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

<u>Historical Conditions of Broad Beach</u>

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.

Mean High Tide Line Surveys Prior to Construction of Emergency Revetment

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.

Construction of Emergency Revetment (2010)

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.

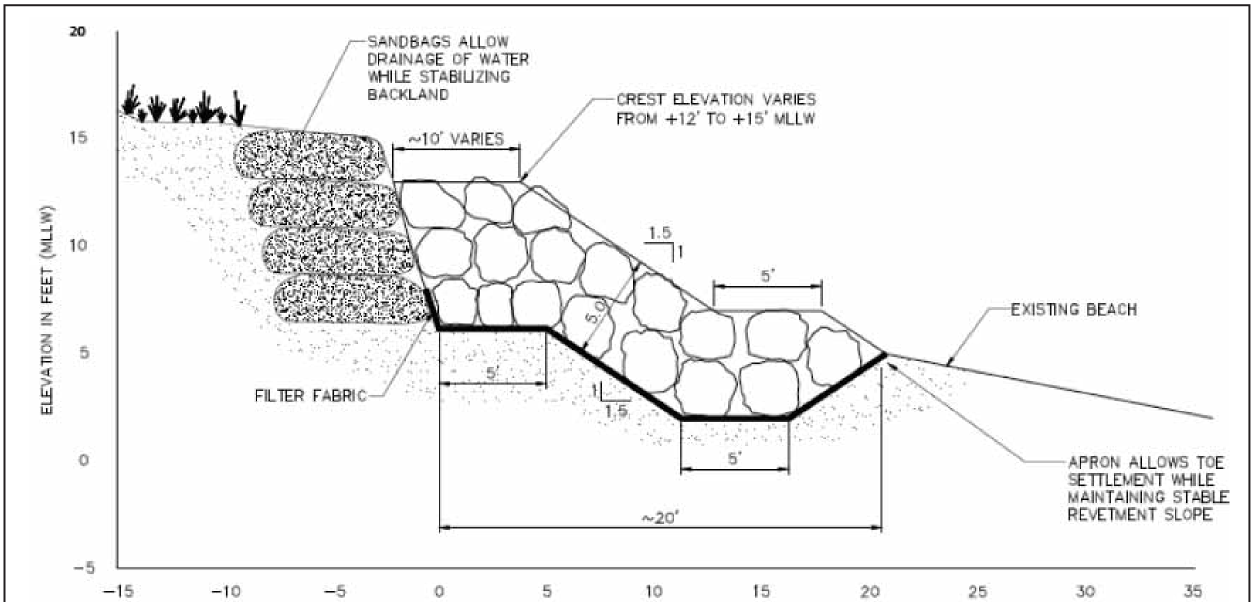


Illustration 2-3. *Along most of Broad Beach (3,700 feet) the emergency rock revetment was built over and in front of existing sand bag geotextile revetments, as shown in this cross section.*

[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

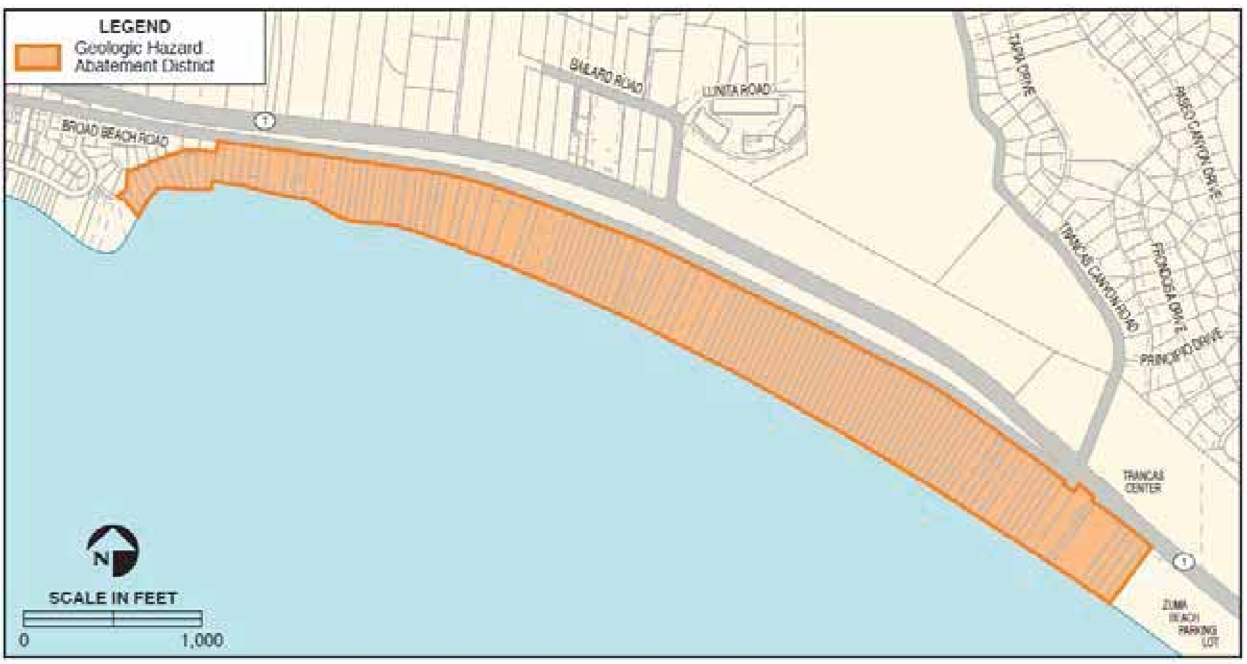
Since installation of the revetment in 2010, wave activity, particularly during winter storms, has continued to erode Broad Beach; however, the remaining dunes landward of the revetment have been largely protected. Erosion is primarily occurring along beach areas seaward of the revetment and outside 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).*



