainage from Trancas Creek, and runoff from several storm drains. Section 3.7.6, *Utilities and Service Systems,* describes the existing utility infrastructure. Potential effects on marine sediment quantity are discussed in Section 3.1 *Coastal Processes, Sea Level Rise, and Geologic Hazards*.

3.5.1 Environmental Setting Pertaining to the Public Trust

<u>CSLC Lease Area and Public Trust Impact Area</u>

The CSLC Lease Area and Public Trust Impact Area includes Broad Beach and the western portions of Zuma Beach, with proposed beach and dune restoration construction activities extending laterally for approximately 6,200 feet from Trancas Creek Lagoon on the east to Lechuza Point on the west and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment (refer to Figures 1-1 and 1-2). The area encompasses approximately 46 acres of proposed beach and dune construction on Broad Beach, as well as construction staging at the west end of Zuma Beach Parking Lot 12, 1,000 feet of Zuma Beach used for stockpiling of imported sand adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach. The area of potential impact for marine water quality includes offshore waters and ocean floor in the vicinity of Broad Beach, down coast along and offshore of Zuma Beach and Westward Beach to Point Dume. These beaches support sensitive estuarine habitats at Trancas lagoon and Zuma Beach wetlands. Impacts to Trancas Creek Lagoon are discussed in detail below due to its proximity to Broad beach while those to Zuma Wetlands are not discussed due to its distance from Broad Beach.

<u>BBGHAD Inland Project Area</u>

The BBGHAD Inland Project Area includes three quarries proposed as sand supply sources, and the sand transportation routes inland of Pacific Coast Highway (PCH), that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). These areas have limited potential for effects on marine water quality and are not discussed further in this section.

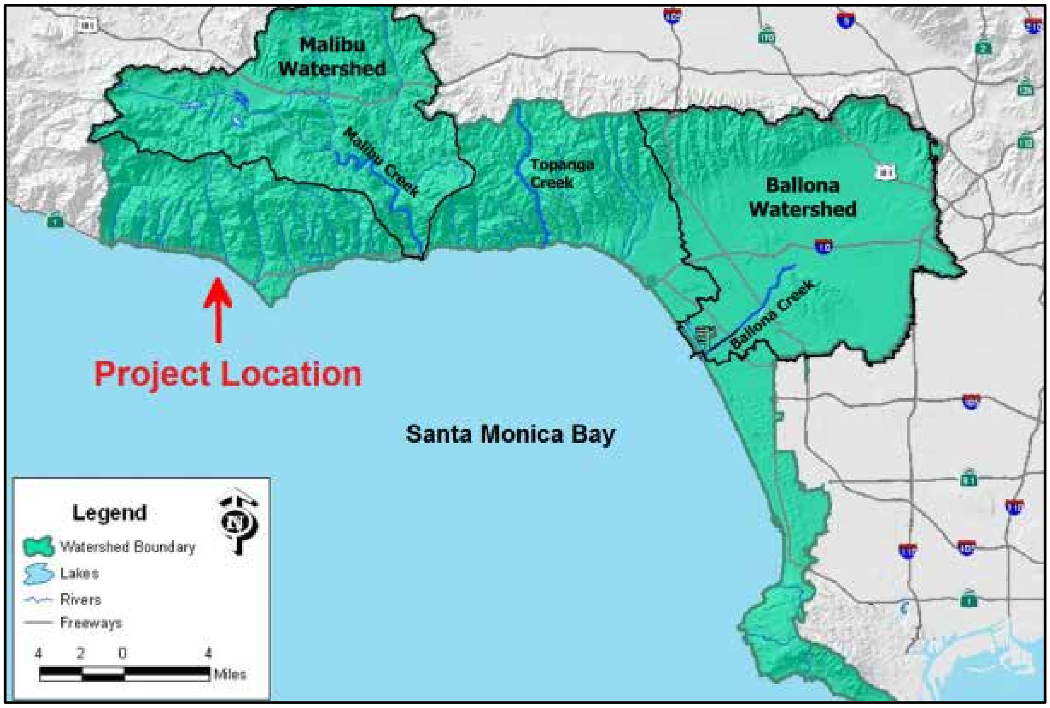
<u>Santa Monica Bay Watershed</u>

Trancas Watershed. The Trancas watershed is drained by Trancas Creek, a perennial stream, which is located at the eastern end of the CSLC Lease Area. The mouth of the creek is often blocked by a sand berm (Illustration 3.5-1) which prevents tidal exchange and causes the creek water to pond during seasonal high flows forming a lagoon (Santa Monica Bay Restoration Plan 2008). The Trancas lagoon is exposed to marine tidal influences during winter months but isolated from the ocean as stream flows decline and sand barriers develop. Lagoon habitat is predominately freshwater despite periodic saltwater influences (City of Malibu 1995).

Illustration 3.5-1*. Trancas Lagoon is often filled with runoff from Trancas Creek and obstructed from drainage to the ocean by fluvial deposits.*

Santa Monica Bay Watershed Management Area (SMBWMA). The CSLC Lease and Public Trust Impact Areas lie within the SMBWMA, which drains an area of approximately 414 square miles (mi^2) into Santa Monica Bay (see Figure 3.5-1). The SMBWMA is divided into major watershed units and smaller watersheds following individual canyons and drainages, including 62 identified watersheds within the city of Malibu (MGP 1995). Large coastal watersheds include Ramirez (4.5 mi^2), Las Flores (4.75 mi^2), Solstice (4.43 mi^2), Trancas (8.39 mi^2), and Zuma Canyon (8.86 mi^2), Topanga (19.68 mi^2) and Arroyo Sequit (10.96 mi^2). Broad Beach lies within the Big Sycamore Canyon major watershed and splits the minor boundaries of the Trancas Canyon and Encinal Canyon watersheds.

Figure 3.5-1. Project Location within SMBWMA



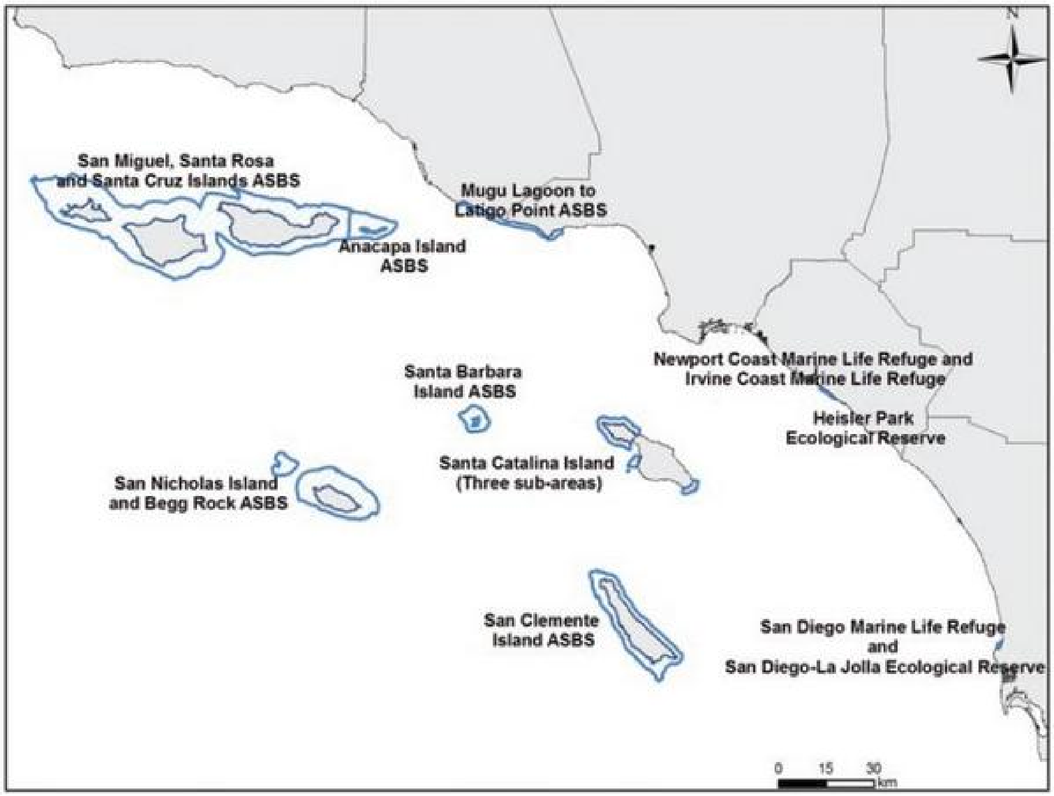
Source: Los Angeles Regional Water Quality Control Board (LARWQCB) 2007b.

Marine Water Quality

The State Water Resource Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) enforce established water quality standards in California. The SWRCB designates State water-quality protection areas to protect marine species or biological communities from undesirable alterations in natural water quality. Areas of special biological significance (ASBS) are a subset of the State water-quality protection areas. These areas are considered intrinsically valuable or have recognized value to humanity for scientific study, commercial use, recreational use, or esthetic reasons. Broad Beach is located within the Mugu Lagoon to Latigo Point ASBS, which extends along 24 miles of coastline (Figure 3.5-2). On October 11, 2011, the U.S. Environmental Protection Agency (USEPA) approved a final list of waterbodies for inclusion in the Los Angeles RWQCB (LARWQCB) Clean Water Act (CWA) Section 303(d) list of impaired waterbodies. The 303(d) list includes the following impairments:

- Nearshore/offshore waters throughout the Bay–dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCBs) in tissue and sediment, debris, sediment toxicity, and fish consumption advisories;
- Trancas Beach (Broad Beach)–fish consumption advisories for DDT and PCBs, and elevated coliform density; and
- Zuma Beach (Westward Beach)–fish consumption advisories for DDT and PCBs, and indicator bacteria.

Figure 3.5-2. ASBS within Southern California



Source: Southern California Coastal Water Research Project (SCCWRP) 2004.

The SWRCB and California Coastal Commission (CCC) have designated Critical Coastal Areas (CCAs) statewide that are directed at improving degraded water quality and providing extra protection from nonpoint source pollution to marine areas with recognized high resource value. CCAs often overlap with SWRCB designated ASBS and include impaired water bodies identified in the Section 303(d) list, marine managed areas, wildlife refuges, waterfront parks, and beaches. CCAs along the Bay coast include: Ballona Creek; Santa Monica Canyon, Topanga Canyon Creek, Malibu Creek, and the coastal area west of Latigo Point, corresponding to ASBS Number 24.

Water contaminants could be introduced to water bodies through freshwater inflow and urban discharges.

Freshwater Inflow. Freshwater inflow to the Bay comes from surface runoff, creeks, and rivers, as well as dry streambeds that terminate in the Bay. Rainfall and the associated freshwater inflow to the Bay are episodic within any given year, and also vary substantially among years (Jenkins and Wasyl 2005). California's coastal climate varies in cycles that last 20 to 30 years (Goddard and Graham 1997). Discharges and inflows into the bay affect marine water quality by acting as transport for pollutants (e.g., oil, fuel, and lubricant drips and leaks from automobiles that are washed down a watershed by runoff) and sediment to enter the Bay through runoff and intentional discharges.

Urban Discharge and Runoff. The coastline along much of Santa Monica Bay is heavily urbanized, with a large population living along and inland of the shoreline and with numerous outfalls that discharge contaminants generated by anthropogenic sources such as industrial discharges, treated and untreated effluent, and other materials into the Bay. Additionally, due to the Mediterranean climate of much of southern California, pulses of storm water runoff carry concentrated contaminants, which have accumulated onshore during long dry spells, into the marine waters of the Bay over relatively short storm durations. Although some synthetic organic contaminants sorb onto fine sediment particles and are initially deposited near the discharge location, they can be repeatedly resuspended by surface gravity waves, internal waves, or coastal currents, and transported far from the source (Noble and Xu 2003). Other contaminants, such as bacterial and viral pathogens, can remain suspended in the water column where they are transported over great distances by coastal currents. These discharges contribute to the water quality, turbidity, and visibility of the Bay as well as within the Public Trust Impact Area. Potential urban discharges in the waters offshore of the CSLC Lease Area may include OWTS effluent from the houses along Broad Beach using OWTS, especially those with leach fields on the ocean side of the home. Such discharges may also affect down coast areas. See Section 3.7.6, *Utilities and Service Systems* for information regarding utility infrastructure and impacts to infrastructure.

Seawater Physiochemistry

The physical and chemical properties of seawater, such as seawater clarity, temperature, dissolved oxygen, salinity, hydrogen-ion concentration, nutrients, seawater metals, and dissolved organic compounds, and bacteria, are regularly used to evaluate marine water quality. Throughout the Bay, the Southern California Coastal Water Research Project (SCCWRP), the Surface Water Ambient Monitoring Program, and the California Cooperative Oceanic Fisheries Investigations conduct regional assessment programs. This subsection examines seawater clarity and nutrients, since the Project implementation would have the potential to affect turbidity through increased beach sand erosion and increased nutrient loading from OWTS leachate.

Water clarity, transparency, transmissivity, ambient light penetration, turbidity, and suspended-solid concentrations all reflect how well water transmits light. Turbidity decreases the clarity of seawater and can limit the penetration of ambient light in the upper reaches of the water column. It is largely determined by the concentration of suspended particulate matter and, within the upper water column, turbidity dictates the depth of the euphotic zone. The base of the euphotic zone is where ambient light intensity is reduced to roughly one percent of surface illumination, which is the minimum necessary for phytoplankton growth. Turbidity increases in coastal waters as a result of phytoplankton blooms, storm and freshwater runoff, sediment resuspension, and wastewater discharges from seafloor outfalls. Transmissivity varies markedly over time, and has its highest variability within this nearshore region (Nezlin et al*.* 2004). On average, the lowest water clarity is found at the end of April, when upwelling winds are typically at their maximum. When combined with increased turbidity near the seafloor from wave resuspension, a mid-depth maximum in transmissivity (water clarity) is often observed in the nearshore region. This vertical distribution differs from that of the other seawater properties, which tend to steadily increase or decrease with depth.

In addition to ambient light intensity, phytoplanktonic photosynthesis depends on the availability of inorganic nutrients, particularly phosphates and nitrates. Factors that influence nutrient concentrations include upwelling, biological processes, wastewater disposal, and stormwater runoff. For the most part, concentrations of nitrate, phosphate, and silicate are negligible within the euphotic zone due to rapid uptake by phytoplankton. However, sewage and surface-water runoff can contain high levels of nitrogen and phosphate, and can locally alter nutrient levels within receiving waters.

Excessive nutrient loading, as often seen from fertilizer and untreated sewage effluent, can lead to harmful phytoplankton (algal) blooms within surface waters and impact dissolved-oxygen levels. Within the Bay, marine impacts are primarily caused by recurring blooms of *Alexandrium* and *Pseudo-nitzschia* that produce potent neurotoxins (Schnetzer et al. 2007). These neurotoxins accumulate in fish and shellfish that are ingested by mammals, including humans, and cause paralytic and amnesic shellfish poisoning. Bioaccumulation of algal toxins through the food web has been linked to significant wildlife mortality events of fish, birds, and marine mammals.

Inland Quarry Sand Source Sand Quality

Based on Applicant-prepared studies, the quarry sand materials were determined to be free of contamination and suitable for beach nourishment and dune construction (see Appendix J). The sand sources at the quarry sites were formed in pre-industrial times and have not been exposed to modern sources of pollution. Further, they are far removed from potential contamination sources and are upslope/upstream from urbanization or drainage sources. In addition, all quarry materials are comprised of over 92.5 percent sand and, therefore, are not likely to hold onto any contaminants.

3.5.2 Selected Regulations Pertaining to the Marine Water Quality

State and other statutes related to marine water quality are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. In addition, in December 1988, California and the USEPA established the Santa Monica Bay National Estuary Program to recognize the need to restore and protect the Bay and its resources. The program's coalition of governments, environmentalists, scientists, industry, and the public was charged with developing and implementing a Comprehensive Conservation Management Plan for Bay protection and management. The resulting Bay Restoration Plan was approved by the Governor in December 1994 and by the USEPA in 1995. The Plan's goal, to reduce pollutant loadings to the Bay from point and nonpoint sources, was designed to prevent degradation of the marine ecosystem, protect beaches, and minimize risks to human health. The Plan identified key problems and recommended actions to mitigate them. The Santa Monica Bay Restoration Project was established to implement the Plan. In 2003, the project formally became the Santa Monica Bay Restoration Commission, an independent non-regulatory State agency charged with implementing the nearly 250 actions identified in the plan that target critical problems such as polluted urban runoff, degraded wetlands, and risks to public health associated with seafood consumption and swimming near storm-drain outlets.

3.5.3 Public Trust Impact Criteria

This section describes criteria for evaluating the significance of Project-related activities or incidents that may result in impacts to marine water resources. In general, the persistence, extent, and amplitude of such impacts dictate their significance. Although the thresholds of significance for water-quality impacts are based on quantitative limits promulgated in existing standards, guidelines, and permits, interpretation of unacceptable changes in seawater conditions often require some judgment. For example, standards contained in a particular permit may be outdated, or a discharge may be causing previously unrecognized water-quality impacts. In other instances, perceived impacts may be a statistical artifact, for example, from a naturally occurring outlier in the distribution of ambient conditions. Thus, the significance of potential project-related changes in seawater properties must be gauged against the backdrop of naturally occurring variability within the Bay.

Based on these considerations, impacts to marine water quality would be considered to have a major adverse effect if any of the following conditions were to occur as a result of the Project:

- Discharges that create pollution, contamination, or nuisances as defined in Section 13050 of the California Water Code;
- Release of toxic substances that would be deleterious to humans, fish, bird, or plant life;
- Measurable increases in contaminant concentrations compared to background concentrations within National Marine Sanctuaries, Marine Protected Areas, ASBS, CCAs, or ESHAs, such as coastal wetlands and kelp beds;
- Exceedance of water-quality objectives identified in applicable SWRCB or RWQCB documents (e.g., the California Toxics Rule [SWRCB 2005], California Ocean Plan [SWRCB 2012], or Basin Plan [LARWQCB 2007a]), including: a significant reduction in the transmittance of natural light after initial mixing; and creation of a visible oil sheen on the surface of the receiving waters, or marine release of fluids contaminated with oil and grease or dissolved aromatic-hydrocarbon concentrations, exceeding specified limits.

This impact analysis considers the CSLC Lease Area and Public Trust Impact Area in its existing setting, subsequent to the 2010 emergency rock and sand bag revetments installation.

3.5.4 Public Trust Impact Analysis

The severity of potential Project impacts are a function of the Project's location within the physiographic environment, the physicochemical properties of the receiving waters, the circulatory and dispersive capacity of the regional oceanographic regime, and any existing contamination in sand added to the beach.

The Project could adversely impact marine water quality, particularly during construction activities. Deposition of 450,000 cy of sand onto Broad Beach and its distribution by heavy equipment would increase the amount of sand exposed to coastal erosion processes, which would affect turbidity of the waters immediately offshore of Broad Beach as well as within the Public Trust Impact Area down coast from Broad Beach, particularly along Zuma Beach. New sand introduced to Broad Beach may also introduce contaminants that could affect marine water quality.

Impact MWQ-1: Project Implementation Impacts due to Turbidity or Other Impairment of Area Waters

Project construction and nourishment/renourishment activities may increase turbidity in, or result in a violation of other water quality standards for, nearshore waters (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (MWQ-1)</u>

Hard structures such as rock revetments along the coast disrupt the natural transport of sand along the coast. As part of the long-term strategy for protection of private property, including homes and septic systems, from coastal erosion, the emergency revetment placed in 2010 would be buried as part of the proposed Project beneath a new system of sand dunes in the landward edge of the widened, nourished beach. This shore protection would remain buried unless severe beach erosion or other conditions preclude maintaining sufficient beach width for protection.

Initial construction of the Project and backpassing events would involve movement and redistribution of large quantities of sand by heavy construction equipment and its redistribution through wave action along the beach adding to nearshore turbidity. Initial construction impacts on turbidity would be short-term and confined to the vicinity of Broad Beach while longer term redistribution of sand would mimic natural processes. Following the initial nourishment, the beach profile is projected to erode over 5 to 10 years. After 10 years following the initial nourishment event, this erosion is expected to trigger the Project's proposed one-time additional nourishment, with impacts to marine water quality similar to the initial Project. In total, this renourishment is projected to extend the lifetime of the beach and dunes system to approximately 10 to 20 or more years, when the revetment would again become exposed.

Turbidity increases from the Project activities would be localized to the nearshore marine environment and would be temporary. Because seafloor sediments within the nearshore environments consist of well-sorted sands, nearly all suspended particulates would settle out of the water column rapidly, and any initial turbidity increase would become imperceptible before the last sand particle settles on the seafloor. This is especially true because the nourishment/renourishment activities would not directly interact with the marine environment. Nourishment would only potentially and indirectly affect nearshore waters where ambient seawater clarity is naturally lower and far more variable than in offshore areas the Bay.

The potential also exists for leaks or spills of oil or fuel from construction equipment. Earthmoving equipment, such as bulldozers and scrapers, would operate on Broad Beach during the initial 8-month nourishment, the follow-up 6-month renourishment event approximately 10 years later, and backpassing activities. A 20-truck fleet would be also used to transport sand to the beach, with approximately 30 trucks per hour entering and exiting the staging area from 7:00 AM to 6:00 PM. All equipment and material for the Project would be stored at the Zuma Beach Parking Lot 12, with beach access provided near the western end of the parking lot. Leaks or spills are considered low probability if the equipment is well maintained, and all fueling is restricted to the staging area. However, equipment can malfunction or suffer damage when operating in a dynamic environment like a beach resulting in a release of oil or fuel on public trust lands. See Section 3.7.5 *Public Health and Safety Hazards* for a full discussion on release of hazardous materials.

During construction, monitoring of impacts to waters of the U.S. would be needed to assess turbidity levels, with adaptive management activities and/or corrective action measures taken should monitoring indicate unacceptable turbidity levels above ambient conditions. Ensuring that sand is placed high on the beach profile as part of dune system installation would also minimize indirect effects of additional sand or disturbance within the nearshore environments, with commensurate minimization in potential turbidity. These minimization measures are identified below in the Avoidance and Minimization Measures (AMMs) subsection of this impact discussion. Therefore, Project nourishment / renourishment activities would result in minimal impacts to marine water quality.

<u>Avoidance and Minimization Measures</u>

Implementation of the following AMMs would address this impact.

AMM MWQ-1a: Prepare and Implement Turbidity Monitoring Plan. A Turbidity Monitoring Plan shall be implemented during Project construction and nourishment/renourishment activities to monitor any effects to water clarity in offshore of and down coast from Broad Beach. The Plan shall be submitted to the California State Lands Commission (CSLC) staff for approval, in consultation with the Los Angeles Regional Water Quality Control Board, at least 2 weeks before Project mobilization and shall include, at a minimum, the following elements:

- Details on how the Applicant will continually evaluate construction-related turbidity relative to natural (background) turbidity occurring in unaffected areas during Project construction and nourishment/renourishment activities;
- Requirements for a qualified observer to record turbidity from a suitable vantage point during each day of dredging and construction; and
- Specific adaptive management activities and/or corrective action measures should include monitoring to indicate unacceptable turbidity levels above ambient conditions.

AMM MWQ-1b. Prepare Pollution Prevention Plan and Implement Best Management Practices (BMPs). The Applicant shall prepare a Pollution Prevention Plan, or Stormwater Pollution Prevention Plan (SWPPP), in accordance with Project plans and specifications and applicable regulations (e.g., State Construction Stormwater National Pollutant Discharge Elimination System permit requirements). The Plan shall be submitted to California State Lands Commission (CSLC) staff for review and approval at least 2 weeks prior to commencement of onsite Project activities. The Plan shall include a list of all heavy equipment and shall require all equipment to be stored and fueled in the Zuma Beach Parking Lot 12, which shall be conspicuously demarcated. The Project contractor shall ensure that the BMPs described in the Plan are implemented. Documentation that the BMPs are being implemented shall be maintained on site and shall be readily accessible for review by CSLC staff and any other authorities having jurisdiction. BMPs shall include, but not be limited to:

- Heavy equipment and construction activities shall be restricted to the defined construction areas, as demarcated by the Project engineer. Additionally, vehicles and personnel shall only use existing access roads to the maximum degree feasible.
- All equipment used onsite shall be properly maintained such that no leaks of oil, fuel, or residues will occur. No vehicle fueling shall occur on the beach or dune areas. Provisions shall be in place to remediate any accidental spills, in both the terrestrial and marine environments.
- Waste, such as removed materials, chemicals, litter, and sanitary waste at the Project site, shall be properly disposed of at a permitted off-site facility.

AMM MB-2c (Sand Placement Footprint Limitation) would apply to construction activities to limit sand deposition areas. **AMM HAZ-2** (Develop Hazardous Material Spill Prevention Control and Countermeasure Plan) would also apply to limit potential for hazardous materials release to the marine environment.

Rationale for Avoidance and Minimization Measure(s)

Monitoring turbidity during Project activities as required under AMM MWQ-1a would trigger responses to minimize turbidity impacts to the extent practical. Additionally, limiting the extent of backpassing to onshore areas within a defined reach would reduce potential disruption of nearshore sands. In addition, AMM MB-2c would minimize sand and shoreline disturbance and reduce the likelihood of increased turbidity within nearshore marine environments. Project activities would result in increased turbidity during construction activities and during equilibration after nourishment or backpassing, but this turbidity would be a minor adverse effect with application of these AMMs. Implementation of BMPs in the Plans required under AMMs MWQ-1b and HAZ-2 will reduce the potential for a release of oil and fuel. Impacts are considered to be minor with implementation of the avoidance and minimization measures.

Impact MWQ-2: Beach Nourishment and Backpassing Impacts to Trancas Lagoon

Beach nourishment and construction activities would occur near the mouth of Trancas Creek potentially affecting tidal exchange and the natural functioning of Trancas Lagoon (Minor Adverse Effect, Class Mi).

Impact Discussion (MWQ-2)

The Project’s beach nourishment footprint would narrow at the east end of Broad Beach, just short of the mouth of Trancas Creek where it forms Trancas Lagoon. The mouth of the creek is generally blocked by a sand berm, which prevents tidal exchange and causes the creek water to pond during seasonal high flows. At certain times of the year, the lagoon may even extend eastward down the beach for several hundred feet (Illustration 3.5-2). The beach nourishment would result in substantial widening of the beach west and up drift of the Lagoon, and the new 300-foot-wide beach would generally coincide with the western boundary of the lagoon. The addition of significant amounts of new sand to this system immediately up drift of the lagoon may incrementally increase the length of periods between episodic breaching as part of natural lagoon processes which is caused by overtopping of the beach by impounded lagoon water, flooding, or by high tides and wave action Thus, the frequency and duration of lagoon breeching may be slightly altered by the Project as sand erodes from Broad Beach and moves down coast to and beyond the beach fronting the lagoon. However, these changes are not anticipated to be substantial or to lead to any major changes in lagoon water quality as the added sand would likely incrementally increase the width, but not the height of the berm. In addition, the lagoon system is well adapted to prolonged seasonal closures, which are a natural part of this ecosystem.

During both nourishment and construction, earthmoving equipment would be staged at Zuma Beach Parking Lot 12 and would cross the beach area below the creek mouth to access Broad Beach. Equipment anticipated to be crossing the area daily includes two bulldozers, two front-end loaders, two scrapers, an excavator, and dozens of heavy haul

Illustration 3.5-2. *Trancas Lagoon. Clockwise from upper left: Aerial view from in front of lagoon showing sand barrier; Ground view from mouth of creek showing lagoon from behind; Ground view of lagoon showing extension of water to the east; Aerial view of lagoon showing extension of water to the east.*

trucks. In the event that the creek was breached during construction operations, or when the lagoon has extended eastward along the beach (Illustration 3.5-2), construction impacts could impede or divert tidal exchange associated with the creek or result in construction impacts to the lagoon waters that would impact nearshore marine water quality.

As part of the Project, the BBGHAD has committed to halt construction activities when Trancas Lagoon is in a breached state, thereby reducing potential impacts related to construction equipment passing through the area of tidal exchange. Additionally, Project construction impacts would be temporary and, with implementation of the AMMs discussed below, would not significantly interfere with the natural functioning of the creek or lagoon. Therefore, this impact would be minor with implementation of AMMs.

<u>Avoidance and Minimization Measures</u>

Implementation of the following AMMs would address this impact.

AMM MWQ-2: Construction Limitations. In the event that the Trancas Lagoon mouth is breached during the initial construction period or at any time during backpassing operations, the Broad Beach Geologic Hazard Abatement District (BBGHAD) will halt construction during high flow episodes where the body of construction equipment would come in contact with flow into or out of the Lagoon. Construction activities would be halted until the creek is no longer in a breached state and there is at least 30 feet of dry sand between the lagoon mouth and Pacific Ocean, and California State Lands Commission (CSLC) staff authorizes recommencement of construction activity.

AMM TBIO-5a (Maintain the Hydrology of Trancas Creek Lagoon) would help to reduce potential construction impacts to tidal exchange and the natural functioning of Trancas Lagoon.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

AMM MWQ-2 would reduce impacts to Trancas Lagoon water quality by restricting the types and timing of activity near the Lagoon. AMM TBIO-5a would also apply and would reduce ongoing impacts to the function of Trancas Creek and Lagoon from nourishment and backpassing. After implementation of these AMMs, impacts would be minor.

Impact MWQ-3: Revetment Retention Impacts Associated with Nutrient Loading of Area Waters

Retention of the revetment would protect Onsite Wastewater Treatment Systems (OWTSs) from wave action and reduce or eliminate contact between marine water and untreated sewage effluent (Beneficial Effect, Class B).

<u>Impact Discussion (MWQ-3)</u>

As discussed above, the emergency revetment placed in 2010 would be buried beneath a new system of sand dunes in the landward edge of the widened, nourished beach as part of the long-term strategy for protection of private property, including homes and septic systems, from coastal erosion. This shore protection would remain buried unless severe beach erosion or other conditions preclude maintaining sufficient beach width for protection. Following the initial replenishment, the beach profile is projected to erode over 5 to 10 years, which would trigger the proposed one-time additional nourishment. This renourishment is projected to extend the lifetime of the beach and dunes system to approximately 10 to 20 years, when the revetment would again become exposed.

Retention of the revetment would have a beneficial effect on marine water quality, as it would protect OWTSs from wave action. Contact between marine water and untreated sewage effluent would result in nutrient loading in the marine water offshore of Broad Beach. Nutrient loading in coastal waters can lead to algal blooms. Certain types of algae emit toxins. Coming into contact with these toxins can cause stomach aches, rashes and more serious problems for humans. Additionally, algal blooms consume large amounts of oxygen that fish, shellfish and other aquatic organisms need to survive. They make water cloudy, reduce the ability of aquatic life to find food, and clog fish gills. Toxins in some algal blooms can sicken or kill pets, marine mammals, fish and shellfish (USEPA 2012). Given that the presence of the existing revetment helps to protect OWTSs from wave action, it reduces these potential impacts and provides a beneficial effect to marine water quality.

Impact MWQ-4: Beach Sand Contaminant Resuspension and New Sand Chemical Compatibility

Initial and Follow-up Nourishment Events, including annual backpassing, would suspend or resuspend contaminants, particularly if onshore quarry sand sources contain contaminants (Negligible, Class N).

Impact Discussion (MWQ-4)

The import and distribution of 600,000 cubic yards of sand to Broad Beach and a near-term loss of approximately 25 percent of sand into the littoral zone could release contaminants from imported sand or resuspend contaminants from offshore sediments associated with the operation of heavy equipment on the intertidal beach. This disruption and could disperse contaminants within the water column and increasing their bioavailability. However, NPDES monitoring of seafloor sediments in the Bay indicates that the sediments are largely uncontaminated compared to other areas of the Bay, and that their physical properties would result in only temporary and localized turbidity increases and negligible impacts associated with contaminant resuspension.

Laboratory testing of sand from the three inland quarries has found this sand to be free of contamination with chemical pollutants. The sand sources at the quarry sites were formed in pre-industrial times and have not been exposed to modern sources of pollution. They are far removed from potential contamination sources and are upslope/upstream from urbanization or drainage sources. Additionally, all quarry materials are comprised of over 92.5 percent sand, which is less susceptible to absorbing contaminants than finer materials. As such, based on Tier I Assessment requirements, quarry material meet standards required to be used for the Project (see Appendix J).

Additional chemical testing of the quarry sand was performed by Moffatt & Nichol (2012) to inform decision-making and provide empirical data regarding the proposed sand material. One chemistry sample from each of the three quarries was tested by a certified analytical laboratory (American Environmental Testing Laboratory in Burbank, CA) for a standard suite of bulk chemistry analyses, as specified in the Inland Testing Manual, as administered by the USEPA and the USACE. The analysis included metals, polyaromatic hydrocarbons, phenols, chlorinated pesticides, and aroclors. Each chemistry sample was comprised of equal portions of four discrete samples taken from stockpile "quadrants." This compositing technique is commonly used to address spatial variability in sediment composition. Chemistry results were compared to established numeric screening guidelines as used by the USEPA and the USACE for material compatibility determinations.

Quarry sand samples resulted in Non-Detectable (ND) measurements for results for polyaromatic hydrocarbons, organic phenols, chlorinated pesticides, and organic aroclors. This means that the constituent being tested for was below the detection limit of the testing lab (CSLC 2013). Table 3.5-1 contains conventional measurements for the quarries, while Table 3.5-2 contains metal measurements for the quarries along with established screening levels for comparison.

Table 3.5-1. Conventional Measurement for Inland Sand Sources

Conventional Measurements	Grimes	P.W. Gillibrand	CEMEX
Percent Solids (total) (%)	98.6	99.9	99.4
Total Organic Carbon (mg/kg)	450	370	440
TPH (total) (mg/kg)	ND	ND	ND
Solids, Volatile (%)	0.79	0.184	0.398
Total Sulfides (mg/kg)	ND	ND	ND
Oil & Grease (mg/kg)	ND	ND	ND

Source: CSLC 2013.
Note: No established screening levels were identified in the report.
ND – Non-Detectable

Table 3.5-2. Metal Measurements for Inland Sand Sources

	RSL		CHHSL	NOAA Screening		Quarries		
Metals	C	NC	Residential	Salt ERL	Salt ERM	Grimes	P.W. Gillibrand	CEMEX
Arsenic (mg/kg)	0.39	22	0.07	8.2	70	1.74	ND	0.232
Cadmium (mg/kg)	1800	70	1.7	1.2	9.6	ND	ND	ND
Chromium (mg/kg)	--	--	100000	81	370	1.7	1.78	1.48
Copper (mg/kg)	--	3100	3000	34	270	2.24	0.748	1.22
Lead (mg/kg)	--	400	150	46.7	218	1.26	0.261	0.705
Mercury (mg/kg)	--	5.6	18	0.15	0.71	ND	ND	ND
Nickel (mg/kg)	--	--	1600	20.9	51.6	1.57	1.12	1.25
Selenium (mg/kg)	--	390	380	--	--	ND	ND	ND
Silver (mg/kg)	--	390	380	1	3.7	ND	ND	ND
Zinc (mg/kg)	--	2300	2300	150	410	10.3	3.68	8

RSL- ‘Regional Screening Level’ established by the USEPA (www.epa.gov/region9/superfund/prg/)
CHHSL – ‘California Human Health Screening Levels’ established by the California Office of Environmental Health Hazard Assessment
C – Carcinogenic
NC – Noncarcinogenic
Salt ERL – ‘Effects Range Low’ contaminant concentration in salt water for which effects are rarely seen
Salt ERM – ‘Effects Range Medium’ contaminant concentration in salt water for which effects are routinely seen

Chemical analysis results determined that of the analyzed chemicals, none were over any established screening levels. Therefore, using sand from the quarries would have a negligible impact to marine water quality in the vicinity of the Public Trust Impact Area.

3.5.5 Summary of Marine Water Quality Impacts and AMMs

Impact	Class	AMMs
MWQ-1: Project Implementation Impacts due to Turbidity or Other Impairment of Area Waters	**Mi**	**AMM MWQ-1a**: Prepare and Implement Turbidity Monitoring Plan **AMM MWQ-1b**: Prepare Pollution Prevention Plan and Implement Best Management Practices (BMPs) **AMM MB-2c**: Sand Placement Footprint Limitation **AMM HAZ-2**: Develop Hazardous Material Spill Prevention Control and Countermeasure Plan (SPCCP)
MWQ-2: Beach Nourishment and Backpassing Impacts to Trancas Lagoon	**Mi**	**AMM MWQ-2**: Construction Limitations **AMM TBIO-5a**: Maintain the Hydrology of Trancas Creek Lagoon
MWQ-3: Revetment Retention Impacts Associated with Nutrient Loading of Area Waters	**B**	No AMMs recommended
MWQ-4: Beach Sand Contaminant Resuspension and New Sand Chemical Compatibility	**N**	No AMMs recommended

3.6 SCENIC RESOURCES

This section of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR) describes the visual environments and public aesthetic resources that would be affected by the proposed Broad Beach Restoration Project (Project), identifies criteria to assess the severity of impacts to these resources, and recommends avoidance and minimization measures (AMMs) where applicable to reduce impacts. The information presented in this section is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. As noted in Section 1, *Introduction*, because implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) (pursuant to Pub. Resources Code, §§ 26601 and 21080, subd. (b)(4)), the scope of review and analysis provided here is limited only to those areas where impacts to public trust resources and values may occur.

3.6.1 Environmental Setting Pertaining to the Public Trust

CSLC Lease Area and Public Trust Impact Area

The CSLC Lease Area and Public Trust Impact Area (refer to Figure 1-2) includes Broad Beach and the western portions of Zuma Beach, with proposed beach and dune restoration extending laterally for approximately 6,200 feet from Lechuza Point to Trancas Creek Lagoon, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment (refer to Figure 1-1). The area encompasses the approximate 46-acre beach and dune construction area, as well as the construction staging at the west end Zuma Beach Parking Lot 12, stockpiling of imported sand on Zuma Beach adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach. The CSLC lease area includes approximately 40.5 acres of public trust tidal and subtidal lands held by the State. The CSLC Lease Area together with the Public Trust Impact Area include locations with protected viewsheds that have visual access to Broad Beach and other sections of public trust lands along the coast, including views from Zuma Beach and Point Dume State Beach, and of these areas and upcoast beaches from Pacific Coast Highway (PCH), which is eligible to be a State scenic highway through this area.

BBGHAD Inland Project Area

The BBGHAD Inland Project Area includes three quarries proposed as sand supply sources, as well as the sand transportation routes inland of PCH, that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). None of these roads is currently designated as a scenic highway and these areas do not support scenic resources related to public trust resources administered by the CSLC related to coastal access and recreation and are not discussed further in this section.

Relationship between Scenic Resources and Public Trust Resources and Values

Changes in the visual characteristics of the CSLC Lease Area and Public Trust Impact Area have the potential to affect the public's right to use and enjoy public trust resources including Broad Beach, the waters immediately offshore Broad Beach, local public beaches (e.g., Zuma Beach and Point Dume State Beach), and protected scenic vistas with visual access to Broad Beach (Figure 1-2). Public use and enjoyment of public trust lands and the waters throughout Broad Beach include passive (beach walks, bird watching) and active recreation (surfing, swimming, kayaking, paddle boarding, boating). Visual quality within the public trust lands and waters is an important element for the public's enjoyment of these activities.

Definition of Visual Impacts

Scenic resources are composed of natural and man-made features that give a particular area its visual qualities. Landforms, water surfaces, vegetation, and manufactured features are considered characteristic of an area if they are inherent to the structure and function of its landscape. The significance of a change in visual character is influenced by the importance or uniqueness of a view, viewer sensitivity, the duration of views, and the contrast of the change with the existing natural or man-made environment. Social considerations, including public value placed on a visual resource, public awareness, and general community concern for visual resources in the area can also play a role. These social considerations are addressed as visual sensitivity and are defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of that resource. High visual sensitivity exists when the public can be expected to react strongly to a potential change in visual quality. Moderate visual sensitivity exists when affected views are secondary in importance or are similar to others in the region. Low visual sensitivity exists when little or no public concern exists about changes in the landscape.

Scenic Character of the Malibu Shoreline

The 27-mile-long Malibu shoreline from Point Mugu south to the city of Santa Monica is recognized as a highly scenic area. Visual resources of note include multiple sandy beaches and coves, such as Zuma and Windward Beaches down coast from Broad Beach, and Leo Carrillo Beach upcoast, Scenic bluffs, areas of undeveloped shoreline and the backdrop of the steep ridges and hillsides of Santa Monica Mountains and associated undisturbed native habitats are also considered highly scenic. Views of these resources are available from Broad Beach and public trust lands within and adjacent to area parks and beaches, as well as from PCH.

Historical Scenic Conditions of Broad Beach

Development along Broad Beach began in the 1930s, consisting of generally smaller rural homes and beach cottages. During the 1970s, 80s, and 90s, development accelerated; larger homes were constructed on the dunes and bluffs backing Broad Beach, with the majority of land behind Broad Beach developed with residential structures by 2000 (Illustration 3.6-1). Most recently, in a process that is ongoing at Broad Beach and in other coastal communities, many older smaller homes are being rebuilt as larger estate residences, further increasing the scale and coverage of development backing public intertidal lands.

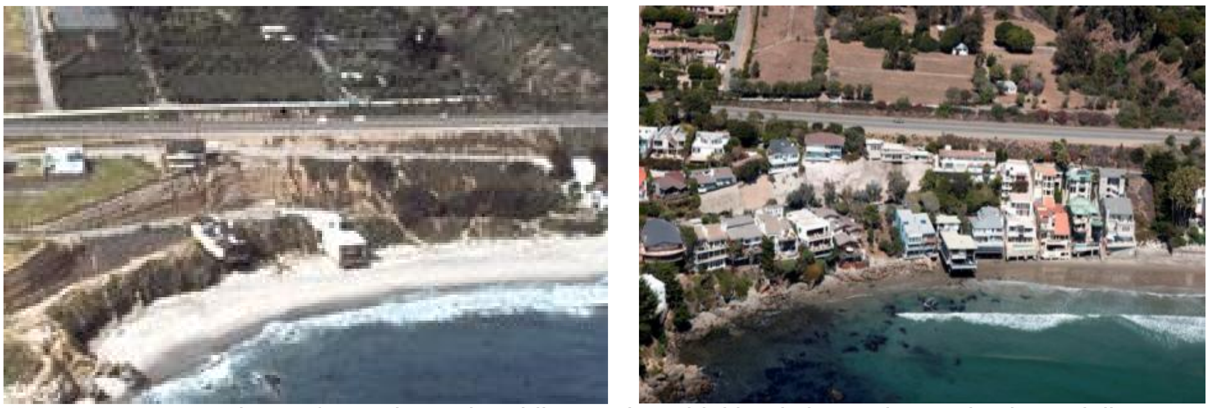


Illustration 3.6-1. *Views of Broad Beach public trust intertidal lands have changed substantially over the last 40 years, as can be seen in these aerial photographs from 1972 (left) and 2010 (right).Views of a wide sandy beach backed by dunes have been replaced by those of a low tide beach backed by closely-spaced, sometimes multiple-story houses fronted by large coastal protection structures, including tall seawalls, timber bulkheads, and the recently installed emergency revetment (2010).*

Broad Beach remained a relatively wide beach through the 1970s, considerably wider than it is today. The width of Broad Beach reached a peak in 1970 at an annual average of 60 feet landward of the mean high tide line (MHTL). However, coastal erosion accelerated in the 1980s and 90s, with much of the sand was lost from Broad Beach during this period. This directly changed the visual character of the beach, with much or all of the dry sand beach berm eliminated, and larger areas of rocky intertidal habitat seasonally exposed near the west end of Broad Beach. In response to this change, homeowners began to install extensive coastal protection structures, often immediately adjacent to public land. These included rock and sand bag revetments and concrete and timber bulkheads. Further, some properties raised houses up on pilings and elevated foundations near the west end of the beach.

The variety of coastal protection structures present on Broad Beach prior to the 2010 revetment contributed to a relatively incoherent visual character (Illustration 3.6-2). The natural elements of Broad Beach (rocky intertidal habitat, bluff features, etc.) were similar to present conditions; however, the different colors, textures, and shapes of the various rock, timber, geotextile, and Sakrete revetments contributed to an exaggerated

Illustration 3.6-2. *Prior to installation of the rock revetment in 2010, individual homeowners protected their properties with a variety of rock, timber, geotextile, and Sakrete revetments.*

aesthetic contrast between individual properties backing the beach and a discontinuous overall character. In addition, certain types of revetments, especially those involving plastic or cloth, were prone to disassemble as a result of wave action and become litter on the beach. Since the individual revetments extended outward onto the beach for different lengths, it is unclear whether any of them covered public trust lands, or to what extent. Similar to the 2010 rock revetment, many of the individual revetments were also tall enough to limit public views landward of the beach.

The existing emergency revetment was constructed along 4,100 feet of Broad Beach in 2010 in response to high erosion rates during the 2009 to 2010 winter season and widespread failure of temporary emergency sand bag revetments. The revetment is constructed of a combination of boulders and smaller rock fill, as well as portions of sand bag reinforcements. The two existing public beach access ways were reconstructed at that time to include stairways with guide rails to traverse the approximately 12- to 15-foot- high revetments (Illustration 3.6-3). The property owner at 30822 Broad Beach Road opted not to participate in the emergency revetment project, leaving a 100-foot-long break in the revetment in front of this property near the east end of the Project area.

The existing revetment covers 3.02 acres of public and private beach area. Of this coverage, approximately 0.86 acre of public trust lands are currently covered by the revetment, which is highly visible within Broad Beach and limits landward views and public access to the beach.

Illustration 3.6-3. *The existing revetment rises up 12 to 15 feet in height above the low tide intertidal lands along Broad Beach, limiting public views landward from these public trust lands.*

Visual Environment of Broach Beach

The natural environment at Broad Beach consists of a narrow sandy beach on the west end, which widens towards the east end, backed by an emergency revetment along a majority of the beach, with residential development landward (Illustration 3.6-4). Significant visual resources available from public trust lands along Broad Beach include views of open water, the beach, and the bluffs. PCH, which is eligible for State scenic highway designation, runs parallel to Broad Beach Road and has limited views of the beach due to vegetation and residential development.

Illustration 3.6-4. *Public trust intertidal lands along Broad Beach afford users views of the ocean, beach, emergency revetment, and residential properties along the beach.*

At moderate tides, Broad Beach is currently a narrow ribbon of primarily wet-sand beach. The revetment dominates landward views from central and eastern Broad Beach, with portions of homes visible over the top of the 12- to 15-foot-tall rock stack (Illustration 3.6-5). At lower tides, up to 200 feet of intertidal beach is exposed, with these low-tide sand flats providing public views of intertidal and offshore areas, Zuma Beach, and Point Dume to the east, Lechuza Point to the west, and steep chaparral-covered slopes of the Santa Monica Mountains to the north. At these lower tides, although well set back, homes along the eastern portion of Broad Beach become more visible from the waterline as the revetment does not impede landward views. At the eastern-most end of Broad Beach in areas without the revetment, relatively intact coastal dunes remain fronting 5 existing homes, four undeveloped lots, and the Malibu West Beach Club, although often decaying or damaged geotextile sand bags of Sakrete revetments are dispersed throughout Broad Beach.

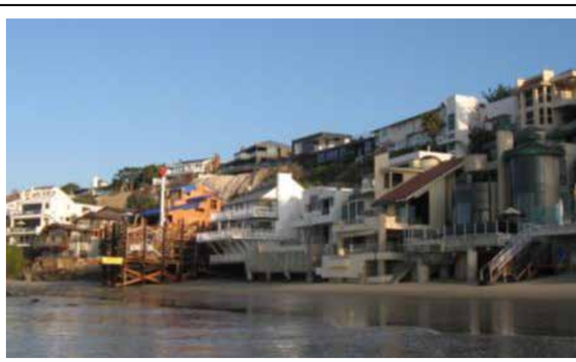


Illustration 3.6-5. *Existing developments, including protective structures and the emergency revetment, dominate views from intertidal lands and offshore waters of Broad Beach.*

The beach becomes increasingly rocky in the west, in the sheltered cove inside of Lechuza Point, where rocky intertidal habitat intermingles with intermittent sandy beach (Illustration 3.6-6). At lower tides in this area, beachgoers can view tide pools and marine life, including sea anemones, mussels, starfish, and beds of bright green surfgrass. Landward views are dominated by homes built along taller dunes and the bluff face and top, with scattered trees and other vegetation, breaking up and softening views of residential development. Landward views from public trust lands at the west end of the beach are dominated by two- and three-story homes, foundations, seawalls, and pilings supporting these homes; however, the relatively natural bluff face within Lechuza Cove, and skyline Monterey cypress trees and other vegetation contribute to a more natural setting in the cove itself.


Illustration 3.6-6. *Lechuza Cove includes both sandy beach and rocky intertidal habitat with tide pools that support marine life; skyline bluff top trees contribute to a more natural setting in the cove. At the east end of the beach, Trancas Lagoon and remnant dunes support additional natural public trust resources such as occasional native dune wildflowers and shore and wading birds.*

Residential homes along the beach are a primary visual feature along Broad Beach (Illustration 3.6-7). Development in the area includes 109 homes along Broad Beach and the Malibu West Beach Club. Approximately 79 residences are located landward of the existing emergency revetment, while 35, located at the east and west ends of the Broad Beach, lie outside the revetment's boundaries. Residences toward the west end of the beach often have individual seawalls or rock revetments while those at the far east end lie behind dunes and geotextile sand bag revetments reminiscent of those present along the entire beach prior to the 2010 rock revetment (Illustration 3.6-7).

Due to historic losses of beach sand, landward views from the western end of Broad Beach are dominated by exposed foundations, temporary and permanent seawalls, temporary staircase extensions, and coastal protection structures, including the emergency revetment. The offshore visual environment is frequently enjoyed by surfers, swimmers, boaters, and commercial and recreational fishermen operating within the guidelines of the State Marine Conservation Area (see Section 3.3, *Marine Biological Resources*, for more information on fishing restrictions). Views of Broad Beach from the ocean are unobscured, and observers have views of the beach, the existing revetment,

Illustration 3.6-7. *Exposed foundations, pilings, seawalls, revetments and large 2- and 3-story homes dominate landward views along intertidal lands and offshore waters of western Broad Beach. Remnant sand dunes and often decaying geotextile revetments line the eastern end of Broad Beach, degrading views for users of the beach and coastal waters.*

the houses, and the bluffs. From offshore waters, shoreward views are dominated by the Malibu coastline and backed by the Santa Monica Mountains.

Views from PCH, which is eligible to be a State Scenic Highway, would be impacted by an estimated 43,000 truck trips that would be needed to transport 600,000 cubic yards (cy) of sand from inland quarries to the sand storage and construction staging areas in Zuma Beach. PCH affords clear views of the Pacific Ocean to the south and the Santa Monica Mountains National Recreation Area to the north.

3.6.2 Selected Regulations Pertaining to Scenic Resources

State and other statutes related to scenic resources are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*.

3.6.3 Public Trust Impact Criteria

The coastal areas of Malibu are considered a highly sensitive visual resource and viewer expectations are correspondingly high. Visual impacts related to Project construction or operation is considered a major adverse effect if one or more of the following apply:

- The project is inconsistent with or in violation of public policies, goals, plans, laws, regulations or other directives concerning visual resources;
- Routine operations and maintenance visually contrast with or degrade the character of the viewshed (degradation may result from the scale and/or size of project features, site design, color and texture contrast, or permanent introduction of light and glare);
- The project results in a perceptible reduction of visual quality, lasting for more than one year and visible from moderately to highly sensitive viewing positions (a perceptible reduction of visual quality occurs when, for a highly sensitive view, the visual condition is lowered.; or
- Night lighting would result in glare conditions affecting nearby residences.

This impact analysis considers the Broad Beach area in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting without the emergency revetments, characterized by a narrow beach and dune without the rock and sand bag revetment.

3.6.4 Public Trust Impact Analysis

The proposed beach and dune restoration would have short- to mid-term beneficial effects on the visual quality of Broad Beach over a 10- to 20-year horizon due to the restoration of a wide sandy beach backed by a system of sand dunes that would eventually be vegetated with flowering native species, such as red sand-verbena and beach primrose. The rock and sand bag revetment, as well as currently exposed foundations, seawalls, geotextile revetments, and staircase extensions, would not be visible over the 10- to 20-year Project horizon because they would be buried beneath the restored dunes. Additionally, the beach and associated dunes would provide dominant foreground views for public beach users, softening and reducing the dominance of homes that currently line the back beach. The Project would restore sandy beach conditions to Broad Beach, creating a positive impact to the visual resources of the public trust for as long as beach renourishment continues.

After completion of all planned beach nourishment events, natural processes are expected to continue to erode the beach, and eventually re-expose the revetment, presenting many of the same adverse impacts it currently creates. As erosion of the beach and dune restoration areas continues, after the initial and follow-up beach nourishment activities, a permanently authorized revetment would disrupt views from the public beach and would impact the public’s use and enjoyment of approximately 1.59 to 1.90 acres of public trust lands and lateral access easements. AMMs involving continued nourishment or removal of the revetment are proposed to reduce these effects. Additionally, the proposed sand transportation routes are designated along existing roadways and highways that currently carry regional traffic and a range of vehicle types, including heavy haul vehicles similar to those proposed to transport inland sand supply to the Zuma Beach sand stockpile area. As such, the potential aesthetic impacts of the additional 43,000 truck trips associated with the Project are considered in the analysis.

Impact SR-1: Visual Effects from the Presence of the Emergency Revetment

The emergency revetment impacts the visual quality of Broad Beach (Minor Adverse Effect, Class Mi).

Impact Discussion (SR-1)

Prior to the installation of the rock and sand bag revetment, the aesthetic quality of Broad Beach was characterized by degraded dune habitat, sand bags, timber, and other materials used for shoring. Construction of the 12- to 15-foot-high, 22- to 38-foot-wide temporary emergency rock revetment uniformly distributed rock along a 4,100-foot stretch of the beach and resulted in major adverse effects to visual resources at Broad Beach. The revetment dominates views from the public beach, particularly at moderate tides when beach width is limited.

The Project would offset the impacts of the revetment by burying the revetment under a restored sand dune habitat system, which would result in beneficial effects to the visual resources of Broad Beach as long as the dune system is maintained through the proposed nourishment and backpassing activities. The buried revetment is expected to emerge over time as coastal processes erode the dune system. The proposed renourishment at approximately 10 years following the initial beach nourishment would extend the term of this beneficial effect. However, permanent authorization of the revetment through a long-term lease and permit approvals would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed. This loss in the visual quality granted by the restored dune habitat system is expected to occur after 20 years.

Avoidance and Minimization Measure(s)

Measures to address long-term visual impacts include:

> **AMM TBIO-1a** (Implementation of a Comprehensive Dune Restoration Plan) would require long-term monitoring and maintenance activities. **AMM REC-4a** (Requirement of Additional Nourishment) would address continued presence of the revetment or potential future removal of the revetment. **AMM REC-4b** (Sea Level Rise Effects) would address erosion towards the end of the Project life.

Rationale for Avoidance and Minimization Measure(s)

The Project includes burying the revetment with sand for beach nourishment and dune restoration; however, the revetment would eventually be exposed after approximately 20 years unless a renourishment program is implemented. The AMMs summarized above would ensure that long-term impacts of the revetment are also addressed.

Implementation of AMM TBIO-1a would serve to lessen adverse impacts to the visual resources of Broad Beach and the west end of Zuma Beach through the development and maintenance of a dune system that buries the revetment. This would ensure that the revetment is no longer visible to users of Broad Beach and surrounding areas during the Project, therefore improving the visual resources of Broad Beach. Implementation of AMMs REC-4a and REC-4b would ensure that the Project does not create long-term adverse impacts to visual resources of Broad Beach by addressing potential future re-exposure of the revetment.

Impact SR-2: Short-Term Visual Effects from Beach Restoration Construction Activities at Broad Beach and Zuma Beach

Construction activities would create temporary negative visual impacts during dune restoration, nourishment events, and backpassing events (Minor Adverse Effect, Class Mi).

Impact Discussion (SR-2)

Construction activities associated with Project implementation would have short-term impacts to the visual quality of the Project area (Illustration 3.6-8). The visual environment would be temporarily disrupted by the presence and activities of construction equipment. Views in the Project area would be substantially degraded on a daily basis for the duration of construction activities, impacting visual quality of Broad Beach and vicinity.

Illustration 3.6-8. *Visual impacts from proposed beach nourishment activities would include operation of heavy construction equipment on the beach for up to an 8-month period.*

Night lighting from nighttime operations in the staging area, including both Parking Lot 12 and the adjacent 1,000 feet of beach could impact the night sky. These impacts would be limited to working hours (Monday through Friday, 7:00 AM to 6:00 PM) due to the equipment associated with the beach nourishment activities, including two strands of work lights. Sand transportation activities would also occur during extended working hours (Monday through Friday, 7:00 AM to 9:00 PM). During night operations, generator-powered, shielded lights would be placed on the beach and directed at the immediately relevant work area. Night lighting would be needed only in sufficient quantities to ensure a safe work environment. Although the presence and operation of construction machinery and equipment and lighting to support night operations would impact the visual quality of Broad Beach, these impacts would be limited and temporary and no permanent negative changes to the visual character of the area would occur as a result of the Project's construction phases.

The initial construction phase is anticipated to span over 8 months, so construction activities would not degrade visual quality over the long term. Backpassing operations are expected to occur no more than once per year (maximum of 20 events). Backpassing would involve excavation of approximately 5 acres in a roughly rectangular area of 2,200 to 2,700 feet long and 75 feet wide to a maximum depth of 6 feet (see Section 2.0, *Project Description*). Up to 35,000 cy of excavated material from the eastern portion of Broad Beach would be transferred to approximately 5 acres of the depleted western portions. This redistribution of sand within the Project area would disturb approximately 10 acres of beach sand and seaward dune habitat. All of these backpassing operations would presumably take place in the fall/winter and occur for a period of up to 3 weeks, so these events would also be short-term and therefore not to have a major adverse effect. Finally, a subsequent renourishment event is expected to add 450,000 cy to the beach approximately 10 years after the initial construction. Since the volume of sand of the renourishment is less than the initial construction, construction time should be less than 6 months. Therefore, the renourishment event would also be temporary and involve no permanent negative changes to the area's visual character.

<u>Avoidance and Minimization Measure(s)</u>

AMM SR-2a: Shielded Lights during Night Operations. During night operations, lights placed on the beach shall be shielded and directed at the immediately relevant work area. When daily construction activities cease after work hours, lights shall be shut off, dimmed, or shielded to the maximum extent feasible.

AMM SR-2b: Nightly Equipment Removal. Mobile heavy equipment placed on the beach shall be returned to the staging area at the end of each workday, both for public safety and for aesthetic considerations.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

AMMs SR-2a and SR-2b would reduce the amount of time construction equipment would be visible from the beach and minimize the use of night lighting, thereby reducing visual impacts from construction activities. Full implementation of these measures would reduce impacts.

Impact SR-3: Visual Effects from the Nourishment of Broad Beach

Nourishment of Broad Beach would improve the visual quality of Broad Beach over the short- to mid-term (Beneficial Effect, Class B).

Impact Discussion (SR-3)

Nourishment of the beach and dune system at Broad Beach is expected to restore sandy beach conditions to a state not present since the 1970s. The beach and dune system would dominate views from Broad Beach, improving existing views by creating a wide sandy beach and by burying the revetment, exposed foundations, seawalls, staircase extensions, and other visual disturbances to the backdrop of the public beach. A renourishment event involving 450,000 cy of sand, scheduled to occur approximately 10 years after the initial nourishment, and annual backpassing events would extend the visual improvements. The design of the new dunes would include varying footprints and shapes as well as a dune habitat restoration to mimic former dunes at Broad Beach and the dunes currently present on the eastern end. This would result in positive impacts to the visual resources of Broad Beach for as long as nourishment activities continue.

The Project contains a provision for installation of emergency sand bag revetments along the eastern 550 feet of Broad Beach that is not protected by the emergency rock revetment. Although these sand bag revetments would encroach upon the visual quality of the dune system and beach areas, this Project component would increase the longevity of the dune system at the unprotected east end of the Project area. To minimize the visual effects of this activity on Broad Beach's public trust resources and values, the sand bag revetments would be installed outside of and fronting the restored dunes only during periods of erosion, such as toward the end of the useful life of either the initial or follow-up nourishment events. Sand bags would also be filled using beach sand only and the dunes would not be disturbed.

Impact SR-4: Visual Effects from 43,000 Truck Trips along Pacific Coast Highway

Transport activities could create temporary negative visual impacts associated with a high volume of large trucks traversing Pacific Coast Highway during the initial construction phase (Negligible Effect, Class N).

Impact Discussion (SR-4)

As noted above, an estimated 43,000 truck trips would travel along the PCH to deliver sand to the sand stockpile and staging areas in Zuma Beach. Portions of the PCH, which are eligible for designation as a State Scenic Highway, afford scenic views of the Pacific Ocean, and a high volume of large trucks could degrade the views of users of public trust lands, such as State parks and beaches, and of travelers along this route. Once the trucks arrive at Zuma Beach, they would enter the westernmost parking lot and unload in one of the staging areas. While the trucks are present, they would temporarily add to the overall visual disruption caused by the equipment and materials in the staging areas and associated construction activities. Truck presence near Broad Beach would be temporary, as trucks would leave after unloading sand. Additionally, this impact would also be limited based on the overall project timeline, which would occur over a maximum of 8 months. Therefore, impacts to these areas are negligible.

Impact SR-5: Visual Effects from the Addition of Sand to the Local Littoral Cell

Nourishment of Broad Beach would add sand to the Santa Monica Littoral Cell, which would increase the sand budget of several other beaches down the coast, thus potentially improving their visual qualities (Beneficial Effect, Class B).

Impact Discussion (SR-5)

Broad Beach is within the Santa Monica Littoral Cell, which extends from Point Mugu to Palos Verdes. The Project would add 600,000 cy of sand to Broad Beach, of which a majority is anticipated to erode through coastal process to the Santa Monica Littoral Cell where it would settle in down coast catchments and basins. In addition, the renourishment event proposed to take place 10 years after the initial nourishment would contribute an additional 450,000 cy. These additions to the littoral cell would be incorporated into the natural movement of sand down the coast, increasing the sand received by beaches south of Broad Beach. The transport of sand to down coast areas would occur most substantially within the short-term following deposition of the inland sand supply upon Broad Beach before the dune system is fully established. This increase of sand would nourish and thus slightly widen down-coast beaches. This effect could add to the aesthetic value of these beaches, especially where beaches are also currently very narrow. Therefore, a limited beneficial effect would result.

Table 3.6-1 Summary of Scenic Resources Impacts and AMMs

Impact	Class	AMMs
SR-1. Visual Effects from the Presence of the Emergency Revetment	**Mi**	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM REC-4a:** Requirement of Additional Nourishment **AMM REC-4b:** Sea Level Rise Effects
SR-2 Short-Term Visual Effects from Beach Restoration Construction Activities at Broad Beach	**Mi**	**AMM SR-2a:** Shielded Lights during Night Operations **AMM SR-2b:** Nightly Equipment Removal
SR-3. Visual Effects from the Nourishment of Broad Beach	**B**	No AMMs recommended
SR-4. Visual Effects from 43,000 Truck Trips along PCH	**N**	No AMMs recommended
SR-5. Visual Effects from the Addition of Sand to the Local Littoral Cell	**B**	No AMMs recommended

3.7 ADDITIONAL ANALYSES

This section of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR) analyzes seven additional potential impacts to public trust lands, resources, and values associated with the proposed Broad Beach Restoration Project (Project):

- Air Quality and Greenhouse Gases (Section 3.7.1);
- Traffic and Parking (Section 3.7.2);
- Cultural and Paleontological Resources (Section 3.7.3)
- Noise (Section 3.7.4);
- Public Health and Safety Hazards (Section 3.7.5);
- Utilities and Service Systems (Section 3.7.6); and
- Environmental Justice (Section 3.7.7).

As described in Section 2, *Project Description*, the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) seeks to implement a shoreline protection plan to protect homes, septic systems, and other structures from coastal erosion along Broad Beach, in the city of Malibu, Los Angeles County. Project elements include: retain an existing 4,100-foot-long emergency rock revetment and remnant geotextile sand bag revetments on Broad Beach; perform beach nourishment to bury the revetment; and create and maintain a wide, dry sand beach and a restored dune system. As noted in Section 1, *Introduction*, implementation of the Project by the BBGHAD is statutorily exempt from the California Environmental Quality Act (CEQA) (pursuant to Pub. Resources Code §§ 26601 and 21080, subd. (b)(4)). The information presented in this APTR is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. The following areas lie within or are affected by the Project (see Figure 1-2).

<u>CSLC Lease Area and Public Trust Impact Area</u>

The CSLC lease area includes approximately 40.5 acres of public trust lands held by the State (approximately 27 acres of intertidal beach and 13.5 acres of subtidal lands) extending laterally for approximately 6,200 feet from Trancas Creek Lagoon on the east to Lechuza Point on the west (refer to Figure 1-1 and Figure 2-3 through 2-6). Proposed beach and dune restoration activities would encompass 46 acres of public and private land on Broad Beach. The public lands are bordered by adjacent privately owned upland parcels that support single-family residential homes and the Malibu West Beach Club, portions of which would also be subject to dune restoration. Portions of the privately owned parcels along Broad Beach are encumbered with existing public lateral access easements (LAEs) held by State or recorded as deed restrictions.

The Public Trust Impact Area encompasses: (1) the CSLC Lease Area; (2) the west end of Zuma Beach, including Parking Lot 12 located east of Trancas Creek Lagoon, which would accommodate construction equipment and materials staging, and approximately 1,000 feet of Zuma Beach south of this parking lot, which would be used for short-term storage of imported sand to be used on Broad Beach; and (3) areas along Broad Beach Road and Pacific Coast Highway (PCH) that provide public coastal access, as well as down coast beaches (e.g., Zuma Beach, Point Dume State Beach, and Los Angeles County beaches farther south to Point Dume) that may be indirectly affected by changes in sand supply and distribution through littoral drift.

BBGHAD Inland Project Area

The BBGHAD Inland Project Area includes three quarries proposed as sand supply sources, as well as the sand transportation routes inland of PCH that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). Communities along the proposed sand transportation routes include Moorpark, Simi Valley, Santa Paula, Camarillo and Fillmore. These areas generally do not support Public Trust Resources administered by the CSLC; however, the Project has the potential to result in impacts of potential concern to other agencies and members of the public in these areas. Therefore, qualitative analyses of affected resources outside the public trust impact area are provided in this APTR for informational purposes.

Resource areas that may be affected by the Project in the BBGHAD Inland Project Area include Air Quality and Greenhouse Gases; Traffic and Parking; Cultural and Paleontological Resources; Noise; and Environmental Justice. An analysis of potential impacts in the BBGHAD Inland Project Area is included for each of these resource areas. Utilities and service systems outside of the CSLC Lease Area and Public Trust Impact Area would not be affected by the Project; therefore this section does not include a discussion of these impacts. Public health and safety hazards in the BBGHAD Inland Project Area would be related to increased truck traffic and are addressed in Section 3.7.2, *Traffic and Parking*.

3.7.1 AIR QUALITY AND GREENHOUSE GASES

This section describes the potential air quality impacts in the Project Area, the potential effects of Project-generated air pollutant emissions and greenhouse gases (GHGs) on public trust lands, resources and values, and Avoidance and Minimization Measures (AMMs) to reduce potential impacts.

3.7.1.1 Environmental Setting Pertaining to the Public Trust

<u>Relationship Between Air Quality/GHGs and Public Trust Resources and Values</u>

Emissions generated during the implementation of the Project, including mid- to long-term emissions associated with annual backpassing and the follow up renourishment event, have the potential to affect the public's right to safely enjoy public trust resources in the vicinity of Broad Beach and the BBGHAD Inland Project Area. The public's right to access clean air within the public trust lands and waters is an important, contributing element for the public's enjoyment of activities in these locations.

Broad Beach and areas located immediately up and down coast are located in Los Angeles County within the boundaries of the South Coast Air Quality Management District (SCAQMD). The SCAQMD consists of the South Coast Air Basin (SCAB), which includes portions of Los Angeles and neighboring counties and is bound by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east (Figure 3.7-1). Regional emissions in the Broad Beach vicinity, down coast, and along PCH west of Broad Beach are dominated by mobile sources, mainly associated with motor vehicles on PCH and marine vessels in offshore shipping lanes. Broad Beach is not located near any major industrial source of air pollutant emissions.