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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

> **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.

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.

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.

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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).

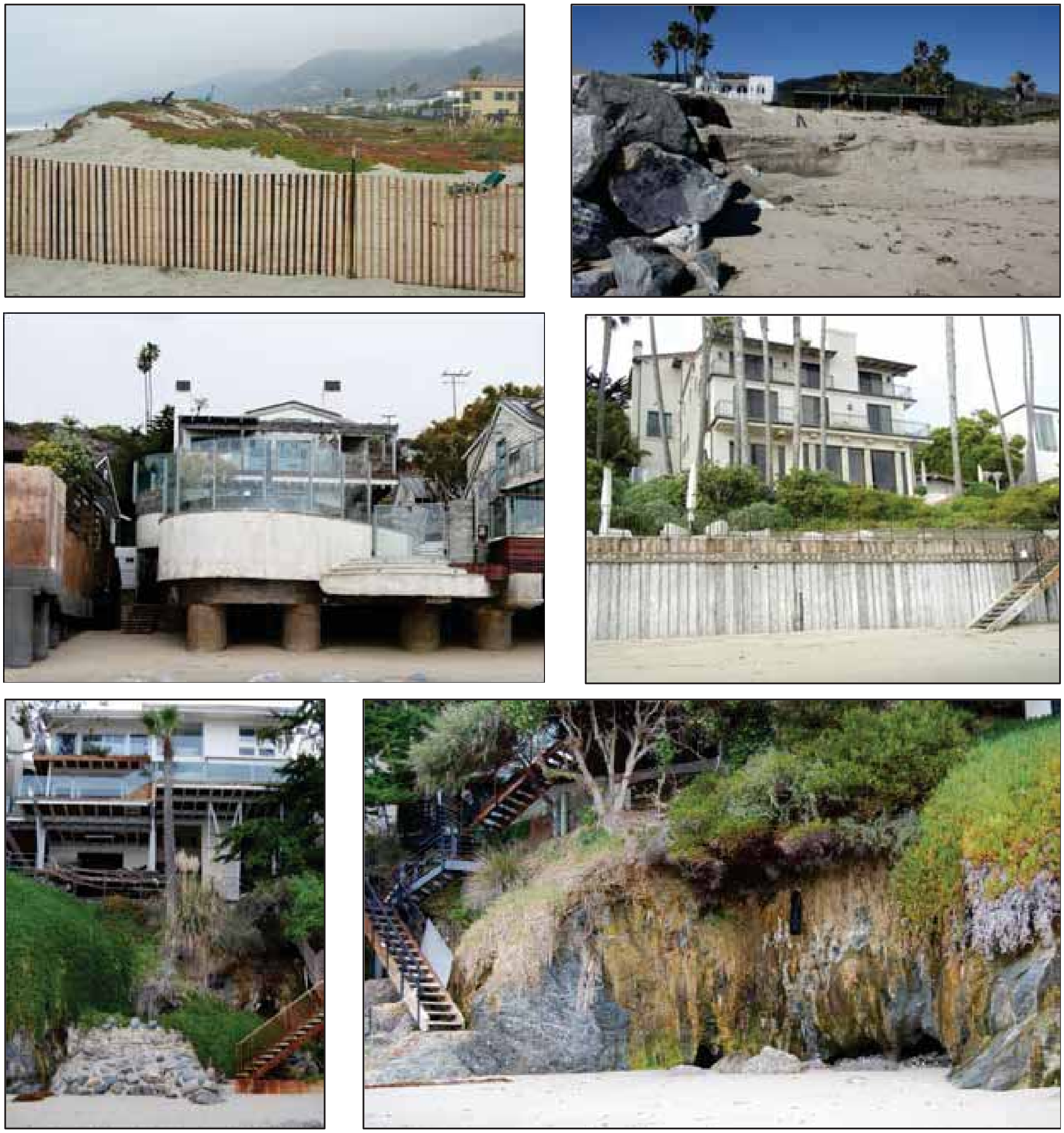