Mobile sources also generate the majority of emissions in the vicinity of the proposed inland sand sources in Ventura County, which include one to three operating quarries—CEMEX, Grimes Rock, and P.W. Gillibrand—and along the roads haul trucks would use to transport sand from the quarries to Broad Beach. These include emissions from traffic along US-101 and other roadways proposed as sand transportation routes. The three primary transportation routes begin at one of the three quarries, end at Zuma Beach Parking Lot 12 along PCH, and use local roads, including, but not necessarily limited to, SR-126, US-101, SR-118, SR-23, and PCH (see Figure 1-2). The quarries and sand transportation routes along SR-23, US-101, Las Posas Road, and northern extents of PCH lie within the South Central Coast Air Basin (SCCAB), which includes Santa Barbara and Ventura counties, under the jurisdiction of the Ventura County Air Pollution Control District (VCAPCD). These sand transportation routes transition into the SCAB when they enter Los Angeles County, including PCH and US-101.

SCAQMD Jurisdiction

FIGURE 3.7-1

Source: SCAQMD 2007.

Regional Climate

A semi-permanent, subtropical, Pacific high-pressure system dominates the Broad Beach vicinity. Generally, mild, cool sea breezes temper the climate; nonetheless, periods of extremely hot weather, passing winter storms, or dry offshore Santa Ana winds occasionally interrupt this mild climate. Winters are seldom cold, frost is rare, and minimum temperatures average between 44 and 59 degrees Fahrenheit (°F). Spring days may be cloudy due to high fog. Rainfall averages about 13.7 inches per year, falling almost entirely from late October to early April (see Table 3.7-1).

Table 3.7-1. Average Monthly Temperatures/Precipitation (Malibu, 1961-1990)

Month	JAN	FEB	MAR	APR	MAY	JUN	July	AUG	SEP	OCT	NOV	DEC	Annual Average
Mean Monthly Temperature (°F) (Maximum/Minimum)	66/ 45	66/ 46	66/ 47	68/ 48	69/ 52	72/ 55	74/ 58	75/ 59	75/ 59	73/ 54	70/ 48	67/ 44	70.1/ 51.3
Total Precipitation (inches)	56	56	57	58	61	64	66	67	67	64	59	56	60.9

Source: National Climatic Data Center (NCDC) 2012.

Seasonal and diurnal wind regimes affect air transport in the Broad Beach vicinity. Diurnal sea-breeze drainage flow typically dominates the local wind pattern. The SCAB is characterized by frequent, strong, elevated inversions. These inversions, created by atmospheric subsidence, limit vertical mixing; therefore, they promote the buildup of pollution, especially in the late morning and early afternoon.

Criteria Pollutants and Toxic Air Contaminants

Pollutants that impact air quality are generally divided into two categories: (1) criteria pollutants, which are air pollutants associated with numerous health effects including increased respiratory symptoms and that are regulated by health-based ambient standards; and (2) toxic air contaminants (TACs), which the California Health and Safety Code defines as an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health. TACs are regulated by minimizing exposure to the lowest extent feasible. Comparisons of contaminant levels in ambient air samples to national and State standards determine whether a region's air quality is healthy or unhealthy. The U.S. Environmental Protection Agency (USEPA) and California Air Resources Board (CARB) set standards to protect public health and welfare with an adequate margin of safety. The Federal Clean Air Act of 1970 first authorized National Ambient Air Quality Standards (NAAQS). The. Under California’s TAC program, CARB, with the participation of the local air pollution control districts, evaluates and develops any necessary control measures for TACs. The general goal of regulatory agencies is to limit exposure to TAC to the maximum extent feasible.

The State legislature authorized California Ambient Air Quality Standards (CAAQS) in 1967. State and Federal health-based air quality standards in California regulate the following criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than 10 microns and 2.5 in diameter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). California also regulates sulfate, visibility reducing particles, hydrogen sulfide (H_2S), and vinyl chloride (VC). However, H_2S and VC are currently not monitored in the SCAQMD because these contaminants are not common air quality problems in the basin. CAAQS and NAAQS for each of these pollutants and their effects on health are summarized in Table 3.7-2.

Broad Beach is located near the SCAQMD Northwest Coastal Los Angeles (NWCLA) County monitoring station, which is located approximately 23 miles northeast in West Los Angeles. Ambient air quality was compared to the most stringent of either the CAAQS or NAAQS. The data indicate that the NWCLA County area is in compliance with the CO, NO_2, SO_2, sulfates and lead standards for both the CAAQS and NAAQS, and the CAAQS sulfate standard. State O_3, PM_{10}, and $PM_{2.5}$ air quality standards were exceeded at the NWCLA County air monitoring station on some days during 2009 through 2012 (see Table 3.7-3).

Table 3.7-2. Ambient Air Quality Standards

Pollutant	Concentration and Averaging Time		Most Relevant Effects
	CAAQS	Primary NAAQS	
O_3	0.09 ppm, 1-hr. avg 0.07 ppm, 8-hr. avg	0.075 ppm, 8-hr. avg	(a&b) short- and long-term exposures: risks to public health (c) vegetation damage; (d) property damage.
CO	20 ppm, 1-hr. avg 9.0 ppm, 8-hr. avg	35 ppm, 1-hr. avg 9.0 ppm, 8-hr. avg	(a) aggravation of aspects of coronary heart disease; (b) decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) impairment of central nervous system functions; (d) possible increased risk to fetuses.
NO_2	0.18 ppm, 1-hr avg 0.03 ppm, annual avg	100 ppb, 1-hr avg 0.053 ppm, annual avg	(a) potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) risk to public health; (c) contribution to atmospheric discoloration.
SO_2	0.25 ppm, 1-hr. avg 0.04 ppm, 24-hr avg	75 ppb, 1-hr avg 0.5 ppm, 3-hr avg	(a) bronchoconstriction accompanied by symptoms that may include wheezing, shortness of breath, chest tightness during exercise or physical activity in persons with asthma.
PM_{10}	50 µg/m_3, 24-hr avg 20 µg/m^3, annual arithmetic mean	150 µg/m^3, 24-hr avg	(a) excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) excess seasonal declines in pulmonary function, especially in children.
$PM_{2.5}$	12 µg/m^3, annual arithmetic mean	12 µg/m^3, annual avg 35 µg/m^3, 24-hr avg	
Sulfates	25 µg/m^3, 24-hr avg	Not applicable	(a) decrease in ventilatory function; (b) aggravation of asthmatic symptoms; (c) aggravation of cardiopulmonary disease; (d) vegetation damage; (e) visibility degradation; (f) property damage.
Visibility-Reducing Particles	In sufficient amount to reduce visual range to < 10 miles at relative humidity <70%, 8-hour avg (10 AM – 6 PM)	Not applicable	Visibility impairment on days when relative humidity is less than 70 percent.
H_2S	0.03 ppm, 1-hr. avg	No Federal Standard	Odor annoyance.
VC	0.01 ppm, 24-hr avg	No Federal Standard	Known carcinogen.

Source: SCAQMD 2014.

Note: By convention, metric units are commonly used to describe pollutant concentrations in the air.
avg = average; ppm/ppb = parts per million/billion (by volume); µg/m^3 = micrograms per cubic meter (air).

Table 3.7-3. Area 2 Monitoring Station Data (NWCLA County, 2009-12)

Constituent		Maximum Observed Concentration (Number of Standard Exceedances - most restrictive)					
		State Standard	**Federal Standard**	**2009**	**2010**	**2011**	**2012**
CO	1-hour	20.0 ppm	35.0 ppm	2 (0 days)	2 0 days)	--	--
	8-hour	9.0 ppm	9.5 ppm	1.5 (0 days)	1.4 (0 days)	1.6 (0 days)	1.2 (0 days)
O_3	1-hour	0.09 ppm	--	0.131 (6 days)	0.099 (2 days)	0.098 (2 days)	0.093 (0 days
	8-hour	0.07 ppm	0.075 ppm	0.094 (5 days)	0.078 (3 days)	0.068 (0 days)	0.073 (1 day)
NO_2	1-hour	0.18 ppm	--	0.08 (0 days)	0.07 (0 days)	0.08 (0 days)	0.06 (0 days)
	Annual	0.03 ppm	0.053 ppm	0.017	0.016	0.016	0.014
SO_2	1-hour	0.25 ppm	--	0.02 (0 days)	0.026 (0 days)	0.012 (0 days)	0.005 (0 days)
	24-hour	0.04 ppm	0.14 ppm	0.006 (0 days)	0.004 (0 days)	0.008 (0 days)	0.005 (0 days)
	Annual	--	0.03 ppm	--	--	--	--
PM_{10}	24-hour	50 µg/m^3	150 µg/m^3	52 (0 days)	37 (0 days)	41 (0 days)	31 (0 days)
	Annual	20 µg/m^3	--	25.4	20.6	29.0	19.8
$PM_{2.5}$[b]	24-hour	--	35 µg/m^3	63.0	35.0	39.7	49.8
	Annual	12.0 µg/m^3	15.0 µg/m^3	13.0	10.5	11.0	10.4
Pb	30-day	1.5 µg/m^3	--	0.01	0.01	0.01	*
	calendar quarter	--	1.5 µg/m^3	0.01	0.01	0.01	
Sulfates	24-hour	25 µg/m^3	--	9.1 (0 days)	7.5 (0 days)	5.9 (0 days)	*****

Source: SCAQMD 2014, CARB 2014.
ppm = parts per million; µg/m^3 = microgram per cubic meter
[a] Less than 12 full months of data.
[b] SO_2, PM_{10}, $PM_{2.5}$, Pb, and sulfates are not measured at the NWCLA County Station. Data are from the Southwest and/or South Coastal Los Angeles County Monitoring Stations.

Ozone and particulate matter are the air pollutants of most concern within Ventura County, which is where the three inland quarries and significant portions of the sand transportation routes to Broad Beach are located. Ventura County is in attainment for all CAAQS and NAAQS except ozone (State 1-hour and Federal 8-hour standards) PM_{10} (State 24-hour/annual average standards), and $PM_{2.5}$ (State annual average standard).

Climate Change and GHG Generation

GHGs are any gases that absorb infrared radiation in the atmosphere, including water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), and fluorocarbons. GHGs lead to the trapping and buildup of heat in the atmosphere near the earth's surface, known as the Greenhouse Effect. The atmosphere and the oceans are reaching their capacity to absorb CO_2 and other GHGs without significantly changing the earth's climate. As discussed further below, the increase in GHGs in the earth's climate is projected to substantially affect a wide range of issues and resources, sea level rise, flooding, water supply, agricultural and forestry resources and energy demand.

Climate Change

As stated on California's Climate Change Portal (www.climatechange.ca.gov/Climate):

> Climate change is expected to have significant, widespread impacts on California's economy and environment. California's unique and valuable natural treasures - hundreds of miles of coastline, high value forestry and agriculture, snow-melt fed fresh water supply, vast snow and water fueled recreational opportunities, as well as other natural wonders - are especially at risk.

In addition, the Intergovernmental Panel on Climate Change (IPCC), in the section of its Fifth Assessment Report by Working Group II, "Climate Change 2014: Impacts, Adaptation, and Vulnerability," (IPCC 2014; released March 31, 2014) specific to North America (Chapter 26), stated in part:

> **North American ecosystems are under increasing stress from rising temperatures, CO_2 concentrations, and sea-levels, and are particularly vulnerable to climate extremes (*very high confidence*).** Climate stresses occur alongside other anthropogenic influences on ecosystems, including land-use changes, non-native species, and pollution, and in many cases will exacerbate these pressures (*very high confidence*). [26.4.1; 26.4.3]. Evidence since the Fourth Assessment Report (IPCC 2007) highlights increased ecosystem vulnerability to multiple and interacting climate stresses in forest ecosystems, through wildfire activity, regional drought, high temperatures, and infestations (*medium confidence*) [26.4.2.1; Box 26-2]; and in coastal zones due to increasing temperatures, ocean acidification, coral reef bleaching, increased sediment load in run-off, sea level rise, storms, and storm surges (*high confidence*) [26.4.3.1].

California has already been affected by climate change: sea level rise, increased average temperatures, more extreme hot days and increased heat waves, fewer shifts in the water cycle, and increased frequency and intensity of wildfires. Higher sea levels can result in increased coastal erosion (which may have a secondary effect such as uncovering hazards such as occurred in March 2014 along the Santa Barbara coastline), more frequent flooding from storm surges, increased property damage, and reduced waterfront public access options. Other projected climate change impacts in California include: decreases in the water quality of surface water bodies, groundwater, and coastal waters; decline in aquatic ecosystem health; lowered profitability for water-intensive crops; changes in species and habitat distribution; and impacts to fisheries (California Regional Assessment Group 2002). These effects are expected to increase with rising GHG levels in the atmosphere.

Greenhouse Gases

According to the IPCC, the concentration of CO_2, the primary GHG, has increased from approximately 280 parts per million (ppm) in pre-industrial times to well over 380 ppm. The current rate of increase in CO_2 concentrations is about 1.9 ppm/year; present CO_2 concentrations are higher than any time in at least the last 650,000 years. To meet the statewide GHG reduction target for 2020, requiring California to reduce its total statewide GHG emissions to the level they were in 1990 (Health & Safety Code, § 38550), and the 2050 goal of 80 percent below 1990 levels (Executive Order S-3-05), not only must projects contribute to slowing the increase in GHG emissions, but, ultimately, projects should contribute to reducing the State's output of GHGs. To reach California's GHG reduction targets, it is estimated that per capita emissions will need to be reduced by slightly less than 5 percent per year during the 2020 to 2030 period, with continued reductions required through midcentury.

In its 2008 "Report on Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act," the California Air Pollution Control Officers Association (CAPCOA) stated:

> [w]hile it may be true that many GHG sources are individually too small to make any noticeable difference to climate change, it is also true that the countless small sources around the globe combine to produce a very substantial portion of total GHG emissions (CAPCOA 2008).

The global warming potential (GWP), or potential of a gas or aerosol to trap heat in the atmosphere, of different GHGs varies since GHGs absorb different amounts of heat. A common reference gas, CO_2, is used to relate the amount of heat absorbed to the amount of the gas emissions, referred to as CO_2 equivalent (CO_2e). CO_2e is the amount of GHG emitted multiplied by the GWP. The GWP of CO_2 is therefore defined as 1. Methane has a GWP of 21; therefore, 1 pound of methane produce 21 pounds of CO_2e. Table 3.7-4 shows a range of gases with their associated GWP, their estimated lifetime in the atmosphere, and the range in GWP over 20, 100, and 500 years.

GHG emissions are generally classified as direct and indirect. Direct emissions are associated with the production of GHG emissions in the immediate Broad Beach area, and include combustion of natural gas, combustion of fuel in engines and construction vehicles, and fugitive emissions from valves and connections of equipment used during Project implementation or throughout the Project life. Indirect emissions include emissions from vehicles (both gasoline and diesel) delivering materials and equipment to Broad Beach (e.g., haul trucks).

Table 3.7-4. Global Warming Potential of Various Gases

Gas	Life in the Atmosphere (years)	20-year GWP (average)	100-year GWP (average)	500-year GWP (average)
Carbon Dioxide	50-200	1	1	1
Methane	12	21	56	6.5
Nitrous Oxide	120	310	280	170
HFC-23	264	11,700	9,100	9,800
HFC-125	32.6	2,800	4,600	920
HFC-134a	14.6	1,300	3,400	420
HFC-143a	48.3	3,800	5,000	1,400
HFC-152a	1.5	140	460	42
HFC-227ea	36.5	2,900	4,300	950
HFC-236fa	209	6,300	5,100	4,700
HFC-4310mee	17.1	1,300	3,000	400
CF4	50,000	6,500	4,400	10,000
C2F6	10,000	9,200	6,200	14,000
C4F10	2,600	7,000	4,800	10,100
C6F14	3,200	7,400	5,000	10,700
SF6	3,200	23,900	16,300	34,900

Source: USEPA 2007.
GWP = Global Warming Potential; CF = chlorfluorocarbon; HFC = hydroflourocarbon.

3.7.1.2 Regulations Pertaining to Additional Analysis

State and other statutes related to air quality and GHGs are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. Pursuant to a consolidated coastal development permit (CDP), the California Coastal Commission (CCC) will address the Project's consistency with the Coastal Act and city of Malibu Local Coastal Program (LCP).

Under the provisions of the Federal Clean Air Act, the USEPA requires each state that has not attained the NAAQS to prepare an Air Quality Management Plan (AQMP), a separate local plan detailing how these standards are to be met. The California Lewis Air Quality Act of 1976 established the SCAQMD and mandated a planning process requiring preparation of an AQMP. The SCAQMD Governing Board adopted the Final 2012 AQMP on December 7, 2012. Proposed projects in the Basin are to be evaluated for conformity with the provisions of the 2012 Plan, along with any subsequent amendments. The 2007 Ventura County AQMP was adopted by the VCAPCD on May 13, 2008. Proposed projects under the jurisdiction of the VCAPCD are to be evaluated for conformity with the provisions of this 2007 Plan along with any subsequent amendments. Local regulations are listed in Table 3.7.5.

Table 3.7-5. Local Air Regulations

South Coast AQMD	Regulations II and III	Regulations II and III (Permits) contain rules specifying requirements and permit fees to construct and operate stationary equipment capable of emitting air contaminants, including air pollutant emission control equipment. Regulation II sets general requirements for obtaining SCAQMD permits. Rules 201 through 203 require Permits to Construct and Permits to Operate. Rule 219 provides for exemptions from permit requirements under Regulation II.
	Regulation IV	Regulation IV (Emission Prohibitions) defines the allowable concentration and emission levels for pollutants from specific sources and activities, as well as related inspection and maintenance requirements. Rule 402, Nuisance, prohibits discharge of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that endanger the comfort, repose, health, or safety of any such persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property. Rule 403, Fugitive Dust, prohibits emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area that remain visible beyond the emission source property line. Best available control measures identified in the rule would be required to minimize fugitive dust emissions from unpaved areas. For landside Project construction staging areas, measures such as site watering and vehicle speed control on unpaved surfaces may be required.
	Regulation XIII	Regulation XIII (New Source Review) sets forth requirements to obtain permits to construct/permits to operate for new, or modification of existing sources.
	Regulation XIV	Regulation XIV (Toxics and Other Non-Criteria Pollutants) specifies standards and control requirements for emissions of toxic and other non-criteria pollutants from specified sources.
Ventura County APCD	Permits– Regulations II and III	VCAPCD Regulations II and III contain rules specifying requirements and permit fees to construct and operate stationary equipment capable of emitting air contaminants, including air pollutant emission control equipment. Regulation II sets the general requirements for obtaining VCAPCD permits. Rules 13 and 14 require Permits to Construct and Permits to Operate. Rule 23 provides for exemptions from permit requirements under Regulation II.
	Prohibitions – Regulation IV	Regulation IV defines the allowable concentration and emission levels for pollutants from specific sources and activities, as well as inspection and maintenance requirements for sources of emissions. For example, Rule 51, Nuisance, prohibits discharge of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endangers the comfort, repose, health, or safety of any such persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property.
	Rule 55, Fugitive Dust	Rule 55 prohibits emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area that remain visible beyond the emission source property line. Best available control measures identified in the rule would be required to minimize fugitive dust from unpaved areas.
	Other VCAPCD Regulations	V (Orchard Heaters); VI (Source Testing & Stack Monitoring); VII (Hearing Board); VIII (Emergency Action); IX (Public Records); X (Transportation Outreach Program); XI (Conformity); XII (Enforcement, and Regulation); XIII (Registration Programs).

3.7.1.3 Public Trust Impact Criteria

Criteria for determining the significance of air quality impacts are based on Federal, State, and local air pollution standards and regulations. Impacts on air quality are considered to be significant if the Project's emissions would: increase ambient air pollution levels from below to above these standards; contribute measurably to an existing or projected air quality violation; or be inconsistent with measures contained in applicable Air Quality Management/ Attainment Plans.

Potential significant air quality impacts near Broad Beach are evaluated using SCAQMD significance criteria for measurable emissions, Project-related emission factors, and daily threshold levels from Project operation (see Table 3.7-6).

Table 3.7-6. SCAQMD Air Quality Significance Thresholds

Thresholds	Pollutant	Construction, lbs/day	Operation, lbs/day
Mass Daily Thresholds (Project-Level Emissions)	NO_x	100	55
	VOC	75	55
	PM_{10}	150	150
	$PM_{2.5}$	55	55
	SO_x	150	150
	CO	550	550
	Lead	3	3
Mass Daily Thresholds (Localized Emissions)[1]	NO_x	221	221
	PM_{10}	13	3
	$PM_{2.5}$	6	2
	CO	1,531	1,531
TAC/Odor Thresholds	TAC (carcinogen and non-carcinogen)	Maximum Incremental Cancer Risk ≥ 10 in 1 million; Cancer burden above 0.5; Hazard Index ≥ 1.0 (Project increment)	
	Odor	Project creates an odor nuisance (see SCAQMD Rule 402)	
Ambient Air Quality for Criteria Pollutants	NO_2 1-hr avg annual avg	District is in attainment. Project is significant if it causes or contributes to exceedance of the following attainment standards: • 0.18 ppm (State) • 0.03 ppm (State) and 0.0534 (Federal)	
	PM_{10} 24-hr avg annual avg	10.4 $\mu g/m^3$ (construction) and 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m^3$	
	$PM_{2.5}$ 24-hr avg	10.4 $\mu g/m^3$ (construction) and 2.5 $\mu g/m^3$ (operation)	
	SO_2 1-hr avg 24-hr avg	0.25 ppm (State) & 0.075 ppm (Federal – 99th percentile) 0.04 ppm (State)	
	Sulfate 24-hr avg	25 $\mu g/m^3$ (State)	
	CO 1-hr avg 8-hr avg	District is in attainment. Project is significant if it causes or contributes to exceedance of the following attainment standards: • 20 ppm (State) and 35 ppm (Federal) • 9.0 ppm (State/Federal)	
GHG Emissions	CO_2, N_20, CH_4, etc.	· Project is presumed to be insignificant for GHG if Project GHG emissions are < or reduced to < 10,000 MT CO_2e/year. · If an existing project emits > 10,000 MT of CO_2e/year, then any increases above the baseline level would be significant.	

$\mu g/m^3$ = micrograms per cubic meter; avg = average; CO_2e = carbon dioxide equivalents; GHG = greenhouse gas; lb = pounds; MT = metric tons; ppm = parts per million; TAC = Toxic Air Contaminant

[1] Localized significance thresholds for a 5-acre site in Northwest Central Los Angeles County at a 25-meter receptor distance.

Source: SCAQMD 2014. Available at http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2

Potentially significant air quality impacts along the sand transportation routes in Ventura County are evaluated using VCAPCD criteria. The VCAPCD's Ventura County Air Quality Assessment Guidelines for the Preparation of Air Quality Impact Analyses (Guidelines), which were adopted in 1989 and revised in 2003, are used by most jurisdictions in the county to assess project air impacts. According to these Guidelines, a project that may cause an exceedance of any ambient air quality standard (State or Federal), or may make a substantial contribution to an existing exceedance of an air quality standard will have a significant adverse air quality impact. As outlined in the VCAPCD Guidelines, the Project would have a major and adverse effect if it would:

- Generate emissions exceeding 25 pounds per day (lbs/day) of reactive organic compounds (ROC/G) or nitrogen oxides (NO_x);
- Cause an exceedance or making a substantial contribution to an exceedance of an ambient air quality standard;
- Directly or indirectly cause the existing population to exceed the population forecasts in the most recently adopted AQMP;
- Be inconsistent with the Ventura County AQMP and emit greater than 2 lbs/day of ROC/G or NO_x; or
- Create a human health hazard by exposing sensitive receptors to toxic air emissions.

For TACs, the VCAPCD Guidelines recommend the following significance thresholds, which are the same as those adopted by the SCAQMD:

- Lifetime probability of contracting cancer is greater than 10 in one million (as identified in a health risk assessment [HRA]).
- Ground-level concentrations of non-carcinogenic toxic air pollutants would result in a Hazard Index of greater than 1 (as identified in an HRA).

While the VCAPCD has not yet adopted a GHG emissions threshold, recent environmental impact assessments within the county have used the threshold 10,000 tons per year, consistent with recommended State thresholds.

Under these Guidelines, projects that generate more than 25 lbs/day of ROC/G or NO_x would individually and cumulatively jeopardize attainment of the Federal ozone standard and thus have a significant adverse impact on air quality. The VCAPCD's 25 lbs/day thresholds for ROG and NO_x do not apply to temporary construction emissions; for construction impacts, the VCAPCD recommends imposition of reduction if emissions of either pollutant exceed 25 lbs/day. The VCAPCD also considers a project to have a significant air quality impact if it may generate fugitive dust emissions in such quantities as to cause injury, detriment, nuisance, or annoyance to any considerable number of persons, or which may endanger the comfort, repose, health, or safety of any such person, or which may cause or have a natural tendency to cause injury or damage to business or property. This non-numeric threshold is particularly applicable to the generation of fugitive dust during construction grading operations. The VCAPCD recommends minimizing fugitive dust through use of dust control measures.

3.7.1.4 Public Trust Impact Analysis

This impact analysis considers the existing setting (i.e., the emergency rock and sand bag revetments are in place). The Project will have construction emissions and ongoing operational emissions that affect air quality within both the SCAB and SCCAB. The Project would generate air emissions due to the following activities: construction equipment and fugitive dust; heavy haul trucks transporting sand from quarries; and vehicles commuting to and from Broad Beach.

Short-term construction-related emissions would be generated in the vicinity of Broad Beach during beach nourishment, dune construction, annual backpassing, and one follow-up (after about 10 years) beach renourishment event. Additionally, public trust lands and resources down coast from Broad Beach within the South Coast Air Basin are generally considered in this analysis. These emissions have the potential to affect the public's right to safely enjoy public trust resources and activities.

Emissions would also be generated at the proposed inland sand sources in Ventura County, which include one to three operating quarries—CEMEX, Grimes Rock, and P.W. Gillibrand—and along the traffic corridors haul trucks would use to transport sand from the quarries to Broad Beach. An Air Quality and Climate Change Technical Report has been prepared for the Project (see Appendix G); the air quality impact analysis presented below is based on the results of this Report, which used the California Emissions Estimator Model (CalEEMod) Version 2013.2.1 to estimate emissions for criteria pollutants, GHGs, and TACs that would result from implementation of each phase of the Project. The CalEEMod data encompass the entire BBGHAD Project area, including emissions generated by trucks traveling from and to the quarries within Ventura County to Broad Beach. These data are provided in Appendix G for use by the applicable air quality agencies.[1]

Air emissions associated with a project are cumulative and affect both local and regional air quality. In this analysis, air emissions associated with the Project have been analyzed as a whole, and therefore impacts related to Project activities in the CSLC Lease Area and Public Trust Impact Area as well as the BBGHAD Inland Project Area have been combined in this impact discussion.

[1] A critical assumption for this model was that 600,000 cubic yards (cy) of sand would be hauled to Broad Beach for initial nourishment, resulting in 43,000 round trips by trucks with 14-cy capacities for 56 miles each way. The Report assumed 411 round trips.

Impact AQ-1: Construction and Transportation Impacts on Air Quality

Construction activities would generate emissions that exceed South Coast Air Quality Management District thresholds, while emissions from Haul Trucks would exceed Ventura County Air Pollution Control District thresholds (Major Adverse Effect, Class Mj).

Impact Discussion (AQ-1)

Initial Nourishment Construction Activities

Operation of construction equipment with internal combustion engines (e.g., generators, bulldozers, backhoes, scrapers) and offsite vehicles (e.g., employee vehicles; delivery trucks) would generate criteria air pollutants (CO, ROC, NO_x, SO_2, and PM) during Project implementation. Large equipment traveling on disturbed soil, unpaved surfaces, and various earth-moving activities, such as trenching, grading, and clearing generates "fugitive dust" and other PM emissions. These emissions mostly depend on the size of graded area, volume of moved soil, the number of construction machinery and vehicles, and the duration of construction. Based on the CalEEMod data, total construction emissions generated during Project implementation would exceed SCAQMD project-level thresholds for pounds of pollutant generated each day for volatile organic compounds (VOCs), CO, and NO_x but not for SO_X, PM_{10}, and $PM_{2.5}$ (Table 3.7-7). Additionally, onsite construction emissions would exceed SCAQMD localized significance thresholds for NO_x and $PM_{2.5}$, but not for CO or PM_{10}; there are no localized significance thresholds for VOCs and SO_x (Table 3.7-7).

Table 3.7-7. Project Construction Criteria Emissions (SCAQMD)

Phase	Year	Peak Day Emissions (pounds/day)					
		VOC[1]	CO	NO_x	SO_2[2]	PM_{10}	$PM_{2.5}$
Maximum Total Emissions (with trucking)[3]	1	169.9	665.8	506.1	1.3	124.3	37.0
SCAQMD Project-Level Thresholds[4]		75	550	100	150	150	55
Above SCAQMD Threshold?		**Yes**	**Yes**	**Yes**	**No**	**No**	**No**
Maximum Onsite Emissions[5]	1	26.6	167.1	301.0	0.2	8.3	4.9
SCAQMD Localized Significance Thresholds[6]		--	1,531	221	--	13	6
Above SCAQMD Threshold?		**N/A**	**No**	**Yes**	**N/A**	**No**	**No**

[1]ROG as defined by CalEEMod is assumed to be equal to VOC as defined by SCAQMD.
[2]CalEEMod reported SO_2 emissions are assumed to be representative of SO_X emissions.
[3]Emissions are a conservative estimate based on the current Project Description, using a 56-mile average haul route distance, 420 truck loads per day, and an 11-hour construction day and have been updated from quantities listed in the Air Quality and Climate Change Report, Appendix G,
[4]SCAQMD significance threshold for construction activities.
[5]Emissions are based on an 11-hour day operating schedule and have been proportionally adjusted from quantities stated in Appendix G in order to reflect the current Project Description;
[6]Localized significance thresholds for a 5-acre site in Northwest Central Los Angeles County at a 25-meter receptor distance. It is assumed that mo more than 5 acres of Broad Beach would be worked on at any given time.

Air emissions from construction equipment were estimated using the emission factors from the CalEEMod software. All machinery used in the Project would be equipped with appropriate mufflers and all engines would be regularly maintained. Controlled emission factors were used from CalEEMod to calculate fugitive dust emissions. Detailed calculations are contained in the Air Quality and Climate Change Technical Report in Appendix G. In this analysis, emission quantities have been adjusted from those stated in Appendix G to reflect the current Project Description (see Section 2). Implementation of AMMs AQ-1a and AQ-1b (see below) would reduce potential impacts and would be required to obtain permits by the applicable air districts for these Project activities.

Total Project VOC, CO, and NO_x emission levels would exceed SCAQMD project-level significance thresholds due to emissions associated with use of grading, the use of construction equipment, and the relatively large number of haul truck trips necessary to transport 600,000 cy of sand. NO_x emissions would also exceed localized significance thresholds due to grading and use of construction equipment at Broad Beach. Given that VOC, CO, and NO_x emissions would exceed SCAQMD project-level significance thresholds and NO_x emissions would exceed localized significance thresholds, Project construction would result in a potentially major adverse effect.

The majority of inland construction emissions would be associated with hauling of sand from the quarries. Receptors close to PCH would experience a temporary increase in concentrations of VOC, CO, NO_X, and PM throughout the duration of the hauling phase, which is expected to last 5 months. Although of low potential to occur, CO hotspots may develop in areas with high vehicle density, such as congested intersections. Hauling activities would also affect local air quality along PCH, as haul trucks would pass close to hundreds of homes, several State Parks and campgrounds, and multiple public coastal access points and beaches. Table 3.7-8 lists examples of receptors that may be impacted from hauling operations, along with their proximity to PCH. Additional informal access points as well as access at County beach parks may also be impacted.

Table 3.7-8. Local Sensitive Receptors along PCH

Receptor	Minimum Distance from Travel Lane
Homes along PCH	35 ft
Sycamore Canyon Beach	130 ft
North Beach Campground	200 ft
Leo Carillo State Park	200 ft
Point Mugu State Park Campground	360 ft
El Matador State Beach	500 ft

As shown in Table 3.7-9, hauling activities along inland routes within Ventura County would emit VOC and NO_X levels in exceedance of thresholds listed in the VCAPCD Guidelines during the 5-month period. As the sand transportation routes pass through communities in Moorpark, Simi Valley, Santa Paula, Camarillo and Fillmore, hauling activities would affect air quality near residences, schools, and other sensitive land uses near transport routes. More information on sensitive land uses near the sand transportation routes is provided in Section 3.7.2, *Traffic and Parking*.

Table 3.7-9. Inland Project Criteria Emissions (VCAPCD)

Phase	Year	Peak Day Emissions (pounds/day)					
		VOC[1]	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Maximum BBGHAD Inland Project Area Emissions[1]	1, 10 [2]	143.3	498.7	205.1	1.1	116.0	32.1
VCAPCD Threshold		25	-	25	-	-	-
Above VCAPCD Threshold?		**Yes**	**-**	**Yes**	**-**	**-**	**-**

[1] Emissions based on a 56-mile average haul route distance and 420 truck trips per day. Inland Emissions Calculated by (Total Emissions - Onsite Emissions = Emissions in Inland Project Areas)
[2] Emissions levels in inland Project Areas are expected to be the same for both initial nourishment and renourishment hauling operations

Emissions of NO_x and VOCs can be reduced by using newer, cleaner diesel engines that meet USEPA Tier emissions requirements. However, based on the projection that the Project would exceed the SCAQMD NO_x threshold of 100 lbs/day by a factor of approximately five and the VOC threshold of 75 lbs/day by a factor of approximately two, and that onsite NO_x emissions would exceed the localized significance threshold of 221 lbs/day by 80 lbs/day, it is anticipated that the Project's construction-related emissions would continue to exceed the SCAQMD NO_x and VOC thresholds even with use of newer technologies described in AMM AQ-1c below. Therefore, impacts from NO_x and VOC emissions would remain a potentially major adverse effect.

While the projected emissions for PM are below SCAQMD project-level and SCAQMD localized thresholds, fugitive dust from the sand that would be stockpiled, moved, and placed throughout the dune construction and backpassing phases of the Project could impact local receptors. AMM AQ-1d below would reduce fugitive dust emissions associated with the Project by requiring implementation of dust control measures during construction activities, if necessary, to include spraying water from tank trucks over exposed areas. Additionally, use of newer technologies through implementation of AMM AQ-1c would also reduce $PM_{2.5}$ emissions at the Project site. Implementation of these AMMs would reduce this impact such that it would have a minor adverse effect.

PM_{10}, $PM_{2.5}$ and SO_2 emissions from Project construction are not anticipated to exceed the SCAQMD project-level or localized thresholds of significance and would not be a major adverse effect during construction.

Backpassing and Renourishment Construction Activities

After initial nourishment, both backpassing operations and one follow-up renourishment event would generate emissions. The renourishment operation is projected to occur approximately 10 years after Project initiation in accordance with triggers based on monitoring. Renourishment is anticipated to involve placing an additional 450,000 cy of sand on the beach, similar to the original nourishment event. Sand would be deposited on Broad Beach within 6 months. The sand source for renourishment operations would be the same as for the initial nourishment, unless applicable agencies approve other borrow sites. For the purposes of this analysis, renourishment operations are assumed to use the same construction methods, sand transportation routes, and truck haul trips per day as in the initial nourishment operation.

Backpassing operations will move sand from wider reaches of Broad Beach to narrower reaches of the beach and will occur no more than once per year. Backpassing would use scrapers, bulldozers, or other heavy equipment to excavate sand from the "sand rich" segment of Broad Beach and transport the sand to the eroding reach. Backpassing would likely involve movement of 35,000 cy of sand from the beach's east end to its west end, which is anticipated to occur during the fall/winter season. The duration of sand backpassing could be up to 3 weeks. Backpassing operations will not require the transportation of additional sand from inland sand sources, and therefore emissions from backpassing operations will not occur within Ventura County.

Because backpassing and renourishment are both relatively short term temporary construction activities, these activities were analyzed using SCAQMD construction thresholds as well as VCAPCD Guidelines for air emissions.[2] Construction activities for the initial and renourishment operations would be similar in type and scale, and therefore air quality impacts associated with nourishment and renourishment would be similar. As with initial beach construction, maximum daily emissions during renourishment would exceed SCAQMD thresholds for pounds of pollutant generated each day of VOCs, CO, and NO_x, but not for SO_X, PM_{10}, and $PM_{2.5}$ (see Table 3.7-10). Additionally, onsite construction emissions would exceed SCAQMD localized significance thresholds for NO_x and $PM_{2.5}$, but not for CO or PM_{10}. Backpassing operations would not exceed SCAQMD thresholds nor localized significance thresholds.

As with the initial nourishment, VOCs and NO_x emissions during the single renourishment event would be reduced through the implementation of AMM AQ-1c; however, these emissions are not expected to be reduced below SCAQMD thresholds. Therefore, emissions of VOCs, CO, and NO_x would remain above SCAQMD Project-level thresholds and emissions of NO_x would remain above SCAQMD localized significance thresholds, and this impact would be a potentially major short term adverse effect. Because backpassing would not exceed any SCAQMD localized significance thresholds, localized emissions would have a minor adverse effect. Implementation of AMM AQ-1c would reduce NOx, VOC, and PM emissions such that this impact would have a minor adverse effect.

[2] Backpassing would occur up to one time annually over a maximum 3-week period. Renourishment would occur once in approximately 20 years and would extend over an estimated 6 months.

Table 3.7-10. Project Backpassing and Renourishment Criteria Emissions

Phase	Year	Peak Day Emissions (pounds/day)					
		VOC[1]	CO	NO_x	SO_2[2]	PM_{10}	$PM_{2.5}$
Backpassing Emissions[3]	2-20	6.2	50.5	75.6	0.07	3.6	1.7
Renourishment Emissions[4]	10	168.2	651.5	487.2	1.3	123.9	36.8
SCAQMD Project-Level Thresholds[5]		75	550	100	150	150	55
Backpassing Above SCAQMD Threshold?		**No**	**No**	**No**	**No**	**No**	**No**
Renourishment Above SCAQMD Threshold?		**Yes**	**Yes**	**Yes**	**No**	**No**	**No**
Onsite Backpassing Emissions	2-20	6.2	50.5	75.6	0.07	3.6	1.7
Onsite Renourishment Emissions[6]	10	24.7	**152.8**	282.1	0.2	7.9	4.7
SCAQMD Localized Significance Thresholds[5]		--	1,531	221	--	13	6
Backpassing Above SCAQMD Threshold?		**No**	**No**	**No**	**N/A**	**No**	**No**
Renourishment Above SCAQMD Threshold?		**No**	**No**	**Yes**	**N/A**	**No**	**No**

[1] ROG as defined by CalEEMod is assumed to be equal to VOC as defined by SCAQMD.
[2] CalEEMod reported SO_2 emissions are assumed to be representative of SO_X emissions.
[3] Emission quantities in Appendix G were originally based on 50,000 cy and have been pro-rated to 35,000 cy assuming no change to duration of emissions.
[4] Emissions quantities calculated on initial nourishment emissions data, less emissions from dune construction and planting activities, assuming that construction hours and methods will be the same for both initial nourishment and renourishment
[5] SCAQMD significance threshold for construction activities.
[6] Emissions quantities calculated from total renourishment emission, less inland Project emissions.

<u>Avoidance and Minimization Measure(s)</u>

AMM AQ-1a: South Coast Air Quality Management District (SCAQMD) Compliance. Prior to placement of any sand on areas of Broad Beach under the jurisdiction of the CSLC, the Applicant shall provide CSLC staff copies of approvals or a letter of non-objection from the SCAQMD for construction and sand transport activities associated with the Broad Beach Restoration Project.

AMM AQ-1b: Ventura County Air Pollution Control District (VCAPCD) Compliance. Prior to placement of any sand on areas of Broad Beach under the jurisdiction of the CSLC, the Applicant shall provide CSLC staff copies of approvals or a letter of non-objection from the VCAPCD for transport of sand from inland quarries in Ventura County.

AMM AQ-1c: Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOCs), and Particulate Matter (PM) Control. The Applicant shall implement a NO_x reduction program including the following, or equivalent, measures:

- All off-road construction equipment shall be tuned and maintained according to manufacturers' specifications.
- Any temporary electric power shall be obtained from the electrical grid, rather than portable diesel or gasoline generators.
- All off-road diesel construction equipment with greater than 100-horsepower engines shall meet Tier 4 requirements. If the SCAQMD determines or concurs that a Tier 4 fleet or portion thereof cannot be

obtained, the Applicant shall use construction equipment that meets Tier 3 emissions requirements or use other California Air Resources Board (CARB)-verified emission control technologies to achieve the same level of emission reduction.

- Limit onsite truck idling to less than 5 minutes.
- A copy of the certified tier specification, best available control technology documentation, or the CARB or SCAQMD operating permit for each piece of equipment shall be provided when each piece of equipment is mobilized.

AMM AQ-1d: Fugitive Dust Emission Control. The Applicant shall submit and implement a Fugitive Dust Control Plan that includes SCAQMD controls for fugitive dust, according to Rule 403. Fugitive dust control measures in the plan shall include the following:

- Require minimum soil moisture of 12 percent for earthmoving, by using a moveable sprinkler system or water truck. Moisture content can be verified by lab sample or moisture probe (69% reduction).
- Limit on-site vehicle speeds roads to 15 miles per hour (mph) with radar enforcement (57% reduction) and posting of speed limits.
- All trucks hauling sand and other loose materials are to be tarped with a fabric cover and maintain a freeboard height of 12 inches (91% reduction).
- Water storage piles by hand or apply cover when wind events are declared, according to SCAQMD Rule 403 when instantaneous wind speeds exceed 25 mph (90% reduction).
- Appoint a construction relations officer to act as a community liaison concerning onsite construction issues, such as dust generation.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

The AMMs would reduce NO_x ,VOC, and PM emissions and help protect public health, but would not eliminate potential impacts on local and regional air quality.

Impact AQ-2: Construction Impact of Greenhouse Gas (GHG) Emissions

Potential beach enhancement activities would increase GHG emissions (Negligible Effect, Class N).

<u>Impact Discussion (AQ-2)</u>

Transport and placement of sand as part of beach nourishment would generate GHGs, with the largest source of GHG emissions associated with sand transport. GHG emissions were estimated using equipment size and fuel use data to estimate criteria emissions along with emission factors as defined by the CARB and USEPA (see Appendix G). GHGs associated with Project construction include emissions from combustion sources (construction equipment), offsite vehicles, electrical generation, and fugitive CO_2 and CH_4 emissions. Emissions associated with all equipment, including mobile sources, as shown in Tables 3.7-11 and 3.7-12, are short-term and would not exceed the SCAQMD threshold of 10,000 tons per year. Therefore, potential impacts to Public Trust resources would be negligible.

Table 3.7-11. Initial Project Construction GHG Emissions

Construction Activity	Year	Off-Road Equipment	On-Road Vehicles	Total
		CO_2e Emissions (MT/year)		
Nourishment	1	1,608.2	1,980.0	3,588.2
Dune construction	1	21.1	378.9	400.0
Planting, fencing, signage, irrigation[1]	1	--	16.0	16.0
Total For all Activity (MT CO_2e)				**4,004.2**
30-year Amortized (MT/year CO_2e)				**133.5**

[1] No off-road equipment is used for the planting, fencing, signage, and irrigation phase.
[2] Haul truck trip length was changed to 56 miles after execution of the CalEEMod runs using an original hauling distance of 45 miles. Because emissions are a linear function of vehicle miles traveled, hauling emissions from the CalEEMod output files were scaled by multiplying by a factor of 56/45.

Table 3.7-12. Follow-Up Project Construction GHG Emissions

Construction Activity		CO_2e Emissions for Source Category (MT/year)	
		Phase	Project Total
Total Annual Emissions	Backpassing	Annual Project area sand redistribution	42
One-Time Emissions[1]	Renourishment[2]	10-year event (2024)	108
	Vegetation[3]	Planting, fencing, signage, irrigation	-0.4
	Construction	Nourishment, dune construction, and planting, fencing, signage, irrigation	133
Total			**271**

[1] Total emissions from one-time events are amortized over 30 years. Emission quantities in Appendix G were originally based on 50,000 cy and have been pro-rated to 35,000 cy
[2] Total CO_2e emissions from renourishment is anticipated to be 3229 pounds since it would be 90 percent of the initial nourishment event (i.e., 450,000 cy instead of 500,000 cy).
[3] Negative emissions from vegetation change indicate an increase in CO_2e sequestration.

Impact AQ-3: Construction Toxic Pollutant Emissions and Potential Health Risks

Construction activities would generate emissions of toxic air contaminants that would potentially impact human health (Minor Adverse Effect, Class Mi).

Impact Discussion (AQ-3)

A HRA in accordance with SCAQMD Rule 1401 procedures was performed to analyze the risk of the estimate diesel particulate matter (DPM) emissions from on-site construction activities. DPM has carcinogenic and chronic health risks, but no acute health effects. The worst-case health risk associated with beach enhancement could potentially exceed applicable health risk criteria for individual cancer risk. Based on the HRA modeling results, potential health risks would be considered potentially significant with the peak annual excess cancer risk exceeding 10 in one million at several locations. Sources that contributed the greatest to the health risk levels mainly included diesel engines from haul trucks and sand-spreading activities at Broad Beach.

As shown in Table 3.7-13, construction activities would generate a total of 346 lbs of DPM emissions. Because the analysis for calculating cancer risk assumes exposure over 70 years, the amortized exposure is equal to 4.95 lbs/yr. The maximum individual cancer risk (MICR) and chronic health index (HIC) were calculated using parameters found in the tables in Rule 1401 Attachment L. Construction activities were assumed to cover up to 5 acres at any given time and the distance to a nearest sensitive receptor was assumed to be 50 meters. The calculated MICR is 5.68E-06 and the calculated HIC is 2.49E-01, which are below the SCAQMD significance thresholds of 10 in a million and 1.0, respectively (see Appendix G). If higher Tier equipment is used, the estimated emissions and associated health risk would be lower than that estimated here.

Table 3.7-13. Toxic Air Contaminant Emissions at Broad Beach Area

Construction Activity	Year	Off-Road Equipment Diesel PM	
		(tons)	(lbs)
Nourishment	1	0.17	342
Dune Construction	1	0.002	4
Planting, Fencing, Signage, Irrigation	1	--	--
Total for All Activity		**0.173**	**346**
70-year Amortized[1]		**2.47E-03/yr**	**4.95/yr**

[1] The diesel exhaust PM_{10} emissions from on-site off-road construction equipment are amortized over 70 years because the analysis for calculating cancer risk assumes exposure occurs over 70 years.

Emissions of toxic materials can be further reduced by limiting operations near sensitive receptors and installing devices on diesel engines that reduce emissions of toxic materials. These devices are verified and registered by the CARB and are commonly used on diesel engines throughout industry to reduce DPM, the main toxic component of diesel exhaust.

TAC emissions are also a product of motor vehicles. About half of TAC emissions in the U.S. result from motor vehicles, and vehicles account for 75 percent of CO emissions (USEPA 2012). The Project is estimated to have 43,000 truck haul trips traveling about 56 miles per day along the sand transportation routes during initial nourishment operations. According to the Traffic and Parking Assessment in Appendix H, trucks in this Project will have a 2.0 Passenger Car Equivalent (PCE). Therefore the project is expected to produce the emissions of 86,000 passenger car trips. The exact levels of TAC emissions from truck hauling activities are currently unknown; however, AMM AQ-1c would reduce emissions such that this impact would have a minor adverse effect.

<u>Avoidance and Minimization Measure(s)</u>

The following AMM would also be required to minimize levels of public health risk.

AMM AQ-3: Diesel Particulate Emission Controls. The Applicant shall install California Air Resources Board (CARB)-verified Level 3 diesel catalysts on all diesel-powered off-road equipment or use diesel engines that have an equivalent particulate matter (PM) emission rate (Tier 4 engines). (See www.arb.ca.gov/diesel/verdev/vt/cvt.htm for a current list of CARB-verified Level 3 diesel catalysts.) Catalysts or engine certifications shall demonstrate achieving 85 percent reduction for diesel PM.

In addition, **AMMs AQ-1c** and **AQ-1d** would reduce emissions of TACs.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

CARB recommends diesel catalysts, which are widely used to reduce emissions from diesel engines, as part of its Airborne Toxic Control Measures and maintains a list of certifications of applicable technologies. CARB has evaluated various types of control options for diesel particulate and identified the control efficiency, cost, and source test data. CARB found that the most effective control technologies are catalyst-based diesel particulate filters. CARB requires diesel catalyst manufacturers to certify that they can achieve the required reduction levels. Reductions in potential diesel particulate emissions would minimize potential health risks. Reductions in diesel particulate emissions would reduce the potential excess cancer risk to a level that is less than the SCAQMD significance threshold.

3.7.1.5 Summary of Air Quality and Greenhouse Gases Impacts and AMMs

Impact	Class	AMMs
AQ-1: Construction and Transportation Impacts on Air Quality	**Mj**	**AMM AQ-1a**. SCAQMD Compliance **AMM AQ-1b**. VCAPCD Compliance **AMM AQ-1c.** NO_x/VOC/PM Emission Controls **AMM AQ-1d.** Fugitive Dust Emission Controls
AQ-2: Construction Impact of Greenhouse Gas Emissions	**N**	No AMMs recommended
AQ-3: Construction Toxic Pollutant Emissions and Potential Health Risk	**Mi**	**AMM AQ-3.** Diesel Particulate Emission Controls **AMM AQ-1c.** NO_x/VOC/PM Emission Controls **AMM AQ-1d.** Fugitive Dust Emission Controls

3.7.2 TRAFFIC AND PARKING

This section of the Revised APTR describes local roads (including PCH) and parking facilities along Broad Beach and the Public Trust Impact Area (see Figure 1-2), impacts on these local facilities, and their use by the public when accessing public trust lands and waters. Public transit is not discussed, as the public's use of transit to access the shoreline is unlikely to be affected by short-term construction activities. The information in this section is based primarily on the Traffic and Parking Assessment for the Project, prepared by Linscott, Law & Greenspan (2013, 2014) provided in Appendix H and subject to independent peer review by Associated Transportation Engineers. This section also provides a qualitative assessment of the inland transportation routes from the three proposed inland sand sources (P.W. Gillibrand Quarry, CEMEX Quarry, and Grimes Rock Quarry) to PCH.

3.7.2.1 Environmental Setting Pertaining to the Public Trust

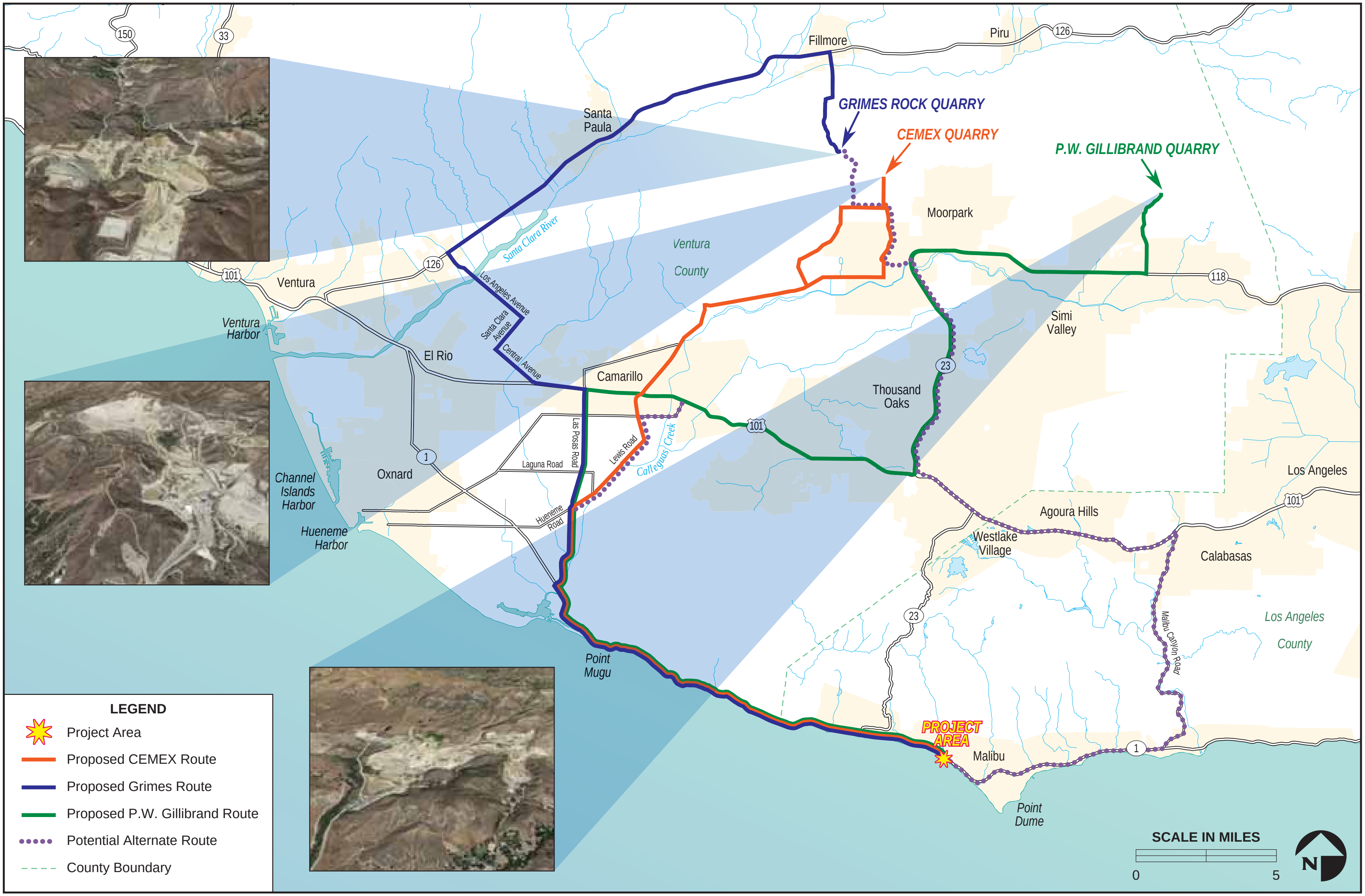
<u>Relationship of Traffic and Parking to Public Trust Resources and Values</u>

Traffic and parking relate to public trust resources to the extent that construction activities may worsen traffic and parking and affect the public's ability to access public trust lands along the shoreline and ocean waters.

<u>PCH</u>

PCH runs east and west through the Project area. PCH provides four travel lanes (two in each direction) with a center median in this reach that includes signalized and unsignalized left turn lanes at intersections (Illustration 3.7-1). Traffic volumes on PCH are approximately 25,000 average daily trips (ADTs) on the segment of PCH that fronts Zuma Beach. The two-lane segment of PCH from Las Posas Road to Yerba Buena Road has an approximate peak hour traffic volume of 1,173 trips and currently operates at a Level of Service (LOS) rating of D, while the passing lane segment is rated B. The AM and PM peak hour LOS for each of these intersections is provided in Table 3.7-14. Posted speed limits along PCH are 55 and 50 miles per hour (mph) west and east of Trancas Canyon Road respectively. The line of sight for drivers is generally excellent. Free road shoulder parking is available on the entire oceanside frontage of PCH along the western end of Zuma Beach.

Illustration 3.7-1. *PCH in the Project vicinity is a 50 to 55 mph, four-lane divided highway with scattered intersections. Free road shoulder parking is available on the ocean side of PCH along its Zuma Beach frontage.*



amec

Beach Nourishment Sand Sources

FIGURE 3.7-2

Table 3.7-14. Current LOS of Intersections in Broad Beach Vicinity

Intersection	Peak Hour	Delay or Volume/Capacity (V/C) Ratio	LOS
Decker Road/PCH	AM PM	13.1 seconds 20.1 seconds	B C
Trancas Canyon Road-Broad Beach Road/PCH	AM PM	0.508 0.527	A A
Guernsey Avenue/PCH	AM PM	20.6 seconds 21.6 seconds	C C
Heathercliff Road/PCH	AM PM	0.544 0.565	A A
Kanan Dume Road/PCH	AM PM	0.813 0.950	D E

PCH provides access to multiple state and county parks and local beaches along the coast from Point Mugu east to Zuma and Broad Beaches. Substantial amounts of public coastal access parking are provided in developed lots along this section of shoreline with access driveways off PCH. Onroad and road shoulder parking along both the north and southbound lanes also occur throughout this reach of PCH, particularly at heavily used locations, such as Leo Carrillo State Beach. Beachgoers unload surfboards, kayaks and other beach equipment adjacent to travel lanes cross PCH at uncontrolled locations (i.e., jaywalking) throughout such areas, creating potential traffic hazards.

<u>Broad Beach Road</u>

Broad Beach Road is a two-lane public residential roadway that provides the primary access to homes along the coast in the area (Illustration 3.7-2). Broad Beach Road extends easterly for 1.5 miles from the PCH/Broad Beach Road intersection along the coast to a signalized intersection at PCH/Trancas Canyon Road. Two public coastal access ways are located along central and western Broad Beach. These access points lead from on-street, road-shoulder parking opposite residential parcels and over the existing emergency revetment to the beach. Free parking along Broad Beach Road is generally located on the unpaved road shoulder in un-marked spaces. Availability is dependent on the number of beachgoers at any given time; however, open parking is generally available within walking distance of these access points. Parking is not specified for beach use, and is used by the residents living along Broad Beach Road as well as by contractors and construction workers.

Illustration 3.7-2. *Broad Beach Road is a quiet, two-lane, residential street with informal parking available for coastal access on the road shoulder. In places, private encroachments for landscaping or retaining walls displace parking spaces. Construction worker parking for ongoing remodels can also occupy parking spaces.*

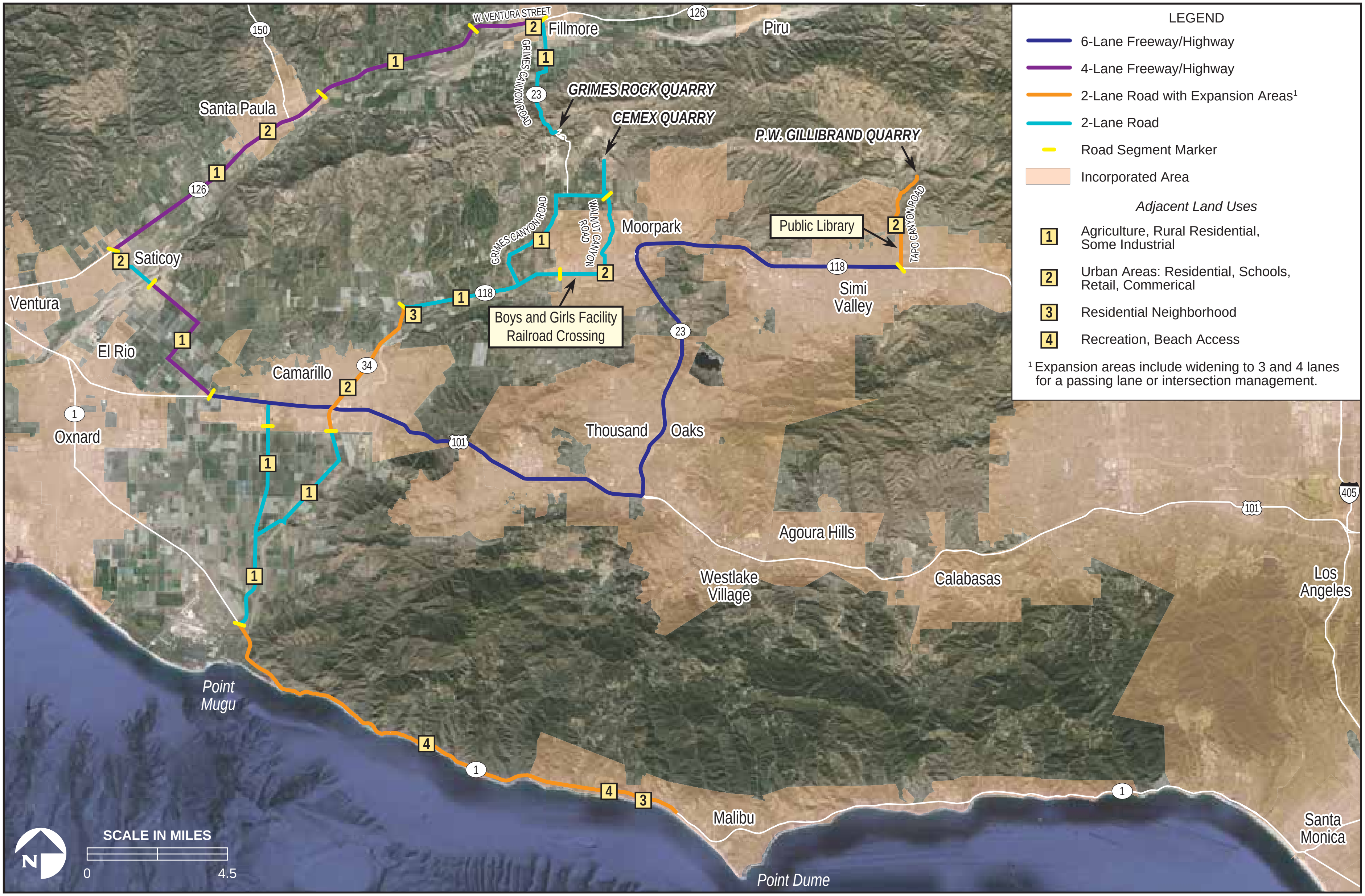
Zuma Beach Parking Lot 12 and Staging Area

Zuma Beach is a Los Angeles County-owned and operated park that extends for approximately 1.5 miles along the coast east of Broad Beach, with public parking lots situated between PCH and the beach for almost its entire reach. Primary park access is located at the eastern end of Zuma Beach at the park entrance intersection with Busch Drive. Access to these parking lots is via the Zuma Beach Access Road, a frontage road located just seaward of PCH. Off-street parking at Zuma Beach totals approximately 2,025 spaces in 12 separate lots. Parking counts for September 2012 through May 2013 were used to evaluate parking use and demand. During this period parking ticket sales exceeded the number of spaces available only three times, which corresponded to major holiday weekends. During the rest of the non-summer months, parking supply exceeded ticket sales by an average of 1,587 spaces (Linscott, Law & Greenspan, 2013). The public uses Zuma Beach parking lots to access public trust lands along the shoreline, including Broad Beach to the west. The westernmost Zuma Beach parking lot, Parking Lot 12, is located 700 feet east of the eastern end of Broad Beach. Approximately 260 designated parking stalls are available in Parking Lot 12 of Zuma Beach County Park. Parking is also available on the oceanside frontage of PCH along Zuma Beach and on the shoulder of PCH, adjacent to Zuma Beach.

BBGHAD Inland Project Area

Three primary transportation routes would be used to haul sand as part of the Project (Figure 3.7-2). Each route originates at one of three quarries in Ventura County—CEMEX Moorpark Quarry, Rock Grimes Quarry, and P.W. Gillibrand Quarry—and continues to Broad Beach. All three routes include the portion of PCH between Las Posas Road and Broad Beach. Descriptions of the routes are presented below.

- **CEMEX Quarry** (9035 Roseland Avenue, Moorpark). The proposed haul route in Moorpark would include Roseland Avenue, Happy Camp Road, Walnut Canyon Road, Grimes Canyon Road (also known as State Route [SR]-23), and SR 118 to Somis Road/SR-34. The route south of SR-34 includes S. Lewis Road and Hueneme Road in Camarillo and Las Posas Road from Hueneme Road to PCH.
- **Grimes Rock Quarry** (3500 Grimes Canyon Road, Fillmore). As proposed, haul trucks would travel on SR-23 and SR-126 from this quarry to Fillmore on to Saticoy. The route includes SR-118 near Saticoy, sections of Santa Clara and Central Avenues near Camarillo, and US-101 between Camarillo and Thousand Oaks. Las Posas Road in Camarillo would be used between Camarillo and PCH.
- **P.W. Gillibrand Quarry** (5000-5599 Bennett Road, Simi Valley). The proposed haul route includes Bennett Road and Tapo Canyon Road in Simi Valley, SR-118 between Simi Valley and Moorpark, SR-23 between Moorpark and Thousand Oaks, US-101 between Thousand Oaks and Camarillo, and Las Posas Road in Camarillo to PCH.



Truck Route Road Types and Adjacent Uses

FIGURE 3.7-3

Table 3.7-15 below details adjacent land uses to segments along the sand transportation routes. Sensitive land uses include residential neighborhoods in Fillmore, Somis, Moorpark and Camarillo, and schools, such as Walnut Canyon Elementary and Union High in Moorkpark, Camarillo Montessori School, and Ventura County Community College. Other sensitive land uses include the Boys and Girls Club and senior center in Moorpark, and Moorpark Library.

Table 3.7-15. Land Uses Adjacent to Segments of Truck Haul Routes

Route Segment	Adjacent Land uses
SR-23/Grimes Canyon Road	Agriculture, industrial, rural residential, mobile home park, Elkins Ranch Golf Course, horse stables
SR-126 (between Fillmore and Saticoy)	Suburban neighborhoods in Santa Paula, Fillmore and Saticoy, rural single-family homes, agriculture, commercial, Santa Clara School House, 2 community parks
Central Ave and Santa Clara Ave	Agriculture, retail and residential in Saticoy, industrial, golf course, chaparral open space
Walnut Canyon Road, Moorpark	Residential neighborhoods, Moorpark Library, senior center, Walnut Canyon Elementary School, Union High School, Boys and Girls facility, railroad crossing, commercial offices, retail
SR-118 (between Moorpark and Somis)	Residential neighborhoods in Moorpark, agriculture, rural residences, industrial uses
SR-34	Single-family residences in Somis, residential neighborhood in Camarillo, Camarillo Montessori School, business park, agriculture, industrial
S Lewis Road	Rural residential, mobile home park, agriculture, industrial
Las Posas Road	Retail centers in Camarillo, agriculture, Ventura County Community College
Tapo Canyon Road, Simi Valley	Agriculture, Four Oaks Farm, Retail Centers in Simi Valley, commercial offices, residential areas, Township Elementary School
PCH	Scenic lookout points, beaches and beach access parking, residential areas in Malibu, Neptune Net restaurant, North Beach Campground, recreational trails and natural parks

3.7.2.2 Regulations Pertaining to the Public Trust

State and other statutes related to traffic and parking are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. Pursuant to a consolidated CDP, the CCC will address the Project’s consistency with the Coastal Act and city of Malibu LCP. The city of Malibu LCP contains general goals and policies intended to improve access and use of coastal resources. The provision regarding traffic is geared toward “protecting existing and improving future parking availability near shoreline and trail access ways throughout the city” (city of Malibu 2012). In addition, the city of Malibu’s Traffic Impact Analysis Guidelines (August 2012) include criteria for the assessment of traffic impacts.

City of Malibu Intersection Impact Threshold Criteria	Pre-Project *V/C*	LOS	Project Related Increase in *V/C*
Signalized	0.71 - 0.80	C	≥ 0.040
	0.81 - 0.90	D	≥ 0.020
	0.91 or more	E or F	≥ 0.010
Unsignalized	**Project Related Increase in *V/C***	**Final LOS**	
	5 or more seconds	Degrades to LOS D or worse	

LOS = Level of Service; V/C = Volume/Capacity

3.7.2.3 Public Trust Impact Criteria

Impact criteria are adapted from the city of Malibu LCP. A major adverse impact to the public trust resources would occur if the Project results in:

- Reduced access to public parking;
- New obstacles to vehicular access to public trust resources (e.g., construction of a gate, substantial new traffic congestion, damage to roadways); or
- An increase of traffic that exceed thresholds as stated in the city of Malibu's Traffic Impact Analysis Guidelines.

3.7.2.4 Public Trust Impact Analysis

This section describes direct and indirect impacts that may potentially result from Project implementation. Impacts discussed below may occur in the CSLC Lease Area and the Public Trust Impact Area.

Impact TR-1: Construction-Generated Impacts in the Vicinity of Broad Beach

Traffic along Pacific Coast Highway generated from construction activities would have a short-term, unsubstantial impact on public use of roadways to access the shoreline (Minor Adverse Effect, Class Mi).

Impact Discussion (TR-1)

Based on the Linscott, Law & Greenspan (2013, 2014) Traffic and Parking Assessment (see Appendix H):

- traffic generated from construction activities would primarily consist of hauling sand along PCH using 30 six-axle, 14-cy capacity haul trucks arriving at and departing from the staging area (Parking Lot 12 of Zuma Beach) for approximately 6.5 months (depending on weather and other factors), 5 days a week, 14 hours per day (from 7:00 AM to 9:00 PM); and
- the Project would require 840 haul truck trips per day (420 inbound and 420 outbound), or about 60 inbound and outbound trucks per minute (based on the assumption that each truck would haul 14 cy of sand).

Construction employees would generate an additional estimated 30 vehicle trips per day (based on a conservative estimate of 15 employee trips during both the AM and PM peak hours). Additional trips could be generated by material delivery trucks, equipment repair, and fuel and water delivery trucks.