Illustration 2-6. *A wide beach and dune system (left) that protected homes along the far west end of Broad Beach has eroded away. Homes west of Lot 30756 and east of Lot 31350 are protected by the rock revetment, except for Lot 30822, where a 100-foot gap in the revetment exists (top right). Homes along 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.

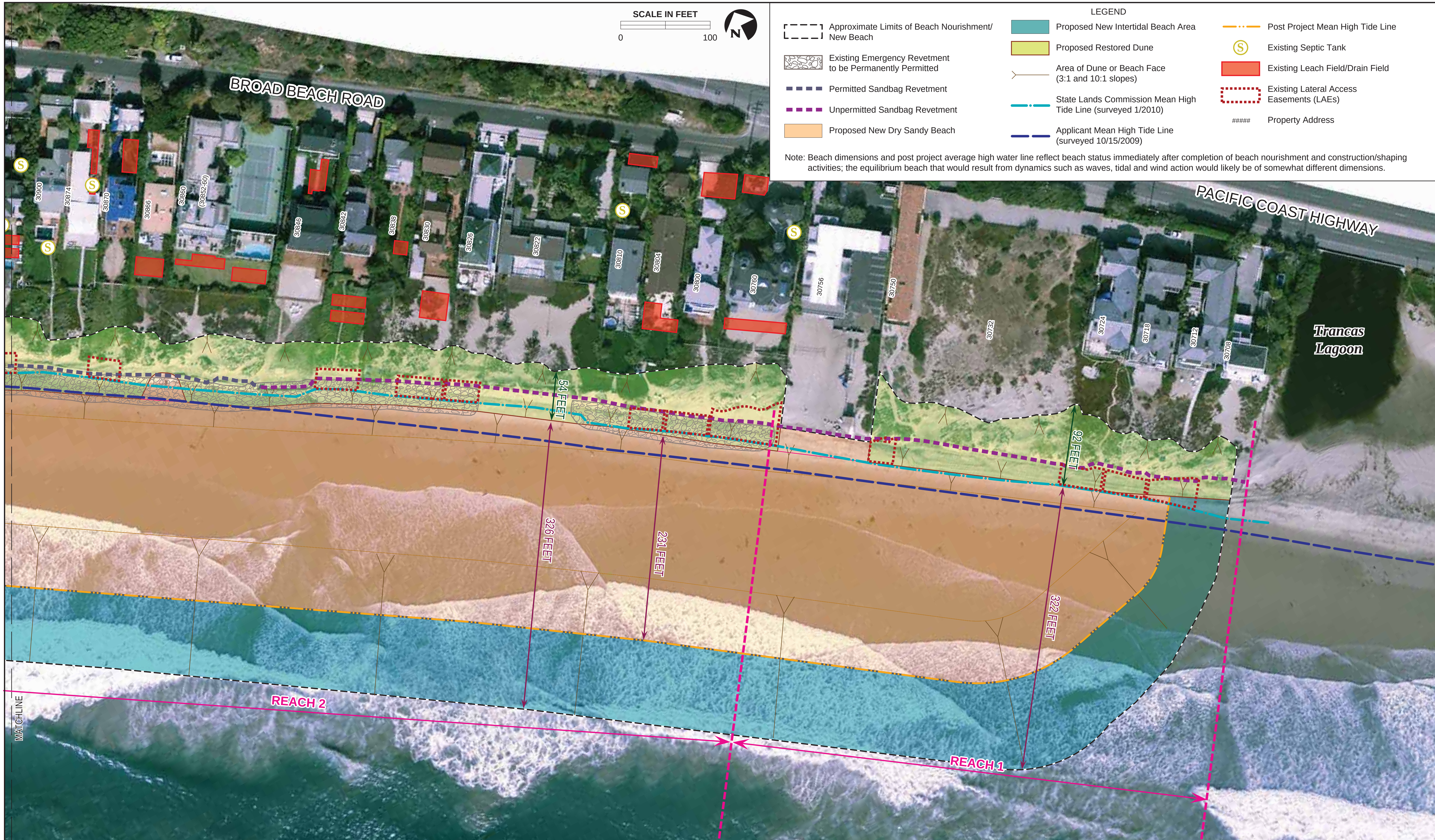
described to the extent information is available (refer to Figure 2-2 through 2-6 for detailed Project plans):