To accommodate construction operations, several traffic alterations are proposed (refer to Section 2.3.2). Parking Lot 12 would be temporarily closed to the public and used for Project staging. Two temporary driveways would allow access to the staging area for haul trucks, materials, and construction workers. The inbound driveway would be located on the south side of PCH, directly across from the PCH/Guernsey Avenue intersection. The inbound driveway would accommodate only right-turn ingress turning movements, and no outbound turning would be permitted. The outbound driveway would also be located on the south side of PCH, on the west end of Parking Lot 12. Inbound turning would be prohibited on this driveway. Both left and right turn egress access would be permitted. For safety reasons, a temporary eastbound right-turn/deceleration lane would be installed at the existing PCH/Guernsey Avenue intersection to reduce truck-related traffic cause. Additionally, a temporary traffic signal would be installed at the Project's outbound driveway to ensure the safety and efficiency of movement for the haul trucks. Figure 2-15 (in Section 2) depicts the various planned traffic improvements and the layout of the Project site and staging area. Despite these measures, the Project may still result in indirect impacts to both the Broad Beach Road and nearby intersections on the PCH over the 6.5-month Project construction timeline.

Impacts to Pacific Coast Highway

The Project could create potential access and safety issues during initial mobilization, periodic equipment deliveries, haul truck activity, and daily construction activities. Initial mobilization would last several days and would involve delivery of heavy equipment, fencing, and other materials via tractor-trailer trucks. It would also involve the installation and organization of the temporary traffic-related improvements to the Project staging area. Ongoing daily construction activities would add an average of 30 daily trips from employees during the 6.5-month construction period. Assuming a passenger car equivalency factor of two car trips per truck trip, it is estimated that haul trucks would add approximately 1,640 passenger car equivalent (PCE) trips. Thus, the total Project-related traffic increase would consist of approximately 1,640 PCE vehicle trips per day. It is estimated that 135 PCE vehicle trips (75 inbound trips and 60 outbound trips) would be generated during the weekday AM peak hour. The same number is assumed for the PM peak hour (60 inbound trips and 75 outbound trips). Therefore, the Project would add 270 trips to the estimated 1,173 existing AM/PM peak hour trips on this segment of the PCH, making an estimated total of 1,443 peak hour trips.

The city of Malibu has specific thresholds related to increases in delay time and Volume/Capacity (V/C) Ratio. Table 3.7-16 illustrates the changes in LOS at the various intersections associated with the project. The anticipated temporary changes expected to result from the project would not surpass any of the city's thresholds.

Table 3.7-16. Changes to LOS at Intersections in Project Vicinity

Intersection	Peak Hour	Existing 2014 Delay or Volume/Capacity (V/C) Ratio	LOS	Existing 2014 w/ Project Delay or Volume/Capacity (V/C) Ratio	LOS	Change in Delay or V/C
Decker Road/PCH	AM	13.1 seconds	B	14.3 seconds	B	2 seconds
	PM	20.1 seconds	C	22.9 seconds	C	3 seconds
Trancas Canyon Road- Broad Beach Road/PCH	AM	0.508	A	0.527	A	0.019
	PM	0.527	A	0.546	A	0.019
Guernsey Avenue/PCH	AM	20.6 seconds	C	20.8 seconds	C	1 second
	PM	21.6 seconds	C	21.6 seconds	C	0 second
Heathercliff Road/PCH	AM	0.544	A	0.544	A	0.000
	PM	0.565	A	0.568	A	0.003
Kanan Dume Road/PCH	AM	0.813	D	0.815	D	0.002
	PM	0.950	E	0.950	E	0.000

Although no thresholds would be surpassed, the potential for unanticipated disruption of automobile, bike and pedestrian flows and safety along the PCH still exists. For example, 840 heavy truck trips per day would incrementally increase traffic hazards to beachgoers parking their cars or crossing PCH to reach the beach. Further, the high rate of inbound trucks (one every 2 minutes) and limited size of the staging area would create the potential for queuing of trucks along PCH which may exceed storage capacity, particularly if equipment breakdowns occur. Such impacts would be short-term. Once Project construction is complete, roadways in the Broad Beach vicinity would return to normal configurations and construction-related impacts would cease.

The temporary transportation improvements included as part of the Project would minimize traffic impacts for the duration of Project construction; however; the improvements in the immediate Broad Beach vicinity would also have the potential to include various traffic and safety impacts. AMM TR-1 requires that a traffic management plan be prepared in order to minimize these potential impacts. According to the traffic study prepared by Linscott, Law & Greenspan (Appendix H), appropriate signage for vehicles, pedestrians, and bicyclists would be posted to inform the public of the changes to the traffic configuration and of new constraints. Pedestrian crossing at the temporary signalized intersection would be prohibited at all times in order to improve public safety. During nights, weekends, and all other times when construction activities are not taking place, fences and proper signage would be used to inform the public and prohibit access to the site. Additionally, all traffic improvements, including those to Parking Lot

12, would be removed upon completion of the Project, thereby restoring original conditions. All signage and other vehicular, pedestrian, and bicycle safety measures in the Broad Beach vicinity would be detailed in a Project Traffic Management Plan. Therefore, these impacts are considered minor with implementation of AMMs.

The renourishment event is expected to include impacts that are very similar to the main nourishment, but reduced in scope by approximately 25 percent. Traffic impacts from backpassing events would also be expected to be similar to the nourishment and renourishment with a reduced scope. The Traffic Management Plan would also consider traffic impacts resulting from the renourishment event and from backpassing events. Therefore, the renourishment and backpassing events would also be minimized and would result in a minor adverse effect.

Impacts to Parking at Zuma Beach

Construction employees associated with the Project would park in the staging area, in Parking Lot 12 of Zuma Beach, in order to prevent parking impacts to coastal access parking on Broad Beach Road. The construction staging area and construction employee parking would collectively occupy the approximately 260 spaces of Parking Lot 12. Although construction would deprive the public of access to parking at the east end of Zuma Beach, this are tends to be more lightly used than parking lots to the east and impacts to parking would be minor as they would be short-term and would occur primarily in winter, outside the peak summer period for beach visitation (Illustration 3.7-3). During Project construction, approximately 1,765 parking spaces in the Zuma Beach Parking lots would remain. According to parking data provided by the county of Los Angeles Department of Beaches and Harbors, this number would be sufficient to support visitors of Zuma Beach for the Project duration. September would be expected to have the highest number of visitors. Surplus parking during this month would nonetheless be expected to reach more than 200 spaces.

Illustration 3.7.3. *Parking at the west end of Zuma Beach where construction staging activities would be located is often underutilized, even in the late spring and early summer (photo taken Saturday, June 16, 2012, mid-day). Free road shoulder parking is also available on PCH.*

Approximately 42 spaces of shoulder parking along PCH adjacent to Parking Lot 12 would also be temporarily eliminated to accommodate the Project. These spaces would be located in two places: between the inbound and outbound project driveways and a segment west of the inbound project driveway to the PCH bridge over Trancas Creek. The first segment would include approximately 33 parking spaces, while the second can accommodate approximately nine parked cars. The loss of these spaces could be absorbed by the remaining spaces in the Zuma Beach parking lots, unrestricted roadside parking along Broad Beach Road and along other areas of the shoulder of PCH (Linscott, Law & Greenspan, 2013). Further, all parking impacts would be temporary, and would not occur during busy summer months. Therefore, impacts related to parking in the Project vicinity would be negligible.

Parking impacts resulting from the renourishment event are expected to be very similar to those of the main nourishment, but reduced by approximately 25 percent. Traffic impacts from backpassing events would also be expected to be similar to the nourishment and renourishment, and have an even more reduced scope. These impacts would be minimized in a way similar to those of the main nourishment event. Therefore, the renourishment and backpassing events would not be expected to include any major parking impacts.

Avoidance and Minimization Measure(s)

AMM TR-1. Traffic Management Plan. The Project Applicant shall provide proof that a traffic management plan has been submitted for review and approval by the California State Lands Commission, California Department of Transportation (Caltrans), and the Los Angeles County Department of Beaches and Harbors. The plan shall include the following elements, considering the initial nourishment, the renourishment event, and backpassing events:

- **Notification Posts**. The Applicant shall post signage to notify beach users of construction areas and the presence and use of construction equipment.
- **Notification of Agencies**. The plan shall identify concerned agencies and include procedures for notification of and coordination with such agencies.
- **Safety Cordoning**. The Applicant shall cordon off construction areas where heavy equipment is being used, as necessary, to ensure safety of beach users.
- **Roadway Signage**. The Applicant shall post adequate signage to notify motorists of the closure of Parking Lot 12, heavy truck traffic along constrained road segments (e.g., rural road intersections) and changes to the traffic configuration in the Broad Beach vicinity as well as locations of coastal access parking in the area.
- **Construction Manager**. A construction manager shall be designated with authority over truck transportation with the authority to redirect or halt trucking as needed. The manager shall be provided with communication equipment (e.g., radios) to manage the trucking operation.

- **Truck Communications**. All trucks shall be equipment with radios or other communication equipment to permit contact and coordination with the construction manager.
- **Truck Idling Locations**. The plan shall identify acceptable truck idling and pull over locations along Pacific Coast Highway (PCH) and other segments of the haul route. These areas shall be designated for use by trucks in case of equipment failures and excessive queuing occurring at the staging areas.
- **Driver Safety Briefing**. All truck drivers shall receive a safety briefing on existing uses along the truck haul routes, particularly areas with significant pedestrian activity.
- **Control Access to Parking Lot 12**. The Applicant shall ensure that appropriate measures are employed to prevent access (especially vehicular) to the staging area and parking lot 12 during periods when construction is not occurring in order to improve public safety. This could include signage and barriers. When safety is not an issue, public access shall otherwise be maintained to the maximum extent feasible.
- **Pedestrian and Bicycle Accommodations**. The Applicant shall provide appropriate accommodations for bicyclists and pedestrians to ensure their safety within the modified traffic configuration and in the Broad Beach vicinity.
- **Damage Repair**. The Applicant shall repair any damage to the PCH/Site Access connection or the construction staging area caused during the construction phase of the Project.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMM TR-1 would ensure that short- and long-term impacts to the transportation and circulation network in the vicinity of Broad Beach and the heavily used Zuma Beach would be minimized to the extent feasible. Following implementation of AMM TR-1, adverse impacts to transportation would be negligible.

Impact TR-2: Increased Parking Demand along Broad Beach Road

A wider dry sandy beach at Broad Beach following renourishment may attract more users which would increase parking demand on Broad Beach Road (Negligible Effect, Class N).

Impact Discussion (TR-2)

The restoration and renourishment of Broad Beach is expected to attract more beachgoers to Broad Beach. The increased number of beachgoers would result in an increased number of vehicles parking along Broad Beach Road, which currently has an estimated 320 spaces along its 1.5-mile-long shoulder. When combined with ongoing remodel projects and loss of some parking due to private encroachment into the road shoulder, future recreationists seeking access to public trust resources along the beach may experience occasional difficulty locating parking near existing access points. This impact is expected to be unsubstantial given the 320 spaces along Broad Beach Road and with the continued availability of safe and accessible parking along PCH and at Zuma Beach parking lot. The impact to parking demand resulting from the renourishment event would be 25 percent less than that of the main nourishment. Traffic impacts from backpassing events would also be expected to be similar to the nourishment and renourishment, and have an even more reduced scope. Therefore, impacts from the renourishment and backpassing events would be negligible.

Impact TR-3: Increased Safety Risk in the Vicinity of Broad Beach

43,000 truck trips along Pacific Coast Highway portion of the sand transportation routes to the Project site would create an increased traffic safety risk (Minor Adverse Effect, Class Mi).

Impact Discussion (TR-3)

Large, heavy vehicles associated with sand transport along PCH and local roads may obstruct views of nearby motorists, bicyclists and pedestrians, creating a more hazardous traffic environment. Construction materials or debris could also potentially fall out of the haul trucks and present a roadway hazard. Finally, the increased level of complication of traffic management mechanisms near the Broad Beach site for the Project duration would also add additional risk to the roadways near the Broad Beach site. Although these additional risks have the potential to have a major adverse impact, implementation of AMM TR-1 would ensure that this impact would remain minor. As AMM TR-1 also applies to the renourishment event and backpassing events, impacts resulting from these portions of the Project would also have a minor adverse effect.

Avoidance and Minimization Measure(s)

AMM TR-1 (Traffic Management Plan) would apply to this impact.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMM TR-1 would ensure that the potential increased safety risk for vehicles, pedestrians, and bicyclists is minimized through appropriately restricting movements, and providing adequate signage and warning.

3.7.2.5 BBGHAD Inland Project Area Truck Routes (Inland Quarries to PCH)

This section describes direct and indirect impacts of transportation routes in the BBGHAD Inland Project Area that may potentially result from Project implementation.

Impact TR-4: Impacts of Inland Truck Hauling Routes from the Inland Quarries to Pacific Coast Highway

Traffic generated from construction activities would have a short-term, impact on public use of roadways to access Broad Beach (Increased Intensity, Class - I).

Impact Discussion (TR-4)

The following impact discussion provides a qualitative assessment of the truck routes from the three inland quarries to PCH in Ventura County. The assessment was conducted using aerial photo interpretation through Google Earth Pro software and the Google map layers identifying points of interest and other features (e.g., schools, community facilities).

CEMEX Quarry (north of Moorpark):

The Applicant's proposed route from CEMEX Quarry would pass through Moorpark on Walnut Canyon Road. The number of large trucks passing through Walnut Canyon Road and Moorpark Avenue may affect pedestrian access and safety of children along the route in urban and residential areas of Moorpark. In particular, potential concerns along Walnut Canyon Road include:

- Narrow segments that run through residential neighborhoods, near three schools, a library, park, and Boys & Girls Club;
- Residential driveways where cars back out onto the road;
- Lack of a sidewalk north of Casey Road, where schoolchildren may use this segment to walk to school; and,
- No emergency shoulder for pullout for vehicles, with similar constraints on Grimes Canyon Road.

Other considerations on this route include a residential neighborhood near Somis, residential areas in Camarillo, and Camarillo Montessori School. The route also passes through agricultural lands, including near Moorpark on SR-23 where many horse stables, ranches and farms are located. Other agricultural areas include SR-118 near Somis and south of Camarillo, where trucks may come into conflict with agricultural vehicles. Often agricultural vehicles have particular needs when using public roads, such as going at slower speeds and using shoulders.

An alternative route is included in the sand transportation route on Grimes Canyon Road, a mostly agricultural route that would bypass Walnut Canyon Road and relieve some truck traffic.

Grimes Rock Quarry (south of Fillmore):

The Applicant's proposed route from Grimes Rock Quarry passes through agricultural lands on N. Grimes Canyon Road, on SR-126 between Fillmore and Saticoy, and on Los Posas Road. As in other routes, safety concerns regarding conflicts with agricultural traffic may potentially be an issue. The route also passes through the cities of Fillmore, Santa Paula, Saticoy, and Camarillo; however, roads in this portion are mostly four-lane freeways or highways and currently sustain high volumes of traffic. Considerations on this route include Santa Clara Schoolhouse, which is a cultural resource along SR-126 near Santa Paula. Impacts of the sand transportation route on cultural resources are further discussed in Section 3.7.3, *Cultural and Paleontological Resources*.

P.W. Gillibrand Quarry (north of Simi Valley):

The Applicant's proposed route from P.W. Gillibrand Quarry would pass through communities in Simi Valley, Moorpark, Thousand Oaks and Camarillo. Sensitive uses on this route include residences, Township Elementary School, and a public library on Tapo Canyon Road (two- to four-lane road). Potential safety issues related to truck traffic may be of concern in this area, including the safety of pedestrians and schoolchildren walking to school. Las Posas Road south of Camarillo is a two-lane road that passes through mostly agricultural land and receives use by agricultural workers operating slow, heavy agricultural equipment. Conflicts with agricultural vehicles on this portion of the haul route may be a concern.

Inland Transportation Routes Impact Summary

Because of the potential number of truck trips needed for the Project (up to 43,000) in a short period of time (approximately 5 months), there would be an increased intensity of use of the roadways along the sand transportation route. Several of the routes are on multi-lane freeways or highways (SR-126, US-101, SR-118, and SR-23) that should be able to accommodate the truck traffic; however, each of the routes pass-through local communities such as the cities of Simi Valley, Moorpark, Fillmore, Saticoy, and Camarillo. Ventura County considered traffic-related issues associated with the quarries as part of its permitting of the quarries; because of the increased intensity of truck trips through these local communities, these cities may impose measures to lessen the impacts of increased truck traffic, such as more traffic/safety patrol units along the truck routes. Implementation of **AMM TR-1** (Traffic Management Plan), which includes measures to address truck safety, would help to reduce potential impacts.

3.7.2.6 Summary of Transportation Impacts and AMMs

Impact	Class	AMMs
TR-1: Construction-Generated Traffic in the Vicinity of Broad Beach	**Mi**	**AMM TR-1:** Traffic Management Plan
TR-2: Increased Parking Demand Along Broad Beach Road	**N**	No AMMs recommended
TR-3: Increased Safety Risk in the Vicinity of Broad Beach	**N**	**AMM TR-1:** Traffic Management Plan
TR-4: Impacts of Inland Truck Hauling Routes from the Inland Quarries to Highway 1 (Pacific Coast Highway)	**- I**	**AMM TR-1:** Traffic Management Plan

3.7.3 CULTURAL AND PALEONTOLOGICAL RESOURCES

This section of the Revised APTR identifies cultural resources and paleontological resources in the Broad Beach Restoration Project Area (Project Area), and evaluates impacts to such resources that would potentially result from the Project. Cultural resources help define human history, remind us of our interdependence with the land, and demonstrate how cultures change over time. Cultural resources can be found in locations where people lived out every-day life, leaving structures and objects as evidence of how they lived, where important events occurred, and where traditional, religious, ceremonial, and social activities took place. Protecting cultural resources preserves human tradition, culture, and history. Paleontological resources, or fossils, are the remains of ancient organisms, and provide the direct evidence of ancient life. Preserving these resources provides opportunities for greater scientific understanding of the Earth's past.

3.7.3.1 Environmental Setting Pertaining to the Public Trust

Relationship of Cultural and Paleontological Resources to Public Trust Resources and Values

The Project may have adverse impacts on cultural and/or paleontological resources as the beach and submerged lands offshore from Broad Beach have the potential to contain cultural resources. The CSLC has jurisdiction over certain cultural resources and considers impacts to such resources under its statutory authority and when exercising its public trust responsibilities (Pub. Resources Code, §§ 6309, 6313, and 6314). Additionally, the Governor's Executive Order W-26-92 states: "all state agencies shall recognize and, to the extent prudent and feasible within existing budget and personnel resources, preserve and maintain the significant heritage resources of the State," and "administer the cultural and heritage properties under its control in a spirit of stewardship and trusteeship for future generations.…"

Although cultural and paleontological resources are not generally considered public trust resources under the common law Public Trust Doctrine, they are important resources that maintain a link to the State's heritage and provide opportunities to gain scientific knowledge of the earth's past. As indicated above, the CSLC has jurisdiction and stewardship responsibilities for cultural resources on lands it administers. Taking into account the protection of cultural resources is, therefore, an appropriate factor for the CSLC when exercising its public trust responsibilities.

The city of Malibu's past includes a long record of Native American Chumash occupation, including an active community today, as well as potential historic ranching and maritime activity. The city's civic center is located near the historic Chumash village of Humaliwo at the mouth of Malibu Creek. The potential also exists for archeological remains from Chumash occupation to occur within the greater Project area, particularly given the proximity of Trancas Creek.

<u>Definition of Cultural and Paleontological Resources</u>

Cultural Resources

Cultural resources are defined as the collective evidence of the past activities and accomplishments of people. These resources include any object, building, structure, site, area, place, record, or manuscript determined to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California. Cultural resources are finite, non-renewable resources that cannot be returned to their original state if they are disturbed or destroyed.

A cultural resource may be considered significant if it meets one or more criteria for listing on the California Register of Historical Resources, as defined in Public Resources Code section 5024.1:

- Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
- Is associated with the lives of persons important in our past;
- Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
- Has yielded, or may be likely to yield, information important in prehistory or history.

A resource that is listed on the National Register of Historic Places is automatically included in the California Register of Historical Resources. Additionally, under State law, any submerged archaeological site or submerged historic resource remaining in State waters for more than 50 years is presumed to be archaeologically or historically significant. (Pub. Resources Code, § 6313 subd. (c).)

Cultural resources associated with the Project may include both historic and prehistoric resources. Historic resources may include, but not be limited to, historic ranch buildings or other early homes, shipwrecks, discarded debris, or materials intentionally placed to provide artificial reefs. Prehistoric resources may include, but not be limited to, submerged artifacts, such as cobble mortars, pestles, net weights, metates (stone mortars), flaked stone tools, or other items (Masters 1983; Masters and Gallegos 1997). Prehistoric resources may include, but not be limited to, preserved deposits of prehistoric habitation debris on the continental shelf that were inundated during marine transgression beginning approximately 11,000 years ago near the start of the current Holocene epoch.

Paleontological Resources

Paleontological resources are fossilized remains of ancient plants and animals, and associated deposits. Protection of these resources is important because they provide the only direct evidence of ancient life. For the purpose of this analysis, scientifically significant paleontological resources are defined as vertebrate fossils that are identifiable to taxon and/or element, noteworthy occurrences of invertebrate and plant fossils, and vertebrate trackways.

Historical Context of the Broad Beach Vicinity

The early prehistory of coastal Southern California remains vaguely understood. The archaeological record reveals the presence of humans beginning about 12,000 years ago on the Channel Islands (Johnson et al. 2002). In Santa Monica Bay, the Malaga Cove site (LAN-138) is also purported to have an early occupation, perhaps beginning at about 10,000 to 9,000 years ago (Moratto 1984). Early coastal sites (those dating more than 9,000 years old) have been characterized as being part of Moratto's proposed Paleo-Coastal Tradition (Glassow 1996). Coastal cultures in existence during the last 9,000 years are better documented. The Malibu area was historically occupied by two Native American tribes: the Ventureño Chumash and the Tongva/Gabrielino. The Chumash tribe was one of the more advanced native societies in California because of its emphasis on manufacturing and trade, development of maritime fishing, and complex bead money system (City of Malibu 1995). Tongva/Gabrielino culture was similar to the Chumash, and also was based on a maritime environment and economy.

There are approximately 120 archaeological sites in the city of Malibu. Sites in the Santa Monica Mountains include village sites, burial grounds, camps or food processing areas, quarries and rock art sites. Many sites have already been destroyed or disturbed. Currently, only a small percentage of the area has been surveyed, indicating that additional archaeologically significant sites may exist in the Malibu area. The east-west trend of the Malibu area resulted in the formation of many places well suited to boat launching and up-welling of nutrients, which provided abundant marine wildlife. These conditions contributed to a high density of population along the coast. The Chumash village that was closest to the Project area was Sumo, situated approximately one mile to the southeast. Ethnographic information indicates that Point Dume was an important shrine for many native cultures throughout southern California (City of Malibu 1995).

In the Malibu area, the prehistoric occupation represents a period of over 9,000 years and ended with the beginning of the Spanish colonization of California at Mission San Gabriel in 1771 on the San Gabriel River, and Mission San Buenaventura in 1782, in what is now Ventura. The Mission Period, during which Native Californians were largely relocated to missions and nearby rancherias, extended to approximately 1834, when the Mexican government secularized the missions (City of Malibu 1995).

The Malibu Pier, a historic site, was constructed in 1905 to support the operations of Frederick Hastings Rindge's Malibu Rancho. Hides, grains, fruit, and other agricultural products were shipped from the pier either directly or by transfer to larger vessels. Building materials and other Rancho necessities arrived at the pier. In 1934, the pier was opened to the public for pier and charter fishing. Fishermen were also shuttled back and forth from the pier and the barge anchored by Minnie A. Caine a mile offshore. During World War II, the end of the pier also served as a U.S. Coast Guard daylight lookout station. Sports fishing boats operated from the Pier until the early 1960s. The pier is approximately 10 miles east of Broad Beach; however, the pier supported local maritime activity that could have resulted in shipwrecks near Project area.

<u>CSLC Lease Area Overview</u>

Historic Resources

There are seven officially recognized historic sites in the city of Malibu, four of which include structures. The only historic resource located within 9 miles of the CSLC Lease Area is Point Dume, which is listed as a California State Landmark (CSL 965) as the western terminus of Santa Monica Bay and an important landmark for navigators since Vancouver's voyage in 1793. It is recognized as a California State Historical Landmark (City of Malibu 1995, California 2012, National Park Service 2011).

Cultural Resources

No resources listed on the National Register of Historic Places or the California Register of Historical Resources occur within the vicinity of Broad Beach. Further, there is a low potential for cultural resources within the area overlying the existing dune and beach. Broad Beach is a sandy beach with continual disruptions from wave activity. Episodes of coastal erosion and deposition, along with development of the entire back dune area with single family homes, reduce the likelihood of intact prehistoric or historic deposits. In addition, the western end of the beach is often scoured to rocky intertidal and bedrock layers, limiting potential for undiscovered buried cultural remains. A review of archaeological studies performed in accordance with development requirements along Broad Beach revealed one archeological assessment that was performed for 30980 Broad Beach Road as part of the Initial Study/Negative Declaration. This assessment found that according to the city of Malibu's Cultural Resource Sensitivity Map, the property is in a low-sensitivity area for cultural resources, and therefore the site has low potential of containing prehistoric or historic archaeological resources.

Paleontological Resources

Los Angeles County is one of the richest areas in the world for both fossil marine vertebrates and land vertebrates, from sediments deposited over the last 25 million years. Many fossilized remains are found in sedimentary rocks of the Santa Monica Mountains that have been tilted and uplifted. Invertebrate fossils found in the area are from the Miocene period. Some of the larger sites containing these fossils include Old Topanga Canyon Road near Calabasas Peak and Dry Canyon (City of Malibu 1995).

There are three significant paleontological resources in the Santa Monica Mountains in the vicinity of the Malibu area; however, only one of these sites is located near the city boundary (City of Malibu 1995). No significant paleontological resources are located within a mile of the CSLC Lease Area (City of Malibu 1995). Because known paleontological sites and resources are generally confined to uplifted portions of the Santa Monica Mountains, there is a low potential for paleontological resources to exist within the CSLC Lease Area. Broad Beach is a sandy beach with continual disruptions from wave activity. These conditions dramatically reduce the likelihood of intact paleontological deposits.

Public Trust Impact Area Overview

This analysis also considers public trust lands and resources down coast from Broad Beach. These generally submerged marine areas may harbor cultural resources similar to those described within the CSLC Lease Area, including a very low potential for historic, prehistoric, or paleontological remains within submerged lands or existing beaches. Similarly, if there were cultural or paleontological materials in the area immediately offshore in these down coast areas, these resources are likely buried and may continue to be buried deeper in sand over time.

BBGHAD Inland Project Area Overview

A search of the National Register of Historic Places, California Register of Historic Places, and Ventura County Planning website revealed nine cultural historic resources adjacent to or along the sand transportation routes outside the public trust impact area (see Table 3.7-17).

3.7.3.2 Regulations Pertaining to Cultural and Paleontological Resources

State regulatory law and other statutes related to cultural and paleontological resources are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. Pursuant to a consolidated coastal development permit (CDP), the California Coastal Commission (CCC) will address the Project's consistency with the Coastal Act and city of Malibu LCP.

Table 3.7-17. Cultural Resources along the Sand Transportation Routes

Name	Address	Year Built
Tanner Homestead	18492 Telegraph Road	1885
Santa Clara Schoolhouse	20030 Telegraph Road	1896
Fillmore Sign	City of Fillmore	1940
King Home/ Agnes Winkler Harris Home	1420 Grimes Canyon Road	1929
Pulkerson Hardware Store	2403 Somis Road	1925
Somis Thursday Clubhouse	5380 Bell Street	1895
St. Mary Magdalen Church	2532 Ventura Boulevard	1913
Point Mugu Recreation Area/State Park	Point Mugu/Highway 1	1846
Eucalyptus Tree Stand	Highway 101/Camarillo	1892

3.7.3.3 Public Trust Impact Criteria

The Project could have a major adverse effect to cultural and/or paleontological resources if it resulted in:

- Physical destruction, relocation, or alteration of a significant cultural resource or its immediate surroundings, such that the significance of the resource would be materially impaired.
- Direct or indirect destruction of a significant paleontological resource or site or unique geologic feature.

This impact analysis considers Broad Beach in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting without the emergency revetments, characterized by a narrow beach and dune without the rock and sand bag revetment.

3.7.3.4 Public Trust Impact Analysis

Cultural resources impacts to the public trust resource prior to the construction of the 2010 revetment are consistent with the current resources concerns described above with the exception of the potential cultural resources that may have been covered or destroyed as a result of installation of the existing rock and sand bag revetment. Prior to construction of the 2010 emergency rock revetment, sand bag revetments were constructed for protection from coastal processes. These sand bag revetments were located in the same general area as the existing 2010 emergency revetment. This potential impact is discussed as part of this analysis.

Impacts to cultural and paleontological resources can occur either directly or indirectly. Direct impacts can result from ground disturbances directly and indirectly caused by Project activities. For example, if there were cultural or paleontological resources buried on the beach, placement of additional sand and operation of heavy machinery could remove, crush, or otherwise destroy these resources. If there were cultural or paleontological materials in the area immediately offshore from Broad Beach or within areas down coast from Broad Beach, these resources may get buried deeper in sand, but would be otherwise unaffected. Cultural and paleontological resources could also face indirect impacts due to increased access to historical sites (i.e., construction employees or new site visitors participating in unauthorized artifact collecting).

Potential for impacts to subsurface cultural and paleontological resources is limited since Broad Beach is a sandy beach regularly disturbed by wave activity, which reduces the likelihood of intact historic or prehistoric cultural deposits and significant paleontological resources. In addition, the entire back beach area has been developed with single family homes and associated secondary structures, septic systems, patios and landscaping. There are no known prehistoric or historic archeological sites in the vicinity of Broad Beach. Reviews of cultural resources in the CSLC Lease Area and the Public Trust Impact Area have not identified significant cultural resources that could be disturbed by Project activities. Additionally, there are no known, significant paleontological sites on Broad Beach or nearby areas.

Impact CR-1: Disturbance of a Significant Cultural or Significant Paleontological Resource due to Construction of the Emergency Revetment

Construction of the emergency revetment may have disturbed cultural or paleontological resources or their surroundings on Broad Beach (Negligible Effect, Class N).

<u>Impact Discussion (CR-1)</u>

Construction of the emergency revetment is unlikely to have impacted subsurface cultural or paleontological resources because the disturbance was limited to a dune area and sandy beach regularly disturbed by wind and ocean current activity. This environment reduces the likelihood of intact prehistoric or historic cultural deposit or intact paleontological deposits. There are no officially recognized historic resources within nine miles of Broad Beach except for Point Dume, a formally listed State Landmark and local beach area one mile north from Broad Beach that is not impacted by the revetment. There are no formally listed cultural resource sites on Broad Beach and there is a low potential for cultural resources within the CSLC Lease Area.

A review of past archaeological studies prepared for houses along Broad Beach revealed that an archaeological assessment was performed on one property. The assessment found that the property is in a low-sensitivity area for cultural resources and has low potential of containing prehistoric or historic archaeological resources (City of Malibu 2009). Also, there are no known, significant paleontological sites on Broad Beach, and no cultural or paleontological resources were discovered during the construction of the revetment. Given the low likelihood of cultural and paleontological material occurring at Broad Beach, construction of the revetment is not likely to have affected cultural resources.

Impact CR-2: Disturbance of a Significant Cultural or Significant Paleontological Resource or its Surroundings due to Beach Nourishment

Beach nourishment activities may disturb cultural or paleontological resources or their surroundings in the Broad Beach Restoration area (Negligible Effect, Class N).

<u>Impact Discussion (CR-2)</u>

An assessment of Broad Beach and areas down coast from Broad Beach indicates that the potential for Project impacts on cultural resources is limited due to (1) the low potential for cultural resources within Broad Beach, and (2) the low potential for the placement of sand to affect existing cultural resources that have not been previously identified. Broad Beach is a sandy beach with continual disruptions from wave activity. These conditions reduce the likelihood of intact prehistoric or historic deposits. A review of archaeological studies prepared for residential homes along Broad Beach revealed that an archaeological assessment was performed in 2012 for one property (City of Malibu 2009). The assessment found that the property is in a low-sensitivity area for cultural resources and has low potential of containing prehistoric or historic archaeological resources. Additionally, no officially recognized historic resources are within 9 miles of Broad Beach except for Point Dume, a formally listed State Landmark, and a local beach area 1 mile away from Broad Beach that would not be impacted by beach nourishment. Due to the low potential for cultural resources in the site, operation of heavy machinery at Broad Beach has low potential to disturb cultural resources. In the event that historic or prehistoric resources are present in the existing sand on Broad Beach, these resources would be further buried by sand after the Project is completed. Therefore, this activity would not constitute a substantial impact.

There are no known cultural resources or significant paleontological sites on Broad Beach or along the portion of the sand transportation route along PCH. Therefore, the Project is expected not to have a major adverse impact on cultural or paleontological resources.

3.7.3.5 BBGHAD Inland Project Area Impact Analysis

This section describes direct and indirect impacts of the inland transportation routes that may potentially result from Project implementation.

Impact CR-3: Disturbance of a Significant Cultural Resource along Sand Transportation Routes

Hauling activities may disturb cultural resources in the BBGHAD Inland Project Area (Negligible Effect, Class N).

Impact Discussion (CR-3)

Nine cultural resources were identified outside public trust lands along the sand transportation route by the National Register of Historic Places, California Register of Historic Places, and Ventura County Planning website. These cultural resources are listed in Table 3.7-17 and are located within 0.25 mile of a roadway.

Sand hauling activities will take place over 5 months and will include a total of 43,000 trips. Because of the potential number of truck trips needed for the Project in a short period of time, there would be an increased intensity of use of the roadways along the three primary sand transportation routes. Several sections of the routes are on freeways or highways (SR-126, US-101, SR-118, and SR-23) that currently sustain a high to moderate volume of traffic and can easily accommodate the truck traffic. Routes that already experience high traffic volumes would experience a negligible increase in traffic-related vibration, air quality and noise due to the Project

Given the existing setting of the nine identified cultural resources along the sand transportation route, and given the temporary nature of the hauling activities, the Project's contribution would result in a negligible impact to cultural resources.

3.7.3.6 Summary of Cultural/Paleontological Resource Impacts and AMMs

Impact	Class	AMMs
CR-1: Disturbance of a Significant Cultural or Significant Paleontological Resource due to Construction of the Emergency Revetment	N	No AMMs recommended
CR-2: Disturbance of a Significant Cultural or Significant Paleontological Resource or its Surroundings due to Beach Nourishment	N	No AMMs recommended
CR-3: Disturbance of a Significant Cultural Resource along Sand Transportation Routes	N	No AMMs recommended

3.7.4 NOISE

This section of the Revised APTR describes the noise environment in the Public Trust Impact Area and analyzes the potential effects of Project-generated noise on the public's use and enjoyment of public trust resources and values. The information in this section is based on the Analysis of Noise Impacts from Extended Trucking Schedule (2014) prepared by Moffatt and Nichol, provided in Appendix O, and the Traffic and Parking Assessment for the Project, prepared by Linscott, Law & Greenspan (2013, 2014) provided in Appendix H. This section also provides a qualitative assessment of the inland transportation routes from the three inland sand sources (CEMEX Quarry, Grimes Rock Quarry and P.W. Gillibrand Quarry) to PCH.

3.7.4.1 Environmental Setting Pertaining to the Public Trust

<u>Relationship between Noise and Public Trust Resources and Values</u>

Noise has the potential to impair the public's use and enjoyment of public trust resources at and adjacent to Broad Beach. Noise also has the potential to disturb marine mammals, birds, and other public trust resources (effects of noise on wildlife are discussed in Sections 3.3, *Marine Biological Resources*, and 3.43, *Terrestrial Biological Resources*). Existing sources of noise in the Project vicinity include:

- Breaking waves along the beach;
- Onshore and offshore public recreational activities including, jogging, dog-walking, surfing, swimming, paddle boarding, and boating;
- Noise generated at private residences, particularly from ongoing remodeling projects, loud music, and outdoor patio parties; and
- Traffic noise along PCH.

Noise is defined as unwanted sound that is heard by people or wildlife and that interferes with normal activities or otherwise diminishes the quality of the environment. Noise is usually measured as sound level on a logarithmic decibel (dB) scale, with the frequency spectrum adjusted by the A-weighting network. The dB is a unit division on a logarithmic scale that represents the intensity of sound relative to a referenced intensity near the threshold of normal human hearing. The A-weighting network is a filter that approximates the response of the human ear at moderate sound levels. The resulting unit of measure is the A-weighted decibel (dBA). To analyze the noise levels in an area, noise events are combined for an instantaneous value or averaged over a specific time period (e.g., one hour, multiple hours, 24 hours). The time-weighted measure is referred to as Equivalent Sound Level (L_{eq}). The equivalent sound level is defined as the same amount of sound energy averaged over a given time period. The percentage of time that a given sound level is exceeded can also be represented. For example, L_{10} is a sound level that is exceeded 10 percent of the time over a specified period.

Human response to noise is dependent on the magnitude, characteristic, and frequency distribution of the sound. Generally, the human ear is more susceptible to higher frequency sounds than lower frequency sounds. Human response to noise is also dependent on the time of day and expectations based on location and other factors. For example, a person sleeping at home may react differently to the sound of a car horn than to the same sound while driving during the day. The regulatory process has attempted to account for these factors by developing noise ratings such as Community Noise Equivalent Level (CNEL) and the Day-Night Average Noise Level (Ldn). The Ldn rating is an average of noise over a 24-hour period in which noises occurring between 10:00 PM and 7:00 AM are increased by 10 dBA. The CNEL is similar, but also adds a weighting of 3 dBA to noises that occur between 7:00 PM and 10:00 PM. Average noise levels over daytime hours only (7:00 AM to 7:00 PM) are represented as Ld and nighttime noises (7:00 PM to 7:00 AM) as Ln.

Effects of noise can be evaluated based on how a project may increase existing noise levels for individuals in the project's vicinity. When a new noise source is introduced, most people begin to notice a change in environmental noise levels at approximately 5 dBA. (See Table 3.7-18 for a scale showing typical noise levels encountered in common daily activities.) Typically, average changes in noise levels of less than 5 dBA cannot be definitely considered as producing an adverse impact.

Table 3.7-18. Common Environmental Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	**70**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**60**	
		Large business office
Quiet urban daytime	**50**	Dishwasher in next room
Quiet urban nighttime	**40**	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: California Department of Transportation (Caltrans) 2013.

In community noise impact analysis, long-term noise increases of 5 to 10 dBA are considered to have “some impact.” Noise level increases of more than 10 dBA are generally considered severe. In the case of short-term noise increases, such as those from construction activities, the 10 dBA threshold between “some” and “severe” is replaced with a criterion of 15 dBA. These noise-averaged thresholds are lowered when the noise level fluctuates, when the noise has an irritating character (e.g., considerable high frequency energy), or if it is accompanied by subsonic vibration. In these cases the impact must be individually estimated.

City of Malibu Noise Ordinances

Malibu Municipal Code (M.M.C.), Title 8, Chapter 8.24 (Noise), Section 8.24.050 (Prohibited Acts), limits construction noise by placing restriction on the hours of construction operations, and regulates noise from construction activities. Construction activities are not permitted outside the hours of 7:00 AM and 7:00 PM. Monday through Friday, or 8:00 AM and 5:00 PM on Saturday. No construction activities would be permitted to take place at any time on Sundays or City-designated holidays, except for emergency work permitted by the City (M.M.C. Sections 8.24.050(G) and 8.24.060(D)).

The city of Malibu’s General Plan Noise (N) Element (1995) applies the state’s Community Noise and Land Use Compatibility standards, and sets conditionally acceptable standards for land uses for interior noise levels. For example, the maximum allowable noise level for outdoor activity areas of new hotel uses (transient housing) exposed to transportation noise sources is 60-dBA[3] Day Night Sound Level (Ldn).[4] A maximum noise exposure to transportation noise sources for indoor spaces for such transient housing is not to exceed 45 dBA Ldn. The Noise Element also establishes maximum noise exposure limit (Lmax) standards for noise-sensitive land uses for both non-transportation and transportation-related noise sources (Tables 3.7-19 and 3.7-20).

3.7.4.2 Regulations Pertaining to the Public Trust

State regulatory law and other statutes related to noise are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. Pursuant to a consolidated CDP, the CCC will address the Project’s consistency with the Coastal Act and city of Malibu LCP.

[3] Noise levels are measured and expressed in decibels (dB). Noise levels weighted to the A noise scale to filter out frequencies not audible to the human ear are written dBA. (Ocean SCOUP MND, 2005).

[4] The Ldn measurement is one 24-hour average sound level where 10 dB is added to all the readings that occur between 10 PM and 7 AM. This is primarily used in community noise regulations where there is a 10dB “Penalty” for night time noise. Typically Ldns are measured using A weighting.

Table 3.7-19. Maximum Exterior Noise Limits from Non-Transportation Sources

Receiving Land Use Category	General Plan Land Use Districts	Time Period	Noise Level (dBA)	
			L_{eq}	L_{max}
Rural	All RR Zones and PRF, CR, MH, OS	7:00 AM - 7:00 PM 7:00 PM – 10:00 PM 10:00 PM – 7:00 AM	55 50 40	75 65 55
Other Residential	All SFR, MFR and MFBF Zones	7:00 AM - 7:00 PM 7:00 PM – 10:00 PM 10:00 PM – 7:00 AM	55 50 45	75 65 60
Commercial, Industrial	CN, CC, CV, CG and I Zones	7:00 AM - 7:00 PM 7:00 PM – 7:00 PM	65 60	85 70

Source: City of Malibu 1995; note that schools are considered sensitive receptors, but their institutional zoning designations allow for higher levels of noise exposure than for other sensitive receptors such as residential uses.

Notes: RR – Rural Residential; PRF – Private Recreational Facilities; CR – Commercial Recreational; MH – Mobile Home Residential; OS – Open Space; SFR – Single-Family Residential; MFR – Multi-Family Residential; MFBF – Multi-Family Beach Front CN – Commercial Neighborhood; CC – Community Commercial; CV – Commercial Visitor Serving; CG – Commercial General; I – Institutional.

Table 3.7-20. Maximum Allowable Noise Exposure Due to Transport Noise Sources

Land Use	Outdoor Activity Areas[1]	Indoor Spaces	
	L_{dn}/CNEL, dB	L_{dn}/CNEL, dB	$L_{eq/dB}$[2]
Residential	50[3]	45	-
Transient Housing (i.e., hotels)	60[3]	45	-
Churches and meeting halls	60[3]	-	40
Office buildings	60[3]	-	45
Schools, libraries and museums, and child care	60[3]	-	45
Playgrounds and neighborhood parks	70	-	-

3.7.4.3 Public Trust Impact Criteria

A major adverse noise impact would occur:

- If a person were to make, or cause or suffer, or permit to be made upon any public beach, occupied by such person, any unnecessary noises, sounds or vibrations which are physically annoying to reasonable persons of ordinary sensitivity or which are so harsh or so prolonged or unnatural or unusual in their use, time, or place as to occasion unnecessary discomfort to any persons within 500 feet of the place from which said noises emanate or which interfere with the peace and comfort of other occupants of public trust lands.
- If construction related noise were to conflict with city of Malibu noise ordinances applicable to the Zuma Beach parking lot and Broad Beach construction area.

This impact analysis considers the Broad Beach Restoration Project area in its existing setting (specifically the Public Trust Impact Area and the CSLC Lease Area), following the sand bag and 2010 emergency rock revetment installations.

3.7.4.4 Public Trust Impact Analysis

Noise impacts to the public trust resource prior to the construction of the 2010 revetment are consistent with the current noise setting described above. Prior to construction of the 2010 emergency rock revetment, sand bag revetments were constructed for protection from coastal processes. These sand bag revetments were located in the same general area as the existing 2010 emergency revetment. Installation of the rock and sand bag revetments may have generated construction-related noise, but is unrelated to this analysis.

The duration of construction and maintenance activities would be short-term. Nourishment and dune construction activities would last 6 months with hauling activities occurring in the first five of those months, sand movement and placement in proposed locations would last 1 month, and planting, fencing, irrigation, and other related activities would last 1 month, for a total initial construction timeline of 8 months. Annual or biannual backpassing may last up to 3 weeks per event, and the renourishment event would last for approximately 6 months. As proposed, construction working hours within the CSLC Lease Area would be limited to Monday through Friday, 7:00 AM to 6:00 PM. However, hauling and stockpiling of inland quarry material to Broad Beach is expected to be allowed from 6:00 pm to 9:00 pm. A total of 420 inbound and 420 outbound truck trips would occur per day, resulting in 30 round trips per hour, or one round trip every two minutes. Based on Project-proposed trucking hours, the hauling and stockpiling portion of the Project would require approximately 100 working days at 5 days per week, and is estimated to be completed after 20 weeks (5 months). No construction or sand staging would occur on weekends or city-designated holidays.

Anticipated short-term ambient noise from the Project would include noise associated with operation of heavy equipment along Broad Beach for sand deposition and movement during initial beach nourishment, backpassing events, and the renourishment event, as well as noise associated with haul trucks traveling to the staging space in the Public Trust Impact Area. For safety purposes, beach recreation would be restricted from areas undergoing sand placement, so recreational or other users would generally only experience Project noise from a distance.

Construction activities on Broad Beach would use heavy equipment, including two bulldozers, two scrapers, an excavator, two front-end loaders, flatbed delivery vehicles, dump trucks, generators, compactor, and miscellaneous power and hand tools (refer to Section 2.3.2, *Construction Staging Area and Equipment*, Table 2-4 Preliminary List of Construction Equipment for the Broad Beach Restoration Project). Backpassing would employ three scrapers and a bulldozer while the renourishment event would require similar equipment to the initial nourishment. Temporary and periodic increases in ambient noise levels would occur during the Project's construction phase, backpassing, and the renourishment event. Additionally, 70 haul trucks would be used during the nourishment and renourishment phases for transportation of sand from the quarry sites. Additionally, the Project also contains a provision for installation of emergency sand bag revetments along the eastern 550 feet of Broad Beach that is not protected by the emergency rock revetment, only as needed to protect the dune system, thereby minimizing the noise generated by this activity to a negligible level. The potential noise impacts of the additional 43,000 truck trips associated with the Project are considered in relation to PCH in the Project vicinity where public trust resources are most likely to be affected by increased roadway noise.

Noise studies conducted in San Diego as part of a similar beach nourishment project measured beach-front baseline noise levels ranging from 62 to 69 dBA, with the major contributing noise source being wave action (San Diego Association of Governments [SANDAG] 2011). Similarly, noise studies for an Environmental Impact Report on Ellwood Beach in Santa Barbara County identified a CNEL of 64 dBA with a range of 57.7 to 63.8 dBA, with the major noise source being ocean waves (CSLC 2006, 2011)

Existing noise in the Public Trust Impact Area of the Project is generated from traffic along PCH, which is located approximately 40 to 60 feet above and 200 to 300 feet from much of the CSLC Lease Area of the Project site. A noise study conducted in 1992 for the city of Malibu General Plan identified a L_{eq} level of 70 dBA at the intersection of Trancas Canyon Road with PCH at the eastern end of the Project area (Malibu 2009). However, roadway noise is limited along the beach due to the elevation difference, distance from the road and the screening effect of houses, with daytime traffic noise primarily audible from decelerating trucks or other peak noises.

A few areas within the Public Trust Impact Area, subject to potential impacts, include various state parks, beaches, and campgrounds along PCH. Noise in the vicinity of these areas is also dominated by ocean waves and mobile sources on or directly adjacent to PCH.

Impact N-1: Construction Impacts to Recreational Users of Broad Beach

Short-term noise levels would increase during Project construction potentially affecting a public beach (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (N-1)</u>

The dominant noise generated during placement of sand would result from diesel engines used to drive equipment. Equipment that is anticipated on the beach includes an excavator, two bulldozers, two front loaders, two scrapers, two backhoes, and four bobcats. Additionally, 70 haul trucks would travel to and from the staging area to deliver sand; not all of these trucks would be within the Public Trust Impact Area of the Project at the same time. Table 3.7-21 provides a summary of noise ranges for typical construction equipment.

Table 3.7-21. Noise Ranges of Typical Construction Equipment

Maximum Noise Level (dBA) 50 feet from Source	Equipment
70	Generator (25 KVA or less)
80	Backhoe , Front End Loader
82	Generator (more than 25 KVA)
84	Dump Truck , Flat Bed Truck
85	Dozer , Excavator
88	Truck

Source: Federal Transit Authority (FTA) 2006.
HP = horsepower; KVA - kilovolt ampere

Noise related to Project activities would only occur for a fixed period of time for each activity: 8 months for initial construction, 3 weeks for backpassing events, and 6 months for the renourishment event. Project operations would exceed the city of Malibu's Noise Control Ordinance (7:00 AM to 7:00 PM) due to proposed truck trips and staging operations at Zuma Beach parking lot being extended to 9:00 PM. As proposed, construction hours would be limited to Monday through Friday, 7:00 AM to 6:00 PM. Although no construction activities would occur on the beach west of Trancas Creek after 6:00 PM, truck ingress and egress to the Zuma Beach Parking Lot 12, deposition of sand onto grizzlies, and sand moving activities in the project staging area in the parking lot and the sand stockpile areas on the beach immediately seaward of the parking lot would continue beyond 6:00 PM until 9:00 PM on weekdays.

Illustration 3.7-4. *During beach nourishment, estimated to last for up to 8 months, heavy equipment (e.g., bulldozers, excavators, or scrapers) operating on Broad Beach could generate noise levels of up to 85 dB, 50 feet from the equipment, and create other hazards to beachgoers.*

Noise from construction activities is typically considered as a point source and noise levels would drop off at a rate of 6 dBA per doubling of distance from the source over hard site surfaces, such as parking lots and water (Federal Transit Authority [FTA] 2006). For purposes of this analysis, all surfaces are considered acoustically hard. The magnitude of construction noise impacts depends on the type of construction activity, noise level generated by each piece of equipment, duration of the activity, and distance between the activity and receptor. Maximum noise levels from construction equipment range from approximately 70 to 90 dBA at 50 feet from the source (FTA 2006). However, maximum noise levels from construction equipment anticipated to be used for the Project range from approximately 70 to 85 dBA at 50 feet from the source (Illustration 3.7-4).

Noise levels vary for each equipment type depending on equipment size, engine horsepower, activity level, and duty cycle. In a typical construction project (without pavement cutting or breaking), the loudest short-term noise levels are those of earthmoving equipment under full load, which would be approximately 85 dBA at a distance of 50 feet from the source. However, with equipment moving from one point to another, work breaks, and idle time, the long-term noise level averages are lower than louder short-term noise events. The Federal Highway Administration Road Construction Noise Model includes usage factors for converting maximum noise levels to hourly noise levels. For purposes of analysis of the Project, a maximum 1-hour average noise level of 80 dBA L_{eq} at 50 feet from the center of construction activities is assumed to occur (SANDAG 2011). Construction equipment is also equipped with mandatory backup alarms, and sand distribution requires construction equipment to back up frequently. Therefore, the diesel engine noise would be accompanied at times by the backup alarm noise.

The analysis preformed for the beach nourishment project in San Diego (SANDAG 2011) was used to obtain approximate noise levels during construction because of the similarity between the two projects. The dominant existing noise at Broad Beach is wave noise, and ambient wave noise levels are expected to range from 63 to 71 dBA. A peak construction noise event would include a diesel engine under load while sounding a backup alarm in proximity to a receptor. In these cases, construction equipment noise levels would be anticipated to occasionally exceed 85 dBA for a few minutes in a given hour. At other times, construction noise would be below 85 dBA, but still well above ambient noise levels.

As the receptor moves away from the construction activity, noise levels for the receptor would decrease with distance. At 200 feet, a decrease of 12 dBA would be anticipated. Thus, at distances greater than 200 feet, maximum construction noise levels would attenuate to 73 dBA Lmax or less, and average noise levels 68 dBA L_{eq} or less (SANDAG 2011). Given background noise levels, equipment, with the possible exception of backup alarms, is not anticipated to be highly noticeable to beachgoers who are more than 300 feet from construction activity.

Backpassing events and the single renourishment event would have potential noise impacts that are similar to those associated with the initial nourishment due to the use of similar construction equipment. Backpassing events, which are expected to occur approximately once a year and have duration of 3 weeks, would require a bulldozer, 3 scrapers, and a supervisor/foreman vehicle. The renourishment event, which is expected to occur approximately 10 years after project initiation and to have duration of 6 months, would require generally the same number and types of construction equipment as the initial nourishment. Therefore, as with the initial beach nourishment activity, construction equipment is not anticipated to be highly noticeable to beachgoers who are more than 300 feet from construction activity.

While the Project would be technically inconsistent with the city of Malibu Noise Ordinance, as hauling and staging operations would occur past 7:00 PM, AMM N-1b would ensure that the Applicant obtains all necessary approvals from the city of Malibu for these extended operations. Additionally, this impact to recreational users of Broad Beach would be limited as the beach would generally be closed during weekday construction operations and recreational use of Broad Beach during the winter nighttime hours between 7:00 PM to 9:00 PM is typically reduced. Given that Project-related noise would be short-term during initial nourishment, backpassing events, and the renourishment event, and would not be highly disturbing nor present a major health and safety concern to beachgoers who are more than 300 feet from construction activity, noise impacts to recreational users of Broad Beach would be a minor adverse effect with implementation of AMMs.

<u>Avoidance and Minimization Measure(s)</u>

AMM N-1a: Use of Noise-Attenuating Devices on Construction Equipment. To the maximum extent feasible, equipment, and trucks used for Project construction shall use best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds).

AMM N-1b: City of Malibu Approval for Exceedance of City Noise Ordinance. Prior to commencement of construction activities, the Applicant shall obtain and provide to CSLC staff all necessary approvals from the city of Malibu for proposed truck trips and staging activities between 7:00pm and 9:00pm at the Zuma Beach Parking Lot 12 and staging area Monday through Friday.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Project construction activities will occur near private residences as well as on the heavily used Zuma Beach. Implementation of these AMMs would ensure that an acceptable noise level would be experienced by the public within the vicinity of Broad Beach and during the public's use of the public trust lands, and would resolve conflicts with the City of Malibu's adopted Noise Ordinance. Further, as noted above, for safety reasons, Broad Beach would be closed during weekday construction periods, minimizing public exposure to construction-related noise.

Impact N-2: Construction and Operational Impact to Sensitive Receptors along Pacific Coast Highway (PCH)

Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along PCH (Major Adverse Effect, Class Mj).

Impact Discussion (N-2)

Nuisance noise impacts from large haul trucks associated with the Project are anticipated to be larger than those from commuting workers or material delivery vehicles. An estimated 840 heavy inbound and outbound haul truck trips per day (420 round trips per day) would transit PCH and pass hundreds of homes and several State Park campgrounds 5 days a week, 14 hours per day (from approximately 7:00 AM to 9:00 PM) over the 5-month transport period during initial nourishment activities, and approximately 10 years later during renourishment.[5] Annual backpassing activities would occur only on Broad Beach and are not anticipated to generate substantial noise effects for sensitive receptors along PCH. In a noise assessment conducted by Ldn Consulting, Inc. in 2011 for a project located in the City of San Marcos, noise levels for truck drive-by noise and truck engine noise were measured at between 72.8 dBA and 74.6 dBA at a distance of 25 feet (Appendix O). For this analysis, it is assumed that the drive-by noise level of the trucks would be 75 dBA at 25 feet. Although these high noise levels would diminish by 6 dBA for every doubling of distance from the travel lane, many homes and campgrounds would likely be exposed to maximum noise levels of up to 72 dBA and 61 dBA respectively when the haul trucks pass during the haul truck hours (Table 3.7-22).

Table 3.7-22. Haul Truck Noise Levels along PCH

Receptor	Minimum Distance from Travel Lane	Maximum Noise Level at Receptor (Lmax)
Homes along PCH	35 ft	72-dBA
Sycamore Canyon Beach	130 ft	61-dBA
North Beach Campground	200 ft	57-dBA
Leo Carrillo State Park	200 ft	57-dBA
Point Mugu State Park Campground	360 ft	52-dBA
El Matador State Beach	500 ft	49-dBA

Note: The noise level for one large truck is approximately 85-dBA at a distance of 50 feet away and would attenuate by 6-dBA for each doubling of distance (FTA 2006).

Noise levels inside homes would likely be attenuated by a further 20 dBA (with windows closed), which would still exceed city of Malibu interior noise standards of 45 dBA. Campers in motor homes and tents would remain subject to higher noise levels. Hauling

[5] The estimate of 420 round trips per day is calculated by dividing the total number of truck trips (i.e., 43,000) by the number of months the hauling operations would occur (i.e., 5) and by the average number of workdays in a month (i.e., 21.7). Fewer haul trucks may be required for renourishment.

operations may have potential to result in disturbance as they would occur from 7:00 PM to 9:00 PM in violation of the city of Malibu Noise Ordinance for hours of allowable construction. While these are maximum noise levels that would occur only when each truck passes and would not be continuous, the expected 420 round truck trips per day would result in one trip each way every 2 minutes between the hours of 7:00 AM and 9:00 PM. However, PCH is a busy highway that carries large volumes of traffic and heavy trucks and is likely already subject to similar maximum noise levels at varying intervals. Still, the Project would greatly increase the prevalence of these high maximum noise level events during hours for which the city of Malibu's Noise Ordinance prohibits construction activities. Therefore, noise impacts to sensitive receptors within Malibu city limits, including residences along PCH, would result in a major adverse effect. Measures to eliminate this impact are unavailable. However, a prohibition on use of truck "jake" brakes may be advisable to help reduce this impact.

Avoidance and Minimization Measure(s)

Implementation of **AMM N-1a** and **AMM N-1b** may reduce noise impacts to sensitive receptors along PCH, but this impact may still have a major adverse effect to sensitive receptors.

3.7.4.5 BBGHAD Inland Project Area Truck Routes (Inland Quarries to PCH)

This section describes direct and indirect impacts of the inland transportation routes that may potentially result from Project implementation.

Impact N-3: Construction and Operational Impact to Sensitive Receptors along BBGHAD Inland Project Area

Short-term highway noise levels would increase during sand hauling, potentially affecting visitor-serving uses and residents along roadways within BBGHAD Inland Project Area (Increased Intensity, Class - I).

Impact Discussion (N-3)

The following discussion provides a qualitative assessment of the truck routes from the three inland quarries to PCH. The assessment was conducted using aerial photo interpretation through Google Earth Pro software and the Google map layers identifying points of interest and other features (e.g., schools, community facilities).

CEMEX Quarry (north of Moorpark)*.* The Applicant's proposed route from CEMEX Quarry would pass through Moorpark on Walnut Canyon Road, an area that generally experiences relatively low noise levels. Large trucks driving on Walnut Canyon Road and Moorpark Avenue may affect sensitive receptors along the route in urban and residential areas of Moorpark. Potential concerns along Walnut Canyon Road include segments that run through residential neighborhoods, three schools, a library, park, and

Boys & Girls Club. An alternative route is included in the sand transportation route on Grimes Canyon Road, a mostly agricultural route that would bypass Walnut Canyon Road and relieve some truck traffic. The proposed route also passes through agricultural lands on SR-23 and SR-118, which are not considered noise-sensitive uses. Other considerations on this route include a residential neighborhood near Somis, residential areas in Camarillo and Camarillo Montessori School.

<u>Grimes Rock Quarry (south of Fillmore)</u>. The Applicant's proposed route from Grimes Rock Quarry passes through agricultural lands on N. Grimes Canyon Road, on SR-126 between Fillmore and Saticoy, and on Los Posas Road. The route also passes through the cities of Fillmore, Santa Paula, Saticoy, and Camarillo; however, roads in this portion are mostly four-lane freeways or highways and currently sustain high traffic volumes and noise levels. Thus, noise from truck traffic would not have a substantial impact in this segment. Considerations on this route include Santa Clara Schoolhouse, which is a cultural resource along SR-126 near Santa Paula (see Section 3.7.3, *Cultural and Paleontological Resources* for a discussion of impacts to cultural resources).

<u>P.W. Gillibrand Quarry (north of Simi Valley)</u>. The Applicant's proposed route from P.W. Gillibrand quarry would pass through communities in Simi Valley, Moorpark, Thousand Oaks and Camarillo. Sensitive uses on this route include residences, Township Elementary School, and a public library on Tapo Canyon Road (two- to four-lane road). Increased noise levels related to truck traffic may be of concern in this area, including disturbance of homes, classroom activities, and the library noise atmosphere. Las Posas Road south of Camarillo is a two-lane road that passes through mostly agriculture land. Trucks traveling on the SR-118, SR-23 and US-101 freeways between Simi Valley and Camarillo would have little impact on nearby residences and sensitive land uses as this part of the route is composed of six-lane freeways and currently experiences high traffic volumes and noise levels.

Inland Transportation Routes Noise Impact Summary

These roadways along the three sand transportation routes from the inland quarries will experience noise disturbances. Hauling activities could expose noise sensitive land-uses located near these routes with minimal setbacks to increased noise levels throughout construction. In particular, the route segments that currently carry lighter volumes of traffic with a commensurate ambient noise level would experience a more noticeable increase in noise generated from heavy haul truck trips. However, routes along US 101 already experience high traffic volumes and the effects from the Project are likely to have a less noticeable effect.

Although not a direct impact to public trust resources, this issue would be of potential concern to residents and other sensitive uses of potential interest to local or other State agencies. Ventura County considered noise-related issues associated with the quarries as part of its permitting of the quarries. Given the existing noise setting for these roadways, which already include high volumes of traffic and related noise, the Project's contribution would result in increased intensity to noise. A prohibition on use of truck "jake" brakes may be advisable to help reduce this impact.

<u>Avoidance and Minimization Measure(s)</u>

Implementation of AMM N-1a may reduce noise impacts to sensitive receptors along the hauling routes, but this impact may still result in an increased intensity of noise.

3.7.4.6 Summary of Noise Impacts and AMMs

Impact	Class	AMMs
N-1: Construction Impacts to Recreational Users at Broad Beach	**Mi**	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment **AMM N-1b:** City of Malibu Approval for Exceedance of City Noise Ordinance
N-2: Construction and Operational Impact to Sensitive Receptors along PCH	**Mj**	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment **AMM N-1b:** City of Malibu Approval for Exceedance of City Noise Ordinance
N-3: Construction and Operational Impact to Sensitive Receptors along BBGHAD Inland Project Area	**- I**	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment

3.7.5 PUBLIC HEALTH AND SAFETY, HAZARDS

This section of the Revised APTR describes the potential public health and safety issues that could occur as a result of implementation of the proposed Project. The Project would include transport of sand with six-axle haul trucks and the operation of heavy construction equipment on Broad Beach. Consequently, Project implementation would result in the potential for traffic incidents and hazardous spills, during initial beach nourishment and dune construction, annual sand backpassing, and subsequent renourishment events. This section also discusses long-term safety issues associated with the existing temporary emergency rock revetment. Public trust impact criteria are used to assess the degree of the impacts and whether AMMs can be implemented to reduce impacts. Traffic issues are discussed in Section 3.7.2, *Traffic and Parking*. Safety issues relating to wastewater disposal and drainage are discussed in Section 3.7.6, *Utilities and Service Systems*.

3.7.5.1 Environmental Setting Pertaining to the Public Trust

Relationship Between Public Health and Safety and Public Trust Resources and Values

Public health and safety hazards have the potential to affect the public's right to use and enjoy the public trust resources on and near Broad Beach. The Project could affect public health and safety through initial dune and beach restoration activities as well as through backpassing events and the proposed renourishment event, both of which would occur in accordance with the pre-determined triggers outlined in Section 2, *Project Description*. Construction activities may present direct hazards, such as the presence of heavy machinery on the beach, or result in accidental release of hazardous materials. Public health and safety hazards could impede recreational use of public trust resources.

The environmental setting presented in this section represents the current conditions within the CSLC Lease Area and Public Trust Impact Area. These conditions include the existing configuration of the Project sites, existing operations, and present environment. Risks associated with public health and safety and a potential release of hazardous materials are evaluated in relation to the current conditions. Broad Beach is currently a low tide beach, with public use and access generally restricted to a narrow beach at moderate tides with all or most of the beach under water at higher tides. The beach is widest on the east and narrows to the west. Residences line the majority of Broad Beach up to Trancas Creek Lagoon. The beach is backed by a 4,100-foot-long temporary emergency rock revetment over the majority of its reach, with other coastal protection structures, such as seawalls and sand bags, in other segments. The beach is generally a wide wet sand beach at lower tides, but becomes increasingly rocky in the sheltered cove inside of Lechuza Point, where rocky intertidal habitat intermingles with intermittent sandy beach.

The emergency revetment currently presents a physical barrier to lateral access for beachgoers as they try to dodge wave run-up, as to a lesser extent do the geotextile revetments. The presence of the emergency revetment creates some limited threats to public safety because there is no longer a gradual transition from a lower to higher elevation along the beach. Thus, when the tide reaches the revetment at moderate to high tides, beach users are forced to climb up the revetment to avoid waves or the incoming tide, rather than walk farther up a sandy beach. Additionally, larger waves have the potential to push a recreational beach user into the rocks of the revetment.

The material composition of the sand in the vicinity of Broad Beach was tested in order to have a baseline understanding of potential chemical contaminants prior to the introduction of new material. The chemical testing of composite samples detected no contamination within the Broad Beach-Zuma Beach survey area (CFC 2011a). For more information about the material composition of Broad Beach please see Section 3.1, *Coastal Processes, Sea Level Rise, and Geological Hazards*.

Sand from the stockpiles of CEMEX, Grimes Rock, and P.W. Gillibrand Quarries, from which the BBGHAD has stated it will purchase sand for the Project, was sampled and analyzed by American Environmental Testing Laboratory in Burbank, CA, a certified analytical laboratory. The standard suite bulk chemistry analysis included, but was not limited to, testing for levels of: metals, polychromatic hydrocarbons, phenols, chlorinated pesticides, and aroclors. The results of the analysis were then compared to numeric screening guidelines provided by the USEPA and U.S. Army Corps of Engineers (USACE) to assess material compatibility determinations. No screening levels were exceeded in the results. Other sand characteristics such as grain size and relative silt and clay content also make the sand compatible as beach fill. For more detailed information about material composition in the borrow site areas, please see Appendix J or refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geological Hazards*.

<u>BBGHAD Inland Project Area Overview</u>

The sand transportation routes are comprised of a range of different roadways which include large freeways and small, winding country roads. Thousands of vehicles use these roadways on a daily basis. Safety issues associated with the sand transportation routes are analyzed separately in Section 3.7.2, *Traffic and Parking*.

3.7.5.2 Regulations Pertaining to the Public Trust

State regulatory law and other statutes related to public health and safety are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. State regulations applicable to the Project are intended to protect public safety and regulate hazardous materials and hazardous wastes are listed below. These regulations also are designed to limit the risk of upset during the use, transport, handling, storage, and disposal of hazardous materials. Pursuant to a consolidated CDP, the CCC will address the Project's consistency with the Coastal Act and city of Malibu LCP. The Malibu LCP incorporates policies from the Coastal Act as well as defining specific policies for the city of Malibu. The policies that are relevant to the Project include:

- **Policy 2.39:** The city shall not close, abandon, or render unusable by the public any existing accessway which the city owns, operates, maintains, or is otherwise responsible for unless determined to be necessary for public safety without first obtaining a Coastal Development permit. Any accessway which the city or any other managing agency or organization determines cannot be maintained or operated in a condition suitable for public use shall be offered to another public agency or qualified private association that agrees to open and maintain the accessway for public use.
- **Policy 4.26:** Development on or near sandy beach or bluffs, including the construction of a shoreline protection device, shall include measures to insure that: (1) no machinery shall be allowed in the intertidal zone at any time to the extent feasible and (2) all construction debris shall be removed from the beach. (Resolution No. 07-04.)

3.7.5.3 Public Trust Impact Criteria

For this analysis, the significance of potential public health and safety impacts is based on the level of safety precautions that would be implemented during replenishment activities. An impact to public health and safety would be significant if it would:

- Create a health hazard or potential health hazard; or
- Expose people to potential health hazards.

3.7.5.4 Public Trust Impact Analysis

The Project would have potential impacts to public health and safety both during construction activities and throughout the life of the Project. Construction activities may present short-term hazards during initial dune and beach restoration activities, as well as during the renourishment event and ongoing backpassing. The Project would improve public safety along Broad Beach during the estimated 10- to 20-year life of the beach nourishment due to burial of the emergency revetment; however, these benefits would diminish as the revetment is re-exposed over time.

The Project would produce short-term public safety hazards at Broad Beach due to construction activities during initial dune and beach restoration activities, as part of all backpassing events, and during all renourishment events. Potential public safety hazards are related to (1) operation of heavy construction machinery and distribution of sand on Broad Beach, and (2) the potential for an accidental release of hazardous materials. Ongoing Project operations would not result in any health risks associated with the use or generation of hazardous materials.

Beach and dune restoration would have mid-term beneficial effects on public safety at Broad Beach over its design life due to the burial of the emergency revetment, which currently presents a limited public safety hazard. The revetment and other temporary and permanent seawalls would no longer act as hazards to public beach users because they would be buried beneath the dunes. The Project would restore sandy beach conditions to Broad Beach, creating a substantial positive impact to public safety for the design-life of the nourishment Project so long as backpassing and nourishment continues.

Over the long-term, the revetment would present a public safety hazard. As nourishment sand is eroded from the beach, the revetment would be re-exposed, presenting the same adverse impacts that it currently creates.

<u>Historical Hazards and Safety Characteristics of Broad Beach (pre-2010 revetment)</u>

Prior to the 2010 rock revetment, conditions related to hazards and hazardous materials were very similar. Natural physical characteristics and processes were comparable to current conditions. Prior to the 2010 revetment, the majority of property-owners placed individual revetments made of rock, timber, geotextile bags, and sand bags. Hazards associated with these revetments closely mirror those presented by the large rock revetment; however, individuals would have less of a risk of injury if trapped by hide tides in between waves and softer revetments (e.g., geotextile bags). Further, while the 2010 revetment is largely continuous, individual revetments included additional breaks and spaces for individuals to shelter themselves between structures. These breaks also provided opportunities to move away from a hazardous situation.

Impact HAZ-1: Authorization of the Revetment Creates Hazards

Authorization of the emergency revetment could impact public health and safety by trapping beach users between large rocks and incoming surf and tides (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (HAZ-1)</u>

Authorization of the emergency revetment, portions of which overlie public trust lands and Lateral Access Easements (LAEs), would create a long-term potential public health and safety hazard for recreational users on Broad Beach during moderate and high tides. Presence of the revetment compels beach users to climb up the revetment to avoid higher tides, rather than walk farther up a sandy beach. Additionally, large waves have the potential to push a recreational beach user into the rocks of the revetment, with some potential for injury. By blocking access to existing public trust land and LAEs, authorization of the revetment would force beachgoers into potentially unsafe situations.

Further, as the central and eastern regions of the revetment sustain damage to critical design features overtime, the current structure as constructed, poses an additional safety hazard to beachgoers. In the event that a portion of the revetment is structurally compromised by wave action, the sudden movement of boulders may injure the public using the sandy beach, or climbing on the exposed revetment.

The Project would offset the impacts of the revetment by burying the revetment under a restored sand dune habitat over the anticipated 10- to 20-year life of the Project. However, authorization of the revetment though a long-term lease and approval of Coastal Development Permits would create the potential for long-term impacts to public safety after nourishment activities end and natural coastal erosion causes the revetment to become exposed.

Avoidance and Minimization Measure(s)

> AMMs that would address long-term impacts to public safety from the presence of the revetment are described in earlier sections of this document, including **AMM TBIO-1a**, Implementation of a Comprehensive Dune Restoration Plan, and **AMM REC-4a**, Requirement of Additional Nourishment.

Rationale for Avoidance and Minimization Measure(s)

Construction of the emergency revetment has resulted in adverse impacts to public health and safety at Broad Beach. Measures that would improve public safety at Broad Beach include continuing beach nourishment activities over the long term or removing the revetment. Continued beach nourishment as outlined in AMM TBIO-1a would remove the risk to public safety presented by the revetment by maintaining a wide sandy beach for public use and keeping the revetment buried under sand. AMM REC-4a would reduce future impacts to public health and safety due to the revetment by addressing the potential future hazards occurring when the revetment becomes exposed due to coastal and climatic processes over the Project life. The combined AMMs would reduce the potential health and safety hazards created by the presence of the emergency revetment in both the mid- and long-term.

Impact HAZ-2: Hazardous Materials Release During Construction

Hazardous material released from construction equipment on the beach during two nourishment events and backpassing could impact public safety (Minor Adverse Effect, Class Mi).

Impact Discussion (HAZ-2)

Earthmoving equipment, such as bulldozers, scrapers, and other construction equipment would be operating on Broad Beach during backpassing and nourishment events. In addition, a 20-truck fleet would be used to transport sand to the beach. Approximately 30 trucks per hour would be entering and exiting the staging area from

7:00 AM to 9:00 PM. This would create the potential for accidental release of fuels, oils, lubricants, and other hazardous materials during the relatively extended periods that such machinery is operating on and around Broad Beach. If a fuel tank or an oil line were ruptured, these hazardous materials would be released onto the public beach or roads, presenting a risk to public health and safety. Such spills are considered low probability as all equipment would be stored overnight in the staging area and all fueling would be restricted to the staging area as well. However, equipment can malfunction or suffer damage when operating in a dynamic environment like a beach. Therefore, such malfunctions or accidents that could lead to release of hazardous materials on public trust lands would be major adverse impacts.

Avoidance and Minimization Measure(s)

AMM HAZ-2: Develop Hazardous Material Spill Prevention Control and Countermeasure Plan (SPCCP). A Hazardous Material SPCCP shall be prepared prior to implementing the Project to minimize the potential for, and effects from, spills of hazardous, toxic, or petroleum substances during Project construction and shall be submitted to California State Lands Commission staff at least 2 weeks before commencement of beach restoration activities. At a minimum, the SPCCP shall:

- Describe storage procedures, construction site housekeeping practices, and other Best Management Practices (BMPs). Common BMPs may include use of containment devices for hazardous materials, training of construction staff regarding safety practices to reduce the chance for spills or accidents, and use of nontoxic substances where feasible.
- Identify processes for inspections and monitoring of BMPs to ensure minimal impacts to the environment occur.
- Describe actions required if a reportable spill occurs, such as which authorities to notify and the proper clean-up procedures.
- State procedures for containing, diverting, isolating, and cleaning up any spills that might occur, such that major adverse impacts on surface and groundwater quality would be minimized or avoided.

Rationale for Avoidance and Minimization Measure(s)

BMPs and the SPCCP required under AMM HAZ-2 will reduce the potential of a release of hazardous materials on Broad Beach, and ensure that any accidental releases are properly handled. Impacts are considered not to be substantial with implementation of the avoidance and minimization measures.

Impact HAZ-3: Hazardous Conditions During Construction at Broad Beach

Construction activities at Broad Beach during nourishment and backpassing events could impact the safety of public beach users (Minor Adverse Effect, Class Mi).

Impact Discussion (HAZ-3)

The presence and operation of large construction equipment and construction crews would pose a safety risk to recreational beach users during initial construction of the beach and dune system and during backpassing and renourishment events. Nourishment of the beach and dune system would include, but not be limited to, the use of: two backhoes, two front-end loaders, two scrapers, two bulldozers, three hopper/conveyor systems, and seven off-road 40-ton dump trucks on Broad Beach. Additional equipment such as pick-up trucks would also be used.

The total construction period for the Project is estimated to extend over 8 months, with the future renourishment event estimated to require slightly less time than the initial nourishment due to the expectation of reduced volumes of sand required. The Project would apply BMPs for the construction activities during initial nourishment, renourishment and backpassing events. These practices include:

- public notice of upcoming construction activity;
- closure of construction areas to public access;
- implementation of a construction vehicle traffic management plan; and
- fencing off of the staging area.

The areas of active work (e.g., the training dikes, areas where earthmoving equipment is being used) would be clearly delineated and access controlled by contractors. Additionally, during backpassing operations, the responsible contractor would station a flag person at each access point to control construction traffic and pedestrian foot-traffic. In addition to these measures, the following avoidance and minimization measures would further reduce public safety hazards during construction activities at Broad Beach.

Avoidance and Minimization Measure(s)

AMM HAZ-3a: Demarcation of Public Access Routes. Public access routes around construction areas shall be clearly marked.

AMM HAZ-3b: Provision of Contact for Reporting Hazards. The Applicant will provide the public with contact information in order to report immediate hazards related to the Project. This information shall be provided via public notice in a local paper and on signs at Broad Beach at least one week (7 days) prior to the commencement of any Project-related activities.

Rationale for Avoidance and Minimization Measure(s)

Because active replenishment areas would be closed to public access, no major impacts to public health or safety would result with implementation of proposed avoidance and minimization measures. The Project would result in public health and safety benefits by adding sand to eroded areas, allowing for increased access to Broad Beach and burial of the emergency revetment.

Impact HAZ-4: Potential for Sediment Placed on Broad Beach to be Contaminated

Sediment material introduced to Broad Beach could impact public health and safety due to the chemical content of the new material (Minor Adverse Effect, Class Mi).

Impact Discussion (HAZ-4)

The sediment sources at the quarry sites were formed in pre-industrial times and have not been exposed to modern sources of pollution. Further, they are removed from potential contamination sources and are upslope/upstream of urbanization and drainage sources. The sediments also contain approximately 92.5 percent sand; therefore, contaminants would have a harder time being held within the sand. Additionally, analysis of the sediment contained in the source stockpiles confirmed that no numerical contaminant screening values set by the USEPA and USACE were surpassed, indicating that the sand would not pose a threat to public health and safety and would thus be compatible for beach nourishment uses. Please see Appendix L, or refer to Section 3.1, Coastal Processes, Sea Level Rise, and Geological Hazards, for more information regarding the source sediments and relevant evaluations.

Nevertheless, the potential remains that unforeseen wastes and materials could be discovered within the nourishment sediment at some point in the process. In the event that such unforeseen contaminants are discovered, public health and safety could potentially be impacted.

Avoidance and Minimization Measure(s)

AMM HAZ-4: Response to Sediment Contamination. Nourishment activities shall be temporarily halted In the event that construction workers, personnel, or other persons identify any indication that hazardous or dangerous materials are present in the imported sediment, or if contaminated sand is inadvertently deposited at Broad Beach, pending an evaluation by the California State Lands Commission (CSLC) staff, in consultation with the California Department of Fish and Wildlife (CDFW) Office of Spill Prevention and Response, to determine the extent of the contamination and most appropriate remediation methods before nourishment activities would be allowed to resume.

Rationale for Avoidance and Minimization Measure(s)

Although all three potential sediment sources have been sampled for the suitability of the sediment materials, there is a remote possibility that contamination may still occur.

Implementation of AMM HAZ-4 would reduce the potential for previously undetected hazardous material to be deposited onto Broad Beach during the Project.

Impact HAZ--5: Burial of the Emergency Revetment

Burial of the emergency revetment could have short- to mid-term benefits to public health and safety (Beneficial, Class B).

Impact Discussion (HAZ-5)

The Project includes burial of the emergency revetment, so it would no longer pose a public safety hazard on Broad Beach as long as it remains buried. The current exposure of the emergency revetment presents a public health and safety hazard for recreational users on Broad Beach during mid to high tide by preventing the beach from having a gradual transition from lower to higher elevation. When the tide rises, recreational users are forced inland toward the rocky revetment, rather than toward higher elevation beach and dunes. The Project would include the restoration of Broad Beach and the associated dune system, which includes burial of the existing revetment under sand. This would restore sandy beach conditions and allow for increased public access and a gradual topographic transition along Broad Beach as long as it continues to be nourished. This would result in a positive short- to mid-term impact to public health and safety at Broad Beach.

3.7.5.5 Summary of Public Safety and Hazard Impacts and AMMs

Impact	Class	AMMs
HAZ-1: Authorization of the Revetment Creates Hazards	**Mi**	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan **AMM REC-4a:** Requirement of Additional Nourishment
HAZ-2: Hazardous Materials Release During Construction	**Mi**	**AMM HAZ-2:** Develop Hazardous Material Spill Prevention Control and Countermeasure Plan
HAZ-3: Hazardous Conditions During Construction at Broad Beach	**Mi**	**AMM HAZ-3a:** Demarcation of Public Access Routes **AMM HAZ-3b:** Provision of Contact for Reporting Hazards
HAZ-4: Potential for Sediment Placed on Broad Beach to be Contaminated	**Mi**	**AMM HAZ-4:** Response to Dredged Sand Contamination
HAZ-5: Burial of the Emergency Revetment	**B**	No AMMs recommended

3.7.6 UTILITIES AND SERVICE SYSTEMS

This section of the Revised APTR describes wastewater disposal and storm water drainage along Broad Beach and potential Project impacts on public trust resources and values. The Public Trust Impact Area adjacent to the CSLC Lease Area includes 109 residences and the Malibu West Beach Club, associated Onsite Wastewater Treatment Systems (OWTS), 11 public storm drains, and an unknown number of private drainage systems. Primary sources of information for this section include:

- Shore Protection As-Built Plan Historic Permit Status per SLC 2010 MHTL (BBGHAD 2013a);
- Broad Beach Restoration Onsite Wastewater Feasibility Study. Prepared by Ensitu Engineering (BBGHAD 2013b);
- Response to comments RE: Coastal Development Permit Application 4-12-043 (Broad Beach), Prepared by Ensitu Engineering (BBGHAD 2014);
- Clean Water Program (City of Malibu 2006) ;
- Limited Engineering Geologic Report 070109 (City of Malibu 2007);
- Council Agenda Report: Item 3.B.10. State Water Resource Control Board (SWRCB) Proposition 84 Area of Special Biological Significant Broad Beach Road Bioinfiltration Project (City of Malibu 2010);
- City of Malibu and County of Los Angeles (LA County) staff; and
- Malibu Water Pollution Control Plant Fourth Quarter and Annual 2008 Monitoring Report Order No. 98-088, CI 6473, File No. 64-049 (LA County 2009).

3.7.6.1 Environmental Setting Pertaining to the Public Trust

<u>Relationship between Utilities and Service Systems Public Trust Resources and Values</u>

Illustration 3.7-5. *Onsite septic systems provide wastewater disposal for many homes along Broad Beach. Treated effluent is disposed of through discharge into leach lines buried in sandy dune soils inland of the revetment adjacent to the beach and ocean.*

Existing residences along Broad Beach Road depend upon individual OWTS for the treatment and disposal of sewage effluent generated at these homes. The majority of these residences rely on conventional septic systems, featuring septic tanks and leach fields. The leach field disposal areas for these homes, where treated wastewater is deposited for percolation into underlying soil, are frequently located in sandy dune areas, often seaward of these homes (Illustration 3.7-5). This proximity to the shoreline creates a potential for OWTS-related sewage effluent to come into contact with the high groundwater table present near the coast or for the OWTS to be exposed to damage by wave action and erosion. Additionally, drainage along Broad Beach Road directs storm water runoff out to the beach where it can infiltrate into the sand and run off to the ocean. Such drainage can carry contaminants into intertidal lands, offshore waters, and other public trust resource areas, and may also cause erosion of public beaches during periods of high flows. The potential for contaminated drainage or effluent contact with and pollution of ground or ocean waters may impact the quality of public trust waters, have adverse effects on public trust resources (e.g., marine life), and impair the public's use and enjoyment of such resources.

<u>Existing Municipal Wastewater Disposal Systems:</u>

The Los Angeles County Department of Public Works (LACDPW) and Las Virgenes Municipal Water District (LVMWD) provide municipal wastewater treatment for incorporated and unincorporated areas of western Los Angeles County. The LVMWD provides service to areas south of the Ventura County line, including Westlake Village, Agoura Hills, Hidden Hills, Calabasas, and unincorporated areas within the Santa Monica National Recreation Area. Water from these areas is treated at the Tapia Water Reclamation Facility located in Calabasas. Service does not extend into the Malibu city limits. The LACDPW provides service to 40 consolidated sewer districts throughout the county, including areas within the city of Malibu. Parcels west and northeast of Broad Beach and the CSLC Lease Area are within service district No. 27; however, the majority of parcels along Broad Beach are not within an established service district. LACDPW provides wastewater treatment for limited areas within the city of Malibu from three separate wastewater treatment plants providing secondary and tertiary treatment of effluent (LA County 2011a):[6]

- **Malibu Mesa Wastewater Reclamation Plant** is a tertiary wastewater treatment plant located on land owned by Pepperdine University (Malibu Times 2009). This facility is located approximately 8 miles east of Broad Beach (Google Earth 2014). The capacity of the treatment plant is 200,000 gallons per day (gpd) of domestic wastewater. The reclaimed water is primarily used for irrigation on the Pepperdine University campus (LA County 2011a).
- **Malibu Water Pollution Control Plant** is a secondary wastewater treatment facility located at 3620 Vista Pacifica (LA County 2009). This facility is located approximately 9 miles east of Broad Beach (Google Earth 2014). The capacity of the plant is 51,000 gpd of domestic wastewater. Treated wastewater is discharged from the facility into seepage pits for disposal (LA County 2011a).

[6] Municipal wastewater treatment typically consists of three stages of treatment: Primary treatment removes suspended solids from raw sewage through mechanical separation; Secondary treatment removes dissolved organic materials using microbes; and Tertiary treatment is any additional treatment beyond secondary processes to further improve effluent quality.

- **Trancas Water Pollution Control Plant** is a secondary wastewater treatment facility located at 6338 Paseo Canyon Drive, inland of PCH. This facility is located approximately 0.5 mile north of Broad Beach. The capacity of the plant is 75,000 gpd of domestic wastewater (LA County 2012). Treated wastewater from the plant is discharged into leach fields for disposal (LA County 2011a).

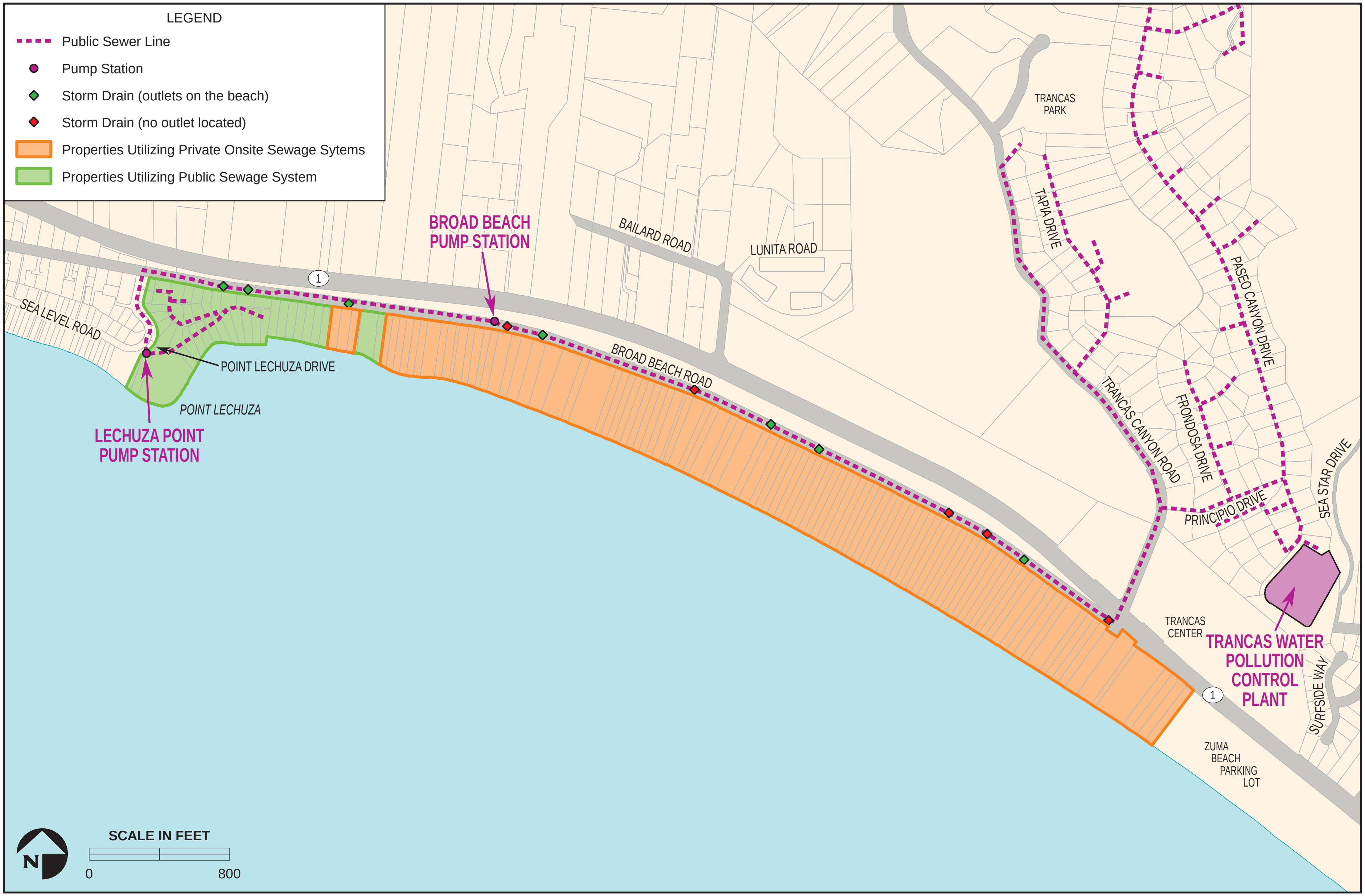
<u>Water and Wastewater Disposal in the Malibu Area</u>

The city of Malibu is a semi-rural community with no centralized wastewater treatment system. The majority of homes and business in the community rely upon OWTS for disposal of sewage effluent, including septic systems, drywells, and more advanced systems, such as aerobic treatment units (ATUs), or "package plants." The use of OWTS for a relatively large number of homes and businesses proximate to the Pacific Ocean and local creeks and estuaries has raised concerns from citizen groups, such as Heal the Bay, regarding potential water quality impacts associated with current wastewater disposal practices. Such concerns have spurred the SWRCB and Los Angeles Regional Water Quality Control Board (LARWQCB) to phase out OWTS in some areas of the community. For example, the city of Malibu is working with interested organizations and the State to address such concerns through pursuing construction of an area-wide wastewater collection treatment system within the Malibu Civic Center.

Approximately 6,400 OWTS are in the city of Malibu (City of Malibu 2006). Conventional OWTS consist of a septic tank and a subsurface wastewater infiltration system. Wastewater is conveyed out of the home via a pipe to the septic tank. Within the septic tank, wastewater undergoes natural, physical, chemical, and biological treatment through microbial processes. Wastewater leaves the septic tank through a separate pipe that leads to a leach field and perforated pipes or a seepage pit to allow the treated wastewater to infiltrate into the surrounding soil. Once in the soil, microbes continue to treat the water and remove excess nutrients that may remain (USEPA 2011).

<u>Wastewater Disposal in the Broad Beach Area</u>

Wastewater disposal along the 1.5-mile-long reach of Broad Beach Road is provided by a mix of public and private wastewater disposal systems (Figure 3.7-4). Wastewater from residences along Broad Beach west of Lechuza Point is collected through a public sewer line located beneath Broad Beach Road and treated at the LACDPW-operated Trancas Water Pollution Control Plant located across PCH, approximately 0.5 mile north of Broad Beach. Existing public wastewater collection infrastructure along Broad Beach Road consists of a 4-inch-diameter ductile iron pipe (DIP) force main that runs from the Lechuza Point Pump Station located at Point Lechuza Drive and east along Broad Beach Road to Trancas Canyon Road. This sewer line turns north along Trancas Canyon Road across the PCH and connects to the Trancas Water Pollution Control Plant (LA County 2006, 2011b).



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Wastewater Treatment in the Vicinity of Broad Beach

FIGURE 3.7-4

The majority of Broad Beach is not a part of the Trancas Zone of the LACDWP Consolidated Sewer Maintenance District, though 19 residences within the Project and the Consolidated Sewer Maintenance District receive wastewater treatment through the Trancas Water Pollution Control Plant (LA County 2011c). When this sewer system was established in the 1960s, property owners along west Broad Beach Road opted to receive public wastewater disposal service, while the remaining property owners along east Broad Beach (i.e., majority of the BBGHAD) opted out of receiving public wastewater disposal services (City of Malibu 2012). Wastewater from properties located east of Lechuza Point is treated by individual private OWTS. In order to connect to this system and receive public wastewater services, property owners would need authorization, including accordance from the 177 homeowners within the Malibu West subdivision; approval by the Los Angeles County Board of Supervisors and the Local Agency Formation Commission; and a LARWQCB review (Yi 2012). Additionally, there is limited wastewater treatment capacity at the Trancas Wastewater Treatment Plant, which is currently operating at 75 percent of capacity (Yi 2012). Given this high level of complexity, connecting to this sewer system may not be a viable option for residences currently served only by OWTS.

Private OWTS are maintained by the homeowner, although city regulations provide guidelines for maintenance and inspections. OWTS installed on Broad Beach include effluent infiltration designs of both leach fields and seepage pits. As seen in Figures 2-2 through 2-6, the locations of leach and drain fields within the Public Trust Impact Area on Broad Beach Road vary from parcel to parcel, with some systems located landward of existing homes, some located in centralized courtyards or the homes, some located seaward of the homes, and some with OTWS elements spread throughout the property. Most leach or drain fields are located seaward of existing homes (Table 3.7-23).

Table 3.7-23. Location of OWTSs along Broad Beach

Total residences with an OWTS[1]	Residences with Multiple OWTS locations	OWTS Location in Parcel[2]		
		Landward	Middle	Seaward
95	13	40	25	45

Source: BBGHAD 2013a.

[1] Four undeveloped parcels not within the Trancas Zone are included in the total count of residences with an OWTS.

[2] The location of the OWTS for undeveloped parcels was determined based on previous development or personal communication with the city of Malibu (4/3/14 via email).

In all OWTS locations, the soil within the area of the leach field or seepage pit is sandy and effluent discharge migrates vertically through the sand to reach groundwater sources or bedrock material (City of Malibu 2007). In exploratory studies, standing groundwater has been found above the sand/bedrock contact, which occurs at a depth of 16.0 feet (City of Malibu 2007).

A number of homes located at the west end of Broad Beach dispose of wastewater through onsite ATUs, or "package plants." These systems are modular sewage-treatment units that treat effluent using natural processes that require oxygen. The system consists of an aeration chamber, a mechanical agitator, and a sludge settling compartment. Secondary treatment takes place in the aeration chamber. Some units also include a disinfection device (Virginia State University 2009). Effluent from a package plant can be discharged into a leach field or diverted into another receiving stream for disposal. Discharge in the Public Trust Impact Area would likely be through a leach field.

In 2013 and 2014, Ensitu Engineering conducted studies of wastewater disposal in the Public Trust Impact Area for the BBGHAD (BBGHAD 2013b, 2014; see Appendix I). These studies evaluated the status of OWTS along Broad Beach, including the locations of existing leach fields, lot size, availability of leach field or waste water system expansion or relocation areas, and the relationship of the existing revetment to these systems. Ensitu also reviewed and interpreted City Code Section 15.14.030, *On-site wastewater treatment system operating permit requirement*, which requires inspection and evaluation of such systems to obtain an operating permit for the OWTS prior to change in ownership, major remodel, or plumbing expansion. Based on this review, Figure 3.12-2 shows a sample of homes along Broad Beach where, according to Applicant-prepared studies, relocation of the OWTS landward of the home is potentially infeasible under city code due to revetment location where leach field expansion would be necessary, as evaluated and identified by Ensitu (BBGHAD 2014). Ensitu also opined that constraints are posed to OWTS expansion or relocation based on city ordinance interpretation and concluded that many OWTS would need to be upgraded to meet city code requirements prior to resale, repair or expansion of the homes.

However, the city code allows some flexibility to obtain an operating permit for the OWTS. Under constrained circumstances, the city would work with individual property owners on such issues and evaluate "alternative on-site wastewater treatment systems" that could be used to meet Malibu Plumbing Code requirements (City of Malibu, 2014).[7] Based on review of city ordinances and contact with city officials, wastewater disposal constraints would not necessarily constrain options for revetment location or relocation. (See Section 4, *Project Alternatives.*) While many of these homes may not have the ability to expand their leach fields to meet city codes to serve a major remodel or home expansion, past home construction or remodels were approved by the city based on these systems which appear adequate to serve existing development.

[7] Pursuant to Malibu Municipal Code, an Alternative OWTS provides enhanced wastewater treatment that meets or exceeds secondary treatment standards as defined by Section 221 of the Malibu Plumbing Code. It is not limited to a specific type of system (e.g., package plant or modified conventional system).

Package plants differ from conventional OWTS in several ways. A primary difference is that package plants treat effluent through aerobic processes while OWTS use anaerobic processes. This leads to differences in energy consumption, biomass production, nutrient demand, and nutrient removal (Table 3.7-24). OWTS require less energy consumption, have a lower nutrient demand to facilitate biochemical processes, and produce a lower amount of biomass as a result of the process. Package plants result in higher nutrient removal from effluent, which may be beneficial if effluent is discharged into the environment. They may also require more pumping than OWTS since biomass production is higher (Gasparikova et al. 2004).

Table 3.7-24. Anaerobic and Aerobic Treatments Compared

Parameter	Anaerobic OWTS	Aerobic Package Plants
Energy consumption	Low	High
Biomass production	Low	High
Nutrient demand	Low	High
Nutrient removal	Low	High

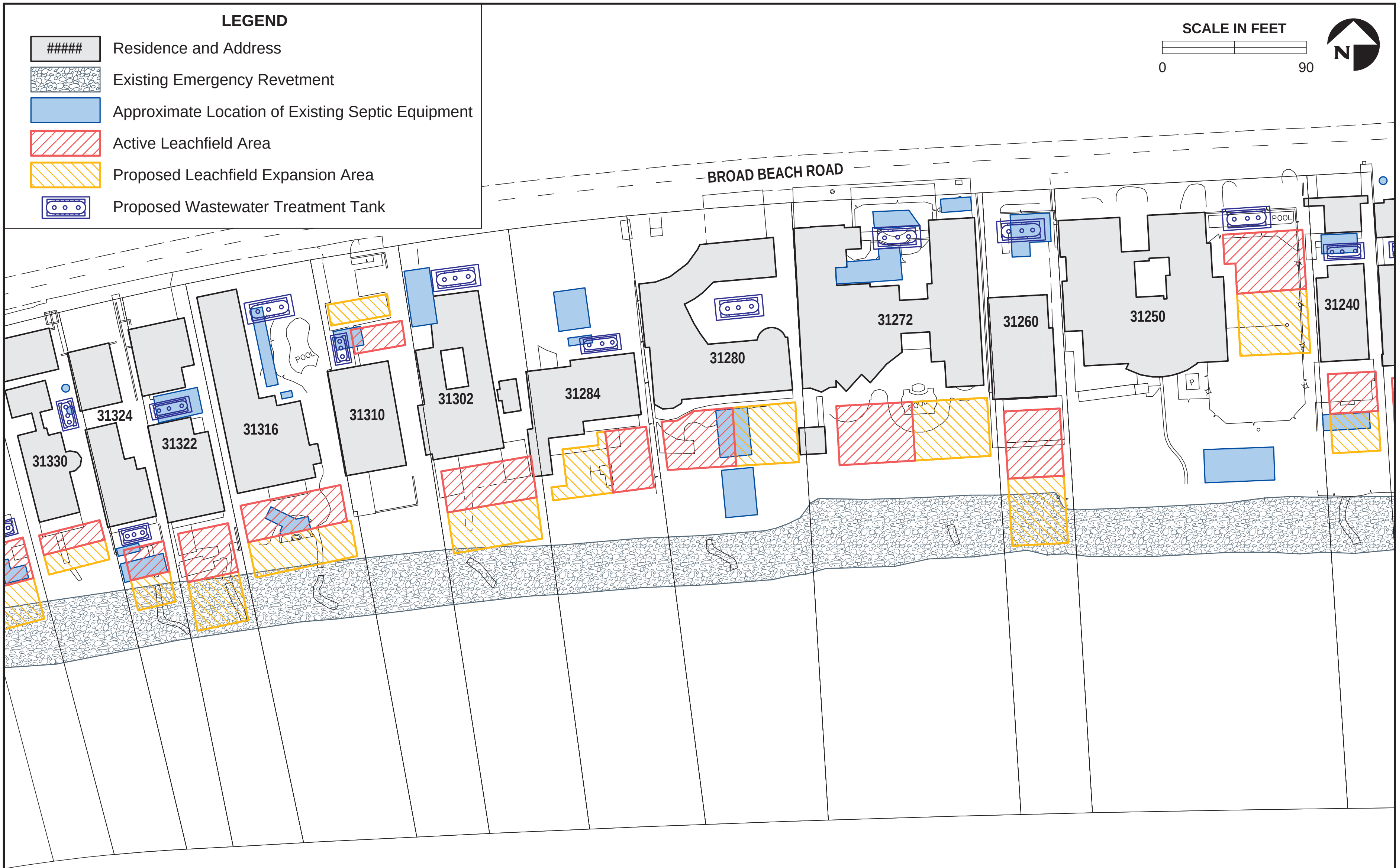
Source: Gasparikova et al. 2004.

Storm Water Drainage on Broad Beach

Eleven existing public storm drains along Broad Beach Road collect runoff from Broad Beach Road, PCH, and adjacent areas. These storm drains channel flows across Broad Beach Road and under existing private parcels to outlets at the beach. Of these 11 drains, six have visible outlets at the beach. The remaining five storm drains appear to have outlet or inlets along Broad Beach Road, but their outlets are not visible on the beach (Illustration 3.7-6).

***Illustration 3.7-6**. Six public storm drains currently empty onto Broad Beach; five others may be buried under the revetment or disabled.*

Management of these drainage systems is the responsibility of the city of Malibu and private homeowners; the city manages elements of these systems inland of existing homes and homeowners manage elements of the system on the ocean side of their homes. The city does not own, hold easements for, or manage these storm drains where these drains pass under private parcels along Broad Beach Road, or their outlets onto Broad Beach; the homeowners are responsible for maintenance or improvements to the seaward end of these drains, including the outlets (City of Malibu 2012). Los Angeles County also maintains two drains to the west of the Public Trust Impact Area along Victoria Point Road and Point Lechuza Drive, though no county drains were identified within the Public Trust Impact Area adjacent to the CSLC Lease Area. In addition to the 11 large drains in the Public Trust Impact Area and the two at Lechuza Point, there are many private drainage systems that range in design from outlets in private sea walls to drainage channels constructed under private beach access stairways.



Source: BBGHAD. 2014. Response to comments RE: Coastal Development Permit Application 4-12-043 (Broad Beach), Prepared by Ensitu Engineering. February.

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Existing Septic System and Leach Field Locations and Proposed Septic System Locations and Leach Field Expansions

FIGURE 3.7-5

Eight of the existing city drains would be modified upstream of the Public Trust Impact Area as part of the proposed construction of a pending Biofiltration Project, designed to improve local water quality. The city of Malibu received two grants in 2009 from the SWRCB through the State's Proposition 84, Areas of Special Biological Significance (ASBS) Grant Program, which is dedicated to improving water quality. Of the total $3.1 million awarded, $2.5 million is dedicated to the biofiltration project that will be located on Broad Beach Road. The biofiltration system will collect dry weather and storm water flows from eight existing drain catch basins and one newly constructed storm drain catch basin along a 1-mile stretch of Broad Beach Road (along the Public Trust Impact Area). The system would allow the flow to percolate through the ground and reduce contaminated road runoff from reaching the ocean untreated (City of Malibu 2011a). Through infiltration, evapotranspiration, and biofiltration, pollutants in the runoff would be substantially reduced before reaching the ocean (City of Malibu 2010). Construction for the biofiltration project is anticipated to begin in 2014, with construction lasting approximately 4 months (City of Malibu 2014).

3.7.6.2 Regulations Pertaining to the Public Trust

State and other statutes related to utilities and service systems are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. Pursuant to a consolidated CDP, the CCC will address the Project's consistency with the Coastal Act and city of Malibu LCP.

3.7.6.3 Public Trust Impact Criteria

Impact criteria were adapted from the Malibu General Plan. Impacts to public services would be a major adverse effect if the Project would:

- Expose existing wastewater treatment systems to damage from coastal processes or other natural/man-made events with resultant pollutant releases; or
- Obstruct or inhibit drainage from existing storm drain systems

Where applicable, this impact analysis considers the CSLC Lease Area and Public Trust Impact Area both in their existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting without the emergency revetments, characterized by a narrow beach and dune habitat.

3.7.6.4 Public Trust Impact Analysis

<u>Historical Utility Characteristics of Broad Beach (pre-2010 revetment)</u>

The pre-revetment description of the CSLC Lease Area and Public Trust Impact Area is consistent with existing description with the exception of exposure and protection of the OWTS associated with the residences adjacent to the CSLC Lease Area. A total of 121 legally assessed parcels are within the Public Trust Impact Area and adjacent to the

Table 3.7-25. Parcel Summary

Description	Quantity
Legally Assessed Parcels	121
Functioning Parcels	114
Developed Parcels	110
Undeveloped Parcels	4
OWTS	95*
Parcels included in Trancas Wastewater District	19

Source: BBGHAD 2013a.

* Includes four undeveloped parcels that lie outside of the Trancas Zone.

CSLC Lease Area (Table 3.7-25). Five of these parcels are developed in conjunction with a neighboring parcel to result in 114 “functioning” parcels. Of the 114 functioning parcels, 110 have buildings (109 homes and one beach club) on them, and 95 of those 110 buildings treat their wastewater though an OWTS. Four of the parcels included in the count of OWTS are currently undeveloped or vacant (BBGHAD 2013a).

As described in Section 2, *Project Description*, prior to construction of the emergency rock revetment on the beach, private property owners installed permitted and unpermitted sand bag revetments, rock revetments, and sea wall barriers to protect their property and all OWTS infrastructure. As-built plans show 72 sand bag barriers, 21 owner installed rock revetments, and eight sea walls constructed for protection from wave damage (Table 3.7-26). Public and private drainage through the sand bag revetments was achieved through engineering drainage pipes into the construction of the revetment. Illustration 3.7-7 shows different drain outlets along the beach.

Table 3.7-26. Existing Protection Structures Installed by Property Owners.

	Parcels	Permitted	Unpermitted
Sand bags	72	49	23
Owner installed rock revetment	21	11	10
Sea wall	8	8	0
Total	101	68	33

Source: BBGHAD 2013a

OWTS that would be most at risk of exposure are those with leach fields or other OWTS elements located seaward of the residences with no coastal protection structures installed. The next most at risk parcels would be those with leach fields or other OWTS elements seaward of the residences that have some kind of protection structure between the OWTS and the beach. Two parcels fall into the first category of having OWTS elements seaward side of the residence with no protection structure along the boundary of the property; 45 parcels have all or some part of the OWTS seaward of the residence and also have an owner installed protection structure along the boundary of the property.

Sand bag protection structures are by far the most common owner installed type of protection. These structures were efficient to construct and effective at slowing erosion caused by the continual washing of waves. Over time, these sand bags deteriorate, reducing their effectiveness, adding debris to the beach and requiring either replacement or a new type of structure (Illustration 3.7-8).

Illustration 3.7-7. *Examples of pipes through the revetment. Top row: Storm water drains protruding through sand bag revetment along Broad Beach to drain Broad Beach Road and upland watershed. Bottom row: Construction of a storm drain through the sand bag revetment. Some drains were designed with contained outfalls while others remained as plain pipes draining directly on to the beach.*

Illustration 3.7-8. *Examples from left to right of sand bag revetments in increasingly degraded states due to time, exposure to the elements, and continual impact from wave action.*

<u>Impacts to Wastewater Disposal</u>

While the Project does not involve installation or removal of wastewater infrastructure, impacts to wastewater disposal in the Public Trust Impact Area and CSLC Lease Area may potentially result from Project implementation. These impacts, both direct and indirect, are discussed below.

Impact UTL-1: Project Increases Protection of Seaside Broad Beach OWTS

Authorization of the emergency revetment, proposed supplemental sand bag installation, as needed, and creation of a wide sandy beach and new dune system would protect existing leach and drain fields from damage by wave action over the mid-term, preventing potential water pollution (Beneficial, Class B).

<u>Impact Discussion (UTL-1)</u>

This impact is similar to **Impact MWQ-3 - Revetment Retention Impacts Associated with Nutrient Loading of Area Waters** (see Section 3.4, *Marine Water Quality*). Because the impact is beneficial, no AMMs are identified.

Impact UTL-2: Long-Term Exposure of OWTS to Coastal Erosion

Limited nourishment events and granting permanence to substandard revetment construction would expose OWTS to damage from wave and tidal action over the long-term (e.g., 20+ years) (Major Adverse Effect, Class Mj).

<u>Impact Discussion (UTL-2)</u>

The Project would include authorization of a revetment that is not constructed to endure direct exposure to continual impacts by tides and waves over the long term, particularly with sea level rise. Further, the Applicant is proposing only two significant sand nourishment events (i.e., sand deposition). After these two beach nourishment events are implemented, only periodic backpassing is proposed to maintain the beach. Without additional sand deposition activities, subsequent coastal erosion would eventually expose the revetment to direct wave and tidal action.

Because the revetment is constructed of substandard-sized rock that is not keyed together, driven into bedrock or set deeply into the beach, it is not designed to resist exposure to long-term continual wave and tidal action. Therefore, after loss of the beach and dune systems, projected to occur in 10 to 20 or more years, the revetment would begin to lose integrity as smaller rocks and boulders are detached from the revetment and scattered by surf action. Well within the economic lifespan of homes along Broad Beach (an estimated 100 years, per Malibu's LCP), this process can be expected to lead to deterioration of the revetment to such an extent that high winter surf could break through gaps or overtop lowered sections, thereby damaging septic systems and leach fields with potential major adverse effects to water quality and the public's right to use and enjoy public trust resources. Further, proposed emergency sand bag revetments would serve only as interim protection for homes and OWTS unprotected by the revetment along 550 of beach at the east end of Broad Beach. Over the long term, these sand bag revetments would be destroyed by wave action and septic systems and leach fields subject to damage or destruction. This process can be expected to accelerate with sea level rise. The process may also lead to requests for additional emergency permits to repair the revetment or to unpermitted additions to the revetment, creating enforcement issues for property owners and local and State agencies.

<u>Avoidance and Minimization Measure(s)</u>

> Implementation of **AMM TBIO-1a** (Implementation of a Comprehensive Dune Restoration Plan) would address this impact, but it would remain a major adverse effect. Reducing this major adverse impact would require implementation of one of several alternatives to the Project that would improve longer term protection of OWTS from damage associated with waves and tides and, to a lesser extent, sea level rise or that include relocation or removal of leach fields. See Section 4, *Alternatives*.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Implementation of AMM TBIO-1a would restore dunes and public beach to protect OWTS from coastal erosion over the long-term life of the Project.

Impact UTL-3: Effects on Existing Public Drainage Systems

Construction of the revetment covered existing exposed public drainage pipes, and construction of the restored dunes and beach nourishment would potentially further bury or obstruct storm drains (Minor Adverse Effect, Class Mi)

<u>Impact Discussion (UTL-3)</u>

The Project proposes to accommodate drainage and runoff from existing public storm drains by sculpting the proposed new dune system around the outlets to allow runoff to drain onto the wide sandy beach. All of these existing drains would be below the crest of the new dunes and likely below the elevation of the landward portions of the beach. Reduced beach fill would be used along the drainage channels from the outlet to the ocean to aid with the seaward drainage of runoff.

Historically, drainage pipes that once were buried below the dunes became exposed as Broad Beach retreated through natural coastal processes. Prior to construction of the revetment, these pipes protruded from the sand-bagged property faces. Construction of the revetment reduced the length of protruding pipe, and in some cases the pipe was completely covered by the revetment rocks. Introduction of the revetment may have altered the drainage flow from the pipes. Instead of draining directly to the sand, the water now first drains onto and through the revetment rocks. This may slow the draining water and allow it to percolate into the sand, thereby decreasing sand erosion along the path of draining water. However, any alteration of the drainage flows has not adversely affected storm water drainage to the beach. Overall, the addition of the rock revetment had a negligible effect on the public drainage pipes.

The Project would include creation of a system of restored sand dunes approximately 55 to 102 feet in width and 20 feet in height, in addition to a sandy beach of 104 to 286 feet in width and 12 to 17 feet in depth. The proposed new dunes would completely bury the existing revetment, as well as the private drain outlets. The dune system would be sculpted around the six public drains with outlets along the beach. A break in the dune system would leave the drain outlets unobstructed and free to naturally drain into and through the sand out to the ocean.

Potentially major adverse effects on drainage into the CSLC Lease Area could result from burying or obstructing storm drains. These effects may include localized drainage problems, water backup, pooling, or flooding, and possible secondary consequences associated with erosion of newly restored dunes and public beach. Because sand is highly porous, burying such drains below the restored dune system has a low potential to create drainage problems during low-flow events, which would likely be absorbed by and percolate though the new dune system. However, during moderate- to high-flow events, some potential exists for backup and obstruction of flood flows due to the thousands of tons of sand proposed to be placed over outlets.

Sculpting the proposed dunes around the six existing public drain outlets would involve leaving gaps in the dunes and using reduced amounts of beach fill in the potential runoff channels fronting these outlets. This would interrupt the continuity of the dunes, reducing their effectiveness in shielding the revetment from wave action and public views, interrupting habitat continuity within the dunes, and potentially creating a vehicle for high flows to erode newly created dunes as runoff channels meander. This could potentially damage revegetated dunes, proposed cross dune access walkways, and other dune management improvements (e.g., signs, ropes and bollards, and fencing).

The proposed drainage plan has the potential to create drainage and flood impacts, as well as beach erosion and possible damage to the proposed new dunes. These constitute potentially major adverse impacts. Implementation of the AMM outlined below would reduce this impact to a minor level.

<u>Avoidance and Minimization Measure(s)</u>

AMM UTL-3: Master Drainage Plan (MDP). The Applicant shall prepare and submit a MDP to the California State Lands Commission (CSLC) staff for review and approval. This plan shall include measures to minimize potential for water backup in storm drains, and associated drainage/flooding concerns, as well as minimizing or avoiding damage to newly created dune Environmentally

Sensitive Habitat Areas (ESHAs) and beach habitats. This MDP shall address all existing and proposed modifications to public storm drains and pipes in the lease area, including those seaward of the mean high tide line. It shall be prepared by a qualified Civil Engineer and be based upon data and analysis provided by a registered hydrologist. At a minimum, the MDP shall:

- Identify the exact location and size of all public drains along Broad Beach, including its relationship to State sovereign land and Lateral Access Easements (LAE), hydrological data on the watersheds and flow characteristics of each drain, particularly high flood flows (e.g., 100-year event) and potential for flooding or drainage problems or erosion of dune and beach areas.
- Design plans (overhead and cross-sections) for proposed modifications to public storm drains, including existing storm drains incorporated into the project design.
- Identify specific drainage proposals for each storm drain and how they would affect public trust resources.
- Identify measures to safely and adequately convey drainage through and across the proposed dune system and beach, including methods to avoid or minimize impacts to public trust resources and the ESHAs.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Implementation of AMM UTL-3 would reduce adverse effects to public drainage systems that may result from Project implementation. Specifically the master drainage plan would minimize the potential for water backup, pooling, or flooding, and possible secondary consequences associated with erosion of newly restored dunes and public beach.

3.7.6.5 Summary of Utilities and Service Systems Impacts and AMMs

Impact	Class	AMMs
UTL-1: Project Protection of Seaside Broad Beach OWTS	**B**	No AMMs recommended
UTL-2: Long Term Exposure of OWTS to Coastal Erosion	**Mj**	**AMM TBIO-1a:** Implementation of a Comprehensive Dune Restoration Plan
UTL-3: Effects on Existing Public Drainage Systems	**Mi**	**AMM UTL-3:** Master Drainage Plan (MDP)

3.7.7 ENVIRONMENTAL JUSTICE

This section of the Revised APTR analyzes whether the Project has the potential to adversely and disproportionately affect minority populations and low-income communities, thus creating a conflict with the intent of the CSLC's Environmental Justice Policy. This section focuses on the western portion of the city of Malibu, including residents in both Broad Beach and the surrounding area that could be exposed to environmental impacts as well as impacts to inland communities along the sand transportation routes. Additionally, since the beaches and submerged lands are public trust resources that are also used for economic activity, this analysis also considers sensitive industries that may be impacted through Project implementation.

3.7.7.1 Environmental Setting

Relationship to Public Trust Resources and Values

The CSLC holds title to and manages the intertidal and submerged land underlying the State's navigable and tidal waterways, including Broad Beach below the mean high tide line and the associated offshore area. These lands are held under and governed by the provisions of the Public Trust Doctrine for specific public purposes such as fishing, water-dependent commerce, navigation, ecological preservation, and scientific study, among others. These public purposes are protected for all groups, including minority populations, low-income communities, and sensitive industries.

Definition of Environmental Justice

State law defines environmental justice as "fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (Gov. Code § 65040.12, subd. (e)). This definition is consistent with the Public Trust Doctrine principle that management of trust lands is for the benefit of all people, and minority populations, low-income communities, and sensitive industries need to be considered to ensure that they do not face disproportionate adverse impacts from implementation of management activities. The concept of disproportionate environmental health impacts and burdens refers to the finding that some populations systematically experience higher levels of risks and impacts than the general population, and federal guidelines recommend that the Community of Concern selected be the smallest governmental unit that encompasses the footprint for each resource (USEPA 1998).

Demographics in the Vicinity of Broad Beach and in the BBGHAD Inland Project Area

The CSLC Lease Area and Public Trust Impact Area are located on the western coastal portion of the city of Malibu, Los Angeles County. Census Bureau (2010) designations for the areas that include the CSLC Lease Area and Public Trust Impact Area, and their associated populations, are as follows:

- County of Los Angeles (population 9,818,605)
- County Subdivision of Agoura Hills/Malibu (population 63,824)
- City of Malibu (population 12,645)
- Western portion of the city of Malibu, comprising Census Tracts 8004.06 (population 2,644) and 8004.08 (population 7,122)

The smallest governmental unit that represents this region is the sum of census tracts 8004.06 and 8004.08. U.S. Census data from 2010 for these census tracts were used to characterize the community near Broad Beach for this analysis (Illustration 3.7-9).

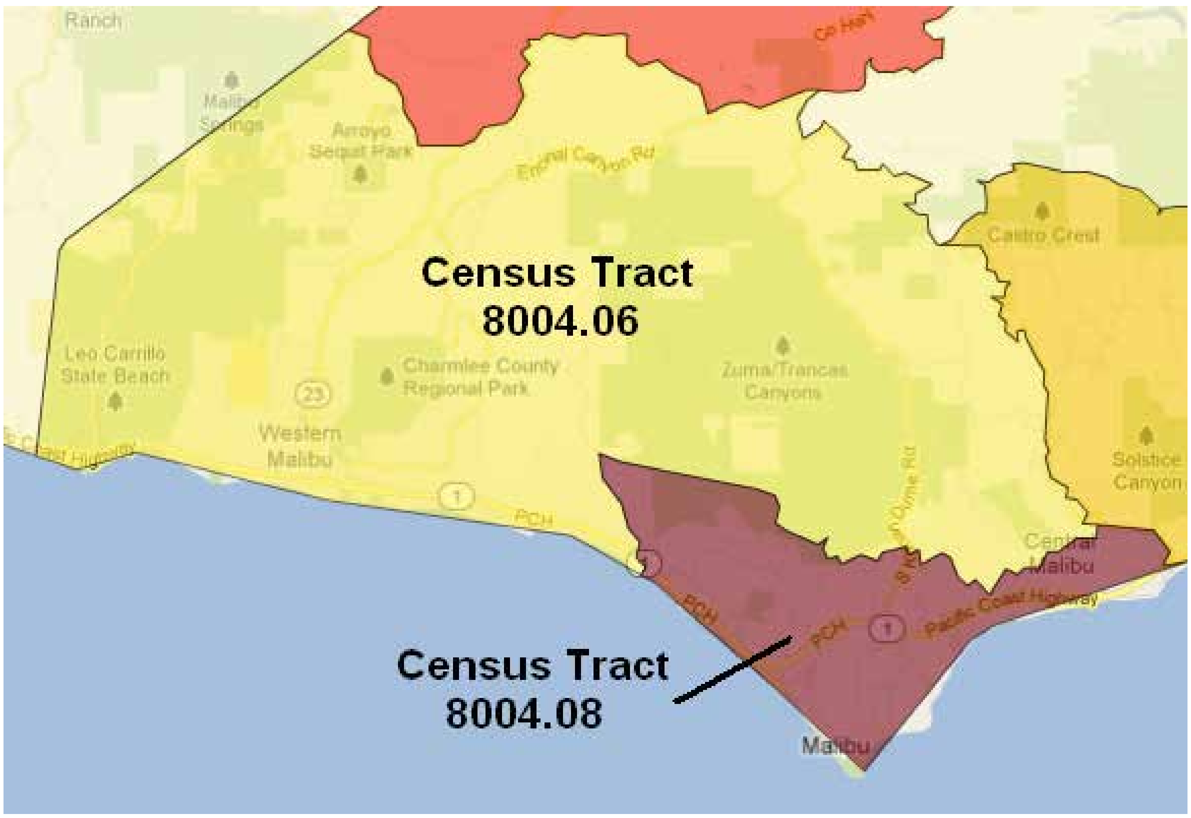


Illustration 3.7-9*: The smallest governmental unit that represents the Project area is the sum of census tracts 8004.06 and 8004.08.*

The demographic scope of the BBGHAD Inland Project Area and proposed inland sand transportation routes includes Ventura County in its entirety.

- County of Ventura (population 802,983)

Minority and Low-Income Populations

The smallest Census-designated area that includes race and ethnicity statistics is at the census tract level. Within Census tracts 8004.06 and 8004.08, Asians comprise the largest minority group (2.4 percent), while Pacific Islander and Native American groups comprise the smallest percentage of the population (0.1 percent combined). All minority groups are relatively small within Census tracts 8004.06 and 8004.08, with 10.0 percent of the population belonging to any minority group, as compared to 49.7 percent in all of Los Angeles County (Table 3.7-27). This does not represent a disproportionately high percentage of minorities in the vicinity of Broad Beach as compared to the county as a whole.

Table 3.7-27. Race and Ethnicity in 2010

	Study Area		Malibu		LA County		Ventura County	
	Population	%	Population	%	Population	%	Population	%
Total Population	9,766	100	12,645	100	9,818,605	100	802,983	100
White	8,788	90.0	11,565	91.5	4,936,599	50.3	699,465	87.1
Minority	978	10.0	1,080	8.5	4,882,006	49.7	103,518	12.9
Black	173	1.8	148	1.2	856,874	8.7	17,355	2.2
Asian	239	2.4	328	2.6	1,346,865	13.7	53,865	6.7
Native American	18	0.2	20	0.2	72,828	0.7	10,795	1.3
Pacific Islander	11	0.1	15	0.1	26,094	0.3	2,462	0.3
Other	223	2.3	182	1.4	2,140,632	21.8	0	0.0
Two or More	314	3.2	387	3.1	438,713	4.5	19,041	2.4
Hispanic*	747	7.6	769	6.1	4,687,889	47.7	309,092	38.5

Source: U.S. Census Bureau 2010.

*May be counted in one or more of the other categories as well.

Hispanic or Latino write-in respondents could potentially be categorized under any of the U.S. Census Bureau-designated classification groups including "other" in addition to the Hispanic classification (the U.S. Census Bureau considers Hispanic an origin, not a race). Within Census tracts 8004.06 and 8004.08, Hispanic/Latino write-in respondents comprised 7.6 percent of the population, as compared to 47.7 percent of the population of Los Angeles County (Table 3.7-27). This does not represent a disproportionately high percentage of people with Hispanic origin in the Project Area as compared to the county as a whole.

Ventura County has a 12.9 percent minority population, which is not substantially different from the 10.0 percent minority population in within Census tracts 8004.06 and 8004.08. Ventura County does not face a disproportionately high percentage of minorities relative to the western portion of Malibu. However, Ventura County has a disproportionately high Hispanic population relative to west Malibu with 38.5 percent in Ventura County versus 7.6 percent in west Malibu (Table 3.7-27). Therefore, the potentially impacted population along the inland sand transportation routes has a disproportionately high Hispanic population relative to the population near Broad Beach.

Census data from the 2010 Census were also analyzed to determine poverty status in the Broad Beach vicinity. As displayed in Table 3.7-28, 5.2 percent of the individuals residing near Broad Beach and 6.3 percent of residents in the city of Malibu had income

Table 3.7-28. Poverty Status in 2009

	Study Area	City of Malibu	LA County	Ventura County
Population for Whom Poverty Status was Determined	8,851	11,284	9,604,871	813,821
Income in 2009 Below Poverty Level	463	707	1,508,618	87,189
Percent with Income in 2009 Below Poverty Level	5.2%	6.3%	15.7%	10.7%

Source: U.S. Census Bureau 2010.

levels below the poverty level in 2009. In contrast, 15.7 percent of Los Angeles County residents had income levels below the poverty level in 2009. Census tracts 8004.06 and 8004.08 do not include a disproportionately high percentage of residents below the poverty line relative to the county in which the Project is taking place.

When comparing income levels in the BBGHAD Inland Project Area, there is a disproportionately high percentage of residents below the poverty line in the BBGHAD Inland Project Area (in Ventura County) (10.7%) relative to the community near Broad Beach (5.2%) (see Table 3.7-28). This represents a disproportionately high percentage of low-income residents that may face adverse impacts related to moving sand along the sand transportation routes, relative to the residents in Broad Beach that would gain benefits from nourishment of Broad Beach.

Sensitive Industries

Several industries rely on the public trust resources at Broad Beach for their economic viability. Recreational fishing and/or diving operations constitute the local social and economic sector most likely to be impacted by the Project. Additionally, commercial fisheries may be impacted. These industries are reliant on the State's coastal resources, so they are governed by State regulations regarding coastal waters. Coastal marine environments and associated species are protected by the Marine Life Protection Act (MLPA; Fish & G. Code, §§ 2850-2863), which also regulates what economic activities are allowed in designated coastal waters. Under the MLPA, some coastal areas of California are designated as Marine Protected Areas (MPAs) that have specific rules about the permitted use of the area. The South Coast MPAs went into effect in 2012. The MLPA defines the Southern California coast as the coastal area from Point Conception to the California/ Mexico border, which includes beaches within the Public Trust Impact Area.

The Public Trust Impact Area is located in the coastal area designated by the MLPA as the Point Dume State Marine Conservation Area (SMCA). The Point Dume State Marine Reserve (SMR) is east of and adjacent to the SMCA. The SMR is a no-take reserve, so all recreational and commercial fishing activity is prohibited in this area. The SMCA allows the take of specific species by both commercial and recreational fishermen. Commercial fishermen are allowed to catch finfish—defined as species of bony fish or cartilaginous fish (e.g., sharks, skates, and rays)—except pelagic finfish, including Pacific bonito and white seabass. Pelagic finfish is a subset of finfish defined by the MLPA as: northern anchovy, barracudas, billfishes, dolphinfish, Pacific herring, jack mackerel, Pacific mackerel, salmon, Pacific sardine, blue shark, salmon shark, shortfin mako shark, thresher sharks, swordfish, tunas, and yellowtail. Recreational fishermen are permitted to catch pelagic finfish, including Pacific bonito and white seabass by spearfishing. The SMCA does not allow the take of amphibians, invertebrates, plants or algae. Under Point Dume SMCA guidelines, commercial fishing for particular species is permitted in this MPA. The beach and coastal waters offshore Broad Beach are also used for recreational fishing and/or diving operations.

3.7.7.2 Regulations Pertaining to Environmental Justice

State and other statutes related to environmental justice are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*.

3.7.7.3 Public Trust Impact Criteria

A conflict with the CSLC's Environmental Justice Policy would occur if the Project:

- Has the potential to disproportionately affect minority and/or low-income populations at levels exceeding the corresponding medians for the county in which the Project is located; or
- Results in a substantial, disproportionate decrease in the employment and economic base of minority and/or low-income populations residing in the county and/or immediately surrounding cities.

Impacts to public users and recreational and commercial users (e.g., commercial fishermen and recreational divers) in the immediate Broad Beach vicinity and to residents, public users, and recreational and commercial users in beaches down coast of Broad Beach are considered. This impact analysis considers Broad Beach in its existing setting subsequent to the 2010 emergency rock and sand bag revetments installation.

3.7.7.4 Public Trust Impact Analysis

The social and economic effects of the Project would be beneficial. A nourished beach at Broad Beach would cover the exposed temporary emergency revetment with a wider and larger sand area backed by a restored dune system. Expansive sandy beaches provide greater recreational opportunities and opportunity for public access, and enhance tourism in the region. Broad Beach is a public beach, so beach nourishment would provide benefits to all groups, including minority and low-income beach users. Also, private property and infrastructure would have additional protection from wave action and storm events while nourishment activities continue at Broad Beach. Potential users of Broad Beach and the waters offshore could come from any ethnicity or income level. In contrast, residents of Broad Beach are more likely to be of relatively higher income levels. The demographics of Broad Beach and the area surrounding Broad Beach do not qualify as a disadvantaged population within the CSLC's Environmental Justice Policy.

Impact EJ-1: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Emergency Revetment

The presence of the emergency revetment impacts public access, and has the potential to disproportionately affect minority and/or low-income populations (Negligible Effect, Class N).

<u>Impact Discussion (EJ-1)</u>

Broad Beach is a public beach that people of all races and income levels have an opportunity to visit. The emergency revetment limits public access to public trust lands and easements granted the public for coastal access (see Section 3.5, *Land Use, Recreation and Public Access*), resulting in adverse impacts to all members of the public, including minority and low-income groups. However, such impacts would not disproportionately affect minority or low-income groups. Further, the Project would include burial of the emergency revetment, increasing public access to Broad Beach over the short- to mid-term (e.g., 10 to 20 years). This would lessen adverse impacts to public access from the presence of the revetment until such a time as nourishment ceases and the revetment becomes exposed. At that time, access impacts would occur to all members of the public, including minority and low-income groups. Therefore, this impact is negligible.

Impact EJ-2: Potential for Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to Beach Nourishment at Broad Beach

Beach nourishment activities would not have impacts that could disproportionately affect minority and/or low-income populations in the Project area (Negligible Effect, Class N).

Impact Discussion (EJ-2)

No disproportionately high levels of minority or low-income residents are located in the Broad Beach vicinity. According to the 2010 Census, minorities comprise 10.0 percent of the population in the western portion of Malibu, compared to 49.7 percent in Los Angeles County. Also, 5.2 percent of the individuals residing within west Malibu had income levels below the poverty level in 2009, compared to 15.7 percent of Los Angeles County residents. Because the minority and low-income composition of west Malibu is substantially lower than the minority and low-income composition of Los Angeles County, the demographics of the most directly impacted population do not comprise a disproportionately high minority or low-income population. Therefore, the Project has a negligible environmental justice impact.

Impact EJ-3: Disproportionate Decrease in the Employment and Economic Base of Minority and/or Low-income Populations Residing in the County and/or Immediately Surrounding Cities

Beach nourishment activities would not decrease the employment or economic base of minority and/or low-income populations (Negligible Effect, Class N).

Impact Discussion (EJ-3)

The Project would place sand on the existing beach where the only structures are the emergency rock and sand bag revetment. Beach nourishment activities would improve access to the public sandy beach environment and would not have major adverse effects on commercial marine sea life; therefore, commercial fishing and recreational fishing and/or diving operations would not be adversely impacted, and the Project would not eliminate long-term jobs in the area. Therefore, the Project would not create major adverse effects to employment and the economic base of the area surrounding Broad Beach. Sand transportation and beach nourishment will create temporary jobs in the

Broad Beach vicinity, creating positive impacts to employment in the area. No physical changes to local or regional population or housing characteristics would occur.

Impact EJ-4: Increased Area of Accessible Public Trust Lands

Beach nourishment activities would increase the access to and enjoyment of public trust lands on Broad Beach (Beneficial Effect, Class B).

Impact Discussion (EJ-4)

The Project would have beneficial effects on public access to Broad Beach (see Section 3.2, *Recreation and Public Access*), which may allow increased access for minority and low-income populations. In addition, the proposed nourishment would widen the beach, increasing the amount of space for the public to enjoy the beach and the Pacific Ocean. Since the beach consists of public trust land that is open to all members of the public, all populations from the surrounding area would benefit. Therefore, this impact is considered beneficial.

3.7.7.5 BBGHAD Inland Project Area Impact Analysis

This section describes direct and indirect impacts to communities of the inland transportation routes that may potentially result from Project implementation.

Impact EJ-5: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Transportation of Inland Sand to Broad Beach.

Transportation activities may have impacts that could disproportionately affect minority and/or low-income populations in the BBGHAD Inland Project Area (Increased Intensity, Class - I).

Impact Discussion (EJ-5)

The transportation of inland sand to Broad Beach would involve 43,000 truck trips along existing roadways, which include, but are not limited to: US-101, SR-126, SR-118, SR-23, and PCH. The temporary increase in the volume of heavy trucks along these roadways would incur effects related to quality of life issues, such as increased traffic congestion, traffic noise levels, localized air quality effects, and aesthetic appeal. Ventura County has a disproportionately high Hispanic population as well as a disproportionately high percentage of low-income residents compared to west Malibu. It has been noted that in particular, the neighborhood along Walnut Canyon Road in Moorpark has a large Hispanic population. Thus, these quality of life issues have the potential to disproportionately affect the Hispanic population of Ventura County.

The effects of increased truck volume would be temporary, lasting a maximum of 5 months, and would be along roadways that are already frequently traveled by heavy trucks. However, the sand transportation routes pass through communities that include sensitive uses such as residential areas, important public spaces, and schools. Therefore, there would be an increased intensity of the use of roadways and resulting increased traffic congestion, noise, and air emissions, which could result in impacts to environmental justice communities of concern.

Avoidance and Minimization Measure(s)

Implementation of **AMM N-1a** may reduce noise impacts to minority and/or low income communities along the hauling routes, but this impact may still result in an increased intensity of noise.

Rationale for Avoidance and Minimization Measure(s)

Implementation of AMM N-1a would reduce noise associated with.

3.7.7.6 Summary of Environmental Justice Impacts and AMMs

Impact	Class	AMMs
EJ-1: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Emergency Revetment	N	No AMMs recommended
EJ-2: Potential for Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to Beach Nourishment in the Project Area	N	No AMMs recommended
EJ-3: Disproportionate Decrease in the Employment and Economic Base of Minority and/or Low-income Populations Residing in the County and/or Immediately Surrounding Cities	N	No AMMs recommended
EJ-4: Increased Area of Accessible Public Trust Lands	B	No AMMs recommended
EJ-5: Disproportionate Adverse Impacts to Minority and/or Low-income Populations due to the Transportation of Inland Sand to Broad Beach**.**	**- I**	**AMM N-1a:** Use of Noise-Attenuating Devices on Construction Equipment

4.0 ALTERNATIVES

4.1 INTRODUCTION

An important element in analyzing the effects of a project, such as the Broad Beach Restoration Project (Project), on public trust resources is to identify and assess reasonable alternatives that may avoid or reduce adverse effects on such resources and feasibly attain the majority of Project objectives. In this Revised Draft Analysis of Public Trust Resources (APTR), the California State Lands Commission (CSLC) analyzes nine Project alternatives at a programmatic comparison level based on input from California Coastal Commission (CCC), city of Malibu, and other public agency staffs, the public, and the Broad Beach Geological Hazard Abatement District (BBGHAD or Applicant).[1] Alternatives were screened using the following criteria:

- The extent to which project objectives could be accomplished;
- The potential to avoid or reduce public trust impacts; and/or
- The potential feasibility of the alternative considering site suitability, availability of infrastructure, and consistency with local and State coastal plans and regulations.

The following alternatives were selected for full evaluation and are described and analyzed in this section.

Alternative 1	Relocation of Improved Revetment Landward of January 2010 Mean High Tide Line (MHTL) with Beach Nourishment and Dune Restoration
Alternative 2	Relocation of Improved Revetment Landward of Lateral Access Easements with Beach Nourishment and Dune Restoration
Alternative 3	Maximum Pull-back of Seawall with Beach Nourishment and Dune Restoration
Alternative 4	Reduced Beach Nourishment Volume and Dune Restoration with Revetment in Current Location
Alternative 5	Beach Nourishment and Dune Restoration with No Shore Protection Structure
Alternative 6	Relocation of Improved Revetment along Upgraded Leach Fields with Beach Nourishment and Dune Restoration
Alternative 7	Removal of Existing Emergency Revetment on the Eastern End of Broad Beach with Beach Nourishment and Restoration
Alternative 8	No Beach Nourishment at West Broad Beach with Revetment at Current Location
Alternative 9	Reduced and Phased Beach Nourishment at West Broad Beach with Existing Revetment

[1] The 2012 Draft APTR analyzed six project alternatives and three sand source alternatives, including the use of offshore sources of sand. Offshore sources have since been found to be infeasible; consequently, alternatives related to offshore sand sources are not analyzed in this Revised APTR.