- 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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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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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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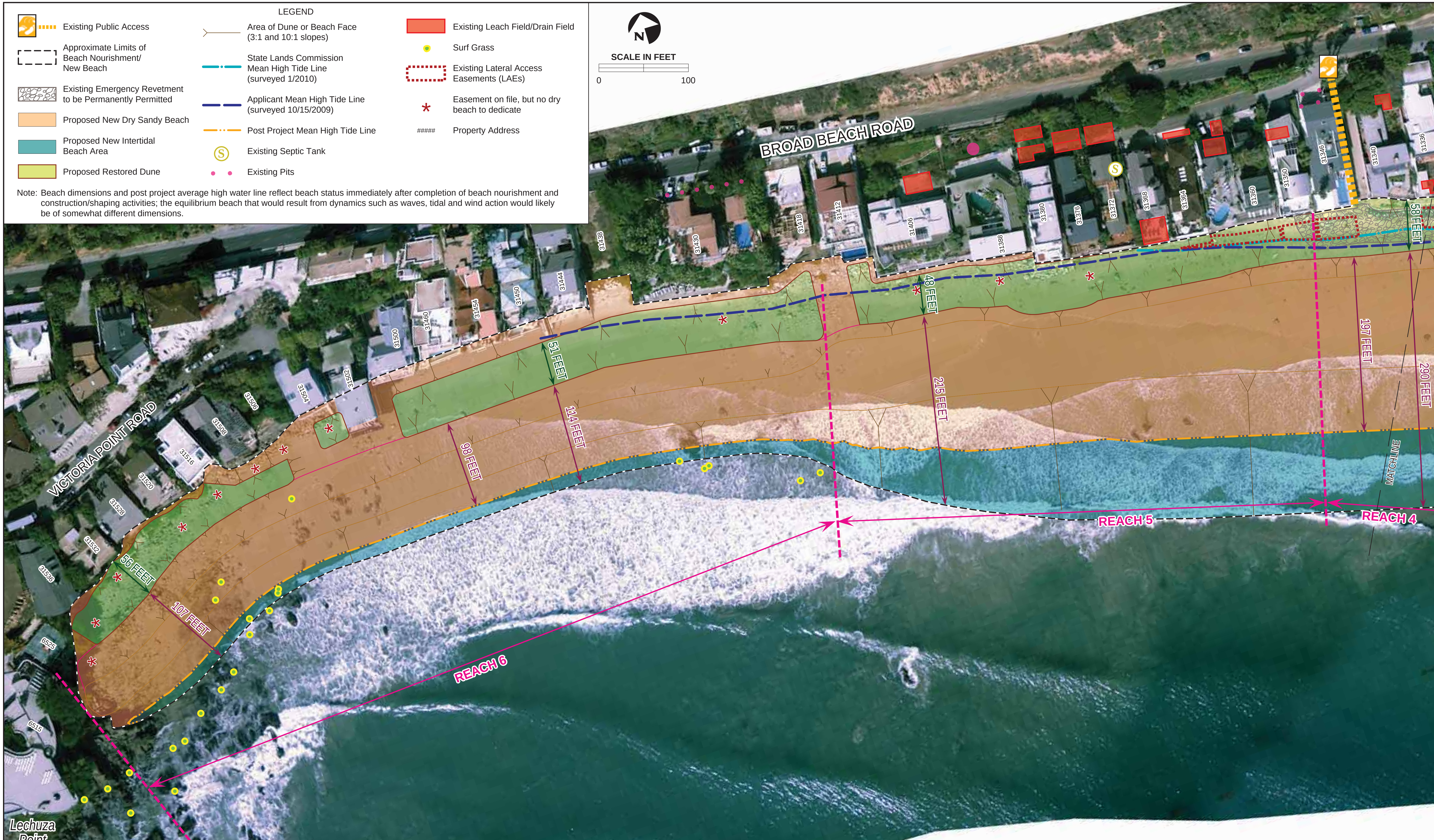

Details of Proposed Project – Western Reach

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*).