Appendix L, *Alternatives Screening*, contains the methodology, rationale for selecting alternatives, and results of the alternatives screening process. Several of the alternatives listed above involve relocation or construction of a hard coastal protection structure landward of all public lands and easements. These approaches would leave areas of private property lying seaward of these coastal protection structures, raising potential beach and dune design, public and private access, and wastewater management issues, including potential tradeoffs regarding private land management, public access, and the effectiveness and extent of the Applicant's proposed habitat restoration and beach nourishment.

In response to agency direction, the Applicant's consultant, Moffatt & Nichol (2013), provided preliminary design proposals for a reinforced revetment, (using geofilter fabric and larger 3- to 5-ton boulders as armoring stone), a seawall, and a range of approaches to beach nourishment and dune creation. This Revised APTR analyzes these design suggestions and, as needed, has amended them to reflect the primary focus of the APTR on protection of public trust resources in balance with meeting Project objectives. Prior to construction of any of these alternatives presented in this analysis, the BBGHAD would be required to submit detailed design plans for review and approval by the CSLC and other applicable agencies.

4.2 EFFECTS OF ALTERNATIVES ON PUBLIC TRUST RESOURCES

This Revised APTR considers a range of reasonable alternatives to the Project, which would avoid or minimize adverse effects on public trust resources and feasibly attain most of the basic objectives of the Project. Each alternative is described below, analyzed for potential adverse effects on public trust resources, and then compared to the effects associated with the Project. This allows interested parties and decision-makers to compare the impacts of each to those of the proposed Project.

New impacts to a resource area, or impacts that have the potential for a noteworthy increase or decrease in severity as a result of a particular alternative, are discussed in detail. Impacts with minimal or no changes in severity are discussed only briefly by resource area in a table specific to each alternative. Table ES-2 in the Executive Summary of this Revised APTR provides a comparative summary of the environmental impacts of the Project and alternatives.

During the implementation of an alternative, a different approach or a combination of approaches may result in corresponding changes to the impacts discussed below. For example, while relocation of the revetment landward of the January 2010 Mean High Tide Line (MHTL) and reduced beach nourishment at west Broad Beach are analyzed separately, these alternatives could be combined resulting in corresponding increases or decreases in the severity of impacts described for each separate alternative and tradeoffs regarding public access and protection of public trust resources.

4.2.1 Alternative 1: Relocation of Improved Revetment Landward of January 2010 MHTL with Beach Nourishment and Dune Restoration

Description

This alternative would be similar to the Project as it would include beach and dune restoration identical to the Project along with the retention of a landward relocated revetment. Under this alternative, the existing emergency revetment would be moved landward of the January 2010 MHTL surveyed by CSLC staff and off of all public trust lands.[2] Much of the revetment would only require minor landward movement of 3 to 5 feet to avoid public trust lands, but several sections on the eastern end of Broad Beach would require more extensive relocation of 15 to 20 feet landward. This alternative would also include placing relocated rock over geotextile filter fabric to reduce the chance of settling and strengthening the relocated revetment with an outer lining of 3- to 5-ton boulders over existing smaller rock (see Figure 4-1). These measures would reduce chance of revetment damage or failure and mobilization of boulders if the revetment were to become exposed due to long-term wave action and persistent wave attack. The reinforced revetment would be no wider than the existing 38-foot width at its base with a crest elevation of approximately 15 feet above Mean Low Low Water (MLLW). This design would be required to demonstrate that the armoring of the existing revetment would not increase the width of the revetment to minimize beach coverage, which may require removal of existing smaller stones, or incorporation of these smaller stones into a steeper reinforced revetment.

Beach nourishment, dune creation, and habitat restoration components under this alternative would remain similar to those described for the Project, with approximately 43,000 haul heavy trips being required to haul 600,000 cubic yards (cy) of sand from inland quarry sources. Similar to the Project, post construction beach width would range from 85 feet on the west end in Lechuza Cove to as wide as 230 feet near the east end of the beach. Dune habitats would be established and restored by creating a sand berm that would run along the length of the beach, with a minimum of 2 feet of sand over the rock revetment. The berm would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the revetment, depending on location. The dune system, consisting of hummocks varying in height from 17 to 22 feet above MLLW would be constructed on top of this berm. The width of the dune system would vary from 40 to 60 feet. Landward relocation of the revetment would result in the exposure of additional existing sand volume seaward of the revetment, potentially incrementally increasing the life of the initial nourishment event and reducing the probability of revetment exposure.

[2] This APTR acknowledges that there is a disagreement among experts between CSLC and Applicant surveyors as to which surveyed MHTL represents the best evidence of the last MHTL prior to artificial fill and accretion (and the boundary between state-owned land and private upland). Since the January 2010 MHTL was surveyed just prior to the emergency revetment construction, this alternative reflects revetment relocation assuming the January 2010 MHTL.

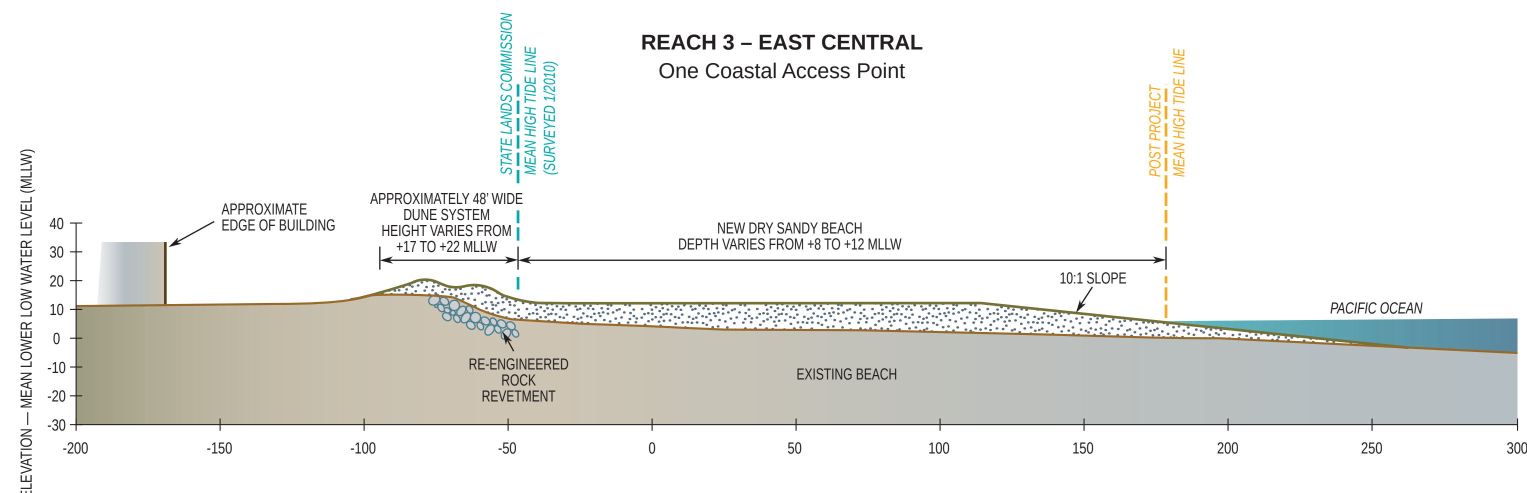
Similar to the Project, public use and access under this alternative would be permitted along the beach to the toe of the restored dunes where a line of rope or cable and signs would prohibit access to potential environmentally sensitive habitat areas (ESHA) within the dunes. This rope or cable system, combined with the approximately 40- to 60-foot-wide dune system, would also ensure residential privacy. In addition, rather than provide for 112 coastal access walkways across the restored dunes as included in the Project, this alternative would include installation of shared private coastal access walkways, with one walkway approximately every 300 feet to be shared between six homes. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dune ESHA. Each of these walkways would be roped off to minimize private access into the dunes. This distance was selected as an intermediate value that would improve dune habitat quality while minimizing disruption to private homeowner beach access.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Since the revetment would be located on private property and not public trust lands, public trust lands would be available for public access, recreation, and habitat restoration. This alternative may still interfere with public rights to pass along existing Lateral Access Easements (LAEs), many of which would remain beneath or landward of the revetment. This alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

This alternative would involve additional new major construction activities compared to the Project. Installing a properly engineered revetment would involve the use of heavy equipment to remove some of the boulders, move some of the existing boulders inland, and install larger boulders. Revetment reconfiguration would require an estimated 4,500 new haul truck trips (approximately two or three boulders per truck) to deliver additional boulders to the beach in order to armor approximately 3,650 feet of the revetment.[3] Armoring would consist of placing a layer of boulders, one or two boulders deep; from below the revetment toe to its crest. A larger staging area within Zuma Beach Parking Lot 12 may be needed to accommodate additional equipment and material storage.

[3] The westernmost 470 feet of the emergency revetment was built to a different standard and incorporated larger boulders; thus it would not receive further armoring.

Detail



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment Relocated and Armored
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Impacted Leach Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

amec

Landward Location of Improved Revetment Inland of Mean High Tide Line Off Public Land with Beach Nourishment and Dune Restoration

FIGURE 4-1

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Additional construction equipment, such as one or two heavy cranes and bulldozers, and additional construction personnel would also be required to relocate the existing rock revetment, and move and position new rock. This would result in increased fueling activity and additional traffic along the beach. This additional truck traffic would increase that associated with sand importation by approximately 10 percent. Traffic control measures for sand haul trucks entering and leaving the parking lot, as well as transiting along the beach would be implemented.

Under this alternative, as many as five onsite wastewater treatment systems (OWTS) would need to be relocated, as the relocated revetment would displace all or portions of the OWTS. Alternately, these short segments of the relocated revetment could be narrowed through steepening slopes of armor stone or narrowing the base of the revetment. This may also require removal of some private improvements, such as patios.

Similar to the Project, approximately 7 acres of the west end of Zuma Beach, including Parking Lot 12 and the beach fronting this area, would be used for construction staging. Equipment storage and staging would occur within the parking lot, sand storage, handling and transfer would occur on the beach. Heavy equipment and truck haul routes would be established on the beach. Most of Broad Beach and western Zuma Beach would remain closed to public access during weekday construction periods.

Major components of this alternative would include:

- Relocating the existing revetment 5 to 20 feet inland using heavy cranes and bulldozers;
- Importing large 3- to 5-ton boulders via an estimated 4,500 heavy haul truck trips and potentially exporting a portion of the smaller rock;
- Placing new larger boulders over and at the toe of the existing revetment using heavy cranes and bulldozers;
- Transporting sand from inland quarries to Broad Beach via 43,000 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach and hauling it up coast to Broad Beach with heavy trucks or scrapers;
- Redistributing sand on Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Creating a system of shared walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Providing two vertical public access trails across the dunes to connect existing public access points to the widened beach and ensuring public lateral access along the widened beach seaward of the January 2010 MHTL;

- Performing backpassing of the sand, ranging of approximately 25,000 to 35,000 cy, from the east to west end of the beach based on triggers and using heavy equipment such as scrapers and bulldozers; and
- Initiating one future major renourishment event of approximately 450,000 cy in roughly 10 years.

<u>Potential Impacts to Public Trust Resources</u>

This alternative to the Project would result in additional construction activities associated with the landward relocation of the revetment above the January 2010 MHTL. This alternative would result in major changes to impacts associated with terrestrial biological resources, recreation, and public access. Adverse impacts resulting from this alternative may include effects on coastal dune ESHAs on the eastern end of Broad Beach, described in the Malibu Local Coastal Program (LCP), as well as an incremental increase in potential for hazardous spills in the terrestrial and marine environment. Further, public access during construction activities would be incrementally reduced relative to the Project due to increased heavy equipment use. However, beneficial impacts associated with this alternative would include improved protection of created dune habitat through a reduction in private coastal access walkways and associated disruption of sensitive dune habitats, as well as improvement of the Project’s consistency with coastal public access and recreation polices, as the revetment would be moved landward of the January 2010 MHTL and off of public trust lands. Resource areas with major changes to impacts relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-1.

Table 4-1. Alternative 1 – Potential for Landward Relocation of OWTS

Address	Number of Affected OWTS	Potential for Landward Relocation Behind Revetment[1]	Potential for Relocation Landward of Home [2]
31324	1	Potentially Feasible	Insufficient Area
31336	1	Potentially Feasible	Insufficient Area
31280	1	Potentially Feasible	Insufficient Area
31250	1	Feasible	Feasible
31228	1	Feasible	Insufficient Area
Total Affected Properties	**Total Affected System Components**	**Number of OWTS Feasible to Relocate Landward of Revetment**	**Number of OWTS Feasible to Relocate Landward of Home**
5	5	2	1

Source: Topanga Underground 2012.
[1]Feasibility determined via aerial imagery and CAD files provided by the city of Malibu.
[2]Feasibility determined via the recommendations of Topanga Underground (2012).

Air Quality and Greenhouse Gases: Under Alternative 1, criteria pollutant emissions would incrementally increase relative to the Project associated with the 4,500 additional heavy haul truck trips used to transport armoring boulders, as well as operation of additional heavy equipment needed to relocate and improve the revetment. These emissions would increase the severity of Impact AQ-1 and exceed South Coast Air Quality Management District (SCAQMD) and Ventura County Air Pollution Control District (VCAPCD) thresholds and SCAQMD Localized Significance Criteria (LSTs) for construction activities, particularly for project-level emissions of volatile organic compounds (VOCs), and onsite and project-level emissions of nitrogen oxides (NO_x). Relative to the Project, emissions of both of these criteria pollutants would incrementally increase under this alternative as there would be additional construction activities as well as a 10 percent increase in heavy haul truck trips (Appendix G). Additionally, there would be an incremental increase in other criteria pollutants including carbon monoxide (CO), sulfur oxides (SO_x), and particulate matter (PM). This increase in emissions relative to the Project, particularly the increase in VOC and NO_x emissions, would require additional avoidance and minimization measures (AMMs) such as use of newer haul trucks with clean-burning diesel engines. Greenhouse gas (GHG) emissions described in Impact AQ-2 would be incrementally increased but would remain below SCAQMD and VCAPCD thresholds. Finally, increased truck traffic and heavy equipment operation associated with reinforcement and relocation of the rock revetment would incrementally increase toxic air contaminant emissions; however Impact AQ-3 would remain minor as thresholds would not be exceeded.

While implementation of Alternative 1 would increase short-term construction-related air quality impacts, this alternative may incrementally reduce the severity of construction emissions from backpassing (see Impact AQ-1). As previously described, additional sand would be made available with the seaward relocation of the revetment behind the January 2010 MHTL. This would incrementally delay the exposure of the revetment after the initial nourishment event based on a continued average sand loss rate of about 35,000 to 45,000 cy per year (Moffatt & Nichol 2013).[4] However, while the need for backpassing may be incrementally reduced, backpassing would still be required to maintain the wide sandy beach, and backpassing construction emissions would be a major adverse effect.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Reinforcement of the revetment with 3- to 5-ton armoring stones would reduce potential impacts of coastal processes on existing private improvements including septic systems across the length of the 4,100-foot revetment. Erosion of beach and dunes after cessation of nourishment would continue as described under the Project, with the benefits of nourishment enduring for an estimated 10 to 20 or more years and the revetment then becoming exposed as a result of persistent wave action. Anticipated sea level rise (SLR) of approximately 8.5 inches by 2030 would further exacerbate erosion effects, including increased frequency and intensity of storm surges and wave attack. However, under

[4] Estimates of sand loss rates vary from 25,000 cy/year based on past observations to 100,000 cy/year based on the GENESIS model; a loss rate of 45,000 cy/year has been determined to be a reasonable worst case estimate (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*).

this alternative, after the revetment is exposed, potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 would be reduced as the revetment would be substantially strengthened by addition of heavier armor stones. Consequently, impacts to public trust resources identified in Impact CP/GEO-3 (e.g., water quality) due to damage to homes, OWTS, and accessory structures from coastal erosion would be reduced. The reengineered revetment would also provide long-term protection for this existing development from coastal erosion.

Similar to the impact of the existing revetment, the reengineered revetment would also impact coastal processes by incrementally increasing wave refraction when exposed and negligibly depriving down coast beaches (e.g., Zuma Beach) of a minor source of sand from dune erosion. However, Impact CP/GEO-7 would remain beneficial as effects of the longshore currents on nourishment and renourishment of sand in the short- to mid-term include both erosion of sand from Broad Beach and accretion of sand at down coast beaches, and additional sand would be exposed seaward of the relocated revetment. Over the long-term, longshore currents would transport this additional sand farther down coast and possibly offshore.

The reinforced revetment with larger boulders as armoring would increase the structural stability of the revetment, reducing potential adverse impacts associated persistent wave attack. This alternative would substantially reduce the adverse effects associated with Impact CP/GEO-1. However, as the revetment could likely not be keyed into the bedrock located at 16 feet below ground level (SubSurface Designs, Inc. 2006), the risk of liquefaction, seismic settlement, and lateral spreading in the event of an earthquake would still exist as described for the Project. Impacts related to sand compatibility (CP/GEO-4), wave height and direction, tides, and currents (CP/GEO-5), wave run-up (CP/GEO-6), and sea level rise (CP/GEO-8) would be similar to those described for the proposed Project, as beach nourishment activities would remain the same.

Terrestrial Biological Resources: Relocation of the existing 4,100-foot revetment would require use of heavy cranes and bulldozers that would have major adverse effects on the existing, but often degraded southern foredune habitat. With landward relocation, the revetment would overly remaining southern foredune habitat, particularly on the eastern reach of Broad Beach. However, the most recent

Illustration 4-1: *Relocation of the revetment beyond the CSLC-surveyed MHTL would adversely affect ESHA located behind the revetment's current location. However, winter storms in 2013-2014 and the major storm event of March 2, 2014, substantially eroded remaining dune habitat leaving a large escarpment, destroying Sakrete and sand bag revetments leaving exposed debris.*

reconnaissance survey at Broad Beach found that the eastern reaches of Broad Beach were eroded extensively during storm events in March 2014 exposing and damaging sand bag and Sakrete revetments and further eroding degraded southern foredune habitat (Illustration 4-1). While heavy equipment would generally operate on the seaward side of the revetment, relocation of the structure would result in large boulders being laid into this southern foredune habitat, potentially adversely impacting native vegetation and/or sensitive wildlife species and increasing the severity of the adverse effects associated with Impact TBIO-2. Adverse effects to ESHAs resulting from this alternative would be similar in type to those described in Impact TBIO-2, but the area of impact would be increased under as additional ESHA would be disturbed due to revetment relocation prior to beach nourishment activities. Impact TBIO-4 may also become more severe due to operation of additional heavy equipment within ESHAs necessary to relocate the revetment. This alternative would also slightly increase the short-term impacts of TBIO-5 as additional sand would be exposed seaward of the relocated revetment. However, the potential beneficial effects of dune restoration associated with Impact TBIO-6 and TBIO-7 would still occur under this alternative. Requiring shared private coastal access walkways would also substantially reduce disturbance of the proposed dune system, protecting this established and restored dune habitat. Impacts related to installation of the existing revetments (TBIO-1), backpassing operations (TBIO-3), and long term erosion of the newly created dune habitat (TBIO-8) would remain largely similar to those described for the Project.

Recreation and Public Access: This alternative would result in the operation of additional heavy equipment, which would increase short-term adverse effects to public access associated with Impact REC-1. However, backpassing operations and associated impacts identified in Impact REC-2 would remain similar to those described for the Project. Landward relocation of the revetment off of public trust land would improve Project consistency with coastal public use and recreation policies. However, the revetment would still cover or cut off access to approximately one acre of LAEs. Although the revetment would be moved landward of the January 2010 MHTL and the beach and dune system is expected to sustain itself marginally longer than the Project, the wide sandy beach would still erode after the cessation of nourishment, leaving the revetment exposed after cessation of beach nourishment and erosion of the newly widened beach in 10 to 20 or more years and ultimately impacting long-term public lateral access as detailed in Impact REC-4. Medium- and short-term benefits to public recreation opportunities due to a wide sandy beach berm and increased lateral access would remain similar to those identified for the Project in Impact REC-3.

Marine Water Quality: Installation of a properly engineered revetment would substantially reduce potential impacts to Marine Water Quality. Potential damage to homes, OWTS, and accessory structures from coastal erosion, and beneficial impacts to public trust resources identified in Impact MWQ-3 would be increased, as the reengineered revetment would provide long-term protection of existing development from coastal erosion. However, leach fields west of 31022 Broad Beach Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013). Consequently, after cessation of beach nourishment and erosion of the newly widened beach in 10 to 20 or more years these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events which may incrementally impact near shore water quality. However, this would also require waves to erode the overlying seaward end of the dune system. Further, after cessation of nourishment and erosion of the beach in 10 to 20 or more years, the CSLC would consider disposition of all improvements that overlie state sovereign lands or LAEs and would address any outstanding wastewater treatment issues at that time. Construction-related impacts to impairment of area waters from operation of heavy equipment and potential for oil leaks or spills described in Impact MWQ-1 would be slightly increased due to the additional construction activities associated with relocation and reinforcement of the revetment. However, as the total quantity of sand added would remain the same as for the Project, Impacts MWQ-2 and MWQ-4 would remain similar.

Utilities and Service Systems: Relocation of the revetment inland of the January 2010 MHTL would require potential landward relocation of as many as five OWTS or the steepening of the landward slope and narrowing of the reinforced revetment in these locations to retain room for septic leach fields. If landward movement of these systems were not possible the revetment would have to be redesigned fronting these residences or potentially relocated landward, but still partially on or in front of the January 2010 MHTL in these areas. This decision would result in potential tradeoff between impacts to recreation and utilities and public systems. Based on aerial imagery it appears feasible for at least two of the systems to be relocated landward and potentially feasible for the remaining two. However, this aerial analysis does not take into consideration underlying utilities that may further complicate landward relocation of the OWTS.

Potential for relocation of OWTS may be limited due to space restraints and code issues. Additionally, relocation of the revetment landward of the January 2010 MHTL west of 31022 Broad Beach Road may cause future permitting issues with the city of Malibu and potentially other agencies as all properties must comply with city code if repairs or upgrades are made to an existing treatment system. Such repairs are required for major remodels or home expansion and also for resale and as such Ensitu (2013) have cited such relocation as infeasible. However, as discussed Section 3.7.6 *Utilities and Service Systems*, the city of Malibu Municipal Code does not appear to directly conflict with this alternative. Further, the feasibility of revetment relocation off public lands does not consider the ability to expand existing homes, but rather the ability of the OWTS to serve the existing home. Finally, Applicant-prepared studies have identified a requirement for septic system leach fields to be setback a minimum of 15 feet from a wave uprush zone, effectively requiring a 15 foot setback from the landward toe of the relocated revetment. As noted above, such uprush is projected to occur only during a 100 year event and after erosion of the beach and overlying dune system in 10 to 20 or more years. The reinforced revetment would limit, but not fully eliminate the size and intensity of such wave uprush; however, limited amounts of water overtopping the revetment would likely have only moderate effects on water quality as contact with any released septic effluent with marine waters would be limited by the revetment.

Under this alternative, beach nourishment and to a greater degree reinforcement of the existing revetment would reduce potential impacts to Utilities and Service Systems. This alternative would substantially increase the beneficial impacts associated with UTL-1. Potential damage to OWTS from coastal erosion, and associated indirect impacts to public trust resources identified in Impact UTL-2, including adverse effects to water quality as well as public use and enjoyment of the beach and ocean would be greatly reduced, as the reinforced revetment would provide long-term protection of existing OWTS from coastal erosion. However, leach fields west of 31022 Broad Beach Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013) after cessation of nourishment activities and erosion of the newly widened beach and dune system in 10 to 20 or more years. Consequently, these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events.

Relocation of the revetment closer inland would also result in similar public drainage-related impacts of the Project as discussed in Impact UTL-3 as construction of the restored dunes and beach nourishment will bury or obstruct public drains. Similar to the Project, Impact UTL-3, such impacts would be a minor adverse effect with implementation of AMM UTL-3 (Master Drainage Plan).

Other Resource Areas: This alternative would have similar impacts to the Project in terms of its effects on scenic resources, marine biological resources, and environmental justice. Effects on transportation, traffic, parking, and noise would be somewhat more severe due to increase levels of vehicular activity and congestion related to construction phases (Table 4-2). Effects on public health and safety hazards and historic resources may be incrementally increased due to increased construction activity associated with the relocation and reinforcement of the revetment.

Table 4-2. Alternative 1 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	No Major Change in Adverse Impacts	Additional construction equipment associated with landward relocation of the revetment may intensify the adverse impacts associated with temporary construction activities, with a slight increase in the severity of adverse effects associated with Impact SR-2 and SR-4. Similar to the Project, permanent authorization of the revetment through a long-term lease and approval of Coastal Development Permits (CDPs) would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed as described in Impact SR-1.
Marine Biological Resources	Incremental Decrease in Indirect Adverse Impacts	Placement of sand and potential burial of rocky intertidal and subtidal marine biological resources would have a major adverse effect to intertidal habitats and offshore habitats of Broad Beach similar to the Project as described in Impacts MB-1, MB-2, MB-3, MB-4, MB-5, and MB-8. Additionally, similar to the Project, impacts to down coast habitats would be negligible as discussed in Impact MB-7. However, potential indirect impacts associated with water pollution from damage to OWTS from coastal erosion would be reduced along the length of the existing revetment. The potential for fuel or oil release described in Impact MB-6 would be slightly increased due to increased construction activities.
Cultural and Paleontological Resources	Incremental Increase in Adverse Impacts	Disturbance of the near shore environment associated with the landward relocation of the revetment would result in a slightly increased potential to disturb cultural resources, resulting in an additional adverse impact similar in type to Impact CR-1. However, implementation of standard Best Management Practices (BMPs) (e.g., work stoppage and notification of the State archeologist) would substantially reduce this impact.
Noise	Incremental Increase in Adverse Impacts	A temporary increase in noise due to additional construction activities associated with the landward relocation of the revetment would result in adverse impacts to beach users and residents on PCH. Consequently, this alternative would result in slight increases in adverse effects associated with Impact N-1 and N-2. However, these impacts would be reduced through implementation of AMM N-1a, similar to the Project.
Public Health and Safety Hazards	No Major Change in Adverse or Beneficial Impacts	This alternative would result in a slight increase in the adverse effects associated with Impact HAZ-2, as the presence of additional heavy construction equipment (i.e., bulldozers, cranes, and haul trucks) would increase the potential for an incidental release of hazardous material on Broad Breach. Additionally, the increase in construction equipment and construction personnel would result in increased inaccessibility and hazardous conditions during construction, slightly increasing the severity of adverse effects associated with Impact HAZ-3. These impacts would be reduced through implementation of AMMs HAZ-2, HAZ-3a, and HAZ-3b.
Traffic and Parking	Incremental Increase in Adverse Impacts	The landward relocation of the revetment would require an estimated 4,500 additional heavy haul truck trips as well as additional heavy construction equipment and construction

Table 4-2. Alternative 1 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		personnel, which would likely increase traffic and congestion on Pacific Coast Highway (PCH) and in the Zuma Beach parking lot, potentially prolonging construction activities and incrementally increasing the severity of the adverse effects associated with Impact TR-1. These impacts would be reduced through implementation of AMM TR-1.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

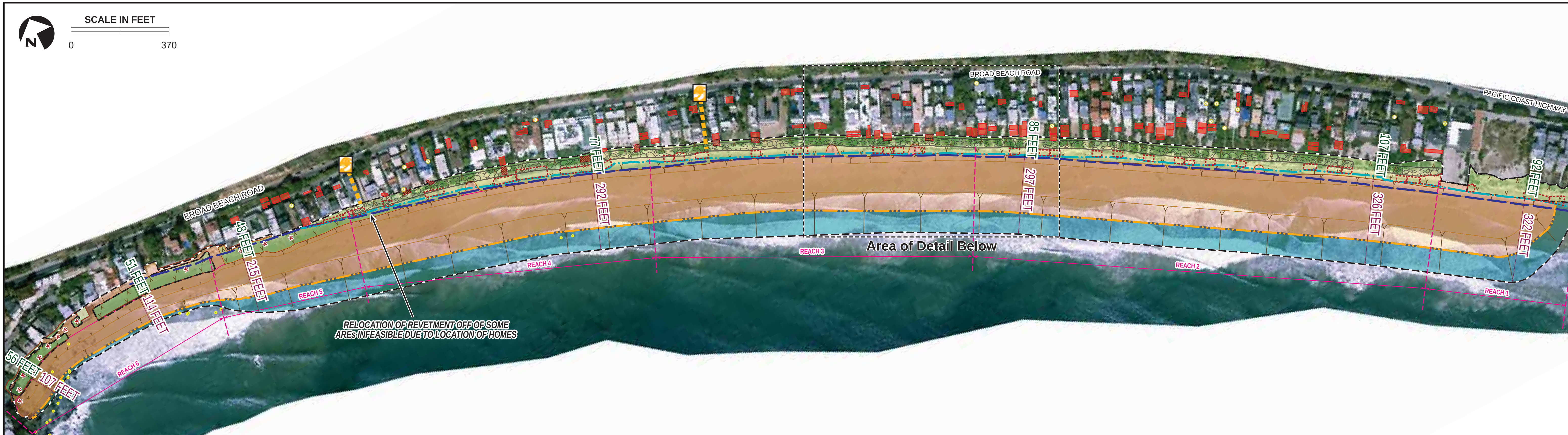
4.2.2 Alternative 2: Relocation of Improved Revetment Landward of Lateral Access Easements with Beach Nourishment and Dune Restoration

Description

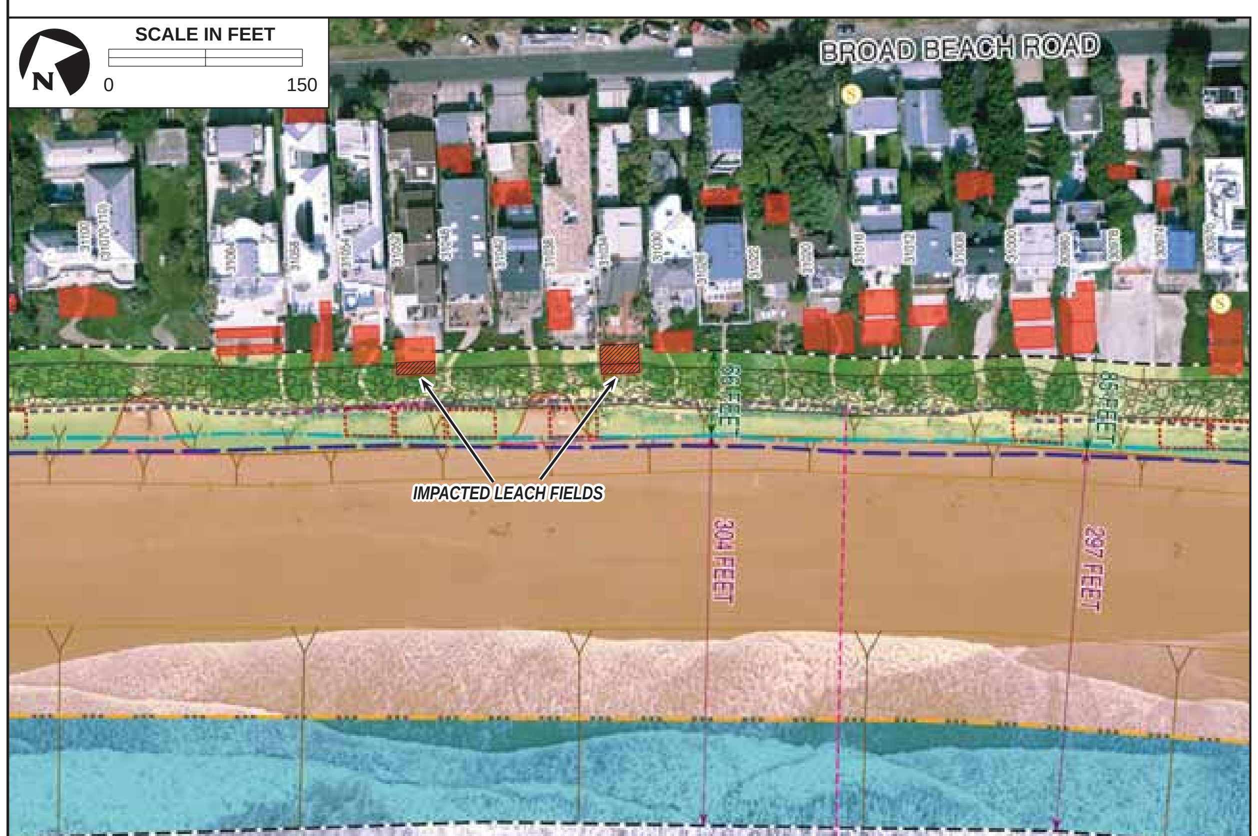
This alternative would be similar to the Project and Alternative 1 as it would include beach and dune restoration identical to the Project along with retention of a landward relocated revetment. Under this alternative, the revetment would be relocated substantially landward from its current location off of all public land below the January 2010 MHTL, including most of the existing LAEs dedicated for public lateral beach access. Landward relocation would include moving the revetment approximately 15 to 60 feet landward across portions of the beach, including the eastern 3,000 feet, where existing homes are set back further from the shoreline (see Figure 4-2). Limited space exists for landward relocation on the western portion of Broad Beach in front of the residences at 31350 and 31346 Broad Beach Road; consequently the current revetment location, approximately 50 feet in length, would be retained in this area.

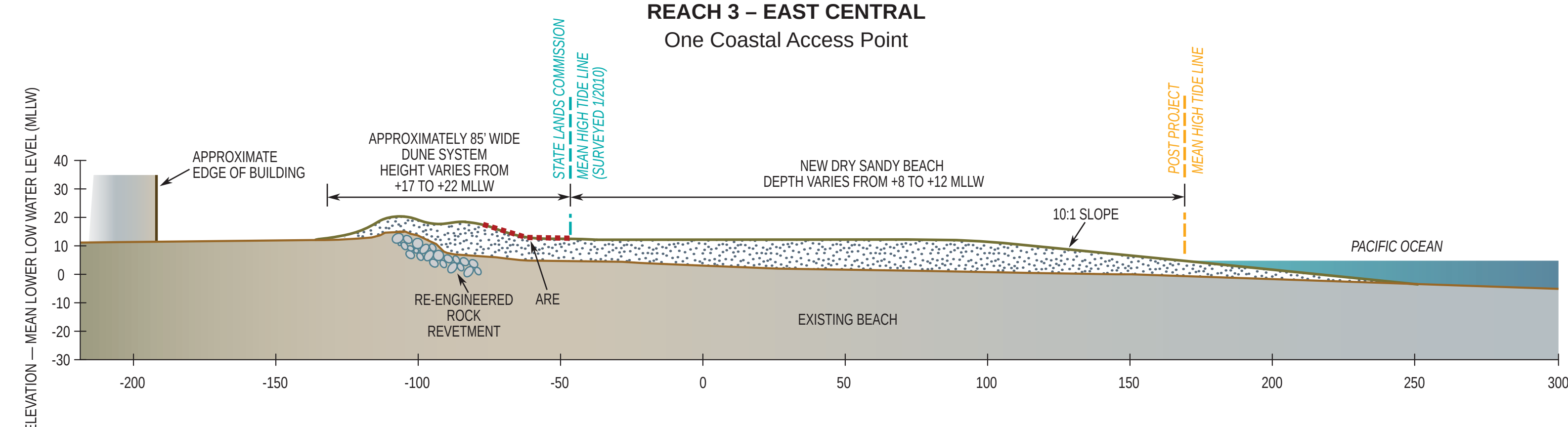
Similar to Alternative 1, this alternative would also include laying relocated rock over geotextile filter fabric to reduce the chance of settling and strengthening the relocated revetment with an outer lining of 3- to 5-ton boulders over existing smaller rock. These measures would reduce chance of revetment damage or failure and mobilization of boulders if the revetment were to become exposed due to long-term wave action and persistent wave attack. The reinforced revetment would be no wider than the existing 38-foot width at its base with a crest elevation of approximately 15 feet above MLLW. Similar to Alternative 1, in order to minimize beach coverage and reduce impacts to OWTS leach fields, this would require removal of existing smaller stones, or incorporation of these smaller stones into a steeper reinforced revetment.

A key goal of this alternative is to reduce impacts to public lateral beach access. Lateral access along Broad Beach is affected by a complicated mix of public trust land, LAEs, and private property. In general, the area below the Ordinary High Water Mark (OHWM) constitutes tidal and submerged lands under the California Constitution and the Public Trust Doctrine, and is thus open for public use and enjoyment. Approximately 51 of the 121 private parcels along Broad Beach have granted and accepted easements, deed restrictions, or other legal documents providing the public with the right to lateral coastal access across the seaward edge of these private properties. The CSLC holds a total of 36 LAEs along Broad Beach; 16 are outside the revetment area (i.e., associated with properties on Broad Beach to the east or west of the revetment), and 20 are directly impacted by the revetment. LAEs vary in terms, but they mainly consist of dry sandy beach extending 25 feet inland from the “daily high water line” or the MHTL; in some cases LAEs are restricted on the landward side by set-back buffers from the residential structures. Most of these LAEs are currently partially or entirely covered by the emergency rock revetment and frequently extend landward of the revetment.



Detail





LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment Relocated and Armored
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Impacted Leach Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

amec

Landward Relocation of Improved Revetment Landward of Easements with Beach Nourishment and Dune Restoration

FIGURE 4-2

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Beach nourishment, dune creation, and habitat restoration concepts would remain similar to those under the Project, with approximately 43,000 haul heavy trips being required to haul 600,000 cy of sand from inland quarry sources. The post-construction dry sand beach berm is projected to extend seaward of the dunes by 90 to 230 feet, with the beach narrower at the west end and wider in the central and eastern sections. For example, beach widths in Lechuza Cove would be as narrow as 90 feet while the entire area east of 31330 Broad Beach Road would be 200 feet wide or wider. This alternative would retain roughly the same profile of the sandy beach as the Project; however, dune width would be substantially increased from the currently proposed approximately 50-foot width. Under this alternative, the restored dune would extend up to 140 feet on the eastern end of Broad Beach. This would require the importation of up to 75,000 additional cy of sand from the inland sand sources, necessary to create the wider dune field. This would also require an additional 5,300 truck trips and incrementally increased construction period of approximately one month. Landward relocation of the revetment would result in the exposure of additional existing sand volume seaward of the revetment, potentially incrementally increasing the life of the initial nourishment event and reducing the probability of revetment exposure.

Similar to Alternative 1, public use and access would be permitted to the toe of the restored dunes, which would lie on public land where a line of rope or cable and signs would prohibit access to coastal dune ESHA. However, in contrast to the Project where the majority of the proposed dunes would be located on private land, under this alternative a major amount of the dune system would be located on public land over overlying LAEs. Additionally, similar to Alternative 1, rather than provide for 112 coastal access walkways across the restored dunes, this alternative would channel residential access across the dunes into shared walkways. The access proposal would be similar to that described for Alternative 1; however, in places, due to the limited setback between the relocated revetment and homes, more frequent beach access walkways would be required as insufficient room would exist for a backdune walkway.

This alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

This alternative would involve additional new major construction activities associated with revetment armoring as described for Alternative 1. In addition, because the revetment would be located further landward, patio and landscape removal, as well as potential abandonment/removal and relocation of existing septic systems, would also entail additional excavation and construction. These activities may be scheduled concurrently with or preceding beach nourishment and thus would extend the projected construction horizon beyond the proposed 8 months by at least 1 additional month. Further, the quarrying and transport of additional sand would result in 5,350 truck trips in addition to the 4,500 additional truck trips required for boulder armoring stone transport.

Relocation and armoring of the revetment may disrupt existing OWTS, up to 14 patios, landscaping, and other private improvements (see Illustration 4-2). This alternative would require potential landward relocation of as many as 22 OWTS or steepening or the landward slope or narrowing of the reinforced revetment in these locations. If landward movement of these systems were not possible the revetment would have to be redesigned fronting these residences or potentially relocated landward, but still partially on or in front of the January 2010 MHTL in these areas. This decision would result in potential tradeoff between impacts to recreation and utilities and service systems.

Illustration 4-2: *The landward relocation of the revetment off of all public trust lands, including those below the MHTL as well as most LAEs, would have major adverse effects as it would require the relocation of private landscape improvements (i.e., patios), as well the decommissioning of up to 22 OWTS.*

Similar to the Project, approximately 7 acres of the west end of Zuma Beach, including Parking Lot 12 and the beach fronting this area, would be used for construction staging. Equipment storage and staging would occur within the parking lot, sand storage, handling and transfer would occur on the beach. Heavy equipment and truck haul routes would be established on the beach. Most of Broad Beach and western Zuma Beach would remain closed to public access during weekday construction periods. Major components of this alternative would include:

- Relocating of the existing revetment anywhere from 15 to 60 feet landward off of public lands and LAEs using heavy cranes and bulldozers;
- Demolishing and reconstructing up to 14 patios and potentially relocating up to 22 OWTS;
- Importing large 3- to 5-ton boulders via an estimated 4,500 heavy haul truck trips and potentially exporting a portion of the smaller rock;
- Placing new larger boulders over and at the toe of the existing revetment using heavy cranes and bulldozers, exporting smaller armor stone and/or steepening and narrowing the revetment on certain properties as needed ;

- Transport of an estimated 675,000 cy of sand from the inland quarries and to Broad Beach via an estimated 48,350 truck trips;
- Transporting the sand from storage areas on Zuma Beach up coast via heavy truck or scraper up coast to Broad Beach;
- Redistributing sand on Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Constructing a wider sand dune system up to 140 feet wide in the east to be planted with native dune species;
- Creating a system of shared walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Providing two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the January 2010 MHTL
- Performing backpassing of the sand from the east to west end of the beach using heavy equipment such as scrapers and bulldozers on a roughly annual basis based on beach profile and width measurement trigger; and
- Initiating one future major renourishment event of approximately 450,000 cy in approximately 10 years.

<u>Potential Impacts to Public Trust Resources</u>

This alternative would include landward relocation of the revetment off of public land and the majority of LAEs. Implementation of Alternative 2 would have similar impacts to Alternative 1 in terms of coastal processes and geological resources, which would be reduced when compared to the Project. Additionally, similar to the Alternative 1, this alternative would also result in additional construction activities, including use of additional heavy equipment and construction personnel, resulting in greater impacts than the Project. The effects would be somewhat more severe than Alternative 1 due to major additional landward movement of the revetment as well as potential relocation of up to 22 OWTS and demolition of 14 patios. This alternative would also require a longer period of construction and importation of additional sand. These activities would incrementally increase construction related impacts, particularly to terrestrial biological resources. Resource areas with major changes to impacts relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-4 at the end of this subsection.

Air Quality and Greenhouse Gases Under Alternative 2, there would be a major increase in criteria pollutant emissions relative to the Project. Similar to Alternative 1, this increase in emissions would be directly associated with the almost 10,000 additional heavy haul truck trips, necessary to transport armor stone and additional sand, the operation of additional heavy equipment to relocate and improve the revetment and to demolish and reconstruct private improvements (e.g., patios). Major revetment relocation would also incrementally increase emission from operation of heavy equipment relative to Alternative 1. These emissions would increase the severity of Impact AQ-1, particularly for emissions of VOCs which would exceed SCAQMD and VCAPCD thresholds for project-level significance and for NO_x which would exceed SCAQMD and VCAPCD thresholds for onsite and project-level significance similar to the Project, including SCAQMD LSTs for construction activities. Emissions of both of these criteria pollutants would substantially increase under this alternative when compared to the Project due to additional construction activities and a 20 percent increase in heavy haul truck trips (Appendix G). Additionally, there would be an incremental increase in other criteria pollutants including CO, SO_x, and PM. This increase in emissions relative to the Project, particularly the increase in VOC and NO_x emissions, would require additional AMMs such as use of newer haul trucks with clean-burning diesel engines. Greenhouse gas (GHG) emissions described in Impact AQ-2 would be incrementally increased but would remain below SCAQMD and VCAPCD thresholds. Finally, increased truck traffic and heavy equipment operation associated with reinforcement and relocation of the rock revetment would incrementally increase toxic air contaminant emissions; however Impact AQ-3 would remain minor as thresholds would not be exceeded.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Similar to Alternative 1, reinforcement of the revetment with 3- to 5-ton armor stones would reduce the potential impacts of coastal processes on existing private improvements including septic systems across the length of the 4,100-foot revetment. Erosion of the beach and dunes after cessation of nourishment would continue as described under the Project, with the benefits of nourishment enduring for an estimated 10 to 20 or more years and the revetment then becoming exposed as a result of persistent wave action.[5] Anticipated SLR of approximately 8.5 inches by 2030 would further exacerbate erosion effects, including increased frequency and intensity of storm surges and wave attack. However, after the revetment is exposed, potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 would be reduced as the revetment would be substantially strengthened by addition of heavier armor stones. Consequently, impacts to public trust resources identified in Impact CP/GEO-3 (e.g., water quality) due to damage to homes, OWTS, and accessory structures from coastal erosion would be reduced. The reengineered revetment would also provide long-term protection for this existing development from coastal erosion.

Similar to the impact of the existing revetment, the reengineered revetment would also impact coastal processes by incrementally increasing wave refraction when exposed and negligibly depriving down coast beaches (e.g., Zuma Beach) of a minor source of

[5] The additional nourishment of 75,000 cy of sand for dune creation at the east end of the beach may prolong beach life by 2 or more years in that area.

sand from dune erosion. However, Impact CP/GEO-7 would remain beneficial as effects of the longshore currents on nourishment and renourishment of sand in the short- to mid-term include both erosion of sand from Broad Beach and accretion of sand at down coast beaches. This beneficial impact would be incrementally increased under Alternative 2 as additional sand would be exposed seaward of the relocated revetment. There would be slightly more exposed sand relative to Alternative 1 as the revetment would be relocated further landward off all public lands, including most LAEs. However, over the long-term, longshore currents would transport this sand farther down coast and possibly offshore.

Under Alternative 2, the reinforced revetment with larger boulders as armoring would increase the structural stability of the revetment, reducing potential adverse impacts under the Project associated with persistent wave attack. Similar to Alternative 1, this alternative would substantially reduce the adverse effects associated with Impact CP/GEO-1. However, if the revetment could not be keyed into the bedrock located at 16 feet below ground level (SubSurface Designs, Inc. 2006), the risk of liquefaction, seismic settlement, and lateral spreading in the event of an earthquake would still exist as described for the Project. Impacts related to sand compatibility (CP/GEO-4), wave height and direction, tides, and currents (CP/GEO-5), and sea level rise (CP/GEO-8) would be similar to those described for the Project. Short- and medium-term beneficial impacts to wave run-up (Impact CP/GEO-6) would remain similar, but may be extended due to the addition of more sand.

Terrestrial Biological Resources: The relocation of the existing 4,100-foot revetment would require use of heavy cranes and bulldozers that would have major adverse effects on the existing, but often degraded southern foredune habitat fronting the homes along Broad Beach, increasing the impacts identified in Impact TBIO-2. Although much of the habitat in these areas has been subject to landscaping with non-native and invasive plant species associated with adjacent residential development, this area consists of southern foredunes, a habitat type identified as rare by the California Natural Diversity Database (CNNDB) and the California Native Plant Society (CNPS). Moreover, due to the rarity and biological significance of dune habitat in Southern California, southern foredunes are designated as ESHA under the Malibu City LCP.

Installation of large boulders in these existing degraded dunes would create potential adverse impacts to native southern foredune vegetation and/or sensitive wildlife. As the revetment would be relocated up to 60 feet further landward under this alternative relative to the Project, the relocation and reinforcement of the revetment would substantially increase the impacts to existing degraded southern foredune habitat; however, much of the highest quality remaining dune habitat at the east end of Broad Beach was eroded and destroyed by wave action in the winter of 2013-2014, particular during the storm of March 2, 2014. Adverse effects to ESHAs resulting from this alternative would be substantially more severe than those that occurred from past installation of the existing revetments described in Impact TBIO-1, although this impact would be largely offset by successful dune creation. Impact TBIO-4 may also become more severe due to operation of additional heavy equipment within ESHAs necessary to relocate the revetment. This alternative would also slightly increase the short-term impacts of TBIO-5 as additional sand would be exposed seaward of the relocated revetment. However, the potential beneficial effects of dune restoration associated with Impact TBIO-6 would still occur and may incrementally increased due to the additional sand volume required under this alternative, offsetting adverse impacts to existing degraded ESHA. Additionally, requiring shared private coastal access walkways would also substantially reduce disturbance of the proposed dune system described in Impact TBIO-7, protecting this newly established and restored dune habitat. Impacts related to backpassing operations (TBIO-3), and long term erosion of the newly created dune habitat (TBIO-8) would remain largely similar to those described for the Project.

Recreation and Public Access: This alternative would result in the operation of additional pieces of heavy equipment by additional construction personnel, which would increase short-term adverse effects to public access associated with Impact REC-1. This alternative incorporates the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode, thus, this alternative would also address Impact REC-4.

Landward relocation of the revetment off of all public trust lands would improve Project consistency with coastal public use and recreation policies. Under this alternative the revetment would cover a negligible area of LAEs fronting 31350 and 31346 Broad Beach Road, where space for landward relocation of the revetment is limited. Additionally, after the 10- to 20- or more year Project life, nourishment sand would be washed away and the beach would recede back to the new revetment, leaving little to no dry-sand beach area for recreation without continued renourishment. However, a maximum landward relocated revetment combined with increased dune width at the beaches' east end would provide additional room for public beach use, particularly at low and moderate tides. This may be gradually offset by SLR after 2050. Backpassing operations and associated impacts to recreational users identified in Impact REC-2 would be similar to those described for the Project. Additionally, medium- and short-term benefits to public recreation opportunities due to a wide sandy beach berm and increased lateral access would remain similar to those identified for the Project in Impact REC-3.

Marine Water Quality: Installation of a properly engineered revetment would substantially reduce potential impacts to Marine Water Quality. Potential damage to homes, OWTS, and accessory structures from coastal erosion, and beneficial impacts to public trust resources identified in Impact MWQ-3 would be increased, as the reengineered revetment would provide long-term protection of existing development from coastal erosion. However, leach fields west of 30970 Broad Beach Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013). Consequently, after cessation of beach nourishment and erosion of the newly widened beach in 10 to 20 or more years these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events which may incrementally impact near shore water quality. However, this would also require waves to erode the overlying seaward end of the dune system. Further, after cessation of nourishment and erosion of the beach in 10 to 20 or more years, the CSLC would consider disposition of all improvements on state sovereign lands and those overlying LAEs and any actions associated with lease extension or termination needed to protect marine water quality. Construction-related impacts to impairment of area waters and the possibility of sand contaminant resuspension would be slightly increased due to the additional construction activities associated with relocation and reinforcement of the revetment and the additional volumes of sand to be added.

Utilities and Service Systems: As previously described, relocation of the revetment inland of the January 2010 MHTL would require potential landward relocation of as many as 22 OWTS or the steepening of the landward slope or narrowing of the reinforced revetment in these locations. If landward movement of these systems were not possible the revetment would have to be redesigned fronting these residences or potentially relocated landward, but still partially on or in front of the public lands in these areas. This decision would result in potential tradeoff between impacts to recreation and utilities and service systems. Based on aerial imagery, it appears that it is infeasible to relocate at least three of the OWTS fronting 31138 and 31122 Broad Beach Road. Additionally, it appears only potentially feasible for seven of the remaining 20 residences. Further, this aerial analysis does not take into consideration underlying utilities that may further complicate or preclude landward relocation of the OWTS.

Potential for relocation of OWTS may be limited due to space restraints and code issues. Additionally, relocation of the revetment landward of the landward of the January 2010 MHTL and most LAEs west of 30970 Broad Beach Road may cause future permitting issues with the city of Malibu and potentially other agencies as all properties must comply with city code if repairs or upgrades are made to an existing treatment system. Such repairs are required for major remodels or home expansion and also for resale and as such have cited such relocation as infeasible (Ensitu 2013). However, as discussed Section 3.7.6, *Utilities and Service Systems*, the city of Malibu Municipal Code does not appear to directly conflict with this alternative for the majority of affected homes. Further, the feasibility of revetment relocation off public lands does not consider ability to expand existing homes, but rather the ability of the OWTS to serve the existing

Table 4-3. Alternative 2 – Potential for Landward Relocation of OWTS

Address	Number of Affected OWTS	Potential for Landward Relocation Behind Revetment[1]	Potential for Relocation Landward of Home [2]
31324	1	Potentially Feasible	Insufficient Area
31316	1	Feasible	Feasible
31280	1	Potentially Feasible	Insufficient Area
31250	3	Feasible	Feasible
31228	1	Feasible	Insufficient Area
31138	1	Not Feasible	Insufficient Area
31122	2	Not Feasible	Insufficient Area
31058	1	Feasible	Feasible
31054	1	Potentially Feasible	Insufficient Area
31052	2	Potentially Feasible	Insufficient Area
31034	2	Feasible	Insufficient Area
30970	2	Potentially Feasible for at Least One Component	Insufficient Area
30966	1	Feasible	Insufficient Area
30952	1	Feasible	Feasible
30928	1	Potentially Feasible	Insufficient Area
30842	1	Feasible	Insufficient Area
Total Affected Properties	**Total Affected System Components**	**Number of OWTS Feasible to Relocate Landward of Revetment**	**Number of OWTS Feasible to Relocate Landward of Home**
16	22	8	4

Source: Topanga Underground 2012.
[1]Feasibility determined via aerial imagery and CAD files provided by the city of Malibu.
[2]Feasibility determined via the recommendations of Topanga Underground (2012).

home. Under this Alternative, it appears that at least six existing homes may lose that ability to dispose of wastewater without major alterations to the relocated revetment alignment and design. Finally, Applicant-prepared studies have also identified a requirement for septic system leach fields to be setback a minimum of 15 feet from a wave uprush zone. As noted above, such uprush is projected to occur only during a 100 year event and after erosion of the beach and overlying dune system in 10 to 20 or more years. Further, the reinforced revetment would limit, but not fully eliminate the size and intensity of such wave uprush. Limited amounts of water overtopping the revetment would likely have only moderate effects on water quality as contact with any released septic effluent with marine waters would be limited by the revetment.

Maintaining or relocating the OWTS for the impacted homes is necessary because there are no feasible opportunities to connect to a centralized public or private sewer system. In order to address potential impacts to the operation of existing leach fields the revetment's design location could be altered to allow space for existing OWTS that cannot be relocated. Altering the revetment's design would require narrowing of the revetment or moving the revetment location seaward where it would again impact and cover LAEs. While the latter is feasible, it would be contrary to the intent of this alternative. Further, revetment design does not permit or allow for sharp breaks in direction, so any adjustment for one house would affect LAEs on adjacent parcels.

Under this alternative, beach nourishment and to a greater degree reinforcement of the existing revetment would reduce potential impacts to Utilities and Service Systems. This alternative would substantially increase the beneficial impacts associated with UTL-1. Potential damage to OWTS from coastal erosion, and associated indirect impacts to public trust resources identified in Impact UTL-2, including adverse effects to water quality and public use and enjoyment of the beach and ocean, would be greatly reduced, as the reinforced revetment would provide long-term protection of existing OWTS from coastal erosion. However, leach fields west of 30970 Broad Beach Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013) after cessation of nourishment activities and erosion of the newly widened beach and dune system in 10 to 20 or more years. Consequently, these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events. Relocation of the revetment closer inland would also result in similar public drainage-related impacts of the Project as discussed in Impact UTL-3 as construction of the restored dunes and beach nourishment will bury or obstruct public drainages. Similar to the Project, Impact UTL-3, such impacts would be a minor adverse effect with implementation of AMM UTL-3 (Master Drainage Plan).

Other Resource Areas: This alternative would have similar impacts to the Project in terms of its effects on scenic resources, marine biological resources, historic, and paleontological resources, and environmental justice. Effects on transportation, traffic, parking, and noise would be somewhat more severe due to increase levels of vehicular activity and congestion related to construction phases. Effects on public health and safety hazards and historic resources may be incrementally increased due to increased construction activity associated with the relocation and reinforcement of the revetment (Table 4-4).

Table 4-4. Alternative 2 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	No Major Change in Adverse Impacts	Additional construction equipment associated with landward relocation of the revetment may intensify the adverse impacts associated with temporary construction activities, with a slight increase in the severity of adverse effects associated with Impact SR-2 and SR-4. Similar to the Project, permanent authorization of the revetment through a long-term lease and approval of CDPs would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed as described in Impact SR-1.

Table 4-4. Alternative 2 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Marine Biological Resources	Incremental Decrease in Indirect Adverse Impacts	Placement of sand and potential burial of rocky intertidal and subtidal marine biological resources would have a major adverse effect to intertidal habitats and offshore habitats of Broad Beach similar to the Project as described in Impacts MB-1, MB-2, MB-3, MB-4, MB-5, and MB-8. Additionally, similar to the Project, impacts to down coast habitats would be negligible as discussed in Impact MB-7. Potential indirect impacts associated with water pollution from coastal erosion damage to OWTS would be reduced along the length of the existing revetment. The potential for fuel or oil release described in Impact MB-6 would be slightly increased due to increased construction activities.
Cultural and Paleontological Resources	Incremental Increase in adverse Impacts	Disturbance of the near shore environment associated with the landward relocation of the revetment would result in a slightly increased potential to disturb cultural resources, resulting in an additional adverse impact similar in type to Impact CR-1. Implementation of standard BMPs would reduce this impact.
Noise	Incremental Increase in Adverse Impacts	A temporary increase in noise due to additional construction associated with the landward relocation of the revetment would result in adverse impacts to beach users and receptors along affected roadways. Consequently, this alternative would result in slight increases in adverse effects associated with Impact N-1. Impacts would be reduced through implementation of AMM N-1a, similar to the Project.
Public Health and Safety Hazards	No Major Change in Adverse or Beneficial Impacts	This alternative would result in a slight increase in the adverse effects associated with Impact HAZ-2, as additional heavy construction equipment (i.e., bulldozers, cranes, and haul trucks) would increase the potential for an incidental release of hazardous material on Broad Breach. Additional construction equipment and construction personnel would also increase inaccessibility and hazardous conditions during construction, slightly increasing the severity of adverse effects associated with Impact HAZ-3. These impacts would be reduced through implementation of AMMs HAZ-2, HAZ-3a, and HAZ-3b.
Traffic and Parking	Incremental Increase in Adverse Impacts	Landward relocation of the revetment and a wider dune system on the beach's east end would require an estimated 10,000 more heavy haul truck trips and additional heavy construction equipment and construction personnel, which would likely increase traffic and congestion on PCH and in the Zuma Beach parking lot, incrementally increasing the severity of adverse effects associated with Impact TR-1. These impacts would be reduced through implementation of AMM TR-1.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

4.2.3 Alternative 3: Maximum Pull-back of Seawall with Beach Nourishment and Dune Restoration

Description

Under this alternative, the existing emergency revetment would be removed and replaced with a vertical seawall located on private property as far landward and as close to the existing primary residences as physically feasible, while also maintaining a minimum setback of 6 feet seaward from the existing OWTS, including septic tanks, leach fields, and other treatment infrastructure. Although the seawall could be feasibly located more closely to the OTWS and their leach fields, this 6-foot setback would decrease potential impacts of wastewater pooling behind the seawall, which would affect the structure's stability and prevent reliable percolation of wastewater effluent. Similar to the Project, the installation of the seawall would be accompanied by beach nourishment and dune restoration, annual backpassing activities, and a follow-up renourishment event (see Figure 4-3).

Construction of a new 2-foot thick, 20-foot high, 4,700-foot long seawall could be accomplished by one of two approaches: 1) use of steel sheet piles with a concrete cap, or 2) use of poured and formed concrete. In either case, the seawall would be fronted by a 10-foot-wide subsurface boulder toe apron to prevent foundation scour by wave action and potential wall collapse (refer to Figure 4-3). A sheet pile seawall would be preferred due to the smaller construction footprint and the close proximity of OWTS and leach fields. Construction of a cast-in-place concrete seawall would require a larger footprint and may not be able to protect existing systems in place. Construction of a cast-in-place concrete seawall would likely require the relocation of OWTS, which may be feasible in some instances, limited in others due to space constraints and code issues as described for Alternatives 1 and 2, and further described below.

Construction of either type of seawall in such close proximity to the residences or OWTS would eliminate area available for dune restoration landward of the seawall. Consequently, all restored dunes would be located seaward of the seawall. Further, the seawall could rise as much as 3 feet above the level of the proposed dunes because the seawall must be taller than a revetment to avoid wave overtopping and potential pooling of seawater behind the wall following complete erosion of the nourished beach.

The new seawall would be constructed through existing backyards, patios, and remnant disturbed dune habitat (see Illustration 4-3). While the existing buildings fronting Broad Beach are unevenly set back from the OHWM, the engineered design of the seawall must be as linear as possible to maximize strength of the wall and to minimize erosion. The proposed seawall would be located no less than 6 feet from the existing leach fields, entirely on private land; however, the distance of the seawall from each residence would vary depending on the location of existing leach fields. The average setback from the toe of the seawall would extend 45 feet and the maximum setback would be about

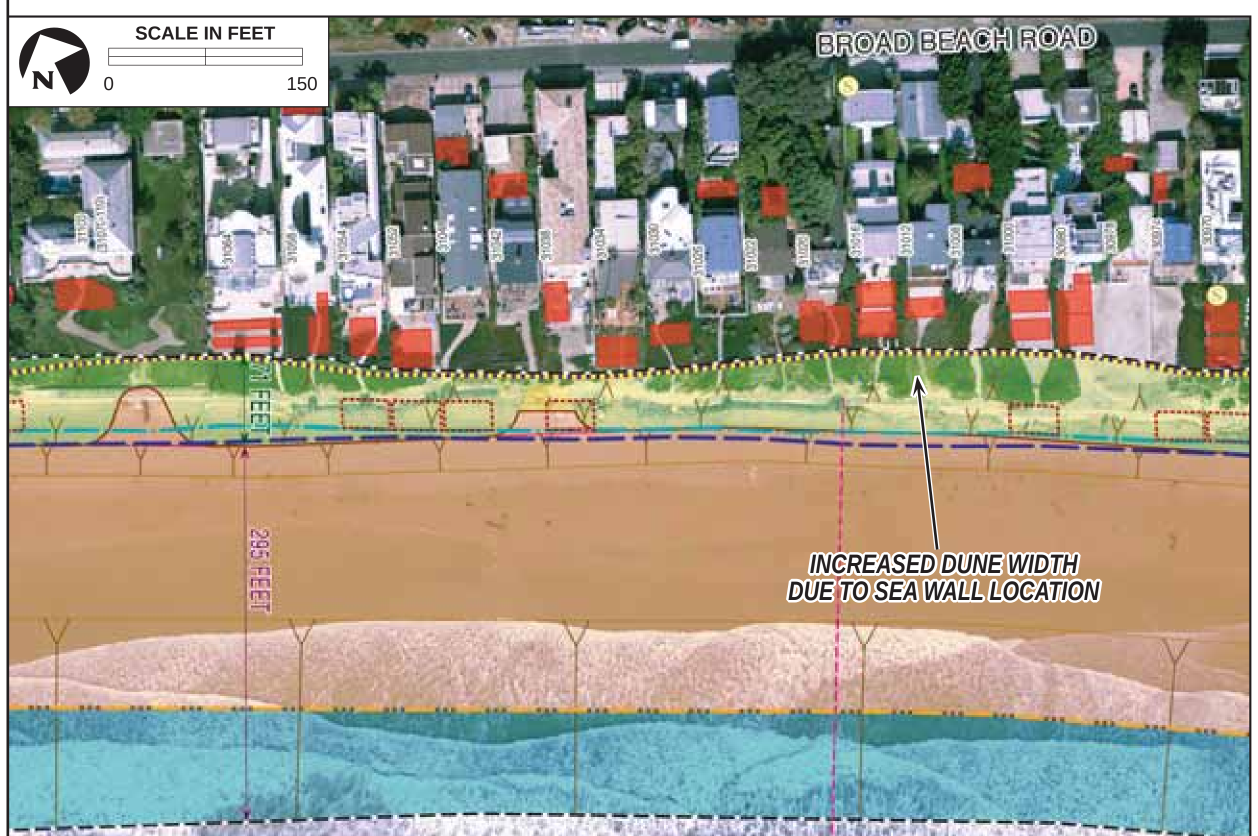
Illustration 4-3: *Construction of a seawall approximately 6 feet from the homes along Broad Beach would require major increases in construction activities. A large number of patios would require demolition and reconstruction. Additionally, a large number of OWTS would require relocation and or abandonment, which would also substantially increase adverse impacts at Broad Beach.*

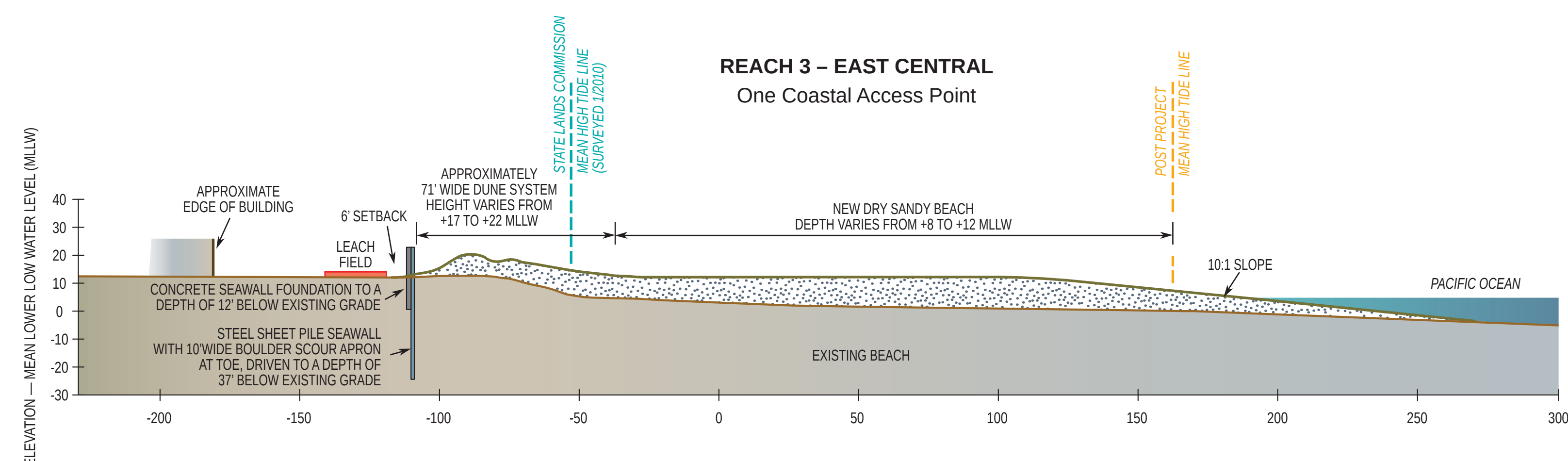
110 feet. Construction of a seawall using either method would require major disruption or removal of existing private improvements, including a number of patios, pools, landscaping, and other accessory use improvements. Construction of the seawall would not necessitate removal or relocation of any portion of primary structures, such as habitable spaces within existing residential units.

Beach nourishment, dune creation, and habitat restoration would be included under this alternative and habitat restoration concepts would remain similar to those proposed under the Project. However, in this scenario, dune restoration would be confined to the seaward side of the seawall. However, the proposed seawall would be constructed as far inland of the OHWM and the boundary between public and private land as possible while also maintaining a 6-foot setback from existing leach fields. On the eastern side of Broad Beach, this would result in a large landward setback from the OHWM compared to the location of the existing revetment, with increasingly small amounts of landward movement along the central and west beach areas. In some locations near the western end of the existing revetment, the seawall alignment would match the existing revetment location since the revetment is already located 6 feet from the existing leach fields.

This alternative would generate beach and dune design and access management issues regarding how best to redesign the Project to achieve the objectives while also accommodating the seawall. In particular, within the eastern and central segments of the beach, approximately 100 to 150 feet of private property that currently supports backyards, patios, and walkways would be located on the ocean-side of the seawall. This alternative would narrow availability of private property to approximately 0 to 20 feet toward the west-central end of the beach. Several approaches to this issue are possible and are discussed in detail in Appendix L, *Alternatives Screening*.

Detail





LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Seawall Alternative
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

amec

Maximum Pull-back of Seawall with Beach Nourishment and Dune Restoration

FIGURE 4-3

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This alternative includes the creation of a wider dune system along the central and eastern reaches of Broad Beach due to the increased setback of the seawall behind the OHWM relative to the existing emergency rock and sand bag revetment. This approach would increase the width of the dune system and habitat restoration area over all private land seaward of the seawall, while also continuing to provide the same wide sandy beach as described under the Project. However, this alternative would require major additional sand (120,000 cy) for dune creation, with an associated 8,500 additional haul truck trips. This alternative may also pose issues regarding the management of public and private property delineated on either side of the seawall. However, this approach would be the most consistent with overall Project objectives.

Under this alternative, the profile of the sandy beach would be the same as that described in the Project, with a beach width of approximately 100 feet on the west, increasing to over 200 feet in the central and eastern areas of Broad Beach. However, the dune width would be substantially increased from the currently proposed approximately 50feet and would instead range from approximately 220 feet wide in the east to approximately 125 feet wide in the central west section, tapering down to approximately 70 feet on the west.

Full public access would be permitted along the entire beach, but restricted from the dunes where a line of rope or cable and signs would prohibit access to ESHA. This rope or cable system, combined with the dune system would also ensure resident privacy. This alternative would channel resident access across the dunes into unpaved shared walkways spaced every 300 feet (each combining access for up to six homes). These shared walkways traversing the dune system from the beach would be connected to a back dune walkway lined with low fencing, located adjacent to the ocean side of the seawall due to limited space available on the landward side. The back dune walkway would be inland of, and parallel to, the restored dunes to restrict or inhibit access by residents and pets into this potential ESHA. However, because the seawall may extend 3 feet above the finished grade, this alternative may require up to 112 stairways (one stairway for each private primary structure at Broad Beach) be constructed up and over the seawall to connect to the private properties at Broad Beach.

This alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

Initially, construction would require use of additional bulldozers and a crane. This alternative would also require approximately 1,794 new trips by heavy haul trucks to remove a major portion of the existing emergency revetment while retaining some of the rocks for use in the boulder toe apron of the seawall.[6] This would be followed by the excavation of a foundation for the seawall, which would cover approximately 8 to 12 feet in both depth and width. This foundation would be necessary to support a poured concrete seawall or to permit emplacing the rock toe apron for the steel sheet pile seawall. For the poured concrete seawall, construction would be accompanied by excavation and recompaction of sand dunes and soil behind the wall to provide stability for the seawall to withstand wave action. Activities associated with this approach would require an approximately 40-foot-wide construction corridor. If a concrete seawall were installed, up to approximately 3,920 cement truck trips would be required for foundation and wall construction. In contrast, construction of the steel sheet pile seawall would require only a 20-foot-wide corridor to permit access of heavy equipment necessary to drive the sheet piles down into deep sand or bedrock using vibratory hammers suspended from cranes. Seawall construction would also include a major increase in the number of construction workers, vehicles, and equipment relative to the Project.

The proposed seawall would be 20 feet high in order to prevent wave overtopping and therefore, would rise up to approximately 8 feet taller than the existing revetment, which currently ranges in height from 12 to 15 feet. Given that the dune system would range in height from 17 to 20 feet along the eastern and central portion of the beach, up to 3 feet of the seawall would be exposed. The increased height of the seawall when compared to the revetment is necessary because revetments tend to absorb wave energy into spaces between boulders while seawalls repel waves, leading to greater impact forces from waves and potential overtopping, if and when the seawall becomes exposed.

This alternative would require installation of many of the same improvements as the Project and associated construction activities. Major components would include:

- Removing most of the existing rock revetment using heavy cranes, bulldozers and an estimated 1,794 haul truck trips to transport sand bags, and other materials composing the existing revetment off of the beach, while retaining some of the rocks for use in the boulder toe apron;
- Redistribution of beach sand within the sand bags and removal of sand bag liners and other remaining debris;
- Importing steel sheet piles on flatbed semi-trucks, or pre-mixed concrete in 3,920 cement trucks;
- Constructing approximately 4,700 feet of seawall using cranes and vibratory hammers to force steel sheet piles 37 feet into sand and bedrock; or excavation of a trench, measuring 8- to 12-feet in depth and width to accommodate the foundation and installation of forms, rebar and concrete to create the seawall;

[6] The number of trips is an estimate, as an unknown number of the existing larger 2-ton stones would be retained to construct the seawall's rock toe apron.

- Use stone from the existing emergency revetment to construct a 10-foot-wide boulder toe apron fronting the seawall using heavy cranes and bulldozers;
- Transport of an additional estimated 120,000 cy of sand from the inland quarries to Broad Beach via an estimated 8,560 truck trips for a total of approximately 51,560 sand haul truck trips;
- Redistributing the sand as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Constructing a system of sand dunes up to approximately 220 feet wide at the east end of the beach to be planted with native dune species;
- Creating a system of shared walkways to provide private lateral and vertical coastal access across the new dune system, including up to 112 stairways on the on the face of the seawall to connect private properties to the shared walkways;
- Providing two vertical public access trails up and over the seawall and across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM
- Performing backpassing of the sand from the east to west end of the beach based on triggers and using heavy equipment such as scrapers and bull dozers; and
- Initiating one future major renourishment event of approximately 450,000 cy in roughly 10 years following initial nourishment activities.

Potential Impacts to Public Trust Resources

This alternative would include removal of a major portion of the existing emergency revetment while retaining some of the rocks for use in the boulder toe apron of the seawall, as well as the installation of a seawall entirely within the private property boundary of the residences fronting Broad Beach. This alternative is the most construction-intensive alternative of any included in this APTR. . This alternative would also involve demolition of up to approximately 55 patios and relocation of up to 54 OWTS, if the cast-in-place seawall were selected. This alternative would also require a longer period of construction of up to an additional 2 to 3 months for revetment removal, seawall construction and transport and distribution of the additional 120,000 cy of inland sand. These activities would incrementally increase construction related impacts, particularly those related to terrestrial biological resources. Resource areas with major changes to impacts relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-6 at the end of this subsection.

Air Quality and Greenhouse Gases: There would be a major increase in air pollutant and GHG emissions associated with increased heavy haul and cement truck trips and the operation of additional heavy equipment during Project construction. Similar to Alternatives 1 and 2, emissions of VOCs and NO_x would be increased under this alternative; however, due to the major increase in construction required under this alternative, Impact AQ-1 would be substantially more severe than under the Project, including under SCAQMD's LSTs for construction activities. Given the potential impacts to air quality, this alternative would require the use of AMMs as outlined in the Project (e.g., use of new trucks with clean-burning engines); however, total impacts to air quality would still increase above those associated with the Project (Appendix G). Greenhouse gas (GHG) emissions described in Impact AQ-2 would be incrementally increased but would remain below SCAQMD and VCAPCD thresholds. Finally, increased truck traffic and heavy equipment operation associated with reinforcement and relocation of the rock revetment would incrementally increase toxic air contaminant emissions; however impact AQ-3 would remain minor as thresholds would not be exceeded.

Whereas implementation of Alternative 3 would substantially increase the severity of construction-related air quality impacts over the short-term, this alternative may incrementally reduce the severity of construction-related air quality emissions from backpassing. As previously described, additional beach width would be made available with the landward construction of the seawall as close to the existing leach fields as possible. This would incrementally delay the exposure of the seawall after the initial nourishment event based on a continued average estimated sand loss rate of between 30,000 and 45,000 cy per year (Moffatt & Nichol 2013). However, while the need for backpassing may be incrementally reduced, backpassing would still be required to maintain the evenly distributed wide sandy beach, and air pollutant and GHG emissions would still be considered a major adverse impact.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Construction of a seawall far landward of the January 2010 MHTL accompanied by a much wider dune system would change potential impacts to coastal processes relative to those described for the Project. Erosion of beach and dunes after the cessation of nourishment would continue as described under the Project; however, in the central and eastern segments of the beach, the substantially wider restored dune system may extend the beneficial effects identified in Impact CP/GEO-3 beyond the estimated 10 to 20 or more years associated with the Project. Anticipated SLR of approximately 8.5 inches by 2030 would further exacerbate erosion effects, including increased frequency and intensity of storm surges and wave attack. In addition, adverse impacts associated with Impact CP/GEO-2 would be greatly reduced, including potential damage to homes, OWTS and accessory structures from coastal erosion. Further, associated indirect impacts to public trust resources identified in Impact CP/GEO-2, such as adverse effects on water quality, would also be greatly reduced. The seawall would provide long-term protection of existing OWTS, primary structures, and relocated patios; however, construction of a cast-in-place concrete seawall would require relocation of up to 54 OWTS, which appears to be infeasible due to space limitation and city code requirements.

The seawall may also potentially result in long-term impacts to sand exchange between the nourished beach and remaining southern foredune habitat present in the rear yards of the residences on Broad Beach. Hard stabilization structures tend to reduce sand exchange between these environments, consequently resulting in accelerated erosion of the beach described in Impact CP/GEO-8 (Pilkey and Wright 1988). Further, while additional sand being exposed seaward of the seawall may incrementally increase short-term benefits to sediment transport to down coast beaches, if and when the seawall becomes exposed, as a hard stabilization structure it may also have adverse down coast impacts, potentially resulting in accelerated erosion down coast in the direction of long-shore transport (Kelly 2000). Consequently, beneficial impacts associated with down-coast sediment transport identified in Impact CP/GEO-7 may be incrementally increased in the short- and medium-term but may be reduced in the long-term.

Construction of a properly engineered seawall would avoid potential adverse impacts associated with liquefaction and wave impacts and eventual damage to homes, ancillary structures, and OWTS with adverse indirect consequences for public trust resources. Relocation of up to 54 OWTS would be required in order to avoid the cast-in-place concrete seawall footprint, which may be infeasible due to space limitation and city code requirements, as discussed further for this alternative under *Utilities and Service Systems* below. This alternative would substantially reduce the long-term adverse effects associated with Impact CP/GEO-1; however, should effluent from OWTS and/or groundwater pooling behind the seawall, it may weaken the seawall and foundation, resulting in potential catastrophic structural failure of this hard stabilization structure and related additional adverse impacts.

Impacts related to sand compatibility (CP/GEO-4) and tides, currents, and wave height and direction (CP/GEO-5) would remain largely similar to those described for the Project. Short- and medium-term beneficial impacts to wave run-up (Impact CP/GEO-6) would remain similar, but may be extended due to the addition of more sand.

Marine Water Quality: Construction of a properly engineered seawall, installation of a wider dune field, and possible relocation of OWTS and other structures landward of the seawall would substantially reduce potential impacts to Marine Water Quality as long as the seawall remains intact. Protection for structures and OWTS would be increased and exceed the lifetime of the restored dunes as a last line of defense, as discussed by Impact MWQ-3. The seawall would provide long-term protection of existing development from coastal erosion.

Terrestrial Biological Resources: Removal of the existing revetment and construction of a seawall would require use of heavy cranes and bulldozers and major excavation and construction in backyards and degraded southern foredune areas, increasing the short-term construction effects on terrestrial biological resources described in Impact TBIO-2.

Although much of the habitat fronting the homes along Broad Beach has been subject to landscaping with non-native and invasive plant species associated with adjacent residential development, this area consists of degraded southern foredune habitat, a habitat type identified as rare by the CNNDB and CNPS. Moreover, due to the rarity and biological significance of dune habitat in southern California, southern foredunes are designated as ESHA under the Malibu City LCP. Construction activities including foundation excavation for the seawall in the southern foredunes would create potential temporary adverse impacts to native southern foredune vegetation and/or sensitive wildlife.[7] Adverse effects to ESHAs resulting from this alternative would be substantially more severe than those that occurred from previous installation of the existing revetments described in Impact TBIO-1. These activities would also increase the severity of Impact TBIO-2, as operation of heavy equipment could result in increased trampling of the degraded coastal dune ESHA. Impact TBIO-4 may also become more severe relative to the Project due to the operation of additional heavy equipment within ESHAs, resulting in a higher potential for hazardous spills. This risk would be compounded if a cast-in-place concrete seawall were selected, as removal of up to 54 OWTS would require additional construction activities and would contribute to the potential for accidents or spills.

However, restoration of a significantly larger dune field would substantially increase short- to mid-term benefits of dune restoration associated with Impact TBIO-6. This would potentially reduce the severity of the overall adverse impacts associated with the landward relocation of the revetment. Additionally, under this alternative the shared walkways would reduce habitat fragmentation and adverse effects of private access across the restored dune, increasing the beneficial effects identified in Impact TBIO-6 and slightly reducing the adverse effects described in Impact TBIO-7. However, long term erosion under this alternative would increase impacts to dune habitat described in Impact TBIO-8, as the dunes would be located almost entirely seaward of the seawall. The additional volume of sand would increase impacts related to longshore sand transport, identified in Impact TBIO-5. Impacts related to backpassing operations would be similar to those described for the Project in Impact TBIO-3.

Recreation and Public Access: Construction of a seawall landward of all public lands and all LAEs would incrementally increase adverse short-term construction impacts identified in Impact REC-1 due to the disruption of public use and enjoyment of public trust lands; however, due to constraints related to existing leach fields, not all portions of the seawall would be able to be located behind existing LAEs. Construction of a seawall as landward of the OHWM as possible would be substantially more consistent with shoreline protection and access policies. However, while this alternative would provide beneficial impacts associated with recreation and public access over the short- to mid-

[7] The highest quality remaining dune habitat suffered serious erosion damage during the winter of 2013-2014, with dunes eroding landward up to 100 feet at the east end of Broad Beach.

term as identified in Impact REC-3, this alternative may substantially increase long-term public access impacts identified in REC-4. Following the cessation of nourishment and erosion of the beach in 10 to 20 or more years, the beach is likely to vary in width seasonally and in relation to climate cycles and El Nino events; however, the beach could possibly erode as far back as the seawall, which would completely eliminate public access along Broad Beach during moderate and high tides. Backpassing operations and associated impacts to recreational users identified in Impact REC-2 would be similar to those described for the Project.

Utilities and Service Systems: Construction of a properly engineered seawall would substantially reduce potential damage to OWTS from coastal erosion, and associated indirect impacts to public trust resources identified in Impact UTL-2. Impacts to water quality and public use and enjoyment of the beach and ocean would be greatly reduced, as the engineered seawall would provide long-term protection of existing or relocated OWTS from coastal erosion.

While a steel sheet pile seawall could be installed fronting existing leach fields, a cast-in-place concrete seawall foundation would require relocation of up to 54 OWTS. However, it would not be feasible to relocate many of these OWTS due to space limitations and potentially city code requirements (see Table 4-5). According to a study prepared by the Applicant, (Moffatt & Nichol September 2012) and review of known OWTS locations, there is insufficient area for the landward relocation of a number of effected OWTS. Up to 26 residences would have insufficient area to accommodate landward relocation of their OWTS landward of Broad Beach. Further, some of these systems might feasibly be relocated between the home and seawall (refer to Table 4-5 and Figure 4-3), this option would require additional research regarding the feasibility for each OWTS and compatibility with the structural stability of the seawall (see discussion above regarding Coastal Processes, Sea Level Rise, and Geologic Hazards).

As no capacity exists in nearby public or private sewer systems, only one option exists to address potential impacts to the operation of existing OWTS if a cast-in-place concrete seawall is selected. The seawall would be sited 6 feet seaward of existing leach fields to reduce the potential for pooling of wastewater behind the structure. Adjusting seawall location would require siting the seawall towards the ocean where it would impact LAEs by overlying this land and restricting public access. This impact would be similar to existing impacts of the emergency rock and sand bag revetment, which overly and block access to these LAEs. While siting the seawall seaward to accommodate existing leach fields is feasible, it would be contrary to the intent of this alternative. Further, seawall design does not permit sharp breaks in direction, so any adjustment for one house would affect adjacent parcels and potentially additional LAEs.

Since the seawall would be relatively impermeable, and would extend far below grade (e.g., more than 30 feet for steel sheet pile wall) it could inhibit the lateral, shoreward migration of effluent through the natural sand filtration. This may cause pooling of effluent below the remaining leach fields increasing hydrostatic pressure behind the wall, potentially contributing to wall failure of the wall and leach field malfunction (Moffatt & Nichol 2012).

Installation of the seawall under the alternative would likely result in substantially greater impacts to the storm drain system than the Project. As discussed in Section 3.7.6, *Utilities and Service Systems*, only six of the 11 buried storm drains are currently visible either under existing homes or through the existing revetment, and the specific size and detailed location of the remaining five storm drains are not fully known. However, although this alternative would likely require reconstruction of existing storm drains through private patios and other improvements and result in a commensurate increase in construction-related impacts, Impact UTL-3 would be a minor adverse effect with implementation of AMM UTL-3 (Master Drainage Plan), as described for the Project.

Other Resource Areas: This alternative would have similar impacts to the Project in terms of its effects on scenic resources, marine water quality, marine and biological resources, and environmental justice. Effects on transportation, traffic, parking, and noise would be somewhat more severe due to increase levels of vehicular activity and congestion related to construction phases. Effects on public health and safety hazards and historic resources may be incrementally increased due to increased construction activity associated with construction of the seawall (Table 4-6).

Table 4-5. Alternative 3 – Potential for Landward Relocation of OWTS

Address	Number of Affected OWTS	Potential for Landward Relocation Behind Seawall[1]	Potential for Relocation Landward of Home [2]
31336	1	Not Feasible	Insufficient Area
31324	1	Potentially Feasible	Insufficient Area
31316	1	Feasible	Feasible
31280	1	Potentially Feasible	Insufficient Area
31250	3	Feasible	Feasible
31240	1	Not Feasible	Insufficient Area
31228	1	Potentially Feasible	Insufficient Area
31220	1	Not Feasible	Insufficient Area
31122	2	Not Feasible	Insufficient Area
31100	2	Feasible	Feasible
31064	2	Not Feasible	Insufficient Area
31058	1	Feasible	Feasible
31054	1	Potentially Feasible	Insufficient Area
31052	2	Not Feasible	Insufficient Area
31038	1	Not Feasible	Insufficient Area
30134	2	Potentially Feasible for at Least One Component	Insufficient Area
31030	1	Feasible	Feasible
31020	2	Not Feasible	Insufficient Area
31012	1	Feasible	Feasible
31000	2	Feasible	Feasible
30970	2	Potentially Feasible for at Least One Component	Insufficient Area
30966	2	Potentially Feasible for at Least One Component	Insufficient Area
30956	1	Potentially Feasible	Insufficient Area
30952	2	Feasible	Feasible
30944	1	Not Feasible	Insufficient Area
30930	1	Not Feasible	Insufficient Area
30928	2	Not Feasible	Insufficient Area
30924	2	Potentially Feasible for at Least One Component	Insufficient Area
30918	1	Feasible	Feasible
30908	1	Not Feasible	Insufficient Area
30900	2	Potentially Feasible for at Least One Component	Insufficient Area
30866	1	Potentially Feasible	Insufficient Area
30860	2	Feasible	Feasible
30842	2	Potentially Feasible for at Least One Component	Insufficient Area
30830	2	Potentially Feasible for at Least One Component	Insufficient Area
30804	1	Not Feasible	Insufficient Area
Total Properties Affected	**Total System Components Affected**	**Number of OWTS Feasible to Relocate Landward of Seawall**	**Number of OWTS Feasible to Relocate Landward of Home**
36	54	10	10

Source: Topanga Underground 2012.
[1]Feasibility determined via aerial imagery provided by the city of Malibu.
[2]Feasibility determined via the recommendations of Topanga Underground (2012).

Table 4-6. Alternative 3 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	Incremental Increase in Adverse Impacts	Additional construction equipment associated with construction of a landward-located seawall would incrementally increase adverse impacts associated with temporary construction activities; this would slightly increase in the severity of adverse effects associated with Impact SR-2 and SR-4. Further, when exposed after erosion of the beach, the seawall would become more and more visible above beachgoers, incrementally increasing the severity of Impact SR-1 over the long term.
Marine Water Quality	No Major Change in Adverse Impacts	There would be a slight increase in the potential for hazardous spills, as additional heavy equipment would be used in seawall construction and additional sand would be added for beach nourishment. The beneficial impact to marine water quality due to protection of OWTSs would be increased under this alternative, due to the improved strength of the seawall.
Marine Biological Resources	No Major Change in Adverse Impacts	There would be no major changes in impacts to marine biological resources. The potential for fuel or oil release described in Impact MB-6 would be slightly increased due to increased construction activities.
Noise	Incremental Increase in Adverse Impacts	Revetment removal and seawall construction would result in major temporary increase in noise and adverse impacts to beach users associated with Impact N-1 and sensitive receptors associated with Impact N-2 and N-3.
Cultural and Paleontological Resources	Incremental Increase in Adverse Impacts	Additional disturbance of the nearshore environment associated with the removal of the emergency revetment and the construction of the seawall, in particular with foundation excavation, as well as the possible demolition and removal of OWTS would result in an increased potential to disturb cultural resources, potentially increasing the adverse effects associated with Impact CR-1.
Public Health and Safety Hazards	Incremental Increase in Adverse Impacts	Demolition and relocation of OWTS associated with selection of the cast-in-place concrete seawall would increase the potential for incidental leaks, increasing the potential for adverse effects associated with to Impact HAZ-2. Operation of additional heavy construction equipment would increase the potential for incidental spills, further increasing potential adverse effects associated with Impact HAZ-2. Increased heavy construction equipment operation would also increase potential adverse effects on safety associated with Impact HAZ-3.
Traffic and Parking	Incremental Increase in Adverse Impacts	Revetment removal would require additional heavy haul truck trips, which may also increase traffic on Pacific Coast Highway and in Zuma Beach Parking Lot 12. When combined with up to 3,920 cement truck trips, 1,750 revetment removal haul truck trips and 8,560 trucks for added sand, these activities would increase the severity of the adverse effects associated with Impact TR-1. However, these impacts would be reduced through implementation of AMM TR-1
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

4.2.4 Alternative 4: Reduced Beach Nourishment Volume and Dune Restoration with Revetment in Current Location

Description

Under this alternative, less sand would be imported from inland sources for each beach nourishment event and the existing emergency revetment would be retained in place. During the initial nourishment event, this alternative would entail importing up to 400,000 cy of sand to Broad Beach, with 100,000 cy used to create the sand dunes and cover the revetment, and 300,000 cy used for beach nourishment.[8] Under this alternative, sand dune design would remain the same as described under the Project, with the dunes ranging between approximately 40 to 60 feet in width and dune hummocks varying in height from 17 to 22 feet above MMLW. However, post-construction beach berm width would be reduced to approximately 50 feet along the western 1,000 feet of Broad Beach and 100 feet along the eastern 5,000 feet of Broad Beach. Similarly, beach berm depth would be reduced from 17 to 12 feet in the western reaches and to 10 feet on the eastern reach (see Figure 4-4). Consequently, the total Broad Beach footprint would be reduced to approximately 30 acres from 46 acres.

This alternative would also include three smaller beach renourishment events of a shorter duration, rather than one larger renourishment event as described for the Project. The first event, which would occur after approximately 3 to 5 years, would include the deposition of up to 150,000 cy of sand. The second event, which would be approximately 8 to 10 years following the first nourishment event, would include up to 200,000 cy of sand. The third event would occur approximately 15 years after the first nourishment and include up to 300,000 cy of sand. The overall nourishment volume over the 20-year project duration would be equal to the Project, including the deposition of no more than 1,050,000 cy in total. As with the Project, sand would continue to be obtained from the three quarry sites located in the Moorpark/Simi area of Simi Valley, approximately 20 to 25 miles north of Broad Beach. More frequent nourishment events would likely require smaller annual or less frequent backpassing of sand using the Project objective triggers. The optimum size and timing of future renourishment would be determined based on monitoring data gathered during each phase of Project operation.

This alternative is intended to restore the beach and dunes while providing information on the beach's optimum equilibrium profile. This information would allow adaptive management to best implement long-term shoreline protection and beach restoration goals on Broad Beach and in the sub-littoral cell. By employing reduced nourishment events, this alternative may reduce the volume of sand lost offshore from post-

[8] This quantity is suggested as a potential value; a detailed study would be required to identify what the minimum sand volume would be to provide a viable beach and allow for assessment of sand transport.

construction beaches, as nourishment volumes can be best adapted to reflect the equilibrium beach.

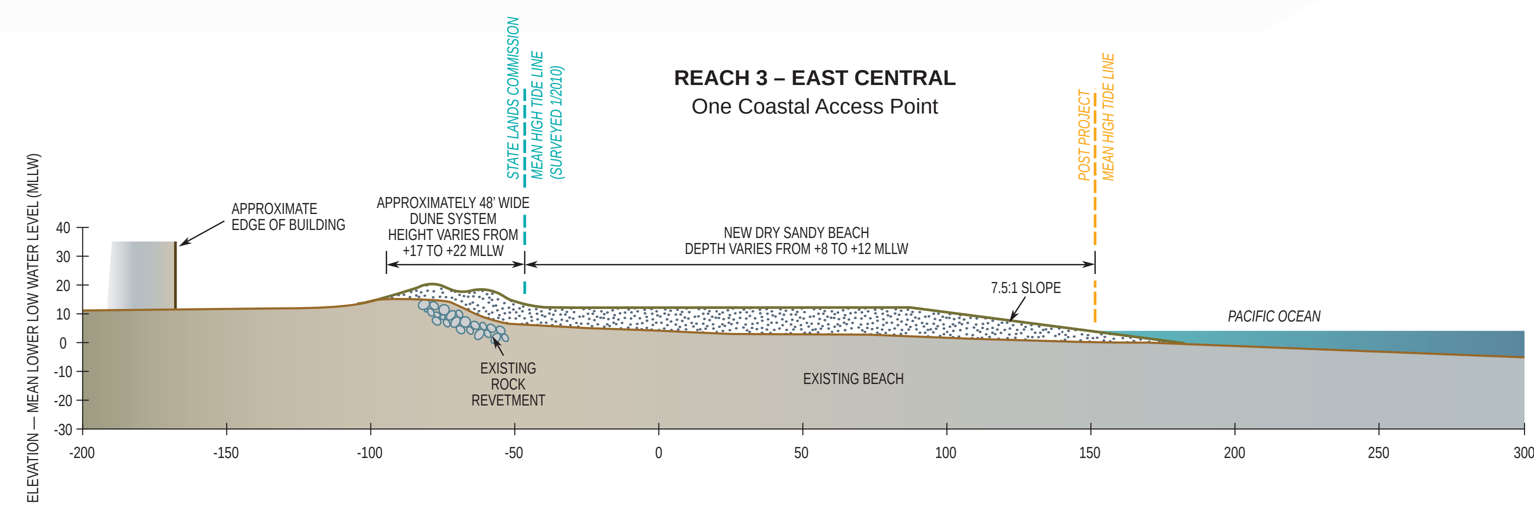
As with alternatives described above, full public access would be permitted along the entire wide sandy beach, but it would be restricted at the toe of the dunes where a line of rope or cable as well as posted signs would prohibit access to this ESHA. This rope or cable system, combined with the approximately 40- to 80-foot-wide dune system would ensure resident privacy. This alternative would channel private access across the dunes into shared unpaved walkways spaced every 300 feet (each combining access for approximately six homes), which would be connected to a back dune walkway lined with low fencing inland of and parallel to the restored dunes.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

This alternative would require installation of many of the same improvements as the Project and associated construction activities. Major components would include:

- Transport of 400,000 cy sand from inland quarries to Broad Beach via 28,700 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach and hauling it up coast to Broad Beach with heavy trucks or scrapers;
- Redistributing sand on Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Creating a system of shared walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Providing two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Backpassing of 25,000 to 35,000 cy of sand from the east to west end of the beach based using heavy equipment such as scrapers and bulldozers and employing nourishment triggers to account for beach width and profile; however, backpassing quantities are expected to be lower than the Project due to the increased frequency of nourishment activities under this alternative; and

Detail



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment to be Permanently Permitted
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

amec

Reduced Beach Nourishment Volume and Dune Restoration with Revetment in Current Location

FIGURE 4-4

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- Initiating three future renourishment events, with the first (150,000 cy) in roughly 3 to 5 years, followed by a second, potentially larger renourishment event of up to 200,000 cy in 8 to 10 years, and a third renourishment event up to 300,000 cy in approximately 15 years.

<u>Potential Impacts to Public Trust Resources</u>

Similar to the Project, this alternative would result in the total deposition of 1,050,000 cy of sand over the course of four individual nourishment events throughout the Project life, though each deposition would be substantially smaller than the nourishment events proposed in the Project. This alternative would have similar impacts to the Project; however, the reduction in sand volume per deposition would potentially change effects on coastal processes, SLR, and geologic hazards, marine biological resources, terrestrial biological resources, recreation, and public access. Major changes to impacts to these resource areas relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-7 at the end of this subsection.

The emergency revetment would remain in its current location with dune restoration and beach nourishment burying the revetment as described for the Project. While other alternatives could be combined with this alternative (e.g., Alternative 1 or Alternative 2), no relocated or modified structures are proposed under this alternative. Under this alternative, the nourished beach would be as wide as 100 feet near the east end of Broad Beach and reduced to 50 feet on the west end. As a part of this alternative, backpassing frequency and potential volumes may be reduced, as backpassing would likely not occur the same year as a major renourishment event.[9] However, the timing and quantity of renourishment events would vary depending on results of the intensive monitoring plan and backpassing, with amounts adjusted to reflect beach width and profile.

Coastal Processes, Sea Level Rise and Geologic Hazards: Implementation of the reduced Project alternative would substantially reduce the amount of initial sand lost offshore and down coast of Broad Beach during the establishment of sand equilibrium on the beach. Further, depending upon the rate at which beach erosion proceeds, damage to the dune system and exposure of the revetment could occur as early as the second year at the west end of the beach, although this may be delayed by backpassing activities. Adding sand in smaller, more frequent increments would alter the benefits identified in Impact CP/GEO-3 by potentially exposing the beach to more rapid erosion earlier than described for the Project, but this would be offset with three additional nourishment events. The overall longevity of this effort is difficult to estimate,

[9] Precise renourishment volumes are difficult to forecast for a variety of reasons. A much smaller beach footprint would need to be recharged with sand, but backpassing may provide less effective at extending beach life due to the more limited Project area and lower sand volumes available to backpassing.

but smaller more frequent renourishment events may allow for adaptive management, potentially resulting in a wider beach profile over the long term and reduced loss of sand to longshore transport. This could prolong Project life under this alternative beyond the 10 to 20 or more years forecast for the Project. Anticipated SLR of approximately 8.5 inches by 2030 would further exacerbate erosion effects stated in Impact CP/GEO-8, including increased frequency and intensity of storm surges and wave attack.

This alternative may also result in reduced indirect closure of the Trancas Creek Lagoon mouth and reduced nourishment of Zuma Beach. However, long-term impacts would remain similar to those identified in Impact CP/GEO-2, as the beach erodes and the inadequately engineered revetment becomes exposed to damaging coastal process and wave action over the long term, leading to indirect impacts to public trust resources. Impacts CP/GEO-1, CP/GEO-4, CP/GEO-5, CP/GEO-6, and CP/GEO-7 would remain similar to the Project.

Marine Biological Resources: The reduced size and more frequent nourishment events would -incrementally increase adverse effects identified in Impacts MB-2 and MB-3 due to repeated burial of rocky intertidal and sandy intertidal habitats. Impacts to near shore subtidal marine habitats, including surfgrass, kelp, and other sensitive marine organisms as stated in MB-4 would be slightly less adverse due to decreased indirect burial. By reducing the beach width in the 1,000 feet of Reach 6 on the west end of the beach to 90 feet from more than 160 feet under the Project, this alternative would substantially reduce both direct and indirect burial of rocky habitats. In particular, by pulling back the toe of beach fill by 70 feet, this alternative would substantially reduce direct and indirect burial of surfgrass, which is concentrated within Lechuza Cove at the west end of Broad Beach. Both the depth and duration of such surfgrass burial would be reduced. Additionally, this alternative would substantially reduce indirect turbidity impacts and impacts to offshore and down coast marine resources as stated in Impact MB-7, including subtidal reefs, as less sand would be lost offshore during each nourishment event. Further, although nourishment events would occur more frequently under this alternative than described for the Project, if Alternative 4 would reduce the need for backpassing, it may incrementally reduce impacts to Impact MB-5, on sandy intertidal organisms between nourishment events. However, mortality of marcoinvertebrates and loss of beach wrack as stated in Impact MB-3 would increase under this alternative as the entire beach would be disturbed more frequently by renourishment, four times under this alternative compared to twice under the Project. Under this alternative, the duration of the nourished beach may be extended, delaying exposure of the revetment. Additionally, more renourishment events would increase the potential for accidents or spills as identified in Impact MB-6. Impacts MB-1 and MB-8 would be similar to the Project.

Terrestrial Biological Resources: Impacts TBIO-1, TBIO-6, and TBIO-8 would be similar to the Project; however, if adaptive management for this alternative is successful and the life of the nourished beach is extended, impacts to coastal dune ESHA would be delayed. Additionally, as described above for marine biological resources, as less backpassing is anticipated under this alternative, impacts to terrestrial biological resources from backpassing identified in Impact TBIO-3 would also be reduced but similar to the Project. Further, smaller more frequent nourishment events may reduce adverse effects on the hydrology of the Trancas Creek Lagoon identified in Impact TBIO-5. Additionally, creation of shared walkways would reduce habitat fragmentation impacts identified in TBIO-7, and increase the beneficial effects associated with Impact TBIO-6. However, three major renourishment events would increase the frequency of disturbance of the entire beach, with associated mortality of marine marcoinvertebrates and diminishment of value of Broad Beach for foraging shorebirds as described in TBIO-2. Additional nourishment events would also incrementally increase adverse effects of construction activities identified in Impact TBIO-4, due to increased risk of accidental hazardous spills and resulting degradation of habitat resources.

Recreation and Public Access: Implementation of the reduced Project alternative would result in more frequent major short-term disturbance impacts to public access during construction activities identified in REC-1 with all or most of Broad Beach likely being closed to public access for several months during nourishment and renourishment events. Additionally, the east end of Zuma Beach would be disturbed during these activities, as Zuma Beach Parking Lot 12 is proposed for use for equipment staging and the beach for sand storage. Under this alternative, three renourishment events would occur after the initial nourishment, two more than included in Project; however, each of these renourishment events would be smaller, requiring a shorter duration of construction. As fewer backpassing events are anticipated, impacts identified in REC-2 would be less adverse. This alternative may also increase the beneficial recreational effects identified in Impact REC-3 by potentially incrementally extending the life of the beach through adaptive management. Long-term effects to recreation identified in Impact REC-4 would remain similar to the Project.

Other Resource Areas: This alternative would have similar or slightly incremental impacts to the Project in terms of its effects on scenic resources, air quality and GHGs, marine water quality, cultural and paleontological resources, noise, public health and safety hazards, utilities and service systems, traffic and parking, and environmental justice.

Table 4-7. Alternative 4 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	No Major Change in Adverse Impacts	There would be negligible changes in short-term visual and aesthetic impacts relative to the Project. While the adverse impacts associated with beach nourishment in SR-2 would occur for a shorter duration under this alternative, they would also occur at a greater frequency.
Air Quality and Greenhouse Gases	No Major Change in Adverse Impacts	There would be negligible changes in air emissions under this alternative. While there would be two additional renourishment events under this alternative relative to the Project, total sand

Table 4-7. Alternative 4 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		deposition under Alternative 4 would be identical to the Project. Consequently, this alternative would have similar total emissions from trucking over the long-term, although these emissions would be spread out over a longer period.
Marine Water Quality	Incremental Increase in Adverse Impacts	There would be an incremental increase in the potential for accidents or spills relative to the Project as there would be three renourishment events under Alternative 4. In decreasing sand lost from the post construction beach, this alternative may incrementally reduce the severity of turbidity and tidal exchange impacts in MWQ-1 and MWQ-2, but increase their frequency. However, other marine water quality impacts would generally be similar to those described for the Project.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	Cultural and paleontological resource impacts would be similar to those described in the Project. This alternative would increase the number of renourishment events on Broad Beach. However, each of the renourishment events associated with this alternative would be shorter in duration relative to those described for the Project. Over the Project life, this alternative may slightly increase the amount of time heavy equipment is mobilized on Broad Beach, which could negligibly increase the adverse impacts associated with Impact CR-2. However, these impacts would be similar to those described for the Project.
Noise	Incremental Increase in Adverse Impacts	This alternative would result in two additional smaller renourishment events of shorter duration when compared to the Project. These additional renourishment events would create two additional periods of construction noise, the shorter duration of the events would result in slightly more adverse overall noise impacts on recreational users and sensitive receptors identified in Impacts N-1,N-2, and N-3 to those described for the Project.
Public Health and Safety Hazards	No Major Change in Adverse Impacts	Increased nourishment event frequency may slightly increase the potential for hazardous spills to occur, which could incrementally increase adverse effects identified in Impact HAZ-2. The increased frequency of construction under this alternative would result in negligible or similar changes to Impacts HAZ-1, HAZ-3, HAZ-4, and HAZ-5.
Utilities and Service Systems	No Major Change in Beneficial Impacts	Impacts would remain similar to the Project, as the emergency revetment would become exposed after the cessation of nourishment, resulting in the potential for damage to OWTS and other improvements. Damage to these features may also result in indirect effects to public trust resources.
Traffic and Parking	No Major Change in Adverse Impacts	Traffic impacts from construction would be similar to but reduced from the Project; less sand would be hauled during each nourishment event and there would be less severe transportation impacts for each nourishment event relative to the Project. However, two additional renourishment events would increase the frequency of traffic disruptions.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

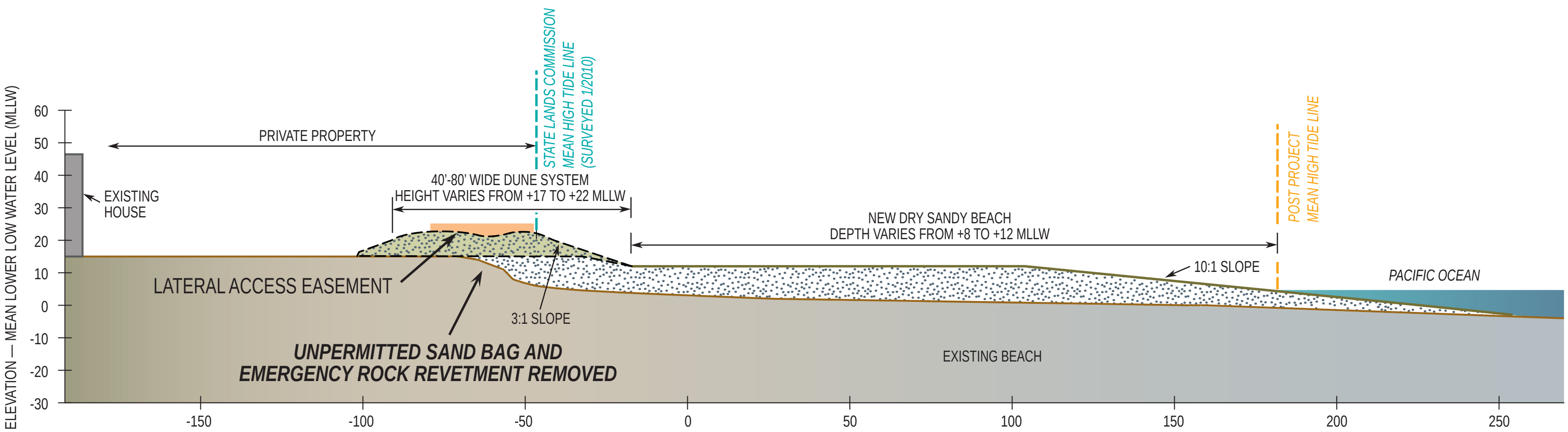
4.2.5 Alternative 5: Beach Nourishment and Dune Restoration with No Shore Protection Structure

<u>Description</u>

Under this alternative, Broad Beach would undergo beach nourishment, dune restoration with 600,000 cy of sand, and habitat restoration as described for the Project (see Figure 4-5.). Similar to the Project, post-construction beach width would range from 85 feet on the west end of Broad Beach (i.e., Lechuza Cove) to as wide as 230 feet near the east end of Broad Beach. Dune design would remain the same as described under the Project with dunes of approximately 40 to 60 feet wide and 17 to 22 feet above MLLW. The new post-construction dry sand beach berm and dune system would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the OHWM. This alternative would also involve annual backpassing activities and a renourishment event following 10 years after initial beach nourishment, similar to the Project.

This alternative would involve removal of the existing shoreline stabilization structures on Broad Beach, including the existing 4,100 foot-long rock revetment and underlying sand bag revetments that were approved under emergency permits (the sand bag revetments are presumed to be intact, at least in some locations, beneath the existing visible rock revetment). Erosion of the nourished beach and dune system would occur over time similar to the Project, but under this alternative, the existing revetment would not re-emerge and provide shoreline protection in the absence of beach nourishment and backpassing activities. While removal of the emergency revetment would reduce impacts associated with recreation and public access policy inconsistencies, it would also result in major future long-term impacts associated with coastal processes and potential damage to private improvements, including private OWTS, such as septic systems and leach fields, and resultant indirect impacts to public resources.

Similar to the Project, under this alternative, public use of and access along the beach berm would be permitted to the toe of the restored dune system where a line of rope or cable and signs would prohibit access to the dune habitats. This rope or cable system, combined with the approximately 50-foot-wide dune system, would also ensure resident privacy. In addition, rather than provide for 112 coastal access walkways across the restored dunes, as proposed by the Project, this alternative would include installation of shared private coastal access walkways, with one unpaved and demarcated walkway approximately every 300 feet to be shared between six homes. The approximate 300-foot distance between walkways was selected as an intermediate value that would improve dune habitat quality while minimizing disruption to private homeowner beach access. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dune ESHA, and be roped off to minimize private access into the dune ESHA.



Beach Nourishment and Dune Restoration with No Shore Protection Structure

FIGURE 4-5

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

Construction under this alternative would be similar to the Project; however, under this alternative, additional heavy construction equipment and approximately 3,600 new heavy haul truck trips would be required to remove the entire existing emergency revetment prior to initial beach nourishment activities. The removed materials would be transported to an approved location or facility (e.g., a rock quarry). Major components of this alternative would include:

- Removing the 4,100-foot long existing revetment using heavy cranes, backhoes, bulldozers and an estimated 3,600 heavy haul truck trips to transport boulders, sand bags, and other materials composing the existing revetment off of the beach;
- Redistribution of beach sand within the sand bags and removal of sand bag liners and other remaining debris;
- Transport of 600,000 cy of sand from inland quarries to Broad Beach via 43,000 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach and hauling it up coast to Broad Beach with heavy trucks or scrapers;
- Distributing the nourishment sand on Broad Beach with earthmoving equipment, such as bulldozers, and grading the nourished beach to dimensions similar to the Project;
- Delineating a distributed system of shared walkways (one walkway per six homes) to provide private lateral and vertical coastal access across the new dune system;
- Provide two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Backpassing of 25,000 to 35,000 cy of sand from the east to west end of the beach using heavy equipment, such as scrapers and bull dozers, with a generally annual frequency based on beach width and profile measurement triggers; and
- Initiating one future major renourishment event of approximately 450,000 cy in roughly 10 years following initial nourishment activities.

Potential Impacts to Public Trust Resources

This alternative would remove the existing emergency rock and sand bag revetment with accompanying proposed beach nourishment and dune restoration, returning Broad Beach to a wide sandy beach backed by coastal dunes. Removal of the revetment would substantially affect a number of resource areas, including coastal processes, SLR, and geological hazards, air quality, GHGs, terrestrial biological resources, utilities and service systems, recreation, and public access. Major changes to impacts of these resource areas are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-8 at the end of this subsection.

Air Quality and Greenhouse Gases: Under this alternative, criteria pollutant emissions would incrementally increase relative to the Project associated with the 3,600 additional heavy haul truck trips used to transport armor boulders offsite, as well as the operation of additional heavy equipment, necessary to remove the revetment. These emissions would increase the severity of Impact AQ-1, particularly for emissions of VOCs, which would exceed SCAQMD and VCAPCD thresholds for project-level significance under the Project, and NO_x, which would exceed SCAQMD and VCAPCD thresholds for onsite and project-level significance under the Project, including SCAQMD LSTs for construction activities. Relative to the Project, emissions of both of these criteria pollutants would incrementally increase under this alternative, as there would be additional construction activities and an increase in heavy haul truck trips associated with the removal of the revetment (Appendix G). Additionally, there would be an incremental increase in other criteria pollutants. GHG emissions described in Impact AQ-2 would remain below SCAQMD and VCAPCD thresholds. TAC emissions related to diesel engines and construction activities would also increase, with Impact AQ-3 becoming incrementally more severe.

Coastal Processes, Sea Level Rise and Geologic Hazards: Removal of the revetment would substantially increase the potential impacts of coastal processes on existing private improvements, including OWTS across the length of the 4,100-foot revetment. Erosion of beach and dunes after cessation of nourishment would continue as described under the Project, with the benefits of nourishment enduring for an estimated 10 to 20 or more years as described in Impact CP/GEO-3. Following the effective life of the beach nourishments and backpassing activities, existing homes, OWTS, and other improvements would once again become exposed to coastal processes as a result of persistent erosion associated with wave action. Under this alternative, after the revetment is removed potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 would no longer apply, as the revetment would be removed. However, as a consequence of removing the revetment, it would no longer act as a last line of defense to coastal processes, and damage to homes, OWTS, and accessory structures would be increased from coastal erosion, as well as associated indirect impacts to public trust resources identified in Impact CP/GEO-2, such as impacts to water quality.

Removal of the existing rock and sand bag revetments would also affect coastal processes by initially decreasing wave refraction and allowing the created dune system to erode, thereby increasing nourishment of down coast beaches (e.g., Zuma Beach). Impact CP/GEO-7 would remain beneficial, as effects of the longshore currents on nourishment and renourishment of sand in the short- to mid-term include both erosion of sand from Broad Beach and accretion of sand at down coast beaches. This beneficial impact would be incrementally increased under this Alternative as additional dune sand would be exposed seaward of the homes. However, over the long-term, longshore currents would transport this sand farther down coast and possibly offshore. Further, when erosion reaches homes and OWTS, adverse impacts would occur as debris, pollutants, and other materials are washed into the surf zone following damage from wave action.

With cessation of beach nourishment, impacts to homes, OWTS, and accessory structures from coastal erosion described in Impact CP/GEO-2 would become substantially more severe. The dune system would erode and homes would be exposed to damage and destruction as the dune field alone does not appear to constitute adequate protection from wave attack during major storm events. As demonstrated by dune erosion occurring during the winter of 2013-2014, where sand erosion of up to 100 feet was observed at the beaches' west end, the dune system may slow, but not halt, coastal erosion absent major changes in climatic cycles and the sediment budget of this littoral cell or continuing renourishment beyond the life of the Project or this alternative. Sea level rise, anticipated to be approximately 8.5 inches by 2030 would further exacerbate erosion effects stated in Impact CP/GEO-8.

Removal of the revetment would substantially increase direct impacts to revetment stability identified in Impact CP/GEO-1, while exposing homes, OWTS and other improvements to impacts from wave action. The removal of the revetment and eventual erosion of the dunes would lead to more damage to homes, private improvements, and/or OWTS, resulting in adverse indirect consequences for public trust resources. These effects would be experienced over the long-term and would be temporarily reduced by backpassing activities and the follow-up renourishment event. Following the cessation of nourishment, homeowners may again request or install emergency coastal protection structures to prevent the impacts resulting from long-term erosion, which may result in major geological impacts related to the public trust resources. Impacts CP/GEO-4, CP/GEO-5, and CP/GEO-6 would remain similar to the Project.

Terrestrial Biological Resources: The removal of the revetment under this alternative would directly impact the existing degraded dune habitats, as heavy equipment would operate on and near these degraded dunes to remove the existing rock and sand bag revetments. This would potentially increase the adverse effects of short-term construction associated with Impact TBIO-2. Although this equipment would be operated from the seaward side of the revetment, impacts to ESHA would still be likely to occur. These impacts would be largely offset by successful implementation of dune restoration. Hazardous spill impacts due to the removal of the revetment may also increase impacts described in TBIO-4.

However, removal of the existing rock and sand bag revetment would allow for the more natural movement of windblown sand within the restored active coastal dunes relative to the Project, resulting in less beneficial impacts to dune habitat functions under this alternative, at least over the next 10 to 20 years. Additionally, the construction of shared walkways at 300-foot intervals would reduce dune habitat fragmentation, ultimately reducing the adverse effects of private access across the restored dune system as stated in TBIO-7. However, over the long term, cessation of nourishment and elimination of the revetment would eventually lead to the erosion of the restored southern foredune habitat in the rear yards of private residences over the long-term, as no hard stabilization structure would be in place as a last line of defense to protect this area. This would represent an additional long-term adverse impact to terrestrial biological resources at Broad Beach as stated in Impact TBIO-8. Implementation of the long-term monitoring and maintenance activities and adaptive management strategies described in AMM TBIO-1a, would reduce, but not eliminate this impact. Impacts TBIO-1, TBIO-3 and TBIO-5 would remain similar to the Project.

Utilities and Service Systems: The removal of the existing emergency rock and sand bag revetments would eliminate the beneficial impacts identified in UTL-1 associated with these shoreline stabilization structures with regards to protection of OWTS from coastal erosion. Following long-term erosion of beach and dunes, approximately 60 OWTS in the rear yards of private residences would become exposed to the effects of coastal erosion, substantially increasing impacts to public trust resources associated with release of sewage effluent identified in Impact UTL-2. However, revetment removal will reduce impacts to drainage systems described in UTL-3. The analysis of impacts to OWTS in the Broad Beach Coastal Engineering Report, completed by Moffatt & Nichol in 2013, projects that coastal erosion could reach and destroy exposed OWTS for many homes that lack sufficient area for landward relocation (Appendix B).

Potential for such dune erosion was recently exemplified in the winter of 2013-2014 when wave action largely destroyed existing sand bag and Sakrete revetments protecting homes and dunes at the east end of Broad Beach. As a result of this wave attack and destruction of sand bar and Sakrete revetments, the wide dune system at the east end of Broad Beach was eroded landward by 80 to 100 feet to within 30 to 50 feet of existing homes. Following cessation of nourishment and erosion of the beach and dune system in 10 to 20 or more years, another emergency revetment would likely be requested by homeowners to prevent destruction of homes and OWTS by wave attack and the associated indirect impacts to public trust resources.

Recreation and Public Access: This alternative would result in increased adverse effects associated with Impact REC-1, as heavy equipment utilized for revetment removal would reduce public access during construction activities. However, by removing the sand bag and rock revetments, this alternative would be the most consistent with coastal policies concerning public access and minimizing use of hard coastal protection structures. Short to medium-term beneficial impacts in REC-3 would also increase due to the removal of the revetment. Impact REC-2 would remain similar to the Project.

As identified in Impact CP/GEO-2, after cessation of nourishment and eventual erosion of the wide sandy beach and dune system, impacts described in Impact REC-4 would be less adverse as the revetment would no longer be in place after long-term cessation of beach nourishment. However, the public access benefits of the wide sandy beach of this alternative would be eliminated. Lateral access would again be restricted to low and medium tides. Further, as the beach erodes back to the dunes, public access would be dependent upon a patchwork of LAEs, the locations of which are often uncertain to beachgoers. This could again bring homeowners and beachgoers into conflict over private versus public property. Eventually, as erosion reaches homes, OWTS, and other improvements, beachgoers would encounter obstacles to lateral access, including debris, OWTS, effluent, or other barrier to use and enjoyment of public trust resources; owners may also request or install emergency coastal protection structures, further limiting public access.[10]

Marine Water Quality: Removal of the emergency rock and sand bag revetment would result in the potential for impacts to marine water quality to occur resulting from long-term erosion and potential damage to existing OWTS occurring behind existing revetments. Construction related to revetment removal would have more adverse impacts to water turbidity as described in Impact MWQ-1. Under this alternative, the beneficial impacts described under Impact MWQ-3 would not occur as the existing revetment would be removed and would no longer serve as the last line of defense for existing development along Broad Beach. This would constitute a major adverse impact and would likely cause homeowners to install or request installation of additional emergency revetments in response to the long-term erosion of Broad Beach after the cessation of proposed nourishment activities. Impacts MWQ-2 and MWQ-4 would remain similar to the Project.

[10] Although permits are required prior to installing emergency coastal protection structures, in some emergency situations homeowners have installed structures in order to protect their homes without first obtaining authorization. This would likely occur again in future emergencies.

Other Resource Areas: This alternative would have similar impacts to the Project for scenic resources, marine biological resources, cultural and paleontological resources, noise, public health and safety hazards, traffic and parking, and environmental justice.

Table 4-8. Alternative 5 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	Incremental Short-term Increase and Long-term Decrease in Adverse Impacts	There would be a slight increase in adverse effects associated with Impact SR-2, as this alternative would result in additional construction equipment relative to the Project. However, removal of the revetment would eliminate the potential for long-term exposure eliminating the adverse effects associated with Impact SR-1. Eventual destruction of homes, patios and OWTS by coastal erosion would create additional aesthetic impacts. All other impacts to scenic resources would be either negligible or similar to the Project.
Marine Biological Resources	No Major Change in Adverse Impacts	There would be no appreciable difference in direct effects relative to the Project. Under this alternative, impacts to marine biological resources would remain similar or slightly increased relative to the Project. However, over the long-term, exposure of OWTS to wave attack could create indirect impacts to such marine biological resources due to release of septic effluent into the surf zone.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	Additional disturbance of the near shore environment associated with removal of the emergency revetment would result in an increased potential to disturb cultural resources, slightly increasing the severity of the adverse effects associated with Impact CR-1. However, as heavy equipment would only be operated on the seaward side of the revetment, the probability of uncovering cultural resources would be minimal. All other cultural and paleontological impacts would be similar to the Project.
Noise	Incremental Increase in Adverse Impacts	Operation of additional heavy haul trucks, cranes, and bulldozers used during revetment removal would incrementally increase the severity of the adverse effects associated with Impact N-1. All other noise impacts would be either similar or slightly increased in relation to the Project.
Public Safety and Health Hazards	Incremental Increase in Adverse Impacts	Additional heavy equipment used during revetment removal would increase the potential for incidental release of hazardous materials, resulting in an incremental increase in the severity of Impact HAZ-2. Further, operation of additional heavy equipment on the beach would increase the short-term hazardous conditions during construction, incrementally increasing the severity of Impact HAZ-3. Impact HAZ-5 would also become a long-term or permanent beneficial impact instead of having a short- to mid-term duration. Impact HAZ-1 would also no longer be relevant, as the revetment would no longer be present to create potential hazards.
Traffic and Parking	Incremental Increase in Adverse Impacts	Revetment removal would require an additional 3,600 truck trips and additional heavy equipment over that required for the Project. This would incrementally increase severity of the adverse effects associated with Impact TR-1 and potentially TR-2, depending on the disposal location of the removed

Table 4-8. Alternative 5 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		boulders (i.e., rock quarry). Other traffic impacts would be similar to the Project.
Environmental Justice	No Change	There would be no appreciable difference in impacts relative to the Project.

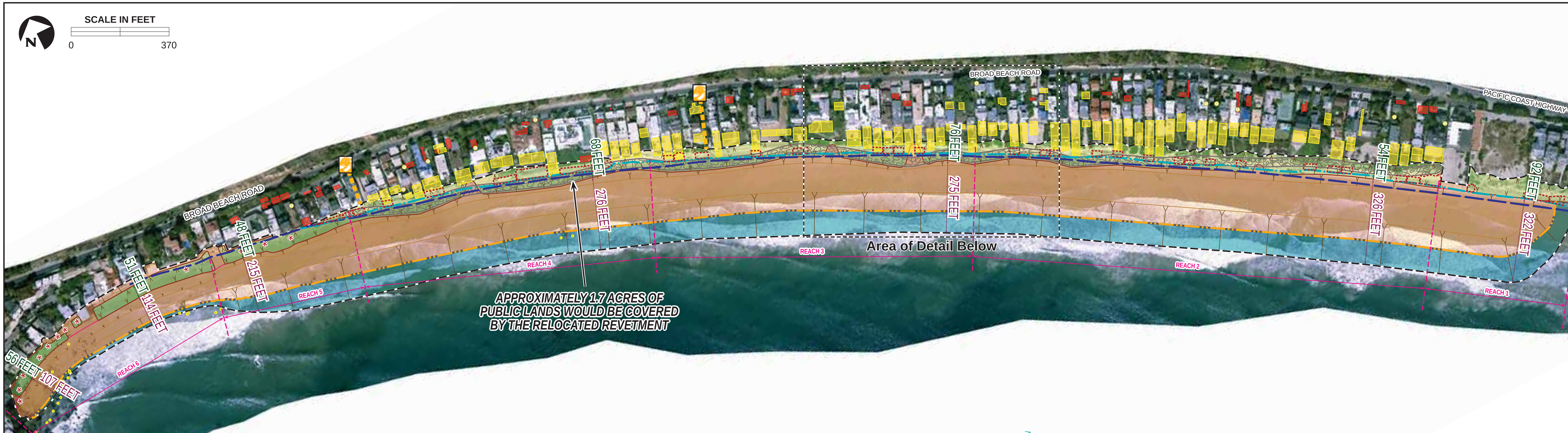
4.2.6 Alternative 6: Relocation of Improved Revetment along Upgraded Leach Fields with Beach Nourishment and Dune Restoration

Description

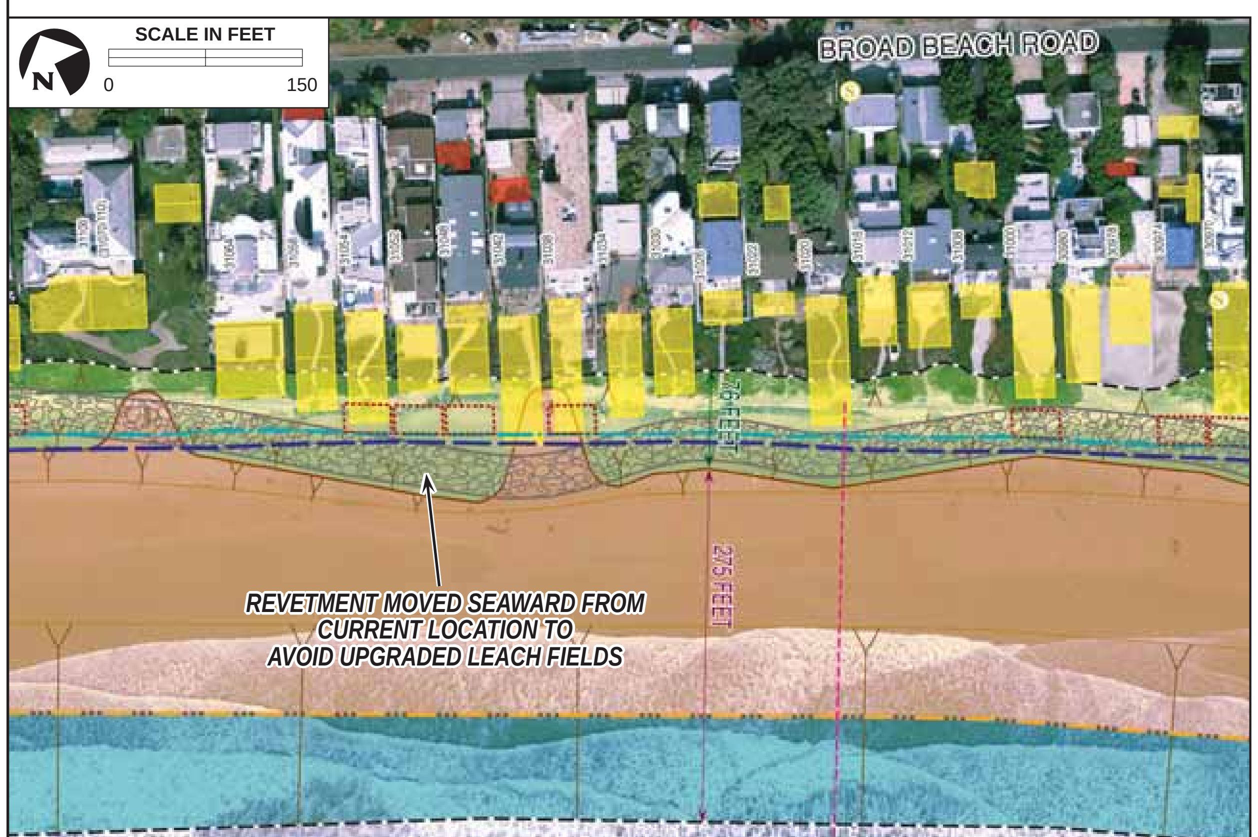
A key goal of this alternative would be to ensure improved disposal of wastewater at Broad Beach, consistent with existing codes. This alternative would include beach and dune restoration identical to the Project, as well as strengthening of the existing revetment and relocation of segments of this revetment. However, this alternative would differ from the Project and the other alternatives in that the existing OWTS located seaward of the residences at Broad Beach would be upgraded to meet current code. Because leach fields for such upgraded OWTS are space-intensive, parcels with limited room for such upgrades near the west end of the existing revetment would require seaward relocation of the revetment. Under this alternative, the majority of the revetment would remain in place, with eastern segments relocated substantially landward and areas to the west relocated seaward onto public trust lands.

Beach nourishment, dune creation, and habitat restoration components under this alternative would remain similar to those described for the Project, with approximately 43,000 haul heavy trips being required to haul 600,000 cy of sand from inland quarry sources. Similar to the Project, post-construction beach width would range from 85 feet on the west end of the Project area (i.e., Lechuza Cove) to as wide as 230 feet near the east end of Broad Beach. Dune habitats would be established and restored by creating a sand berm that would run along the length of the beach, with a minimum of 2 feet of sand over the existing rock and sand bag revetment. The beach berm would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the revetment, depending on location. The restored dune system, consisting of hummocks varying in height from 17 to 22 feet above MLLW would be constructed on top of this berm. The width of the dune system would vary from 50 to 60 feet wide. In places, these dunes would overlie expanded leach fields of OWTS and in places would extend further seaward below OHWM than under the Project.

This alternative would include upgrades to and relocation of OWTS and/or leach fields as far landward as feasible, consistent with the location of existing primary residences, but regardless of existing auxiliary buildings, landscape, and hardscape (Moffatt & Nichol 2013). Most properties at Broad Beach would require significantly larger leach fields to meet current code, in most cases this would include doubling of the size of the leach field. Homes along the eastern reaches of the beach often have setbacks of 75 to 100 feet or more from the revetment, providing space for leach field expansion. In contrast, homes in the central and western reaches of the beach have smaller setbacks from the existing revetment, which limits space necessary for expansion of existing leach fields.

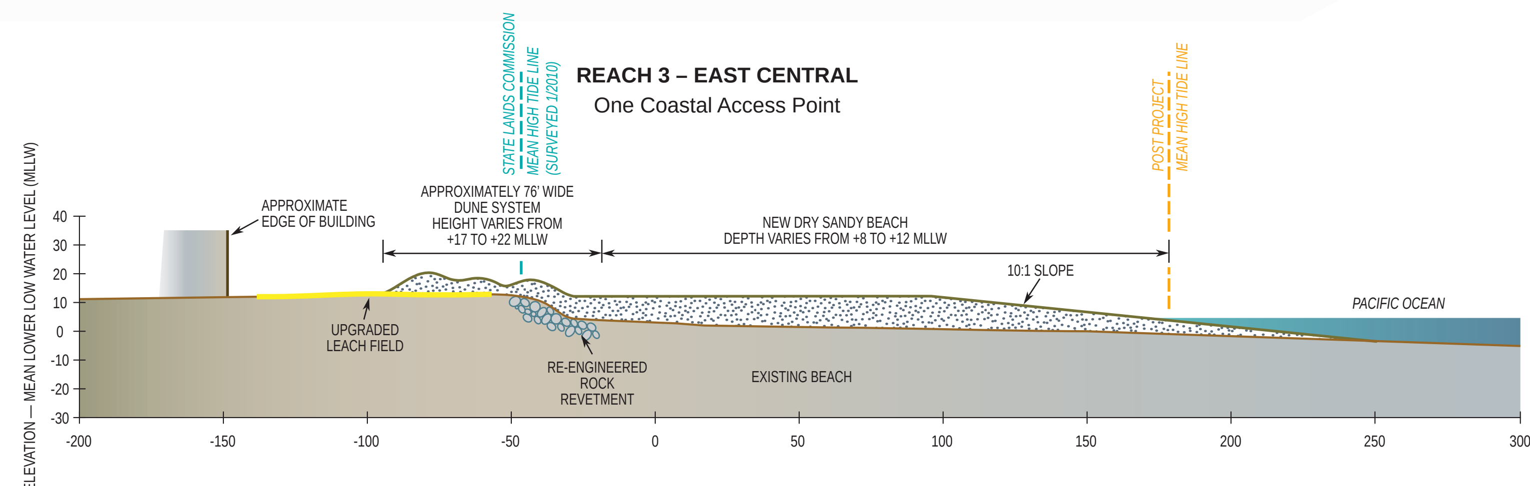


Detail



REACH 3 – EAST CENTRAL

One Coastal Access Point



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment to be Permanently Permitted
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field Not Requiring Upgrade
- Upgraded Leach Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

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Relocation of Improved Revetment along Upgraded Leach Fields with Beach Nourishment and Dune Restoration

FIGURE 4-6

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Under this alternative, the emergency revetment would be relocated landward where feasible along the upgraded leach fields. Ensitu (2013) estimated that landward relocation of the revetment would be infeasible for all properties west of 30918 Broad Beach Road due to leach field encroachment within the wave run-up zone. However, research into required setbacks for OWTS did not uncover a documented requirement between an OWTS and Wave-Uprush Line. In addition, the OWTS would be protected by both the revetment and overlying sand dunes, which are projected to endure for 10 to 20 or more years. The revetment and sand dunes would minimize potential for wave uprush to affect the OWTS. Therefore, wave run-up was not used to guide design of this alternative, but is assessed as a potential impact.

Consequently, this alternative includes landward relocation to the maximum extent feasible consistent with expanded leach fields, but acknowledges that after the cessation of nourishment and erosion of the beach and overlying dunes in 10 to 20 or more years there may be OWTS impacts due to splashing or overtopping of the exposed revetment during large storms (see *Utilities and Service Systems* discussion below). Regardless, as a result of increasing the leach field size for each property, it is likely that segments of the revetment would be relocated *further* seaward onto public land in some locations west of 30918 Broad Beach Road. This would result in major trade-offs between potential impacts to water quality and recreation, and public access. The reinforced revetment would be no wider than the existing 38-foot width at its base with a crest elevation of approximately 15 feet above Mean Low Low Water (MLLW). This design would be required to demonstrate that the armoring of the existing revetment would not increase the width of the revetment to minimize beach coverage, which may require removal of existing smaller stones, or incorporation of these smaller stones into a steeper reinforced revetment.

Similar to the Project, public use of and access along the beach berm under this alternative would be permitted to the toe of the restored dunes where a line of rope or cable and signs would prohibit access to potential ESHA within the dunes. This rope or cable system, combined with the approximately 50-foot-wide dune system, would also ensure resident privacy. In addition, rather than provide for 112 unpaved coastal access walkways across the restored dunes, as included in the Project, this alternative would include installation of shared private coastal access walkways, with one walkway approximately every 300 feet to be shared between six homes. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dune habitat. Each of these walkways would be roped off to minimize private access into the dune habitats. This distance was selected as an intermediate value that would retain dune habitat continuity and quality while minimizing disruption to private homeowner beach access.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

This alternative would involve additional new major construction activities compared to the Project. Installing a properly engineered revetment would require use of heavy equipment to remove some of the boulders, move some of the existing boulders inland, and install larger boulders to enhance revetment stability. Revetment reconfiguration would require an estimated 4,500 new haul truck trips to deliver additional boulders (approximately two or three boulders per truck) to the beach in order to armor approximately 3,650 feet of the revetment, as well as for potential export of smaller stones as needed.[11] Armoring would consist of placing a layer of boulders (one or two boulders deep) from below the revetment toe to its crest. A somewhat larger staging area within the Zuma Beach Parking Lot 12 may also be required to accommodate additional equipment and material storage. Additional construction equipment would also be required to relocate the existing rock revetment and move and position new rock, such as one or two heavy cranes and bulldozers along with additional associated construction personnel,. This would result in increased fueling activity and additional traffic along the beach. This additional truck traffic would increase congestion associated with sand importation by approximately 10 percent. Traffic control measures for sand haul trucks entering and leaving the parking lot, as well as transiting along the beach would be implemented.

In addition, because the revetment would be located further landward, additional excavation and construction would be requires for patio and landscape removal, as well as upgrade and relocation of existing OWTS. These activities may be scheduled concurrently or preceding beach nourishment and thus would extend the projected construction horizon beyond the proposed 8 months by at least 1 to 2 months.