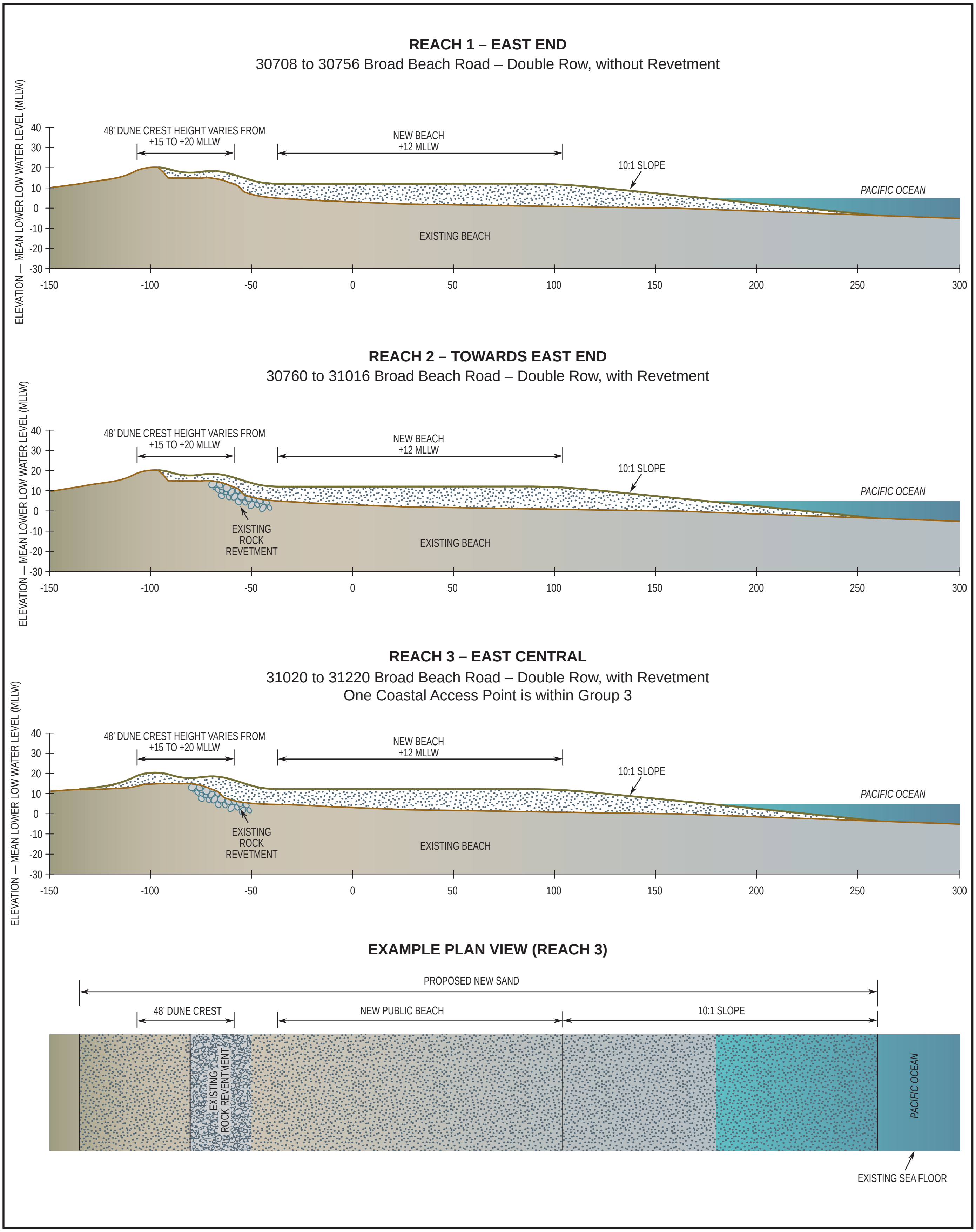
The full quantity of sand required for initial Project beach nourishment (i.e., 600,000 cy of material) is available from CEMEX and Grimes Rock quarries. The third quarry, P.W. Gillibrand, can supplement the Project if the other quarries cannot meet the capacity needed to serve the Project, and can expand 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).

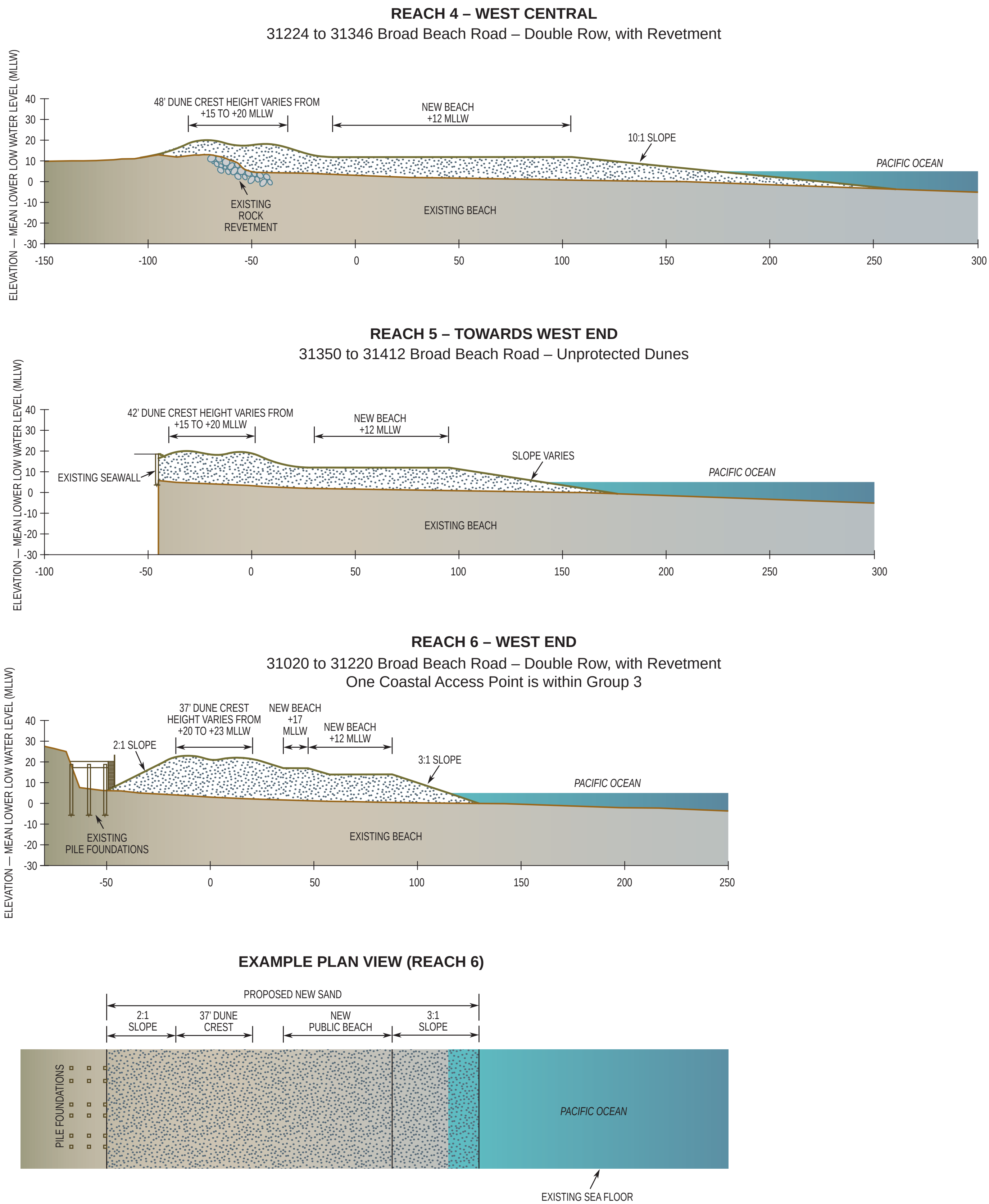
The new post-construction dry sand beach berm is projected to extend seaward of the dunes by 90 to 230 feet, with the beach narrower at the west end and wider in the central and eastern sections (beach widths and sand depth assume the MHTL is at an elevation of 5 feet above MLLW). Beach widths in Lechuza 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



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

FIGURE 2-7a



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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).