- Upgrade and expansion of all OWTS that are located seaward of primary structures to roughly double the size of leach fields, thereby meeting existing code requirements and improving wastewater disposal;
- Relocation of the existing rock and sand bag revetment using heavy cranes and bulldozers to an inland configuration, where feasible, along the seaward edge of

[11] The westernmost 470 feet of the emergency revetment was built to a different standard and incorporated larger boulders; thus it would not receive further armoring.

the upgraded OWTS locations (in some locations, the revetment may have to be relocated seaward to accommodate the upgraded leach fields);

- Importing large 3- to 5-ton boulders via an estimated 4,500 heavy haul truck trips and potentially exporting a portion of the smaller existing rock revetment;
- Placing new larger boulders over and at the toe of the existing revetment using heavy cranes and bulldozers;
- Transporting 600,000 cy of sand from inland quarries to Zuma Beach via 43,000 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach and hauling it up coast to Broad Beach with heavy trucks or scrapers
- Redistributing sand on Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Creating a system of shared unpaved walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Provide two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Performing backpassing of the sand, ranging from 25,000 to 35,000 cy, from the east to west end of the beach based on triggers and using heavy equipment, such as scrapers and bull dozers; and
- Initiating one future major sand supply renourishment event of approximately 450,000 cy in roughly 10 years.

<u>Potential Impacts to Public Trust Resources</u>

This alternative to the Project would result in additional construction activities associated with upgrade of the existing OWTS, demolition of improvements to provide space for such upgrades, and landward relocation of the revetment where feasible or required to accommodate OWTS upgrades. This alternative would result in major trade-offs concerning potential water quality impacts and impacts to recreation and public access (see Illustration 4-4). This alternative would also result in major changes to impacts associated with terrestrial biological resources. Adverse impacts resulting from this alternative may include effects on coastal dune ESHAs on the eastern end of Broad Beach identified in the Malibu LCP, as well as an incremental increase in potential for hazardous spills in the terrestrial environment. Further, public access during construction activities would be incrementally reduced relative to the Project due to increased heavy equipment use. Beneficial impacts associated with this alternative would include reduced long-term potential impacts to marine water quality protection. However, this alternative may be less consistent with coastal public access and recreation policies, as the revetment would remain in its current location partially overlying public lands for more than 50 percent of its reach. Further, seaward relocation of the existing revetment may even be required in front of up to 20 homes in order to permit OWTS expansion. Resource areas with major changes to impacts relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-9 at the end of this subsection.

Air Quality and Greenhouse Gases: Criteria pollutant emissions would increase by more than 10 percent relative to the Project associated with the 4,500 additional heavy haul truck trips used to transport armor stone and the operation of additional heavy equipment necessary to upgrade and relocate the OWTS. Further, operation of additional heavy equipment would be necessary to relocate and improve the revetment. These emissions would increase the severity of Impact AQ-1, particularly for emissions of VOCs, which would exceed SCAQMD and VCAPCD thresholds for project-level significance, and for NO_x, which would exceed SCAQMD and VCAPCD thresholds for both onsite and project-level significance similar to the Project, including SCAQMD LSTs for construction activities. Emissions of these criteria pollutants would substantially increase under this alternative when compared to the Project due to additional construction activities and a 10 percent increase in heavy haul truck trips (Appendix G). Additionally, this alternative would incrementally increase other criteria pollutants including CO, SO_x, and PM. This increase in emissions relative to the Project, particularly the increase in VOC and NO_x emissions, would require implementation of AMMs, such as use of newer haul trucks with clean-burning diesel engines, but would still have a major adverse effect. GHG emissions described in Impact AQ-2 would remain below SCAQMD and VCAPCD thresholds. TAC emissions related to diesel engines and construction activities as stated in Impact AQ-3 would also incrementally increase, but would remain below thresholds.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Similar to Alternatives 1 and 2, reinforcement of the revetment with 3- to 5-ton armor stone would reduce the potential impacts of coastal processes on existing private improvements, including upgraded OWTS across the majority of the length of the existing 4,100-foot revetment. Erosion of the beach and dunes after cessation of nourishment would continue as described under the Project, with the benefits of nourishment enduring for an estimated 10 to 20 or more years, followed by a reemerging revetment as a result of persistent wave action. Anticipated SLR of approximately 8.5 inches by 2030 would have the same erosion effects described in Impact CP/GEO-8 as the Project, including increased frequency and intensity of storm surges and wave attack. However, after the revetment is exposed, potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 would be reduced as the revetment would be substantially strengthened by addition of heavier armor stones. Consequently, beneficial impacts to public trust resources identified in Impact CP/GEO-3 (e.g., water quality) due to protection to homes, OWTS, and accessory structures from coastal erosion would be increased. Although, the reengineered revetment would provide long-term protection for existing development from coastal erosion, its potential relocation further below the OHWM might incrementally alter coastal processes and impact public trust lands.

Similar to the impact of the existing revetment, the reengineered revetment would also impact coastal processes by incrementally increasing wave refraction when exposed and negligibly depriving down coast beaches (e.g., Zuma Beach) of a minor source of sand from dune erosion. However, Impact CP/GEO-7 would remain beneficial as effects of the longshore currents on nourishment and renourishment of sand in the short- to mid-term include both erosion of sand from Broad Beach and accretion of sand at down coast beaches.

The reinforced revetment with larger boulders as coastal armoring would increase the structural stability of the revetment, reducing potential adverse impacts under the Project associated with persistent wave attack. This alternative would substantially reduce the adverse effects associated with Impact CP/GEO-1. However, if the revetment could not be keyed into the bedrock located at 16 feet below ground level, the risk of liquefaction, seismic settlement, and lateral spreading in the event of an earthquake would still exist as described for the Project (SubSurface Designs, Inc. 2006). Impacts CP/GEO-4, CP/GEO-5 and CP/GEO-6 would remain similar to the Project.

Terrestrial Biological Resources: The upgrade and relocation of existing OWTS and the relocation of approximately 1,000 feet of the eastern segment of the existing revetment would require use of heavy cranes and bulldozers that would have major adverse effects on the existing, but often degraded southern foredune habitat fronting the homes along Broad Beach. Although much of the habitat in these areas has been subject to landscaping with non-native and invasive plant species associated with adjacent residential development, this area consists of southern foredunes, a habitat type identified as rare by the CNNDB and the CNPS. Moreover, due to the rarity and biological significance of dune habitat in Southern California, southern foredunes are designated as ESHA under the Malibu City LCP. Upgrade and relocation of the existing OWTS and installation of large boulders in these existing degraded dunes would create major adverse impacts to native southern foredune vegetation and/or sensitive wildlife as stated in Impact TBIO-2. As the revetment would be relocated up to approximately 20 feet further landward in places under this alternative relative to the Project, the relocation and reinforcement of the revetment would substantially increase the impacts to existing degraded southern foredune habitat; however, much of the highest quality remaining dune habitat at the east end of Broad Beach was eroded and destroyed by wave action in the winter of 2013-2014, particular during the storm of March 2, 2014.

Adverse effects to ESHAs resulting from this alternative would be similar to those described in Impact TBIO-1 for the Project. Additionally, due to the upgrade and relocation of OWTS, this alternative would result in even more severe impacts than

Alternative 1 and 2 to remnant dune habitats although this impact would be largely offset by successful dune creation. Impact TBIO-4 may also become more severe due to operation of additional heavy equipment within ESHAs necessary to upgrade and relocate the existing OWTS as well as the revetment. However, the potential beneficial effects of dune restoration associated with Impact TBIO-6 would be less beneficial this alternative, offsetting adverse impacts to existing degraded ESHA. Additionally, requiring shared private coastal access walkways would also substantially reduce disturbance of the proposed dune system as described in TBIO-7, protecting this newly established and restored dune habitats. Impacts TBIO-3 and TBIO-5 would remain similar to the Project.

Recreation and Public Access: This alternative would result in the operation of substantial additional heavy equipment on Broad Beach which would increase short-term adverse effects to public access associated with Impact REC-1. However, while landward relocation of the revetment along the upgraded and relocated leach fields would increase consistency with coastal public use and recreation policies in some locations, particularly east of 30918 Broad Beach Road, in other locations leach field expansion would result in relocation of the revetment seaward, *further* onto public lands. Consequently, under this alternative, the revetment could cover larger areas of public trust land or LAEs than described for the Project. This would result in a major increase in the severity of Impact REC-4. This alternative would be substantially less consistent with coastal polices for recreation and public access.

After the 10- to 20- or more year Project life, nourishment sand would be washed away through erosion and the beach would recede back to the new revetment, leaving little to no dry-sand beach area for recreation without continued renourishment. However, a maximum landward-relocated revetment combined with increased dune width at the east end of Broad Beach would provide limited additional room for public beach use at the east end of Broad Beach, particularly at low and moderate tides. This would decrease the beneficial effects of Impact REC-3. However, this benefit may be offset by less accessible beach on the west end of Broad Beach and by rising sea levels after 2050. In addition, impacts related to backpassing as stated in Impact REC-2 would be similar to the Project.

Marine Water Quality: Unlike the Project or any of the other alternatives, this alternative would see the upgrade of each of the OWTS for many of the residences along Broad Beach Road. This alternative would bring each of the existing systems up to city code and move each of the systems as far landward as practicable. Further, this alternative would include the installation of a properly engineered revetment that would substantially reduce potential impacts to marine water quality. Potential damage to homes, OWTS, and accessory structures from coastal erosion would be reduced and beneficial impacts to public trust resources identified in Impact MWQ-3 would be increased, as the reengineered revetment would provide long-term protection of existing development from coastal erosion. However, leach fields west of 30918 Broad Beach

Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013). Consequently, after cessation of beach nourishment and erosion of the newly widened beach in 10 to 20 or more years these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events, which may incrementally impact near shore water quality. However, this would also require waves to erode the overlying seaward end of the dune system.

Further, after cessation of nourishment and erosion of the beach in 10 to 20 or more years, the CSLC would consider disposition of all improvements overlying state sovereign lands and LAEs and would address these issues as part of lease extension or termination. However, while impacts to marine water quality would be substantially reduced under this alternative, Alternative 6 would involve major trade-offs which recreation and public access, as discussed above. All other impacts identified in Section 3.5, *Marine Water Quality* would be similar to the Project.

Utilities and Service Systems: As previously described, this alternative differs from the Project and each of the alternatives in that it includes upgrades and relocation of the OWTS many of the residences along Broad Beach Road. Additionally, similar to Alternative 1 and 2, the alternative would relocate the revetment inland where feasible, though, due to the increase in the size of the upgraded leach fields, the revetment would be extended *further* seaward onto public land in some locations. West of 30918 Broad Beach Road, where landward movement is not possible in front up to 20 residences, the revetment would be redesigned and narrowed, but would still lie partially on or in front of the public lands in these areas, resulting in a major adverse effect to recreation and public access.

This alternative would resolve future potential permitting issues with the city of Malibu and potentially other agencies as properties are reviewed for compliance with city code if repairs or upgrades are made to an existing OWTS. Such repairs are required for major remodels or home expansion and for resale (Ensitu 2013) (see Illustration 4-4).

Illustration 4-4: *This alternative would include the upgrade and landward relocation of OWTS for all residences fronting the Project area (pictured). This would reduce potential adverse impacts associated with water quality and utilities, but would result in major trade-offs with regard to recreation and public access as the revetment would have to be located seaward of the existing location in many areas in order to accommodate additional leach field space.*

Under this alternative, beach nourishment, OWTS upgrades, and, to a greater degree, reinforcement of the existing revetment would reduce potential impacts to Utilities and

Service Systems. This alternative would substantially increase the beneficial impacts associated with UTL-1. Potential damage to OWTS from coastal erosion, and associated indirect impacts to public trust resources identified in Impact UTL-2, including adverse effects to water quality and public use and enjoyment of the beach and ocean would be substantially reduced, as the reinforced revetment would provide long-term protection of OWTS from coastal erosion. However, leach fields west of 30918 Broad Beach Road would be located within 15 feet of the wave uprush limit calculated by Moffatt & Nichol (2013) after cessation of nourishment activities and erosion of the newly widened beach and dune system in 10 to 20 or more years. Consequently, these leach fields may experience splashing or minor seawater intrusion from waves overtopping the improved revetment during large 100-year storm events.

Relocation of the revetment inland would also result in similar public drainage-related impacts of the Project as discussed in Impact UTL-3, as construction of the restored dunes and beach nourishment would bury or obstruct public drainages. Similar to the Project, Impact UTL-3, such impacts would be a minor adverse effect with implementation of AMM UTL-3 (Master Drainage Plan).

Other Resource Areas: This alternative would have similar or incremental changes to impacts in comparison to the Project for scenic resources, marine biological resources, cultural and paleontological resources, noise, public health and safety hazards, traffic and parking, and environmental justice.

Table 4-9. Alternative 6 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	No Major Change in Adverse Impacts	Additional construction equipment associated with OWTS upgrade and landward relocation of the revetment may intensify the adverse impacts associated with temporary construction activities, with a slight increase in the severity of adverse effects associated with Impact SR-2. Similar to the Project, permanent authorization of the revetment through a long-term lease and approval of CDPs would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed as described in Impact SR-1. All other scenic resource impacts would be similar or slightly increased in comparison to the Project.
Marine Biological Resources	Incremental Decrease in Indirect Adverse Impacts	Placement of sand and potential burial of rocky intertidal and subtidal marine biological resources would have a major adverse effect to intertidal habitats and offshore habitats of Broad Beach similar to the Project as described in Impacts MB-2, MB-3, and MB-4. Additionally, similar to the Project, impacts to down coast habitats would be negligible as discussed in Impact MB-7. However, potential indirect impacts associated with water pollution from damage to OWTS from coastal erosion would be reduced along the length of the

Table 4-9. Alternative 6 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		existing revetment with improved coastal armoring. Further, this alternative would potentially conflict with the city of Malibu LCP and California Coastal Act policies resulting in increased impacts as stated in MB-8.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	Disturbance of the near shore environment associated with the OWTS upgrades and landward relocation of the revetment would result in a slightly increased potential to disturb cultural resources, resulting in an additional adverse impact similar in type to Impact CR-1. However, implementation of standard BMPs would reduce this impact. All other cultural and paleontological impacts would be similar to the Project.
Noise	Incremental Increase in Adverse Impacts	A temporary increase in noise due to additional construction activities associated with the landward relocation of the revetment would result in adverse impacts to beach users. Consequently, this alternative would result in slight increases in adverse effects associated with Impact N-1. However, these impacts would be reduced through implementation of AMM N-1a, similar to the Project. All other noise impacts would be similar to the Project.
Public Health and Safety Hazards	No Major Change in Adverse or Beneficial Impacts	This alternative would result in a slight increase in the adverse effects associated with Impact HAZ-2, as the presence of additional heavy construction equipment (i.e., bulldozers, cranes, and haul trucks) would increase the potential for an incidental release of hazardous material on Broad Beach. The increase in construction equipment and construction personnel would also result in increased inaccessibility and hazardous conditions during construction, slightly increasing the severity of adverse effects associated with Impact HAZ-3. These impacts would be reduced through implementation of AMMs HAZ-2, HAZ-3a, and HAZ-3b. All other public health and safety hazard impacts would be similar to the Project.
Traffic and Parking	Incremental Increase in Adverse Impacts	Landward relocation of the revetment would require an estimated 4,500 additional heavy haul truck trips and additional heavy construction equipment and construction personnel, which would likely increase traffic and congestion on PCH and in the Zuma Beach Parking Lot 12, incrementally increasing the severity of the adverse effects associated with Impact TR-1. These impacts would be reduced through implementation of AMM TR-1. All other traffic and parking impacts would be similar or slightly increased in comparison to the Project.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

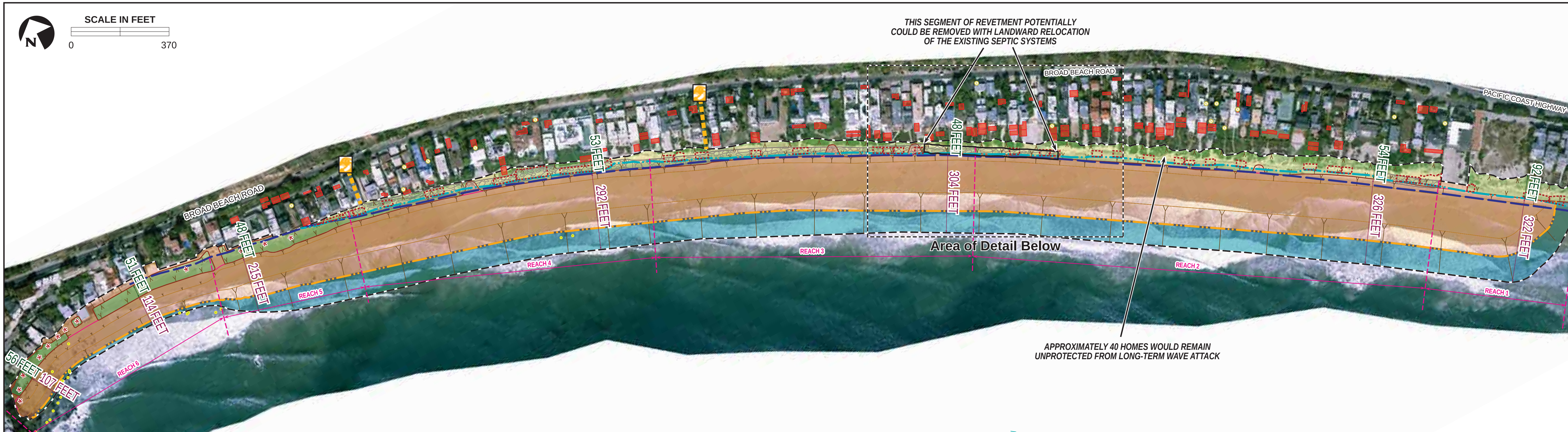
4.2.7 Alternative 7: Removal of Existing Emergency Revetment on the Eastern End of Broad Beach with Beach Nourishment and Restoration

Description

Similar to the Project, this alternative would include beach nourishment, dune creation and restoration across the length of Broad Beach. However, this alternative would include removal of the revetment on the eastern end of Broad Beach. Two different options were considered for Alternative 7. One of which would involve removal of approximately 1,617 feet of revetment on the eastern end with onsite wastewater treatment system (OWTS) upgrades, including septic tanks, leach fields, and/or other treatment infrastructure. The other would involve removal of 1,136 feet, a slightly shorter section of the revetment, without any upgrades to the existing systems. In addition, this alternative would also involve receiving permits for installation of up to 1,617 feet of sand bag revetment at the east end of Broad Beach, if necessitated by severe erosion conditions. The goal of this alternative would be to improve consistency with coastal public access and recreation.

Implementation of this alternative with upgrades to the OWTS on the eastern end of Broad Beach would allow for the removal of approximately 1,617 feet of the revetment, with the remaining 2,483 feet (i.e., 61 percent) being retained in place. Under this option, septic systems and leach fields that could be moved landward would be moved. For added safety, these systems would be located outside of the 15-foot wave uprush line on the eastern end of Broad Beach, as calculated by Moffatt & Nichol (2013). While this alternative is analyzed separately from Alternative 1 and 2, it is possible that Alternative 7 could be combined with one of these alternatives to further remove the retained revetment off public lands. However, as noted in Alternative 2, potential for maximum landward revetment relocation the revetment landward of all LAEs may be limited due to lack of space to accommodate landward OWTS relocation and city code issues.

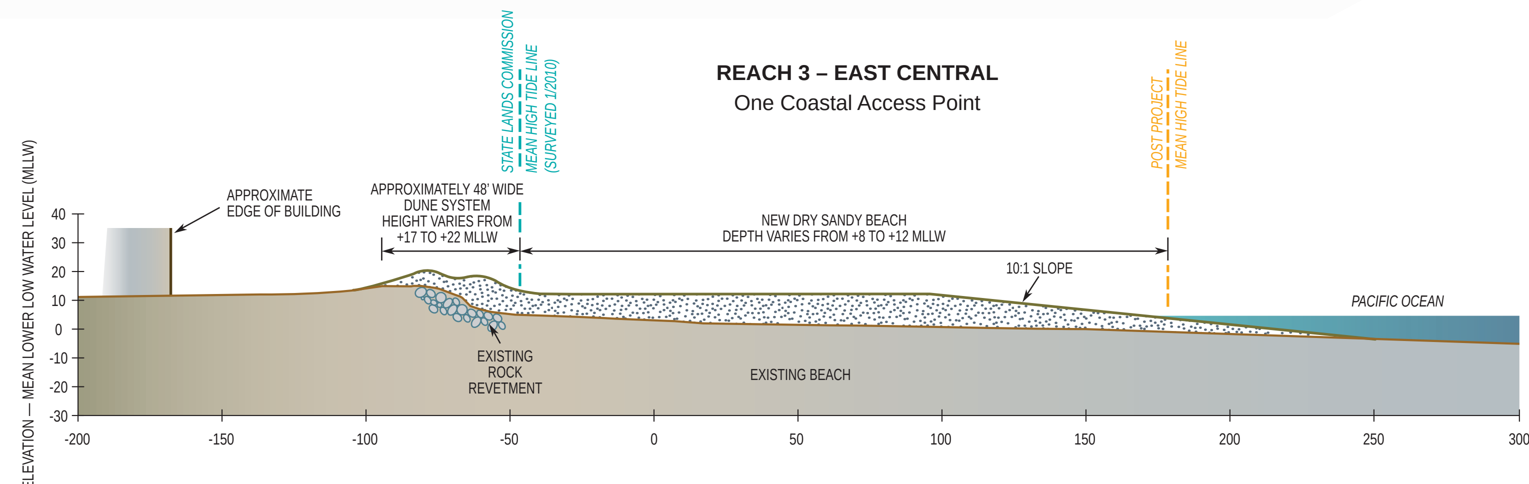
The second option under Alternative 7 would include removal of the approximately 25 percent of the existing emergency rock and sand bag revetments at the east end of Broad Beach without any upgrades to the existing OWTS. Under this alternative, approximately 1,136 feet of revetment would be removed on the eastern end of Broad beach with the remaining 2,964 feet (i.e., 72 percent) of the existing revetment being retained in place. Moffatt & Nichol (2013) determined that without landward relocation, existing leach fields behind the eastern segment of the revetment would have adequate setbacks to withstand potential short- to mid-term erosion following removal of the revetment in this location.



Detail

REACH 3 – EAST CENTRAL

One Coastal Access Point



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment to be Permanently Permitted
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

Removal of the 2012 Emergency Revetment on the Eastern End of Broad Beach with Beach Nourishment and Dune Restoration

FIGURE 4-7

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However, as discussed further below, approximately 500 feet of dunes at the east end of Broad Beach that were either unprotected or protected by sand bag or Sakrete revetments were eroded landward 80 to 100 feet in the winter of 2013-2014 after wave attack destroyed these coastal protections structures (Illustration 4-5). This erosion brought the shoreline to within 30 to 50 feet of some of these homes and into close proximity with OWTS serving these homes.

Illustration 4-5: *This alternative would involve the removal of the eastern end of the existing emergency rock and sand bag revetments. While leach fields and other improvements would remain approximately 15 feet from the calculated wave run-up zone, this area of Broad Beach has sustained substantial damage within the 2013-2014 storm season when a 25-year storm event substantially damaged and removed existing sand bag revetments.*

Similar to the Project, public use of, and access along, the beach berm under this alternative would be permitted along the beach to the toe of the restored dunes where a line of rope or cable and signs would prohibit access to dune habitats. This rope or cable system, combined with the approximately 50-foot-wide dune system, would also ensure resident privacy. In addition, rather than provide for 112 coastal access walkways across the restored dunes as included in the Project, this alternative would include installation of unpaved shared private coastal access walkways, with one walkway approximately every 300 feet to be shared between six homes. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dune habitat. Each of these walkways would be roped off to minimize private access into the dunes. This distance was selected as an intermediate value that would improve dune habitat quality while minimizing disruption to private homeowner beach access.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

Construction would be similar under this alternative in terms of beach nourishment, and grading of the beach and dunes by heavy equipment. However, under this alternative, additional bulldozers and cranes would be necessary to remove the eastern portion of the revetment. Additionally, up to 1,000 new trips by heavy haul trucks would be required initially to transport armor stones from the eastern segment of the emergency revetment off Broad Beach. Further, additional heavy construction equipment would be required if OWTS were upgraded on the eastern end of Broad Beach. Major components of this alternative would include:

- Removing approximately 1,617 feet (with septic system upgrades) or 1,136 feet (without upgrades) of the existing revetment, using heavy cranes, bulldozers, and up to 1,000 heavy haul truck trips to transport boulders off of the beach;
- Potentially relocating up to 19 OWTS on the eastern end of Broad Beach;
- Transport of 600,000 cy of sand from inland quarries to Broad Beach via 43,000 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach and hauling it up coast to Broad Beach with heavy trucks or scrapers;
- Redistributing sand on Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Creating a system of unpaved shared walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Providing two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Backpassing of 25,000 to 35,000 cy of sand annually from the east to west end of the beach based using heavy equipment such as scrapers and bulldozers; backpassing would be initiated based on beach width and profile changes;
- Initiating one future major renourishment event of approximately 450,000 cy in roughly 10 years; and
- Potential use of up to 1,617 feet of sand bag revetments during coastal erosion events to protect the dune system and homes from wave attack.

<u>Potential Impacts to Public Trust Resources</u>

This alternative would differ from the Project in that it would remove at least 1,136 feet of the revetment on the eastern end of Broad Beach. With landward relocation of up to 19 OWTS on the eastern end of Broad Beach, approximately 480 additional feet of revetment would be removed for a total of 1,617 feet. However, landward relocation of the existing OWTS would result in additional construction-related impacts. Even without landward relocation of the existing OWTS, approximately 27 percent of the revetment would be removed on the eastern end of Broad Beach.

However, depending upon storm intensity and direction, removal of revetment could risk impacts to private improvements over the short- to mid-term. While both implementation strategies of this alternative would provide a hard stabilization structure protecting the shore along middle portions of Broad Beach where erosion is greatest, recent storm damage at the east end of Broad Beach may indicate heightened vulnerability of this area to erosion. Although a soft stabilization, using a newly widened dune system, to provide protection for the eastern end of Broad Beach would likely provide protection over the short- to mid-term, improvements closest to the shoreline could be subject to damage. This alternative would result in major changes to impacts with regard to coastal processes, terrestrial biological resources, recreation, and public access, public health and safety hazards, and utilities and service systems. Major changes to impacts to these resource areas are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-10 at the end of this subsection.

Air Quality and Greenhouse Gases: Criteria pollutant emissions would incrementally increase relative to the Project due to the operation of additional heavy equipment necessary to remove the revetment, including up to 1,000 additional heavy haul trips to remove the revetment rock. These emissions would increase the severity of Impact AQ-1, particularly for emissions VOCs, which would exceed SCAQMD and VCAPCD thresholds for project-level significance under the Project, and NO_x, which would exceed SCAQMD and VCAPCD thresholds for both onsite and project-level significance under the Project, including SCAQMD LSTs for construction activities. Relative to the Project, emissions of both of these criteria pollutants would incrementally increase under this alternative, as there would be additional construction activities, as well as heavy haul truck trips (Appendix G). Additionally, there would be an incremental increase in other criteria pollutants including CO, SO_x, and PM. This increase in emissions relative to the Project, particularly the increase in VOC and NO_x emissions, would require additional AMMs, such as use of newer haul trucks with clean-burning diesel engines, but would still have a major adverse effect. GHG emissions described in Impact AQ-2 would remain below SCAQMD and VCAPCD thresholds. Increased TAC emissions from diesel construction equipment would incrementally increase the severity of Impact AQ-3, although emissions would remain below thresholds.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Erosion of the sandy beach and dune after the cessation of nourishment would continue as described under the Project, with potential benefits of beach nourishment enduring for an estimated 10 to 20 or more years with renourishment and backpassing. Under this alternative, potential damage to homes, OWTS, and accessory structures from coastal erosion, as well as associated indirect impacts to public trust resources identified in Impact CP/GEO-2, would be substantially increased in the eastern area of Broad Beach, where a large segment of the revetment would be removed. While beneficial impacts to these homes would increase and likely be protected by the nourished beach and dune system over the short- to mid-term as described in Impact CP/GEO-3, over the long-term, without the revetment as a last line of defense against wave attack, these homes, OWTS, and other private improvements would be more vulnerable to damage resulting from coastal erosion.

Potential for such damage is illustrated by the recent landward erosion of the dune system at the eastern end of Broad Beach during winter 2013-2014. During this winter, dunes at the eastern 500 feet of Broad Beach were eroded 80 to 100 feet landward and coastal protection structures (i.e., sand bag and Sakrete revetments) were damaged or destroyed. Although there was a major storm event on March 2, 2014, it has been estimated that this was a 25-year storm. Similar storm events would overwhelm the dune system, potentially exposing the houses and septic systems to damage, particularly during a 100-year event. Such a storm may also overwhelm and destroy any sand bag revetments installed under this alternative. Anticipated SLR of approximately 8.5 inches by 2030 would have less erosion effects as described in Impact CP/GEO-8, including increased frequency and intensity of storm surges and wave attack.

While creation of a wider beach and dune system, and use of sand bag revetments would likely provide protection to homes and OWTS over at least the short- to mid-term, removal of the revetment under this alternative his may ultimately result in potential major indirect impacts to public trust resources due to the release of septic effluent and debris from damaged structures (e.g., septic tanks and leach fields). These impacts would exhibit a similar character and extent under both implementation strategies. Implementation of this alternative without OWTS upgrades would involve a larger portion of revetment being retained; however, the existing OWTS would be closer to wave run-up and would be more likely to experience persistent wave attack. Relocating the OWTS landward may result in reduced potential for septic effluent release, but landward retreat and reliance on dunes and sand bag revetments would eventually leave improvements subject to damage due to increased potential for wave attack.

Removal of the revetment on the eastern end of Broad Beach would lead to more erosion and rapid damage to homes, ancillary structures, and OWTS over the long-term after the cessation of nourishment. This would ultimately likely result in adverse indirect effects on public trust resources and may trigger future requests for installation of another emergency revetment. Removal of the revetment would also decrease structural stability and increase impacts described in CP/GEO-1. All other impacts described in Section 3.1, *Coastal Processes, Sea Level Rise, and Geological Resources* would be similar to the Project.

Utilities and Service Systems: While the existing OWTS on the eastern end of Broad Beach would be protected by beach nourishment and dune restoration over the short- to mid-term, following the cessation of nourishment activities, these OWTS would be vulnerable to wave attack as the beach erodes in 10 to 20 or more years. This would decrease the beneficial impacts described in Impact UTL-1. Installation of a sand bag revetment along up to 1,617 of beach may prevent damage to these systems during minor storm or a single major event, but may be ineffective during a severe storm season and over the long term. Under this alternative up to 19 OWTS could be feasibly relocated landward which would reduce the long term potential for effluent release following the cessation of nourishment; however, as demonstrated by recent wave attack and erosion of 80 to 100 feet of dunes, all septic systems seaward of the residences lacking revetment protection would still have some potential to be impacted. This would substantially increases impacts to public trust resources associated with release of sewage effluent identified in Impact UTL-2. An analysis of impacts to leach fields is included in the Broad Beach Coastal Engineering Report, completed by Moffatt & Nichol (Appendix B). Following cessation of nourishment and erosion of the beach and dunes after 10 to 20 or more years, residents of threatened homes may request or install another emergency revetment to prevent these impacts to septic OWTS and the associated indirect impacts to public trust resources. Effects on public drainage systems as described in Impact UTL-3 would be similar to the Project.

Terrestrial Biological Resources: Removal of the revetment on the eastern end would entail the operation of heavy construction equipment within degraded dune habitats, resulting in additional major adverse effects associated with Impact TBIO-2. This impact could be compounded by the landward relocation of existing OWTS. However, the most recent reconnaissance survey at Broad Beach found that the eastern reaches of Broad Beach were eroded extensively during storm events in March 2014 exposing and damaging sand bag and Sakrete revetments and further eroding degraded southern foredune habitat. Use of heavy construction equipment would also increase adverse effects associated with Impact TBIO-4 due to the increased potential for hazardous spills in ESHAs. Removal of the revetment on the eastern end would increase the severity of Impact TBIO-5. Additionally, the removal of the revetment on the eastern end of Broad Beach presents another adverse long-term impact as wave action may potentially erode southern foredune habitat in this area following the erosion of the nourishment material, increasing impacts described in TBIO-8. Creation of shared walkways would also reduce habitat fragmentation impacts identified in Impact TBIO-7. Impacts TBIO-1 and TBIO-3 would be similar to the Project.

Recreation and Public Access: Removal of the revetment on the eastern end of Broad Beach would increase short-term adverse disruption of recreational access associated with Impact REC-1. However, this alternative would be incrementally more consistent with coastal public access and recreation policies as the revetment would be removed off public lands on the eastern end of Broad Beach. However, up to 72 percent of the existing revetment would be retained in place. The retention of the western portions of the revetment would continue to make this alternative inconsistent with coastal public access policies. Further, depending on location, installation of emergency sand bag revetments could also constrain public lateral access or obstruct LAEs. Alternative 6 would increase short-term beneficial effects identified in Impact REC-3, and decrease long-term impacts related to cessation of nourishment described in Impact REC-4. Impact REC-2 would be similar to the Project.

Marine Water Quality: Removal of the eastern end of the revetment would result in the potential for impacts to marine water quality to occur resulting from long-term erosion and potential damage to existing OWTS occurring behind the existing revetment. Under this alternative, the beneficial impacts described under Impact MWQ-3 would be much less beneficial as the existing revetment would be removed and would no longer serve as the last line of defense for existing development at Broad Beach. This would constitute a major adverse impact and would likely require the construction of an additional temporary emergency revetment following the long-term erosion of Broad Beach after the cessation of nourishment activities. Impacts MWQ-1, MWQ-2 and MWQ-4 would either have similar or incrementally increased impacts in relation to the Project.

Other Resource Areas: This alternative would have similar or incrementally more severe impacts relative to the Project for scenic resources, marine biological resources, cultural and paleontological resources, noise, public health and safety hazards, traffic and parking, and environmental justice.

Table 4-10. Alternative 7 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	Incremental Short-term Increase and Long-term Decrease in Adverse Impacts	There would be a slight increase in adverse effects associated with Impact SR-2, as this alternative would result in additional construction equipment relative to the Project. However, removal of the revetment along the eastern end of Broad Beach would eliminate the potential for long-term exposure in this area incrementally reducing the adverse effects associated with Impact SR-1. The use of emergency sand bag revetments could leave litter along the beach if and when destroyed by wave action. All other scenic resource impacts would be similar to the Project.
Marine Biological Resources	No Major Change in Adverse Impacts	Impacts to marine biological resources would remain similar or slightly increased relative to the Project. However, over the long term after cessation of nourishment as the beach and dunes erode in 10 to 20 or more years, OWTS could be damaged or destroyed leading to release of effluent into the marine environment.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	Additional disturbance of the near shore environment associated with removal of the eastern end of the emergency revetment would result in an increased potential to disturb cultural resources, slightly increasing the severity of the adverse effects associated with Impact CR-1. However, as heavy equipment would only be operated on the seaward side of the revetment, the probability of uncovering undocumented cultural resources would be minimal. All other cultural and

Table 4-10. Alternative 7 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		paleontological impacts would be similar to the Project.
Noise	Incremental Increase in Adverse Impacts	Operation of additional heavy haul trucks, cranes, and bulldozers used during revetment removal would incrementally increase the severity of Impacts N-1, N-2 and N-3.
Public Safety and Health Hazards	Incremental Increase in Adverse Impacts	Additional heavy equipment used during revetment removal would increase the potential for incidental release of hazardous materials, resulting in an incremental increase in the severity of Impact HAZ-2. Further, operation of additional heavy equipment on the beach would increase the short-term hazardous conditions during construction, incrementally increasing the severity of Impact HAZ-3. Impact HAZ-5 would also become a long-term or permanent beneficial impact instead of having a short- to mid-term duration. Impact HAZ-1 would also no longer be relevant, as the revetment would no longer be present to create potential hazards.
Traffic and Parking	Incremental Increase in Adverse Impacts	Revetment removal would require additional truck trips and additional heavy equipment over that required for the Project. This would incrementally increase severity of the adverse effects associated with Impact TR-1 and potentially TR-2, depending on the drop-off location of the removed boulders.
Environmental Justice	No Change	There would be no appreciable difference in impacts relative to the Project.

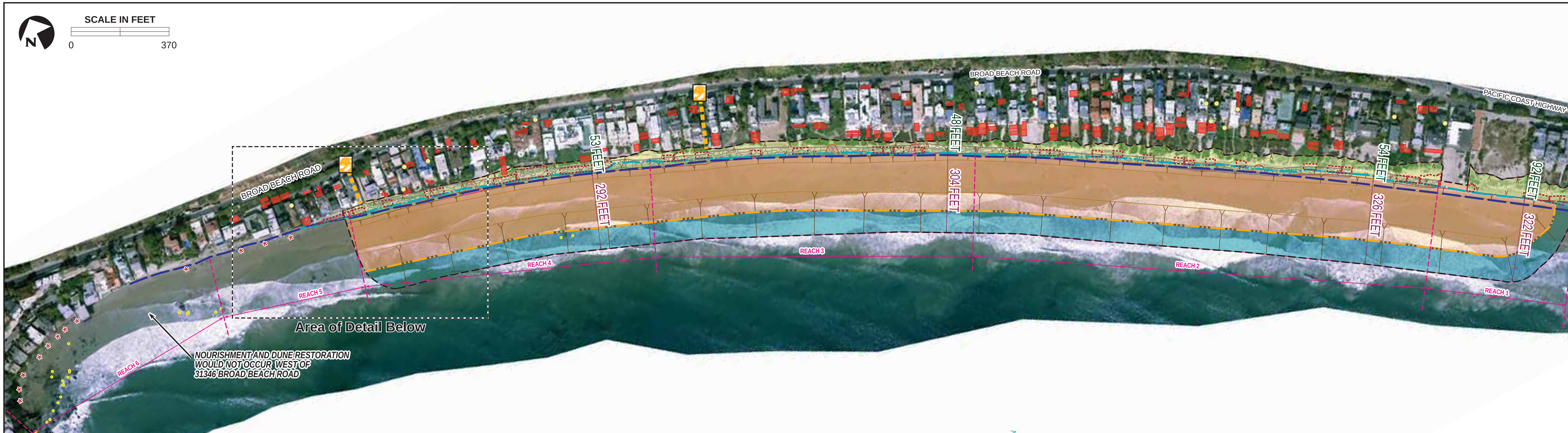
4.2.8 Alternative 8: No Beach Nourishment at West Broad Beach with Revetment at Current Location

Description

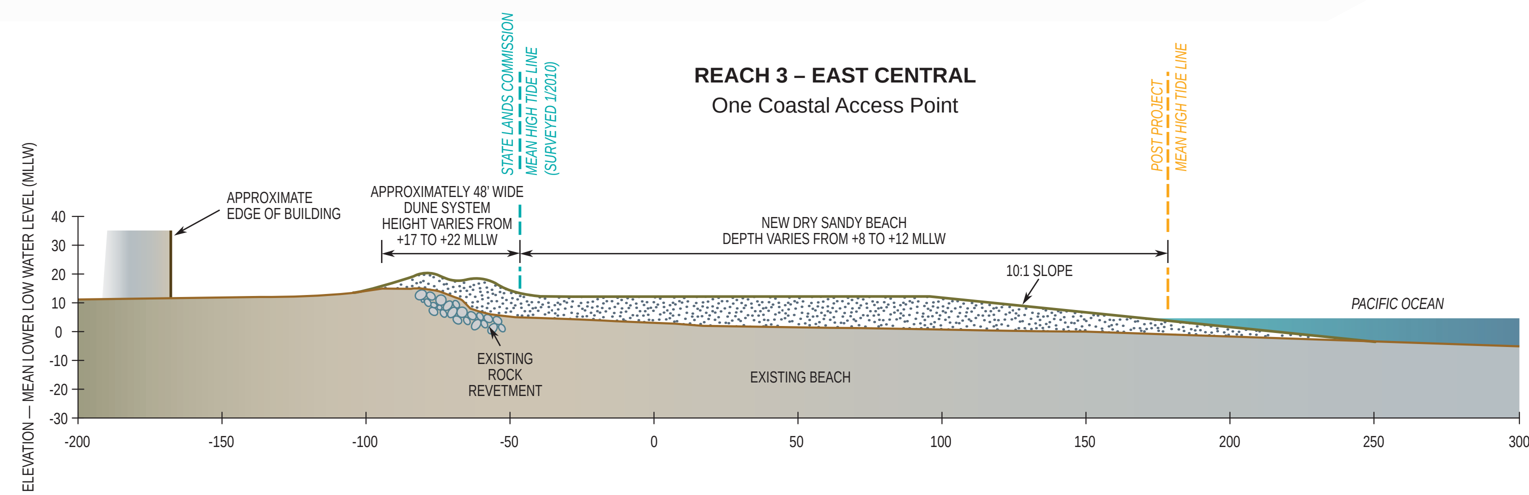
This alternative would include beach and dune restoration as well as retention of the existing revetment, as described for the Project. However, this alternative would also include a major reduction in beach nourishment and dune restoration both in terms of the footprint of nourished beach affected and the volume of sand placement. Under this alternative, the proposed nourishment Project would be reduced by 25 percent to approximately 4,650 feet of nourished beach, approximately 1,550 feet less than the 6,200 feet described for the Project. Additionally, the nourishment would only occur on the central and eastern segments of Broad Beach. Nourishment would extend from Trancas Creek west 4,650 feet and terminate at 31346 Broad Beach Road at the western end of the emergency revetment, just west of the existing western public coastal access point. For the western 25 percent of Broad Beach, this alternative would emphasize protection of public trust resources represented by rocky intertidal and subtidal habitats rather than those provided by sandy beach habitats, public coastal access, recreation, and natural coastal protection. The Project would remain unchanged along approximately 75 percent of the beach under this alternative.

The existing emergency revetment would remain in its current location with dune restoration and beach nourishment burying the revetment as described for the Project. While other alternatives could be combined with this alternative (e.g., Alternative 1 or Alternative 2), no relocated or modified structures are proposed under this alternative. This alternative would include placement of approximately 460,000 cy of sand on the central and eastern regions of Broad Beach, with volumes adjusted based on the Project's beach nourishment and dune restoration design and profile over this reduced length. Under Alternative 8, the nourished beach would be as wide as 300 feet near the east end of Broad Beach. As a part of this alternative, a renourishment event including the deposition of approximately 380,000 cy within the same central and eastern areas of the beach would occur after approximately 10 years.[12] However, the timing and quantity of renourishment event may vary depending on results of the intensive monitoring plan and backpassing.

[12] Precise renourishment volumes are difficult to forecast. A much smaller beach footprint would need to be recharged with sand, but backpassing may provide less effective at extending beach life due to the more limited Project area and lower sand volumes available to backpassing.



Detail



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment to be Permanently Permitted
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

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No Beach Nourishment at West Broad Beach with Revetment at Current Location

FIGURE 4-8

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Additionally, dune habitats would be established and restored in the central and eastern reaches of the beach by creating a sand berm that would run along the length of the beach, with a minimum of 2 feet of sand over the rock revetment. The berm would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the revetment, depending on location. The dune system, consisting of hummocks varying in height from 17 to 22 feet above MLLW would be constructed on top of this berm. The width of the dune system would vary from 40 to 60 feet, with most sections being approximately 50feet wide. The western 1,500 feet of beach would remain a mix of rocky intertidal areas and sandy beach, depending on seasonal sand flow in the littoral cell.

Similar to the Project, public use of, and access along, the beach berm under this alternative would be permitted along the central and eastern segments of the beach to the toe of the restored dunes where a line of rope or cable and signs would prohibit access to the dunes. This rope or cable system, combined with the approximately 40- to 80-foot-wide dune system, would also ensure resident privacy. In addition, rather than provide for 112 coastal access walkways across the restored dunes as included in the Project, this alternative would include installation of shared private coastal access walkways, with one walkway approximately every 300 feet to be shared between six homes. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dunes. Each of these walkways would be roped off to minimize private access into the dunes. This distance was selected as an intermediate value that would improve dune habitat quality while minimizing disruption to private homeowner beach access. Public access to the west would continue, but be feasible primarily during lower tides as the beach is largely submerged during medium and high tides. Direct beach access from the approximately 27 homes on the western end of Broad Beach, including the areas of newly widened beach to the east, would also be restricted to lower tides.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. However, beach access from the western coastal access point would be available generally only on the nourished beach to the east as the western end of Broad Beach would largely be tide-limited. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

Major components of this alternative would include:

- Transport of approximately 460,000 cy of sand from inland quarries to Broad Beach via approximately 33,000 heavy haul truck trips;
- Transporting the sand from storage areas at Zuma Beach up coast to the central and eastern segments of Broad Beach using heavy trucks or scrapers;
- Redistributing sand on eastern and central Broad Beach as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Creating a system of shared walkways to for homes along eastern and central Broad Beach to provide private lateral and vertical private coastal access for homeowners across the new dune system;
- Providing two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Performing backpassing of the sand, ranging from 25,000 to 35,000 cy, from the east to central portion of Broad Beach based on triggers and using heavy equipment such as scrapers and bull dozers; and
- Initiating one future major renourishment event of approximately 380,000 cy in roughly 10 years.

Potential Impacts to Public Trust Resources

This alternative to the Project would largely avoid or substantially reduce direct and indirect burial of intertidal and near shore subtidal habitats as well as minimizing indirect turbidity impacts to marine biological resources. Burial of rocky intertidal and subtidal habitats within Lechuza Cove and offshore of Lechuza Point would be largely avoided. This alternative would limit direct burial and indirect offshore turbidity impacts by eliminating nourishment described for the Project along the 1,500 feet of beach west of 31346 Broad Beach Road at the western terminus of the emergency revetment just west of the existing western public coastal access point.

This alternative would result in changes to impacts associated with air quality and terrestrial biological resources. Additionally, this alternative would result in the greatest trade-offs between different public trust resources, with protection of rocky marine habitats prioritized over public coastal access and beach recreation, sandy beach habitats and coastal protection. By eliminating nourishment west of 31346 Broad Beach Road, approximately 25 percent of Broad Beach that would have been fully accessible and usable by the public and existing residents under the Project would not be widened, with access primarily limited to low tides. Rather, this area would remain similar to existing conditions over the short- to mid-term, with beach erosion potentially continuing or accelerating over the long-term. Approximately 27 homes, septic systems and other private improvements would not receive protection from wave attack provided by the wider beach and dune system and would continue to be exposed to coastal processes.

Additionally, this alternative would not reduce impacts associated with the Project's consistency with coastal public access and recreation polices. However, this alternative could be combined with either Alternative 1 or Alternative 2, which would relocate the existing revetment landward, but this would also result in associated impacts described for these alternatives above. Resource areas with major changes to impacts under Alternative 8 relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-11 at the end of this subsection.

Air Quality and Greenhouse Gases: Under Alternative 9, criteria pollutant emissions would be reduced relative to the Project as there would be approximately a 25 percent reduction in the number of heavy haul truck trips corresponding to reduced nourishment volume. Under this alternative there would be approximately 10,000 fewer truck trips relative to the Project. However, while emissions would be reduced under this alternative it would not substantially reduce the severity of Impact AQ-1, particularly for emissions of VOCs, which would continue to exceed SCAQMD and VCAPCD thresholds for project-level significance, and NO_x, which would continue to exceed SCAQMD and VCAPCD thresholds for onsite and project-level significance, including SCAQMD LSTs for construction activities (Appendix G). Similarly, GHG emissions described in Impact AQ-2 would decrease and would be further below SCAQMD and VCAPCD thresholds, and toxic air contaminants would also be incrementally reduced.

Coastal Processes, Sea Level Rise and Geologic Hazards: Under this alternative erosion of beach and dunes after cessation of nourishment and central and eastern Broad Beach east of 31346 Broad Beach Road would continue as described under the Project, with the benefits of nourishment in these areas enduring for an estimated 10 to 20 or more years and the revetment then becoming exposed as a result of persistent wave action. Anticipated SLR of approximately 8.5 inches by 2030 would further exacerbate erosion effects, including increased frequency and intensity of storm surges and wave attack. However, it is unclear as to whether the nourished beach would erode more quickly under this alternative as it would be unprotected along the western edge due to the lack of nourishment in Lechuza Cove and more exposed to wave attack. Further, it is unclear as to whether backpassing under this alternative would be as effective as described for the Project. Due to the reduced volume of sand included in the nourishment event it is likely that less sand would be available for subsequent backpassing and backpassing would not occur at the far west end of the Beach in Lechuza Cove.

As no nourishment would occur on the western end of Broad Beach under this alternative, approximately 27 homes and associated improvements (e.g., OWTS) along the western 1,500 feet of Broad Beach would potentially continue to erode over this 20 year period as this area would not experience the benefits of two nourishment events described in Impact CP/GEO-6 and would be more susceptible to the adverse impacts related to sea level rise identified in Impact CP/GEO-8. This would represent a major adverse effect relative to the Project as erosion of the western end of Broad Beach could result in additional indirect impacts to the residences and private improvements in this area, particularly the residences that are not fronted by individual shoreline protection devices. Approximately 27 homes and associated improvements exist along these 1,500 feet of beach on the western end of Broad Beach. Based on reconnaissance level field surveys a total of three of these homes are unprotected and 15 have what appears to be substandard seawalls, revetments, or pilings that may expose these homes and improvements to damage in major storm events. Under this alternative, after the revetment is exposed, potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 and associated indirect impacts to public trust resources identified in Impact CP/GEO-3 would remain similar to those described for the Project as the revetment would not be redesigned or reinforced under this alternative. However, exposure of 27 homes to wave attack would create a new major adverse impact not identified for the Project. Based on initial review of existing coastal protection structures, 18 of these homes may construct or apply for permits to construct improved coastal protection.

Additionally, the reduced sand volume under Alternative 8 would result in corresponding reductions to beneficial impacts associated with Impact CP/GEO-7, as approximately 140,000 cy that would have been available for down coast movement under the Project would be reduced but would not be deposited on the western 25 percent of Broad Beach. Impact CP/GEO-7 would remain beneficial under Alternative 8 as the effects of the longshore currents on the remaining 460,000 cy of sand deposited on Broad Beach would still occur over the short- to mid-term. However, over the long-term, longshore currents would transport this sand farther down coast and possibly offshore as described for the Project. Impacts related to the existing revetment (CP/GEO-1), sand compatibility (CP/GEO-4), and tides, currents, and wave height and direction (CP/GEO-5) would remain similar to those described for the Project.

Terrestrial Biological Resources: Under Alternative 8, a revegetated dune system would not be established west of 31346 Broad Beach Road or the western end of emergency revetment as this area would not be nourished as described for the Project. This alternative would eliminate dune restoration over approximately 1,500 feet or approximately 25 percent of CSLC Lease Area, reducing beneficial impacts to terrestrial biological resources identified in Impact TBIO-6 associated with creation of sandy intertidal habitats, such as grunion spawning areas and shorebird foraging habitat. However, the benefit of this impact as it applies to the western portion of Broad Beach is questioned, as the dune restoration would displace sensitive marine habitat (discussed below). The remaining 75 percent of dune system described for the Project would still be restored and revegetated with native species. Consequently, though lessened, beneficial impacts associated with TBIO-6 would still occur.

The reduced nourishment volume, approximately 140,000 cy less sand than described for the Project, would reduce impacts associated with the increased closure period of Trancas Lagoon and the Zuma Wetlands described in Impact TBIO-5. However, as 76 percent of the nourishment volume would still be applied up coast of these features, this sizable reduction in nourishment volume would not substantially reduce these impacts.

Construction-related impact to terrestrial biological resources identified in Impacts TBIO-2, TBIO-3, and TBIO-4 would be incrementally reduced due to the reduction in direct impact area, total sand volume applied, and number of truck trips used for hauling. Additionally, requiring shared private coastal access walkways would also substantially reduce disturbance of the proposed dune system described in Impact TBIO-7, protecting this newly established and restored dune habitat.

Marine Biological Resources: The reduced and phased nourishment west of 31346 Broad Beach Road, within Lechuza Cove would substantially reduce impacts to rocky intertidal and near shore subtidal marine habitats, including impacts to surfgrass, kelp, and other sensitive marine organisms. Implementation of Alternative 8 would substantially eliminate direct impacts to rocky intertidal habitats within Lechuza Cove and off Lechuza Point described in Impact MB-2 and associated conflicts with ESHA policies identified in Impact MB-8, with direct burial impacts limited to scattered rocky outcrops and limited cluster of surf grass along central Broad Beach. While some nourishment sand could move back up coast, over the long-term, no nourishment in this area would mean that rocks would continue to be exposed in spring when sand levels are seasonally low, and buried during the fall when sand levels are typically high. Therefore, this alternative, in combination with monitoring for potential indirect burial of intertidal habitats west of 31346 Broad Beach Road would substantially reduce adverse impacts to intertidal habitats would be appropriately mitigated.

AMM MB-ALT-8: Baseline Surveys for Sensitive Rocky Intertidal Habitats. In coordination with AMM MB-2b, the Project Applicant shall contract with qualified biologists to conduct regular monitoring of biological resources and habitat quality of sensitive rocky intertidal habitats west of 31346 Broad Beach Road. The transects shall be consistent with those used to establish baseline intertidal habitat conditions. Surveys shall be conducted prior to Project completion, following Project completion and again prior to renourishment. A control site shall be established that is acceptable to the California State Lands Commission (CSLC) staff. The summaries of these monitoring surveys shall be prepared and submitted to CSLC staff for review. Any adverse impacts to sensitive rocky intertidal habitats shall be provided to the agencies as part of AMM MB-2b (applies to Alternatives 8 and 9 only).

For reasons similar to those described above for rocky intertidal habitat, this alternative would also substantially reduce Impact MB-4 to subtidal habitats and organisms. As the footprint of the beach would be reduced by approximately 25 percent under this alternative, Alternative 8 would reduce nourishment by 140,000 cy and largely avoid even indirect impacts to shallow subtidal reefs along the western 1,500 feet of Broad Beach, including mortality of surfgrass and kelp off Lechuza Point. This would substantially reduce the smothering or burial of additional subtidal habitat beyond the actual footprint of the expansion. However, known and potential subtidal reefs that occur off of central Broad Beach outside of the seaward edge of proposed fill could still be covered by remobilized sand, particularly during post construction reshaping of the beach by waves and tides. Therefore, although greatly reduced, Impact MB-4 (subtidal habitats) would still have a major adverse effect.

Impacts to subtidal reefs off of the rest of Broad Beach, including burial and indirect turbidity impacts, would still occur. The reduced nourishment volumes may also result in an incremental decrease in impacts to down coast marine resources, as a reduced volume of sand would be available for down coast transport to Zuma Beach, Point Dume State Beach, and Los Angeles county beaches. Additionally, intertidal habitat areas and shoreline marine biological resources farther south may be indirectly affected by changes in sand supply and distribution through littoral drift. This may result in additional reductions to impacts to marine biological resources down coast as identified in Impact MB-7. However, as 76 percent of the proposed nourishment volume would still be applied to Broad Beach under this alternative, this reduction in the severity of down coast transport impacts likely would be incremental for down coast marine biological resources.

The reduced volume of sand and the absence of construction activities on the west end of Broad Beach would incrementally reduce short-term construction related impacts to marine biological resources identified for the Project in Impacts MB-3, MB-4, MB-5, and MB-6.

Recreation and Public Access: As the emergency revetment would be retained under this alternative, Alternative 8 would have similar impacts associated with recreation and public access described in REC-4.

Alternative 8 would incrementally reduce public access benefits associated with a wider dry sandy beach realized under the Project. Under the Project, the nourished beach and dune profile described for the Project would end at 31346 Broad Beach Road. This would leave the western end of Broad Beach (approximately 25 percent of the CLSC Lease Area) in its current condition, generally inaccessible to the public except at low tides and would limit opportunities to use this area for sunning, swimming, and other forms of beach recreation. However, the majority of Broad Beach would provide enhanced opportunities for this type of beach recreation within the proposed beach and dune areas. Broad Beach west of the existing rock revetment is unique from the rest of Broad Beach, because of the rocky intertidal habitat and biological resources that exist at this location. A 2012 public survey of beachgoers at Broad Beach indicated that tidepooling was an attraction for some beachgoers. Under existing conditions, swimming and playing in the surf zone are attractive at the east end of Broad Beach, and less so at the far west end. Although access would not be enhanced at the west end of Broad Beach and would continue to be limited to low tide conditions, this alternative would help maintain the unique existing habitats and tidepooling as a recreation resource. The public would still have improved access for the remainder of Broad Beach.

Private homeowners with beach stairways from the 27 homes along the west end of the beach would be unable to access newly widened beaches on central and west Broad beach, except at low tides or by walking along the road to a public coastal access point. Finally, the existing narrow intertidal beach would be expected to narrow more quickly over the 20 year Project life. Additionally, SLR may further reduce public access during low tide conditions. Consequently, under this alternative, impacts described for REC-3 pertaining to public access would be less beneficial than those described for the Project. Construction-related impacts from initial nourishment and backpassing operations would remain similar to those identified for the Project in Impacts REC-1 and REC-2.

Marine Water Quality: Under this alternative turbidity impacts identified in MWQ-1 within Lechuza Cove would be minimized resulting in a corresponding reduction to impacts described for marine biological resources. Additionally, reduced construction-related activities associated with this alternative would incrementally reduce impacts to Trancas Lagoon and to resuspension of sand contaminants identified in MWQ-2 and MWQ-4. However, while rocky intertidal habitats are concentrated in the western end of Broad Beach, across the length of Broad Beach this reduction in turbidity would not substantially reduce marine water quality impacts described for the Project. Additionally, as no nourishment would occur within the western end of Broad Beach the OWTS at the 18 homes with either no protection or substandard shoreline protection measures would be exposed to wave attack, which would substantially reduce the beneficial impacts of MWQ-3 described for the Project.

Utilities and Service Systems: As described for marine water quality impacts above, under this alternative the revetment would be retained in place similar to the Project, but the western end of Broad Beach would not be nourished. Consequently, potential impacts to OWTS on the western end of Broad Beach would be increased substantially, particularly for those residences without individual shoreline protection devices. This exposure to wave attack would substantially reduce the beneficial impacts of UTL-1 and increase the potential impacts associated with long-term exposure of the OWTS

Other Resource Areas: This alternative would have similar impacts to the Project in terms of its effects on scenic resources, environmental justice, and utilities and service systems. Impacts to traffic and parking, cultural, historic, and paleontological resources, public health and safety hazards, and noise would be incrementally reduced due to the decreased levels construction activity associated with the reduced sand volumes.

Table 4-11. Alternative 8 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	Incremental Reduction in Adverse Impacts	Over the short-term, beneficial impacts of nourishment would not be realized on the western end of Broad Beach as the individual revetments and exposed house pylons in this area would not be covered. Similar to the Project, permanent authorization of the revetment through a long-term lease and approval of CDPs would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed as described in Impact SR-1.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project, although construction-related Impacts identified in Impacts CR-2 and CR-3 may be incrementally reduced due to the reduced construction and hauling activities.
Noise	No Major Change in Adverse Impacts	Residences on the western end of Broad Beach would experience less noise and nourishment would terminate at the end of the existing revetment. While there may be a reduced duration of nourishment due to the reduced nourishment volume on the western end of Broad Beach, this reduction would be incremental at most, consequently the remaining residences and public users along Broad Beach would experience similar noise levels as described in Impact N-1, N-2, and N-3.
Public Health and Safety Hazards	Incremental Reduction in Adverse Impacts	This alternative would result in a slight decrease in the adverse effects associated with Impact HAZ-2, as the duration of nourishment and the presence of heavy construction equipment would be reduced as no nourishment volume would occur on the western end of Broad Beach. However, this reduction in the duration of nourishment would be incremental at most and would not substantially reduce Impact HAZ-2. Similar to the Project adverse effects under this alternative would be reduced through implementation of AMMs HAZ-2, HAZ-3a, and HAZ-3b.
Traffic and Parking	Incremental Reduction in Adverse Impacts	The reduction in nourishment volume would result in a corresponding reduction of approximately 10,000 heavy haul truck trips, which would likely incrementally reduce traffic and congestion on PCH and the inland routes, and in Zuma Beach Parking Lot 12, incrementally reducing the severity of the adverse effects associated with Impact TR-1. These impacts would be further reduced through implementation of AMM TR-1.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.

4.2.9 Alternative 9: Reduced and Phased Beach Nourishment at West Broad Beach with Existing Revetment

<u>Description</u>

Similar to the Project, this alternative would include beach and dune restoration as well as retention of the existing revetment at Broad Beach; however, this alternative would differ from the Project and the other alternatives described above in three key ways:

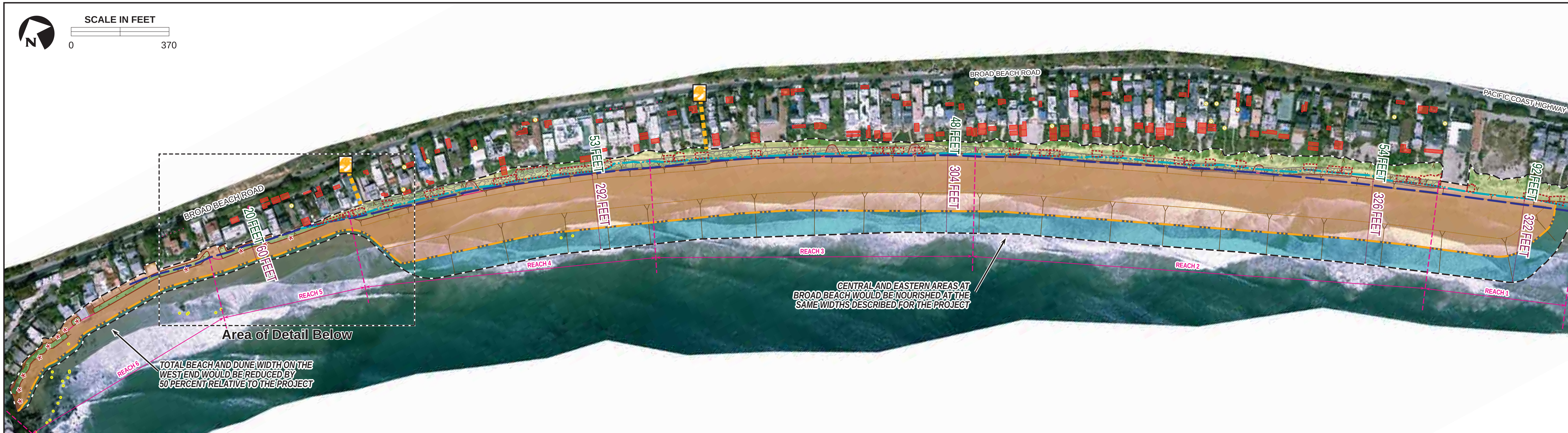
1. Reduced beach nourishment volume at the west end of Broad Beach and Lechuza Cove with 60,000 cy of sand placed within a nourishment footprint reduced by 50 percent west of 31346 Broad Beach Road and the western public coastal point;
2. Phased nourishment events at the west end of Broad Beach and within Lechuza Cove, with approximately 30,000 cy of sand placed within the same reduced footprint during each of the two phases to reduce post construction sand dispersal and loss; and
3. An unvegetated dune berm within Lechuza Cove west of 31502 Broad Beach, the house on pilings overlying beach.

The goal of this alternative would be to minimize burial of rocky intertidal and subtidal habitats by significantly reducing beach width and sand volumes within and adjacent to these sensitive resources on the western end of Broad Beach, while still restoring a wider sandy beach in this area. This alternative would include a reduced beach nourishment and dune restoration volume of 520,000 cy due to a reduced sand volume and placement footprint west of 31346 Broad Beach Road and the western coastal access point, where the existing emergency revetment ends. This alternative would minimize direct and indirect impacts associated with burial of intertidal and shallow subtidal habitat near Lechuza Point while also providing some benefits of beach nourishment for coastal access and for protection of properties along the western 1,500 feet of Broad Beach. Beginning west of 31346 Broad Beach Road and western public coastal access point this alternative would taper the profile of the renourished beach within Lechuza Cove, reducing beach width, footprint and profile. Under the Project, the dune system would be approximately 51 feet in width with a 114 foot wide sandy beach protruding seaward a total of 165 feet from existing homes. In contrast, under this alternative the dune system would be reduced to approximately 20 feet in width and the beach width would be reduced to approximately 60 feet, protruding seaward only 80 feet from existing homes. This would represent more than a 50 percent reduction in total renourishment footprint within the western end of Broad Beach. This tapering of the beach from east to west would likely necessitate lighter duty vehicles to distribute sand at the western end of Broad Beach, where the narrow beach would restrict access and turning radius for heavy duty equipment (i.e., scrapers) proposed by the Project for the sand deposition activities.

Additionally, nourishment within Lechuza Cove would occur in two phases under this alternative. It is estimated that approximately 25 percent of initial sand nourishment volume moves offshore or down coast immediately following construction as the beach reaches equilibrium. This phased approach would minimize post construction sand loss and reduce indirect burial and turbidity impacts to the rocky intertidal and subtidal habitats off of Lechuza Cove. The first phase would occur at the beginning of the initial beach nourishment event, with haul trucks or scrapers transporting the sand to the western end of Broad Beach. Following the deposition of 30,000 cy of sand west of 31346 Broad Beach Road within the reduced footprint, the nourishment of the remainder of Broad Beach east of 31346 Broad Beach Road would occur. After completion of the nourishment east of 31346 Broad Beach Road, another 30,000 cy of cubic sand would be deposited on the western end of Broad Beach with the same reduced footprint. Each of these phased nourishment events would occur over the same footprint west of 31346 Broad Beach Road; however, the first phase would be filled to a reduced depth. For example, the first phase would establish a dune berm approximately 8.5 feet deep and a beach berm approximately 7 feet deep within the reduced footprint. The second phase would increase the depth of the dune berm to up to 17 feet and increase the depth of the beach berm up to 14 feet.[13] Similar to the Project, a renourishment event including the deposition of 450,000 cy would occur after approximately 10 years; however, this re-nourishment event would also in two phases on the west end of Broad Beach, within a similarly limited nourishment footprint. Additionally, the timing and quantity of renourishment event may vary depending on results of the intensive monitoring plan and success of backpassing.

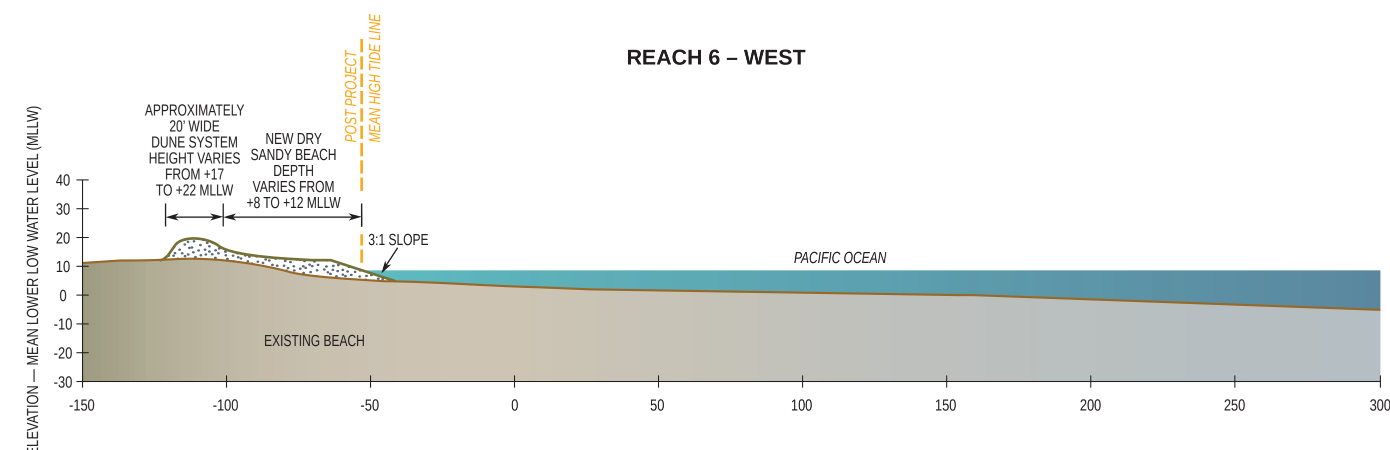
Under this alternative, dune restoration would take three different approaches. East of 31502 Broad Beach Road dune restoration would remain identical to that described for the Project. Dune habitats would be established and restored by creating a sand berm that would run along the length of the beach, with a minimum of two feet of sand over the rock revetment. The berm would extend approximately 30 to 50 feet inland and 0 to 10 feet seaward of the revetment, depending on location. The dune system, consisting of hummocks varying in height from 17 to 22 feet above MLLW would be constructed on top of this berm. The width of the dune system would vary from 50 to 60 feet wide.