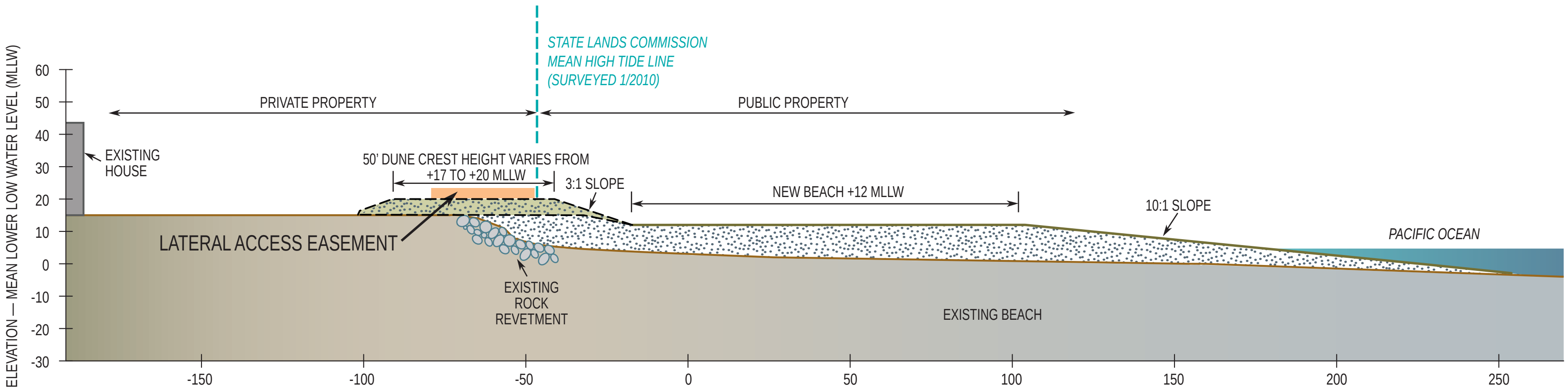
By their nature, dunes attract those who desire to climb up or across them. Doing so would reduce the size of the dunes, weaken their structure, adversely affect burgeoning plant life, and create added risk of trespassing into protected Environmentally Sensitive Habitat Areas (ESHA) and residential areas. 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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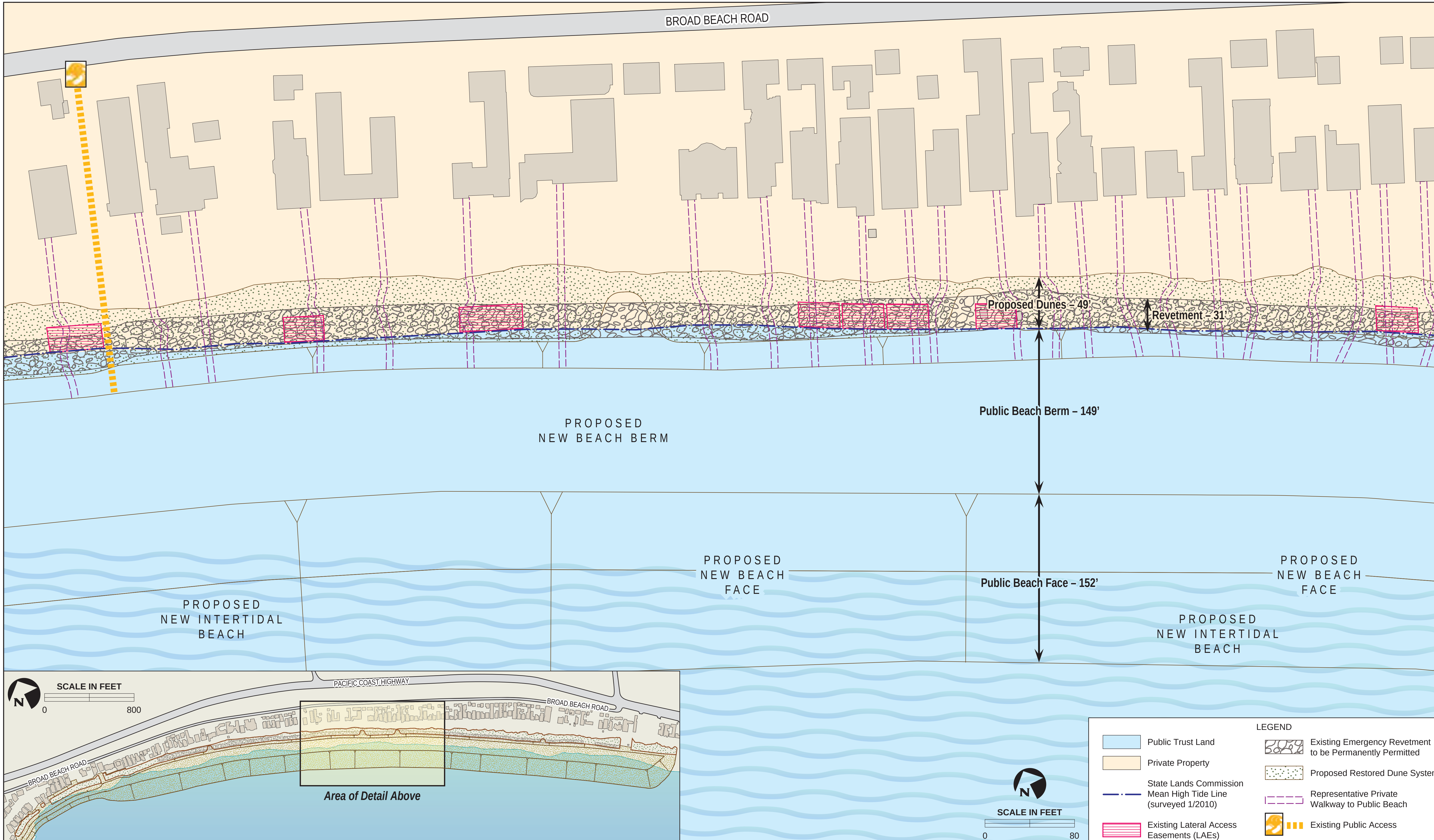
Conceptual Cross-Section of Restored Dune and Beach with Existing OTDs and Proposed Public Access Easements