[13] Ultimate post construction beach depth would also be governed by wave action and tides that would reshape the beach and disperse sand. Beach depth and width would likely change during the intervening 6 months between deposition phases at the west end of Broad Beach. However, under this alternative, the second phase of nourishment would be restricted to the 60 foot wide initial footprint.



Detail

REACH 6 – WEST



LEGEND

- Existing Public Access
- Approximate Limits of Beach Nourishment/ New Beach
- Existing Emergency Revetment to be Permanently Permitted
- Proposed New Dry Sandy Beach
- Proposed New Intertidal Beach Area
- Proposed Restored Dune
- Area of Dune or Beach Face (3:1 and 10:1 slopes)
- State Lands Commission Mean High Tide Line (surveyed 1/2010)
- Applicant Mean High Tide Line (surveyed 10/15/2009)
- Post Project Mean High Tide Line
- Existing Septic Tank
- Existing Leach Field/Drain Field
- Existing Lateral Access Easements (LAEs)
- Easement on file, but no dry beach to dedicate
- Surf Grass
- ##### Property Address

Note: Beach dimensions and post project average high water line reflect beach status immediately after completion of beach nourishment and construction/shaping activities; the equilibrium beach that would result from dynamics such as waves, tidal and wind action would likely be of somewhat different dimensions.

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Reduced Beach Nourishment at West Broad Beach Revetment at Current Location

FIGURE 4-9

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However, in the 1,500 feet of nourished beach west of 31346 Broad Beach Road and the western coastal access point the dune berm would be narrowed to 20 feet in width. While the dune berm between 31346 Broad Beach Road and 31052 Broad Beach Road (i.e., the house on pilings) would be subject to dune restoration activities described for the Project, the 450 feet of narrow dune west of 31052 Broad Beach Road would not be vegetated with native dune species. This area would remain an unvegetated berm as habitat within the cove appears to be historically more characteristic of coastal bluff and beach (see Illustration 4-6).

Illustration 4-6: *Under this alternative the narrow dunes to the west of 31502 Broad Beach Road would not be vegetated. This area would be attractive for walking and tide pooling but would not provide restoration for terrestrial dune habitat.*

Similar to the Project, public use of, and access along, the beach berm under this alternative would be permitted along the beach to the toe of the restored dunes where a line of rope or cable and signs would prohibit access to ESHAs within the dunes. This rope or cable system, combined with the approximately 50 -foot-wide dune system east of 31052 Broad Beach Road and the 20-foot-wide dune system west of 31052 Broad Beach Road, would ensure resident privacy. In addition, rather than provide for 112 coastal access walkways across the restored dunes as included in the Project, this alternative would include installation of shared private coastal access walkways, with one walkway approximately every 300 feet to be shared between six homes. These walkways would be connected by a shared path along the back dune, lined with a sand fence along the seaward side to minimize sand migration into private yards and minimize resident and pet access into the dune habitat. Each of these walkways would be roped off to minimize private access into the dunes. This distance was selected as an intermediate value that would improve dune habitat quality while minimizing disruption to private homeowner beach access. However, west of 31346 Broad Beach Road and the western public coastal point extending west to 31052 Broad Beach Road (i.e., the house on pilings), the narrow beach and dune habitat would appear to limit opportunities for a shared back dune walkway; individual walkways for each would be permitted, but would be lined by bollards and ropes to limit both public and private access into the dunes. In the 450 feet west of 31052 Broad Beach Road (house on pilings), dunes would be sand only and would not be roped off or fenced.

The existing two public vertical coastal access points along Broad Beach Road would remain open and the two public trails across the dunes would be roped off to limit access into the dunes. Additionally, this alternative would also recognize the public's rights to pass along public land below the January 2010 MHTL and across existing

LAEs. This would ensure that over the long-term after nourishment ceases, the revetment is removed, and the beach and dunes erode, the public would continue to have access across the beach. Public access to and along these LAEs would be available when the sensitive dune habitats that overlie these LAEs eventually erode over the long-term and public access to these LAEs becomes necessary and available.

Major components of this alternative would include:

- Transport of 520,000 cy of sand from inland quarries to Broad Beach via 37,300 heavy haul truck trips;
- Transporting of sand from storage areas at Zuma Beach up coast to Broad Beach with heavy trucks or scrapers;
- Redistributing sand, beginning with the western end of Broad Beach, as needed with earthmoving equipment, such as bulldozers, and grading the beach fills to required dimensions;
- Implementing phased nourishment west of 31346 Broad Beach Road and the western coastal access point, with the first phase depositing sand at a reduced depth over a footprint that extends not more than 80 feet seaward from existing homes, and the second phase, occurring after the nourishment of the rest of Broad Beach, depositing sand over the same footprint to a full depth (i.e., up to 17 foot deep dune berm and 14 foot deep beach berm);
- Creating a system of shared walkways to provide private lateral and vertical private coastal access for homeowners across the new dune system east of 31346 Broad Beach Road and the western coastal access point;
- Permitting individual walkways for homes west 31346 Broad Beach Road and the western coastal access point, with dunes roped off and revegetated in the area extending west to 31052 Broad Beach Road (i.e., the house on pilings), but with dunes not revegetated or roped off in the 450 feet of Lechuza Cove;
- Providing two vertical public access trails across the dunes to connect existing access points to the widened beach and ensuring public lateral access along the widened beach seaward of the OHWM;
- Performing backpassing of the sand, ranging from 25,000 to 35,000 cy, from the east to west end of the beach based on triggers and using heavy equipment such as scrapers and bulldozers (average of 25,000 cy/year); and
- Initiating one future major renourishment event of approximately 450,000 cy in roughly 10 years.

<u>Potential Impacts to Public Trust Resources</u>

This alternative would reduce direct burial of intertidal and near shore subtidal habitats as well as potentially reduce indirect turbidity impacts to marine biological resources within Lechuza Cove and offshore of Lechuza Point. This alternative would limit direct burial by reducing the footprint of nourishment west of 31346 Broad Beach Road by more than 50 percent to 80 from 160 feet when compared to the Project. It would also reduce indirect offshore burial and turbidity through phased nourishment which would reduce initial sand volume losses from the post construction beach.

This alternative would also result in changes to impacts associated with air quality and terrestrial biological resources. Additionally, this alternative would result in trade-offs between protection of marine biological resources and public access and recreation. By narrowing the width of the renourished beach west of 31346 Broad Beach Road, approximately 25 percent of Broad Beach would be reduced somewhat in terms of accessibility to both resident and public users relative to the Project. Additionally, this alternative would not reduce impacts associated with the Project's consistency with coastal public access and recreation polices. However, this alternative could be combined with either Alternative 1 or Alternative 2, which would relocate the revetment landward, but this would also result in associated impacts described for these alternatives above. Resource areas with major changes to impacts under Alternative 9 relative to the Project are discussed in detail below, while the resource areas with negligible changes to impacts are summarized in Table 4-12 at the end of this subsection.

Air Quality and Greenhouse Gases: Under Alternative 9, criteria pollutant emissions would be incrementally reduced relative to the Project as there would be a reduction in the number of heaving haul truck trips corresponding to reduced nourishment volume. Under this alternative there would be approximately 5,700 fewer truck trips relative to the Project (Appendix G). However, while emissions would be reduced under this alternative it would not substantially reduce the severity of Impact AQ-1, particularly for emissions of VOCs, which would continue to exceed SCAQMD and VCAPCD thresholds for onsite and project-level significance, and NO_x, which would continue to exceed SCAQMD and VCAPCD thresholds for onsite and project-level significance, including SCAQMD LSTs for construction activities. Similarly, GHG emissions described in Impact AQ-2 would decrease and would be further below SCAQMD and VCAPCD thresholds, and toxic air contaminants would also be incrementally reduced.

However, while this alternative would reduce criteria pollutant emissions and GHG emissions associated with hauling sand for initial nourishment, it may incrementally increase construction emissions from backpassing as described Impact AQ-1. Due to the narrow profile of the renourished beach west of 31346 Broad Beach Road, backpassing triggers may be met more often on the western end of broad beach. It is not expected that backpassing would occur more than once a year, but the unanticipated loss of sand during large storm events may increase the pressure for backpassing from residences on the western end of the beach.

Coastal Processes, Sea Level Rise, and Geologic Hazards: Under this alternative erosion of beach and dunes after cessation of nourishment would continue as described under the Project, with the benefits of nourishment enduring for an estimated 10 to 20 or more years and the revetment then becoming exposed as a result of persistent wave action. Anticipated SLR of approximately 8.5 inches by 2030 would further exacerbate erosion effects, including increased frequency and intensity of storm surges and wave attack. However, under this alternative, erosion of the west end of the beach would occur more quickly relative to the Project due to the reduced width of the nourished beach in this area. Consequently, impacts from coastal processes identified in Impact CP/GEO-8 may be more substantial on the western end of Broad Beach, and short term beneficial impacts related to nourishment identified in impact CP/GEO-6 would be reduced. Under this alternative, after the revetment is exposed, potential impacts of coastal processes on the revetment identified in Impact CP/GEO-2 and associated indirect impacts to public trust resources would remain similar to those described for the Project as the revetment would not be redesigned or reinforced under this alternative. In addition, impacts to unprotected homes, or those with substandard revetments or pilings along west broad beach would be potentially exposed to damage from wave attack, with more severe impacts than those for the Project as identified in Impact CP/GEO-3 (See Figure 4-10). Impacts related to the existing revetment (CP/GEO-1), sand compatibility (CP/GEO-4), and tides, currents, and wave height and direction (CP/GEO-5) would remain similar to those described for the Project.

The reduced sand volume under Alternative 9 would result in corresponding reductions to beneficial impacts associated with Impact CP/GEO-7, as approximately 80,000 cy that would have been available for down coast movement under the Project would not be deposited on the western 25 percent of Broad Beach. Impact CP/GEO-7 would remain beneficial under Alternative 9 as the effects of the longshore currents on the remaining 520,000 cy of beach sand deposited on Broad Beach would still occur over the short- to mid-term. However, over the long-term, longshore currents would transport this sand farther down coast and possibly offshore as described for the Project.

Terrestrial Biological Resources: This alternative would result in reduced dune restoration over approximately 1,500 feet or approximately 25 percent of the CSLC Lease Area. Under Alternative 9, the dune berm to the west of 31346 Broad Beach Road and the western coastal access point would not be sculpted into hummocks and would be narrowed to 20 feet and crossed by approximately 19 private walkways in 1,100 feet (one walkway every 60 feet). Further, in the 450 feet west of 31502 Broad Beach Road (i.e., the house on pilings) the dune would remain 20 feet wide and would not be revegetated with native species. However, as described above, the habitat within Lechuza Cove appears to have been historically more characteristic of coastal bluffs and beach. Additionally, the majority of the dunes along the remainder of Broad Beach would continue to be revegetated with native species and subject to access management provisions. Consequently, beneficial impacts associated would continue elsewhere along Broad Beach, while protection of marine biological resources would receive greater emphasis within Lechuza Cove. However, the benefit of this impact as it applies to the western portion of Broad Beach is questioned, as the dune restoration would displace sensitive marine habitat (discussed below).

The reduced nourishment volume, approximately 80,000 cy less sand than described for the Project, would reduce impacts associated with the increased closure period of Trancas Lagoon identified in TBIO-5. However, as 86 percent of the nourishment volume would still be applied up coast of these features, this incremental reduction in nourishment volume would not substantially reduce these impacts. This reduction in the nourishment volume on the western end of Broad Beach may increase the pressure for backpassing by residents in this area following unanticipated large losses of sand following storm events. However, only one backpassing event would be expected to occur annually and the total area affected by backpassing would be less; therefore impacts associated with TBIO-3 may be slightly reduced. Other construction-related impact to terrestrial biological resources identified in Impacts TBIO-2 and TBIO-4 would be incrementally reduced due to the reduction in direct impact area, total sand volume applied, and number of truck trips used for hauling. Additionally, requiring shared private coastal access walkways would also substantially reduce disturbance of the proposed dune system described in Impact TBIO-7, protecting this newly established and restored dune habitat. Finally, long-term degradation would have similar impacts to newly created dune habitat to those described for the Project in Impact TBIO-8.

Illustration 4-7: *This alternative would substantially reduce impacts to marine biological resources within Lechuza Cove. However, it would also leave the boulder field on the western end of Broad Beach relatively exposed and would result in a narrow beach width west of 31346 Broad Beach Road and the western public access point. Consequently, this alternative would include trade-offs with recreation and public access.*

Marine Biological Resources: The reduced and phased nourishment west of 31346 Broad Beach Road and the western public coastal access point would reduce direct burial of rocky intertidal and near shore subtidal marine habitats, including surfgrass, kelp, and other sensitive marine organisms (see Figure 4.10). As discussed below, this alternative would also reduce indirect impacts to marine biological resources by limiting post-construction offshore loss of beach sand and subsequent potential for indirect habitat burial. However, this would result in trade-offs, with regards to decreases in recreational and public access and coastal protection benefits realized under the Project (Illustration 4-7).

Implementation of Alternative 9 would substantially reduce the severity of impacts to rocky intertidal habitats within Lechuza Cove and off Lechuza Point described in Impact

MB-2. As the beach width would be decreased by approximately 50 percent, this alternative would reduce the direct burial and coverage of rocky intertidal by up to 50 percent (see Figure 4.10). Over the long-term, the reduced cover means that more rocks would be exposed in spring when sand levels are seasonally low, and burial during the fall when sand levels are typically high would be reduced both in terms of area and duration relative to the Project. Additionally, while nourishment would still result in the 100 percent mortality of sessile organisms within most of the beach footprint, the phased nourishment approach would result in reduced mortality of mobile organisms immediately following the nourishment event as some of these organisms in the rocky intertidal may be able to burrow through the reduced overburden following the first and second phases of nourishment. Further, reduced sand volumes, footprint and phased nourishment would likely reduce the duration of both direct and indirect burial, a key factor in marine organism survival.[14] Several factors determine survival of beach invertebrate fauna during burial, including sand depth, the ability for vertical migration through the sand overburden, duration of burial and the recruitment potential of larvae, juveniles, and adult organisms from adjacent areas (Greene 2002).

For reasons similar to those described above for rocky intertidal habitat, this alternative would also substantially reduce Impact MB-4 to subtidal habitats and organisms. As the footprint of the beach would be substantially reduced under this alternative, Alternative 9 would substantially limit impacts, likely avoid all or most direct burial of shallow subtidal reefs during sand placement and associated mortality of surfgrass and kelp described in Impact MB-4 and MB-8. While it is more difficult to estimate the total reduction in indirect impacts that occur when the beach is reshaped and sand moved offshore, it can reasonably be assumed that indirect impacts to these habitats would also be substantially reduced due to narrower beach width and substantially reduced sand volumes. Additionally, remaining impacts to rocky intertidal and subtidal habitats under this alternative would be reduced through implementation of AMMs MB-2a and MB-2b.

Additionally, the phased placement of sand on the western end of Broad Beach would result in a decrease in nearshore turbidity and indirect burial compared to the Project as approximately 25 percent of placed sand is remobilized immediately post construction. Therefore under this alternative, only 7,500 cy of sand would be immediately lost after each of the two initial nourishment phases rather than the 35,000 cy that would be lost in the same area under the Project. This would substantially reduce the indirect smothering or burial of additional rocky intertidal and subtidal habitat beyond the actual footprint of the expansion as both the depth and duration of burial would be reduced.

[14] Many rocky intertidal and subtidal organisms are adapted to periods of burial by sand and can survive weeks or even months of burial, dependent upon the species. By limiting both the extent and duration of burial, this alternative would materially improve marine organism survival rates.

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Summary of West End Properties not Protected by the 2010 Emergency Revetment

FIGURE 4-10

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However, phased nourishment may increase the mortality of organisms within the sandy intertidal as the second phase may occur after intertidal organisms are beginning to recover. Implementation of AMMs MB-2a, MB-2b, and MB-ALT-8 would ensure that any adverse impacts to sensitive intertidal and subtidal habitats would be appropriately mitigated. Additionally, as described for terrestrial biological resources, this alternative may increase the pressure for backpassing events which could result in incremental increases to the severity of impacts described in Impact MB-5.

The reduced nourishment volumes may also result in an incremental decrease in impacts to down coast marine resources described in Impact MB-7 as a reduced volume of sand would be available for down coast transport to Zuma Beach, Point Dume State Beach, and other down coast beaches. Additionally, intertidal habitat areas and shoreline marine biological resources farther south may be indirectly affected by changes in sand supply and distribution through littoral drift. This may result in additional reductions to impacts to marine biological resources down coast. However, as 86 percent of the proposed nourishment volume would still be applied to Broad Beach under this alternative, this reduction in the severity of down coast transport impacts likely would be incremental for down coast marine biological resources. The reduced volume of sand and the absence of construction activities on the west end of Broad Beach would incrementally reduce short-term construction related impacts to marine biological resources identified for the Project in Impacts MB-3, MB-4, MB-5, and MB-6.

Recreation and Public Access: As the emergency revetment would be retained under this alternative, Alternative 9 would have similar impacts associated with recreation and public access described in REC-4. However, as described for the impacts to Marine Biological Resources under this alternative, impacts to rocky intertidal and other sensitive marine habitats would be reduced. The dune and beach profile, per the Project, at the western end of Broad Beach would be approximately 160 feet wide and would substantially cover the rocky intertidal areas, particularly the boulder field fronting 31412 Broad Beach Road. However, under this alternative the beach width at the western end would be reduced by approximately 50 percent and would leave rocky intertidal areas and the boulder field at least partially exposed in the intertidal and surf zone. This alternative would substantially reduce impacts to marine biological resources by reducing the width of the western end of Broad Beach, but would reduce recreation opportunities and public access to some degree.

Broad Beach west of the existing rock revetment is unique from the rest of Broad Beach, because of the rocky intertidal habitat and biological resources that exist at this location. A 2012 public survey of beachgoers at Broad Beach indicated that tidepooling was an attraction for some beachgoers. Under existing conditions, swimming and playing in the surf zone are attractive at the east end of Broad Beach, and less so at the far west end. Although lateral access would be limited at the west end of Broad Beach, this alternative would help minimize impacts to the existing rocky intertidal habitats while still offering improved access for tidepooling as a recreation resource. The majority of Broad Beach would provide for enhanced opportunities for a full range of beach recreation within the proposed beach and dune areas.

The existing narrow intertidal beach would be expected to narrow more quickly over the 20 year Project life. SLR may also reduce public access during low tide conditions. Impacts to public access could be reduced by reducing the length of the narrow beach on the western end of broad beach; however, this would have corresponding impacts to marine habitats in this area. These impacts could also be reduced by increasing the size of the phased nourishment events. For example, phases one and two could each consist of 40,000 to 50,000 cy of sand which would increase the depth or size of the beach on the west end while still minimizing impacts to marine habitats to some extent. Regardless, under this alternative, impacts described for REC-3 pertaining to public access would be less beneficial than those described for the Project. Construction-related impacts from nourishment and backpassing operations would have similar impacts to those identified for the Project in Impacts REC-1 and REC-2.

Other Resource Areas: This alternative would have similar impacts to the Project in terms of its effects on scenic resources, environmental justice, utilities and service systems, and marine water quality. Impacts to traffic and parking, cultural, historic, and paleontological resources, public health and safety hazards, and noise would be incrementally reduced due to the decreased levels construction activity associated with the reduced sand volumes.

Table 4-12. Alternative 9 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
Scenic Resources	No Major Change in Adverse Impacts	Similar to the Project, permanent authorization of the revetment through a long-term lease and approval of CDPs would create the potential for long-term degradation of the visual environment of Broad Beach after nourishment activities end and natural coastal erosion causes the revetment to become exposed as described in Impact SR-1.
Cultural and Paleontological Resources	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project, although construction-related Impacts identified in Impacts CR-2 and CR-3 may be incrementally reduced due to the reduced construction and hauling activities.
Noise	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project. While there may be a reduced duration of nourishment due to reduced sand volume on the western end of Broad Beach, this reduction would be incremental at most.
Public Health and Safety Hazards	Incremental Reduction in Adverse Impacts	This alternative would result in a slight decrease in the adverse effects associated with Impact HAZ-2, as the duration of nourishment and the presence of heavy construction equipment may be reduced do to the reduced nourishment volume on the western end of Broad Beach. However, this reduction in the duration of nourishment would be incremental

Table 4-12. Alternative 9 – Changes in Impact Severity

Resource Area	Relative Change in Impact Severity	Discussion
		at most and would not substantially reduce Impact HAZ-2. Similar to the Project adverse effects under this alternative would be reduced through implementation of AMMs HAZ-2, HAZ-3a, and HAZ-3b.
Traffic and Parking	Incremental Reduction in Adverse Impacts	This alternative would require approximately 5,700 fewer heavy haul truck trips due to the reduced nourishment volume at the west end of Broad Beach, which would incrementally reduce traffic and congestion on the inland routes, PCH, and in the Zuma Beach parking lot, incrementally reducing the severity of the adverse effects associated with Impact TR-1, TR-3, and TR-4. These impacts would be further reduced through implementation of AMM TR-1.
Environmental Justice	No Major Change in Adverse Impacts	There would be no appreciable difference in impacts relative to the Project.
Utilities and Service Systems	No Major Change in Adverse Impacts	Under this alternative the revetment would be retained in place similar to the Project and impacts to utilities and service systems would remain similar to the Project. Potential impacts to septic systems on the western end of Broad Beach may be incrementally increased over the mid-term as there would be a reduced nourishment volume and footprint in this area; however, this would not be substantial as the entire beach would erode over the long-term exposing these areas both under this alternative and under the Project.
Marine Water Quality	Incremental Decrease in Adverse Impacts	This alternative would reduce turbidity impacts on the western end of Broad Beach identified in Impact MWQ-1 and corresponding impacts to marine biological resources identified in Impacts MWQ-2 and MWQ-4. Impact MWQ 3 would remain similar to the Project due to nourishment and retention of the existing revetment.

5.0 MONITORING IMPLEMENTATION PROGRAM

This Monitoring Implementation Program (MIP) provides a summary of each Avoidance and Minimization Measure (AMM) for the Project and specifies the monitoring implementation responsibility for each measure. The California State Lands Commission (CSLC) will suggest a program for monitoring implementation of AMMs for this Project, to ensure that the AMMs are implemented as defined in the Revised Analysis of Impacts to Public Trust Resources and Values (APTR).

5.1 MONITORING IMPLEMENTATION RESPONSIBILITIES

5.1.1 Monitoring Authority

The purpose of the MIP is to ensure that measures provided in the Revised APTR to minimize or avoid adverse effects are implemented. A MIP is a working guide to facilitate not only the implementation of AMMs by the Applicant, but also the monitoring, compliance and reporting activities of the CSLC, or any monitors it may designate.

The CSLC may delegate duties and responsibilities for monitoring to environmental monitors or consultants as deemed necessary. Some monitoring responsibilities will be assumed by responsible agencies within affected jurisdictions, such as the city of Malibu and the California Coastal Commission (CCC). The CSLC will ensure that persons delegated monitoring and compliance duties are qualified.

Any AMM study or plan that requires the approval of the CSLC or CSLC staff must allow at least 60 days for adequate review time. When an AMM requires that a monitoring program be developed during the design phase of the Project, the Applicant must submit the final program to the CSLC or CSLC staff for review and approval for at least 60 days before construction begins. Other agencies and jurisdictions may require additional review time. The environmental monitor assigned to each spread is responsible for ensuring that the Applicant obtains appropriate agency reviews and approvals before construction begins.

The CSLC or its designee will also ensure that any deviation from the procedures identified under the monitoring program is approved by the CSLC. The environmental monitor assigned to the construction spread shall report any deviation or correction immediately to the CSLC or its designee.

5.1.2 Enforcement Responsibility

The CSLC or its designee will be responsible for enforcing the procedures approved for monitoring through the environmental monitor assigned to each construction spread. Any assigned environmental monitor shall note problems with monitoring, notify appropriate agencies or individuals about any problems, and report the problems to the CSLC or its designee(s).

5.1.3 Funding and Implementation Responsibility

The Applicant is responsible for funding and successfully implementing all AMMs in the MIP, and assuring that these requirements are met by all construction contractors and field personnel. Standards for successful avoidance or minimization of impacts are implicit in many AMMs that include requirements such as obtaining permits or avoiding a specific impact entirely. Other AMMs include detailed success criteria. Additional impact avoidance and minimization success thresholds will be established by applicable agencies with jurisdiction through the permit process and through the review and approval of specific plans for the implementation of AMMs.

5.2 GENERAL MONITORING PROCEDURES

5.2.1 Environmental Monitors

Several of the monitoring procedures will be conducted during the construction phase of the Project. The CSLC and the environmental monitor(s) are responsible for integrating the avoidance and minimization monitoring procedures into the construction process in coordination with the Applicant. To oversee the monitoring procedures and to ensure success, the environmental monitor assigned to each construction spread must be on site during construction activities that have the potential to create a major impact or an impact for which mitigation is required. The environmental monitor is responsible for ensuring that all procedures specified in the monitoring program are followed.

5.2.2 General Reporting Procedures

Individuals performing site visits and specified monitoring procedures will be reported to the environmental monitor assigned to the relevant construction spread. The individual conducting the visit or procedure will submit a monitoring record form to the environmental monitor so details of the visit are recorded and progress is tracked. The environmental monitor will develop and maintain a checklist to track all procedures required for each mitigation measure, and to ensure that the timing specified for the procedures is adhered to. The environmental monitor will note any problems that may occur and take appropriate actions as directed by CSLC to rectify the problems.

5.2.3 Public Access to Records

The public will be allowed access to records and reports used to track the monitoring program. Monitoring records and reports will be made available for public inspection by the CSLC or its designee on request.

5.3 MONITORING TABLE

For each AMM, the Monitoring Table identifies 1) the full text of the AMM, 2) the location where the impact occurs, 3) the monitoring and reporting action to be performed by the monitoring agency, 4) how effectiveness of the AMM will be determined, 5) the responsible agency for monitoring the AMM, and 6) the approximate timing of when the agency implementing the AMM should provide plans. **All of the AMMs identified in the Monitoring Table apply to Project impacts (discussed in Section 3.0) and the impacts of each of the alternatives (discussed in Section 4.0) with the exception of AMM MB-ALT-8, which only applies to Alternatives 8 and 9.**

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
Recreation and Public Access					
AMM REC-1: Public Access during Construction and Renourishment. At least 2 weeks prior to commencing construction and renourishment operations, the construction contractor shall post signs notifying the public of the scheduled dates of nourishment operations at the public access points and at other highly visible locations along the beach. Construction contractors shall be responsible for maintaining the beach in acceptable condition for public use outside of construction activities (e.g., weekends) to the maximum extent feasible. Lateral access along the west end of Zuma Beach and Broad Beach shall be restored as soon as possible to permit continued, safe public passage. Construction monitors shall be employed to manage public access during construction activities.	Broad Beach public trust land	Maintenance of beach access by construction contractor	Protect public access during construction and renourishment	CSLC	During initial construction and renourishment operations
AMM REC-2: Public Access during Backpassing. At least 2 weeks prior to commencing backpassing operations, the construction contractor shall post signs notifying the public of the scheduled dates of backpassing at the public access points and at other highly visible locations along the beach. The construction contractors shall be responsible for maintaining lateral beach access to the maximum extent feasible to permit safe public passage (e.g., designated public access points, flagman, and construction vehicle management).	Broad Beach public trust land	Maintenance of beach access by construction contractor	Protect public access during backpassing	CSLC	During annual backpassing operations
AMM REC-3: Beach Profile Reporting. The Applicant shall submit quarterly monitoring reports prepared by an approved third party monitor to CSLC staff. Monitoring reports shall provide beach profile information obtained during that period, consistent with monitoring procedures outlined in Section 2.2.9, *Long-Term Beach Profile Monitoring and Beach Measurements,* of California State Lands Commission's *Analysis of Public Trust Resources and Values*. In addition to the spring and fall full beach profile measurements, a third full beach profile measurement shall be taken immediately after any backpassing event. Monitoring reports shall identify action items for subsequent periods, including but not limited to the initiation of backpassing or renourishment.	Broad Beach public trust land and intertidal waters	Submittal of monitoring reports by Applicant	Ensure backpassing or renourishment events are performed when necessary	CSLC	Quarterly after completion of initial construction, and additionally after backpassing events
AMM REC-4a: Requirement of Additional Nourishment. Additional nourishment events beyond those proposed by the Applicant may be required within the 20-year Project lifetime or the public benefits	Broad Beach public trust	Review by CSLC staff of beach profile	Ensure sustained renourishment	CSLC	After re-nourishment

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
associated with the Project may be lost.	land and private land	reporting	of public beach/dunes		
AMM REC-4b: Sea Level Rise Effects. The effects of sea level rise on Broad Beach shall be analyzed towards the end of the Project life (20 years) and reported to the California State Lands Commission (CSLC). This would include, but not be limited to, analysis of potential changes in property boundaries from the resultant changes in the elevation of the mean high tide line and the effects of increased erosion rates on the need for beach nourishment. Where changes in property boundaries occur that result in additional public trust lands being impeded from public use in the Broad Beach area, the CSLC shall determine appropriate Project measures to ensure no net loss of public trust lands available for public use in the Broad Beach area.	Broad Beach public trust land and private land	Analysis of sea level rise impacts by Applicant	Ensure Project can appropriately adjusted to or account for the effects of sea level rise	CSLC	Near the end of the Project life; 15 to 20 years
Marine Biological Resources					
AMM MB-2a: Compliance with Existing Laws. Prior to commencement of construction activities, the Applicant shall provide California State Lands Commission (CSLC) staff copies of permits or other applicable written approvals from the California Coastal Commission (CCC), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and U.S. Army Corps of Engineers (USACE) that placement of fill west of the existing rock revetment is not inconsistent with the California Coastal Act (CCA), California Marine Life Protection Act (MLPA), Magnuson-Stevens Fishery Conservation and Management Act, and Federal Rivers and Harbors Act, respectively.	Broad Beach public trust land and intertidal waters	Review by CSLC staff of permits and written approvals	Ensure compliance with CCC, CDFW, NMFS, USACE, CCA and MPLA	CSLC	Prior to construction
AMM MB-2b: Multi-Agency Collaboration for Sensitive Marine Habitat Impacts. Prior to commencement of construction activities, the Applicant shall work with jurisdictional marine habitat protection agencies, including CCC, CDFW, NMFS, USACE, and CSLC for review and endorsement of all marine habitat baseline surveys, impact analyses, and appropriate monitoring and any compensation for impacts to sensitive marine habitats and species. Prior to commencement of construction activities, the Applicant shall provide to CSLC staff any resultant surveys, impact analyses, and monitoring and compensation protocols determined through the multi-agency process and required by jurisdictional agencies.	Broad Beach public trust land and intertidal waters	Submittal of surveying, impact analyses, and monitoring reports by Applicant	Establish baseline conditions for marine habitats	CSLC in conjunction with CCC, CDFW, NMFS, and USACE	Prior to construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
AMM MB-2c: Sand Placement Footprint Limitation. If the Applicant receives agency approvals for placement of fill west of the existing rock revetment and if supported by the multi-agency coordination process of AMM MB-2b, construction contracts shall specify that all initial sand deposits during nourishment events shall be placed on the upper beach west of the existing revetment at Broad Beach area near Point Lechuza. Sand placement and mechanical distribution will be limited to areas falling within 120 feet of the bluffs and existing homes. To maximize sand dispersion over time and reduce the depth of burial of lower intertidal rocky habitat, sand to the west of the existing revetment shall be placed in two separate intervals so that only half the total amount of sand is placed at one time. The intervals shall be at the beginning of the placement, and then at the last stage of placement to allow the maximum time span between placements.	Broad Beach public trust land and private land	Limitation of sand placement by contractor	Minimize disturbance of sensitive species and habitat	CSLC	During construction
AMM MB-3: Monitoring for Grunion. If possible, construction activities shall be conducted outside the spawning season for grunion (March through August). If construction cannot be avoided during this period, pre-construction biological surveys for spawning grunion shall be conducted by a certified biologist. If spawning is observed, construction will halt in that area, and the spawning area plus a 250-foot buffer to each side of the spawning area will be protected from Project activities until after the next spring tides (approximately 10 days to 2 weeks).	Broad Beach public trust land and intertidal waters	Monitoring for sensitive species by certified biologist	Minimize disturbance of sensitive species and habitat	CSLC	Prior to construction
AMM MB-5a: Backpassing Management Plan. The Applicant shall retain a qualified biologist to prepare an initial backpassing management plan, with input from project engineers, to guide backpassing over the life of the project. This plan shall be designed to protect undisturbed beach habitat areas while also achieving the Project objectives for ongoing beach nourishment. This plan shall be prepared and submitted for review and approval to the California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), and the California Coastal Commission (CCC) prior to commencement of Project construction activities. The plan shall have the following goals and standards: • Protection of sandy beach habitat during backpassing events.	Broad Beach public trust land and private land	1) Plan review and approval by regulating agencies 2) Preparation of a Backpassing Management Plan by a qualified biologist	Minimize disturbance of sensitive species and habitat	CSLC in conjunction with CCC and CDFW	Prior to construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
• Minimizing the aerial extent of beach disturbance (i.e., areas of excavation or fill) while maximizing sand availability for backpassing consistent with this goal and maintaining an acceptable beach profile and proportionate beach width. • Protection of contiguous areas of macro-invertebrate habitat, particularly within the lower, mid and upper intertidal zones. • Protection and retention of areas of beach wrack • Prior to backpassing, relocation of all beach wrack from areas proposed for excavation or fill to areas that will remain undisturbed using hand crews or light equipment only. • Retention of areas of undisturbed connectivity between portions of the dune habitat and the intertidal zone. • Avoidance of backpassing in spring and early summer to avoid periods of high macro-invertebrate productivity. • Consistent with approved nourishment plans, sand transported from backpassing will be placed high on the beach profile to minimize loss to coastal processes and impacts to rocky intertidal habitat • Backpassing vehicle corridors shall be clearly defined and limited to minimize beach disturbance • Backpassing will be limited to a maximum of one 3-week period annually In no case shall more than 50 percent of the total dry sand and intertidal beach area be subject to disturbance by either excavation or fill.					
AMM MB-5b: Annual Backpassing Plans. The Applicant shall retain a qualified biologist to prepare brief annual backpassing plans, with input from project engineers, to guide each backpassing event over the life of the Project. Each annual backpassing plan shall achieve the goals of the Backpassing Management Plan (AMM MB-1a). Each plan shall be prepared and submitted for review and approval to California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC)	Broad Beach public trust land and private land	1) Plan review and approval by regulating agencies 2) Preparation of Annual Backpassing Plans by a qualified	Minimize disturbance to sensitive species and habitats	CSLC in conjunction with CDFW, USFW and CCC	Annually, prior to backpassing

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
a minimum of three months prior to initiation of backpassing. The annual backpassing plan shall be designed to build upon the goals, standards and analysis within the initial backpassing management plan and be tailored to account for changing circumstance over time.		biologist			
AMM MB-5c: Beach Habitat Management Plan. Prior to commencement of construction activities, the Applicant shall prepare and submit to CSLC staff a Beach Habitat Management Plan (BHMP). The BHMP will set forth measures to minimize the impacts of backpassing and maintain biological productivity of intertidal and high intertidal habitats, including but not limited to prohibition of grooming, creation and maintenance of areas of beach wrack and beach strand habitat on areas of the berm outside of backpassing borrow and deposition zones.	Broad Beach public trust land and intertidal waters	Plan review and approval by regulating agencies	Minimize disturbance to sensitive species and habitats	CSLC	Prior to construction
AMM MB-ALT-8: Baseline Surveys for Sensitive Rocky Intertidal Habitats. In coordination with AMM MB-2b, the Project Applicant shall contract with qualified biologists to conduct regular monitoring of biological resources and habitat quality of sensitive rocky intertidal habitats west of 31346 Broad Beach Road. The transects shall be consistent with those used to establish baseline intertidal habitat conditions. Surveys shall be conducted prior to Project completion, following Project completion and again prior to renourishment. A control site shall be established that is acceptable to the California State Lands Commission (CSLC) staff. The summaries of these monitoring surveys shall be prepared and submitted to CSLC staff for review. Any adverse impacts to sensitive rocky intertidal habitats shall be provided to the agencies as part of AMM MB-2b (applies to Alternatives 8 and 9 only).	Broad Beach public trust land and intertidal waters	1) Monitoring of habitat by a qualified biologist 2) Submittal of monitoring summaries 3) Plan review and approval by regulating agencies	Minimize disturbance to sensitive species and habitats	CSLC	1) Twice per year 2) Annually
Terrestrial Biological Resources					
AMM TBIO-1a. Implementation of a Comprehensive Dune Restoration Plan. In order of off-set past impacts to foredune habitats from installation of emergency sand bag and rock revetments, the Applicant shall prepare and implement a Comprehensive Dune Restoration Plan (Plan). The Plan shall manage and implement the creation of the proposed new coastal dune system across the length of Broad Beach (Section 2, *Project Description)*. The Plan shall include, but not be limited to, the	Broad Beach public trust land and private land	1) Plan review and approval by regulating agencies 2) Site inspections and monitoring reports by a	Mitigate long-term adverse impacts to the functional value of the dune system due to instillation of	CSLC in coordination with CCC, USFWS, CDFW and city of Malibu	1) Prior to construction 2) During construction and ongoing throughout Project

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
following measures: • Conform to any conditions of approval pursuant to the California Coastal Commission's (CCC) Coastal Development Permit for mitigation of ESHA related impacts. • If applicable, conform to U.S. Fish and Wildlife Service (USFWS) Biological Opinion requirements for protection of federal special status species and western snowy plover critical habitat. • In consultation with the California Department of Fish and Wildlife (CDFW) and USFWS, to the extent feasible, the Plan shall be designed and managed to support the state and federal special status species identified as impacted through installation of the emergency sand bag and rock revetments. • The Plan shall include a landscape plan that details specific planting plans, with native vegetation specific to foredune (e.g., red sand-verbena, pink sand-verbena, beach bur, and beach morning glory), dune crest, and back dune habitats. • The Plan shall require and outline specific measures for invasive species removal in on public and private lands in the degraded dune system (e.g., ice plant and pampas grass). It shall also outline specific measures regarding native species salvaging and revegetation, highlighting details regarding appropriate planting densities and planting methods. • The Plan shall outline that the Applicant is responsible for long-term monitoring and maintenance activities, including monitoring and survey methods, as well as detailed monitoring and maintenance schedules. • The Plan shall address the potential for dune habitat disturbance associated with vertical public and private access by limiting the number and frequency of walkways across the dune system. Access into the dune system shall be controlled through use of bollards, ropes, fencing, and signage. The Plan shall also address access for maintenance activities in and adjacent to the restored dune system. • The Plan shall establish a shared walkway across the landward edge of the restored dune system with access ways across the		qualified biologist	the emergency revetment.		

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
dunes to the beach spaced not less than 300 feet. • The Plan shall detail specific adaptive management strategies, such as additional native vegetation installation or restoration and invasive species removal should monitoring find that restoration goals are not be met.					
AMM TBIO-1b. If Applicable, Conform to California Coastal Commission (CCC) Coastal Development Permit for Off-Site Mitigation of ESHA. If applicable, to ensure mitigation for loss of ESHA from installation of the emergency sand bag and rock revetments, the Applicant shall conform with any CCC Coastal Development Permit conditions of approval for Off-site mitigation of ESHA. The Applicant shall provide the CCC approved Off-site ESHA mitigation plan to California State Lands Commission (CSLC) staff prior to commencement of construction and staging activities.	Broad Beach public trust land and private land	Approval of CDP by CCC, if applicable	Ensure mitigation for loss of ESHA	CSLC and CCC	Prior to construction
AMM TBIO-2a. California State Lands Commission (CSLC)-Approved Biologist and Biological Monitors for Construction Activities. The Applicant shall retain a Project biologist and Project monitors approved by the CSLC staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC) to supervise sand deposition and all other construction related activities. The biological monitors shall be present to ensure that damage to any sensitive habitat or sensitive species is minimized and that construction crews strictly comply with all AMMs. Prior to commencement of construction and staging activities, the Applicant shall provide to CSLC staff a Biological Monitoring and Reporting Plan demonstrating conformance with the following requirements: • If applicable, conform with USFWS Biological Opinion requirements pertaining to construction activities and access for protection of federal special status species and western snowy plover critical habitat. • If applicable, conform with CDFW Streambed Alteration Agreement conditions of approval for construction access across the mouth of Trancas Creek and all other construction activities. • Conform with all project construction conditions of approval	Broad Beach public trust lands and intertidal waters, Zuma Beach Parking Lot 12	1) Preparation and submittal of Biological Monitoring and Reporting Plan 2) Plan review and approval by regulating agencies 3) Presence of biological monitors during construction activities	Minimize disturbance to sensitive species and habitats	CSLC, CDFW, USFWS, and CCC	1) Prior to construction 3) During construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
pursuant to the CCC's Coastal Development Permit. • Prior to the commencement of construction-related activities, conduct protocol-level surveys for native plant species, with a special focus on sensitive species, in potential ESHA areas, beyond that which was surveyed by WRA, Inc. (2011, 2013). • Prior to the commencement of construction-related activities, conduct protocol-level surveys for globose dune beetle and western snowy plover. • Where feasible, prior to and during construction, collect and relocate sensitive plant, invertebrate, and reptile species that are likely to be impacted by the proposed nourishment and dune creation activities. • Conduct an additional protocol level survey for western snowy plover and California least tern prior to any construction during the breeding season between March and September. Should breeding individuals be identified, all work within a 300-foot-radius of the nest shall be halted and the Applicant shall immediately contact the USFWS and CDFW. Nourishment and dune construction activities within the 300-foot-radius shall resume only with approval from these agencies and with implementation of mitigation measures provided by these agencies if applicable. • Be present during all construction activities that may potentially cross ESHA as defined by in the Malibu Local Coastal Program, including the degraded dunes and Trancas Lagoon. • Ensure the implementation of all measures associated with AMM TBIO-1a, including the complete implementation of the Comprehensive Dune Restoration Plan, with associated maintenance and monitoring activities. The biological monitors shall record observations and the Project biologist shall submit a weekly report regarding the implementation of and compliance with all construction-related AMMs. Additionally, this report shall include any relevant biological observations, including a list of species encountered at Broad Beach. These reports shall eventually be incorporated into a mid-Project Sensitive Biological Resources Report (see AMM TBIO-3c).					

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
AMM TBIO-2b. Sensitive Resources Impact Avoidance. In consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC), the Project biologist and the Project engineer shall clearly designate all ESHAs, including areas within 100 feet of the Trancas Lagoon as "sensitive resource zones" on the Project maps and construction plans. The Applicant shall provide a Sensitive Resource Impact Avoidance Map to CSLC staff for review and approval prior to commencement of Project construction and staging activities. Construction equipment and operations shall be prohibited in these zones to avoid impacts to special-status biological resources. During construction, heavy equipment shall be operated in accordance with standard best management practices as well as the following measures: • Vehicles and construction equipment shall be confined to a pre-defined equipment access path no greater than the minimum width necessary to complete the necessary construction activities. • In areas of high vehicle traffic on dry sandy beach, driving mats will be laid down prior to the commencement of construction-related activities in order to avoid unnecessary adverse effects to the sandy beach environment. • The location of the sand stockpile shall be moved east toward Zuma Beach to an extent that would allow for passage of trucks and construction equipment without encroachment upon the delineated 100-foot ESHA buffer. If, given the proposed location of stockpiles and access points, trucks and construction equipment are unable to access the sand from the staging area without encroaching upon the 100-foot ESHA buffer, an alternate access point shall be selected along the eastern portion of Parking Lot 12.	Broad Beach public trust lands and intertidal waters, Zuma Beach Parking Lot 12	1) Designation of sensitive resource zones by qualified biologist and Project engineer 2) Prohibition or rescheduling of construction activities within sensitive resource zones	Minimize disturbance to sensitive species and habitats	CSLC in coordination with CDFW, USFWS, CCC	1) Prior to construction 2) During construction
AMM TBIO-2c. Protect Stockpiles of Excavated Material. Inland sand shall not be stockpiled within ESHAs or other sensitive resource zones, including federally designated western snowy plover habitat. Beach sand stockpiles should be protected to the extent feasible by synthetic impervious covers to prevent erosion by wind and/or	Zuma Beach sand stockpile area	Sand piles within designated areas only; protection and cover of sand stockpiles	Minimize disturbance to sensitive species and habitats	CSLC	During construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
rainfall. This notation shall be included on Project construction plans.					
AMM TBIO-2d. Storage of Materials or Heavy Equipment Prohibited Outside of Staging Area. Overnight storage of materials other than sand stockpiling, or heavy equipment on the beach or outside of the construction staging area at Zuma Beach Parking Lot 12 shall be strictly prohibited. This notation shall be included on Project construction plans.	Zuma Beach Parking Lot 12 and sand stockpile area	Overnight storage of materials and equipment in staging area only	Minimize disturbance to sensitive species and habitats	CSLC	During construction
AMM TBIO-3a. Biologist and Biological Monitors for Backpassing Activities. The Applicant shall retain a Project biologist and Project monitors approved by the California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission to supervise backpassing and all other construction related activities. The Project monitor shall ensure that damage to any sensitive habitat or sensitive species within or adjacent to construction zones is minimized. Prior to commencement of construction and staging activities, the Applicant shall provide to CSLC staff a Biological Monitoring and Reporting Plan demonstrating how the Project monitor will conform with the following requirements: • If applicable, conform with USFWS Biological Opinion requirements pertaining to construction and backpassing activities for protection of federal special status species and western snowy plover critical habitat. • If applicable, conform with CDFW Streambed Alteration Agreement conditions of approval for construction access across the mouth of Trancas Creek and all other construction activities. • Conform with all project construction and backpassing conditions of approval pursuant to the CCC's Coastal Development Permit. • Conduct preconstruction trainings with the construction crew leaders so they can readily identify sensitive plant and wildlife species. • Conduct preconstruction surveys of the sandy beach and dune habitats as well as in the vicinity of Trancas Lagoon. • Flag the toe of the dune on the seaward side of all foredune vegetation.	Broad Beach public trust lands and private lands	1) Preparation and submittal of Biological Monitoring and Reporting Plan and its approval by CSLC and regulating agencies 2) Monitoring of construction and backpassing activities by a qualified biologist and Project monitors	Minimize disturbance to sensitive species and habitats	CSLC in coordination with CDFW, USFWS, CCC	1) Prior to construction 2) During construction and backpassing

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
• Conduct a preconstruction meeting with all construction crew leaders and construction crewmembers to discuss the implementation of appropriate mitigation measures.					
AMM TBIO-3b. Avoidance of Sensitive Resource Zones and Vegetation. Following the completion of pre-construction biological surveys, in consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission, the Project biologist shall clearly designate "sensitive resource zones" on the Project maps and construction plans. These zones would include any ESHAs or otherwise sensitive biological resources. Sensitive resource zones are defined as areas where construction would be limited, depending on the particular environmental conditions and construction requirements. No native vegetation shall be impacted or removed during backpassing-related activities. Wetland areas shall be prohibited from use for disposal or temporary placement of excess sand. All equipment used in or near Trancas Lagoon shall be clean and free of leaks and/or grease. Emergency provisions shall be in place prior to the onset of construction and at all times during construction to deal with accidental spills. The Applicant shall provide a Sensitive Resource Impact Avoidance Map to the California State Lands Commission (CSLC) staff for review and approval prior to commencement of Project construction and staging activities.					
AMM TBIO-3c. Sensitive Biological Resources Report. Following the third complete year of Project implementation, the Applicant shall prepare a Sensitive Biological Resources Report. The report shall include the results of past protocol-level surveys, as well as biological surveys conducted prior to each backpassing event. The report shall assess the presence of sensitive species and habitat and analyze the trends in occurrence of sensitive species or habitat. The document shall also include any biologically relevant information gathered during construction monitoring activities. This report shall be submitted to the California State Lands Commission (CSLC) staff within six months following the third complete year of Project implementation and shall be used to direct the timing of future	Broad Beach public trust lands and private lands	Preparation and submittal of Sensitive Biological Resources Report and its review and approval by CSLC	Determine timing of backpassing events and minimize disturbance to sensitive species and habitats	CSLC	Between 3 and 3.5 years after initial construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
backpassing and renourishment events in order to minimize impacts to biological resources to the maximum extent feasible.					
AMM TBIO-4a. Emergency Action Plan Measures Regarding Protection of Biological Resources. Before commencement of project construction and staging activities, the Applicant shall submit to the California State Lands Commission (CSLC) staff an Emergency Action Plan (EAP) to address protection of sensitive biological resources that would potentially be disturbed during a hazardous spill or subsequent cleanup activities. At a minimum, the EAP shall include: • Industry-standard best management practices to avoid potential spills. • Specific measures to avoid impacts on state and federal special status species and western snowy plover critical habitat, and ESHAs, during response as well as cleanup operations. • Identification, where feasible, of low-impact, site-specific, and species-specific remediation techniques. • Identification of standards of a spill response personnel-training program. • An outline of a restoration plan, including preemptive identification of access and staging points and procedures for timely reestablishment of functional habitat values. • A contact list, coordinated with related projects, of key points of contact and emergency response agencies to be retained at all job sites during construction activities.	Broad Beach public trust lands and private lands	Preparation and Submittal of EAP and its review and approval by CSLC staff	Protect sensitive species and habitats	CSLC	Prior to construction
AMM TBIO-4b. Maintain Equipment and Adhere to Work Plan. All equipment used on-site shall be properly maintained such that no leaks of oil, fuel, or residues will occur. Provisions shall be in place to remediate any accidental spills, in both the terrestrial and marine environments. All equipment shall only be stored in the appropriate equipment staging areas. The Applicant shall submit a work plan to the California State Lands Commission (CSLC) staff, California Coastal Commission (CCC), California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), Los Angeles Regional Water Quality	Broad Beach public trust lands and private lands, Zuma Beach Parking Lot 12, access roads near	1) Submittal and approval of work plan by regulating agencies 2) Adherence to work plan	Minimize disturbance to sensitive species and habitats	CSLC in coordination with CDFW, CCC, USFWS, LARWQCB, City of Malibu	1) Prior to construction 2) During construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
Control Board, and city of Malibu for review and approval prior to the commencement of construction and staging activities. The Applicant shall also demonstrate to the approving agencies how construction personnel will be trained on the requirements of the work plan. The work plan shall include a list of all heavy equipment and shall require all equipment to be stored and fueled in the Zuma Beach Parking Lot 12, which shall be conspicuously demarcated. Heavy equipment and construction activities shall be restricted to the defined construction areas, as demarcated by the Project engineer. Additionally, vehicles and personnel shall only use existing access roads to the maximum degree feasible. The work plan shall be retained on the project site at all times during construction and staging activities.	Broad Beach				
AMM TBIO-5a. Maintain the Hydrology of Trancas Lagoon. Prior to commencement of construction and staging activities at Broad Beach, the Applicant shall prepare a Trancas Lagoon Beach Berm Management Plan in coordination with the Santa Monica Mountains Resource Conservation District, U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and the California Coastal Commission (CCC). The Plan shall be submitted to CSLC staff, the CDFW, USFWS, USACE, and CCC for review and approval prior to commencement of construction and staging activities. The proposed Beach Berm Management Plan shall identify the anticipated rate of sand deposition in front of the mouths of these water bodies and include potential measures to maintain the connection between these wetlands and the marine environment, as determined by the approving agencies.	Broad Beach public trust lands, Trancas Lagoon	Provision of fair share contribution	Restore sensitive habitats near or in Trancas Lagoon	CSLC in coordination with SMMRCD	Prior to construction
AMM TBIO-5b. Coordination of Backpassing and Berm Breaching. Prior to commencement of construction and staging activities, the Applicant shall coordinate with California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), the California Coastal Commission (CCC), and the Santa Monica Mountains Resource Conservation District to determine if backpassing sand should be obtained to aid in breaching of the Trancas Lagoon.	Broach Beach public trust lands, Trancas Lagoon	Coordination with regulating agencies	Maintain connection between Trancas Lagoon and Pacific Ocean	CSLC in coordination with CDFW, USFWS, USACE, CCC, and SMMRCD	Prior to construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
AMM TBIO-7. Restrict Access Across the Newly Restored Dune System. Through Applicant consultation with the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), the California Coastal Commission (CCC), and California State Lands Commission (CSLC), access to and across the restored dune system shall be restricted to approved vertical access ways designated with a low-key rope and bollard fence as a means of protecting dune habitat and limiting the adverse impacts associated with increased private and public access to the restored dune system. Such a rope and bollard fence shall be placed at the toe of the dune and along all approved vertical access ways in order to restrict all access to the dunes and accomplish the goal of reducing impacts to the proposed dune habitat. The Applicant shall provide a Dune Restoration Access Plan, approved by the specified agencies to CSLC staff prior to commencement of construction and staging activities.	Broad Beach public trust lands and private lands	1) Preparation and submittal of Dune Restoration Access Plan 2) Plan review and approval by regulating agencies 3) Restriction of access across restored dune	Protect dune habitat	CSLC in coordination with CDFW, USFWS, and CCC	1) Prior to construction 2) Prior to construction 3) During Project-life
Marine Water Quality					
AMM MWQ-1a: Prepare and Implement Turbidity Monitoring Plan. A Turbidity Monitoring Plan shall be implemented during Project construction and nourishment/renourishment activities to monitor any effects to water clarity in offshore of and down coast from Broad Beach. The Plan shall be submitted to the California State Lands Commission (CSLC) staff for approval, in consultation with the Los Angeles Regional Water Quality Control Board, at least 2 weeks before Project mobilization and shall include, at a minimum, the following elements: • Details on how the Applicant will continually evaluate construction-related turbidity relative to natural (background) turbidity occurring in unaffected areas during Project construction and nourishment/renourishment activities; • Requirements for a qualified observer to record turbidity from a suitable vantage point during each day of dredging and construction; and • Specific adaptive management activities and/or corrective action measures should include monitoring to indicate unacceptable	Broad Beach public trust lands and down coast beaches	1) Preparation and submittal of Turbidity Monitoring Plan 2) Recording of turbidity during dredging and construction by a qualified observer	Limit turbidity impacts and disturbance of sediment	CSLC, LARWQCB	Prior to construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
turbidity levels above ambient conditions.					
AMM MWQ-1b. Prepare Pollution Prevention Plan and Implement Best Management Practices (BMPs). The Applicant shall prepare a Pollution Prevention Plan, or Stormwater Pollution Prevention Plan (SWPPP), in accordance with Project plans and specifications and applicable regulations (e.g., State Construction Stormwater National Pollutant Discharge Elimination System permit requirements). The Plan shall be submitted to California State Lands Commission (CSLC) staff for review and approval at least 2 weeks prior to commencement of onsite Project activities. The Plan shall include a list of all heavy equipment and shall require all equipment to be stored and fueled in the Zuma Beach Parking Lot 12, which shall be conspicuously demarcated. The Project contractor shall ensure that the BMPs described in the Plan are implemented. Documentation that the BMPs are being implemented shall be maintained on site and shall be readily accessible for review by CSLC staff and any other authorities having jurisdiction. BMPs shall include, but not be limited to: • Heavy equipment and construction activities shall be restricted to the defined construction areas, as demarcated by the Project engineer. Additionally, vehicles and personnel shall only use existing access roads to the maximum degree feasible. • All equipment used onsite shall be properly maintained such that no leaks of oil, fuel, or residues will occur. No vehicle fueling shall occur on the beach or dune areas. Provisions shall be in place to remediate any accidental spills, in both the terrestrial and marine environments. • Waste, such as removed materials, chemicals, litter, and sanitary waste at the Project site, shall be properly disposed of at a permitted off-site facility.	Broad Beach public trust lands, Zuma Beach Parking Lot	1) Preparation and submittal of Pollution Prevention Plan or SWPPP 2) Implementation of BMPs by contractor	Limit accidental release of contaminants	CSLC and LARWQCB	1) Prior to construction 2) During construction
AMM MWQ-2: Construction Limitations. In the event that the Trancas Lagoon mouth is breached during the initial construction period or at any time during backpassing operations, the Broad Beach Geologic Hazard Abatement District (BBGHAD) will halt construction during high flow episodes where the body of	Mouth of Trancas Lagoon	Potential halt to construction	Reduce water quality impacts to Trancas Lagoon	CSLC	During construction and backpassing events

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
construction equipment would come in contact with flow into or out of the Lagoon. Construction activities would be halted until the creek is no longer in a breached state and there is at least 30 feet of dry sand between the lagoon mouth and Pacific Ocean, and California State Lands Commission (CSLC) staff authorizes recommencement of construction activity.					
Scenic Resources					
AMM SR-2a: Shielded Lights during Night Operations. During night operations, lights placed on the beach shall be shielded and directed at the immediately relevant work area. When daily construction activities cease after work hours, lights shall be shut off, dimmed, or shielded to the maximum extent feasible.	Broad Beach public trust lands	Shielding of lights by contractor	Reduce visibility of night lighting	CSLC	During construction
AMM SR-2b: Nightly Equipment Removal. Mobile heavy equipment placed on the beach shall be returned to the staging area at the end of each workday, both for public safety and for aesthetic considerations.	Broad Beach public trust lands	Nightly equipment removal by contractor	Reduce the amount of time equipment is visible	CSLC	During construction
Air Quality					
AMM AQ-1a: South Coast Air Quality Management District (SCAQMD) Compliance. Prior to placement of any sand on areas of Broad Beach under the jurisdiction of the CSLC, the Applicant shall provide CSLC staff copies of approvals or a letter of non-objection from the SCAQMD for construction and sand transport activities associated with the Broad Beach Restoration Project.	Broad Beach public trust lands	Review by CSLC staff of approvals or letters of non-objection from the SCAQMD	Ensure compliance of Project with SCAQMD	CSLC	Prior to Construction
AMM AQ-1b: Ventura County Air Pollution Control District (VCAPCD) Compliance. Prior to placement of any sand on areas of Broad Beach under the jurisdiction of the CSLC, the Applicant shall provide CSLC staff copies of approvals or a letter of non-objection from the VCAPCD for transport of sand from inland quarries in Ventura County.	Broad Beach public trust lands	Review by CSLC staff of approvals or letters of non-objection from the VCAPCD	Ensure compliance of Project with VCAPCD	CSLC	Prior to Construction
AMM AQ-1c: Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOCs), and Particulate Matter (PM) Control. The Applicant shall implement a NO_x reduction program including the following, or equivalent, measures: • All off-road construction equipment shall be tuned and	Broad Beach public trust lands	Implementation of NOx, VOC, and PM reduction program by	Reduce NO_x, VOC, and PM emissions	CSLC	During construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
maintained according to manufacturers' specifications. • Any temporary electric power shall be obtained from the electrical grid, rather than portable diesel or gasoline generators. • All off-road diesel construction equipment with greater than 100-horsepower engines shall meet Tier 4 requirements. If the SCAQMD determines or concurs that a Tier 4 fleet or portion thereof cannot be obtained, the Applicant shall use construction equipment that meets Tier 3 emissions requirements or use other California Air Resources Board (CARB)-verified emission control technologies to achieve the same level of emission reduction. • Limit onsite truck idling to less than 5 minutes. • A copy of the certified tier specification, best available control technology documentation, or the CARB or SCAQMD operating permit for each piece of equipment shall be provided when each piece of equipment is mobilized.		contractor			
AMM AQ-1d: Fugitive Dust Emission Control. The Applicant shall submit and implement a Fugitive Dust Control Plan that includes SCAQMD controls for fugitive dust, according to Rule 403. Fugitive dust control measures in the plan shall include the following: • Require minimum soil moisture of 12 percent for earthmoving, by using a moveable sprinkler system or water truck. Moisture content can be verified by lab sample or moisture probe (69% reduction). • Limit on-site vehicle speeds roads to 15 miles per hour (mph) with radar enforcement (57% reduction) and posting of speed limits. • All trucks hauling sand and other loose materials are to be tarped with a fabric cover and maintain a freeboard height of 12 inches (91% reduction). • Water storage piles by hand or apply cover when wind events are declared, according to SCAQMD Rule 403 when instantaneous wind speeds exceed 25 mph (90% reduction). • Appoint a construction relations officer to act as a community liaison concerning onsite construction issues, such as dust	Broad Beach public trust lands	Preparation, review and approval of a Fugitive Dust Control Plan and its implementation by contractor	Reduce fugitive dust generation	CSLC in conjunction with SCAQMD	Prior to and during construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
generation.					
AMM AQ-3: Diesel Particulate Emission Controls. The Applicant shall install California Air Resources Board (CARB)-verified Level 3 diesel catalysts on all diesel-powered off-road equipment or use diesel engines that have an equivalent particulate matter (PM) emission rate (Tier 4 engines). (See www.arb.ca.gov/diesel/verdev/vt/cvt.htm for a current list of CARB-verified Level 3 diesel catalysts.) Catalysts or engine certifications shall demonstrate achieving 85 percent reduction for diesel PM.	Broad Beach public trust lands	Installation and use of diesel catalysts by contractor	Reduce Toxic Air Contaminant emissions from diesel engines	CSLC	During construction
Traffic and Parking					
AMM TR-1. Traffic Management Plan. The Project Applicant shall provide proof that a traffic management plan has been submitted for review and approval by the California State Lands Commission, California Department of Transportation (Caltrans), and the Los Angeles County Department of Beaches and Harbors. The plan shall include the following elements, considering the initial nourishment, the renourishment event, and backpassing events: • **Notification Posts**. The Applicant shall post signage to notify beach users of construction areas and the presence and use of construction equipment. • **Notification of Agencies**. The plan shall identify concerned agencies and include procedures for notification of and coordination with such agencies. • **Safety Cordoning**. The Applicant shall cordon off construction areas where heavy equipment is being used, as necessary, to ensure safety of beach users. • **Roadway Signage**. The Applicant shall post adequate signage to notify motorists of the closure of Parking Lot 12, heavy truck traffic along constrained road segments (e.g., rural road intersections) and changes to the traffic configuration in the Broad Beach vicinity as well as locations of coastal access parking in the area. • **Construction Manager**. A construction manager shall be designated with authority over truck transportation with the	BBGHAD's Broad Beach Restoration Project Area	Plan review and approval by regulating agencies	Reduce impacts to transportation and circulation network in the vicinity of Broad Beach	CSLC	Prior to and During Construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
authority to redirect or halt trucking as needed. The manager shall be provided with communication equipment (e.g., radios) to manage the trucking operation. • **Truck Communications**. All trucks shall be equipment with radios or other communication equipment to permit contact and coordination with the construction manager. • **Truck Idling Locations**. The plan shall identify acceptable truck idling and pull over locations along Pacific Coast Highway (PCH) and other segments of the haul route. These areas shall be designated for use by trucks in case of equipment failures and excessive queuing occurring at the staging areas. • **Driver Safety Briefing**. All truck drivers shall receive a safety briefing on existing uses along the truck haul routes, particularly areas with significant pedestrian activity. • **Control Access to Parking Lot 12**. The Applicant shall ensure that appropriate measures are employed to prevent access (especially vehicular) to the staging area and parking lot 12 during periods when construction is not occurring in order to improve public safety. This could include signage and barriers. When safety is not an issue, public access shall otherwise be maintained to the maximum extent feasible. • **Pedestrian and Bicycle Accommodations**. The Applicant shall provide appropriate accommodations for bicyclists and pedestrians to ensure their safety within the modified traffic configuration and in the Broad Beach vicinity. • **Damage Repair**. The Applicant shall repair any damage to the PCH/Site Access connection or the construction staging area caused during the construction phase of the Project.					
Noise					
AMM N-1a: Use of Noise-Attenuating Devices on Construction Equipment. To the maximum extent feasible, equipment, and trucks used for Project construction shall use best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-	BBGHAD's Broad Beach restoration Project Area	Review and approval of final construction plans, including use of noise-attenuating	Acceptable noise level would be experienced by the public	CSLC	Prior to and during construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
attenuating shields or shrouds).		devices.			
AMM N-1b: City of Malibu Approval for Exceedance of City Noise Ordinance. Prior to commencement of construction activities, the Applicant shall obtain and provide to CSLC staff all necessary approvals from the city of Malibu for proposed truck trips and staging activities between 7:00pm and 9:00pm at the Zuma Beach Parking Lot 12 and staging area Monday through Friday.	Broad Beach public trust lands and PCH	Receipt of approvals from City of Malibu for extended construction hours.	Inconsistency with the City of Malibu Noise Ordinance would be resolved	CSLC, City of Malibu	Prior to construction
Public Health and Safety Hazards					
AMM HAZ-2: Develop Hazardous Material Spill Prevention Control and Countermeasure Plan (SPCCP). A Hazardous Material SPCCP shall be prepared prior to implementing the Project to minimize the potential for, and effects from, spills of hazardous, toxic, or petroleum substances during Project construction and shall be submitted to California State Lands Commission staff at least 2 weeks before commencement of beach restoration activities. At a minimum, the SPCCP shall: • Describe storage procedures, construction site housekeeping practices, and other Best Management Practices (BMPs). Common BMPs may include use of containment devices for hazardous materials, training of construction staff regarding safety practices to reduce the chance for spills or accidents, and use of nontoxic substances where feasible. • Identify processes for inspections and monitoring of BMPs to ensure minimal impacts to the environment occur. • Describe actions required if a reportable spill occurs, such as which authorities to notify and the proper clean-up procedures. • State procedures for containing, diverting, isolating, and cleaning up any spills that might occur, such that major adverse impacts on surface and groundwater quality would be minimized or avoided.	Broad Beach public trust lands	Plan review and approval by regulating agencies	Reduce impacts on public health and safety from potential spills of hazardous materials	CSLC	Prior to construction
AMM HAZ-3a: Demarcation of Public Access Routes. Public access routes around construction areas shall be clearly marked.	Broad Beach public trust lands	Demarcation of public access routes	Provide safe access to public trust resources	CSLC	During construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
AMM HAZ-3b: Provision of Contact for Reporting Hazards. The Applicant will provide the public with contact information in order to report immediate hazards related to the Project. This information shall be provided via public notice in a local paper and on signs at Broad Beach at least one week (7 days) prior to the commencement of any Project-related activities.	BBGHAD's Broad Beach Restoration Project Area	Provision of public notice in local papers and on signs	Improve public safety	CSLC	Prior to construction
AMM HAZ-4: Response to Sediment Contamination. Nourishment activities shall be temporarily halted In the event that construction workers, personnel, or other persons identify any indication that hazardous or dangerous materials are present in the imported sediment, or if contaminated sand is inadvertently deposited at Broad Beach, pending an evaluation by the California State Lands Commission (CSLC) staff, in consultation with the California Department of Fish and Wildlife (CDFW) Office of Spill Prevention and Response, to determine the extent of the contamination and most appropriate remediation methods before nourishment activities would be allowed to resume.	Broad Beach public trust lands	Potential halt of construction activities	Reduce impacts of hazardous or dangerous materials	CSLC in coordination with CDFW and OSPR	During construction
Utilities and Service Systems					
AMM UTL-3: Master Drainage Plan (MDP). The Applicant shall prepare and submit a MDP to the California State Lands Commission (CSLC) staff for review and approval. This plan shall include measures to minimize potential for water backup in storm drains, and associated drainage/flooding concerns, as well as minimizing or avoiding damage to newly created dune Environmentally Sensitive Habitat Areas (ESHAs) and beach habitats. This MDP shall address all existing and proposed modifications to public storm drains and pipes in the lease area, including those seaward of the mean high tide line. It shall be prepared by a qualified Civil Engineer and be based upon data and analysis provided by a registered hydrologist. At a minimum, the MDP shall: • Identify the exact location and size of all public drains along Broad Beach, including its relationship to State sovereign land and Lateral Access Easements (LAE), hydrological data on the watersheds and flow characteristics of each drain, particularly high flood flows (e.g., 100-year event) and potential for flooding	Broad Beach public trust lands	Preparation and submittal of MDP	Reduce adverse effects to public drainage systems such as water backup and flooding	CSLC in conjunction with city of Malibu	Prior to construction

Avoidance and Minimization Measure (AMM)	Location	Monitoring/ Reporting Action	Effectiveness Criteria	Responsible Agency	Timing
or drainage problems or erosion of dune and beach areas. • Design plans (overhead and cross-sections) for proposed modifications to public storm drains, including existing storm drains incorporated into the project design. • Identify specific drainage proposals for each storm drain and how they would affect public trust resources. • Identify measures to safely and adequately convey drainage through and across the proposed dune system and beach, including methods to avoid or minimize impacts to public trust resources and the ESHAs.					

6.0 REPORT PREPARATION SOURCES

This section provides a comprehensive list of individuals who contributed to the preparation of the Revised Analysis of Impacts to Public Trust Resources and Values (APTR).

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Nick Meisinger, Environmental Scientist/ Biologist	3	Terrestrial and Marine Biological Resources; Alternatives
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6.3 REFERENCES

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