FIGURE 2-9



Proposed Beach Access Plan

FIGURE 2-10

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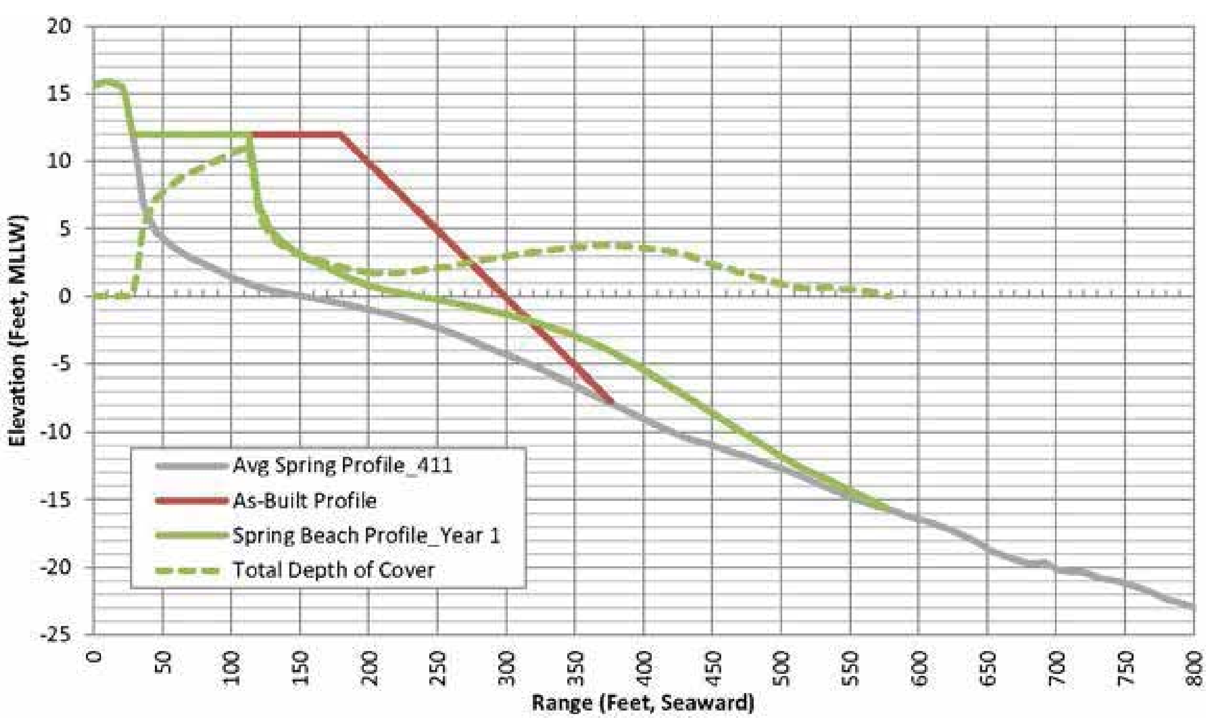
dune system would be vulnerable to damage from foot traffic, and any access to the dunes themselves would be discouraged through the use of sensitive habitat signage and post and rope-type fencing along pathways. However, the Applicant is proposing that Broad Beach property owners would be exclusively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

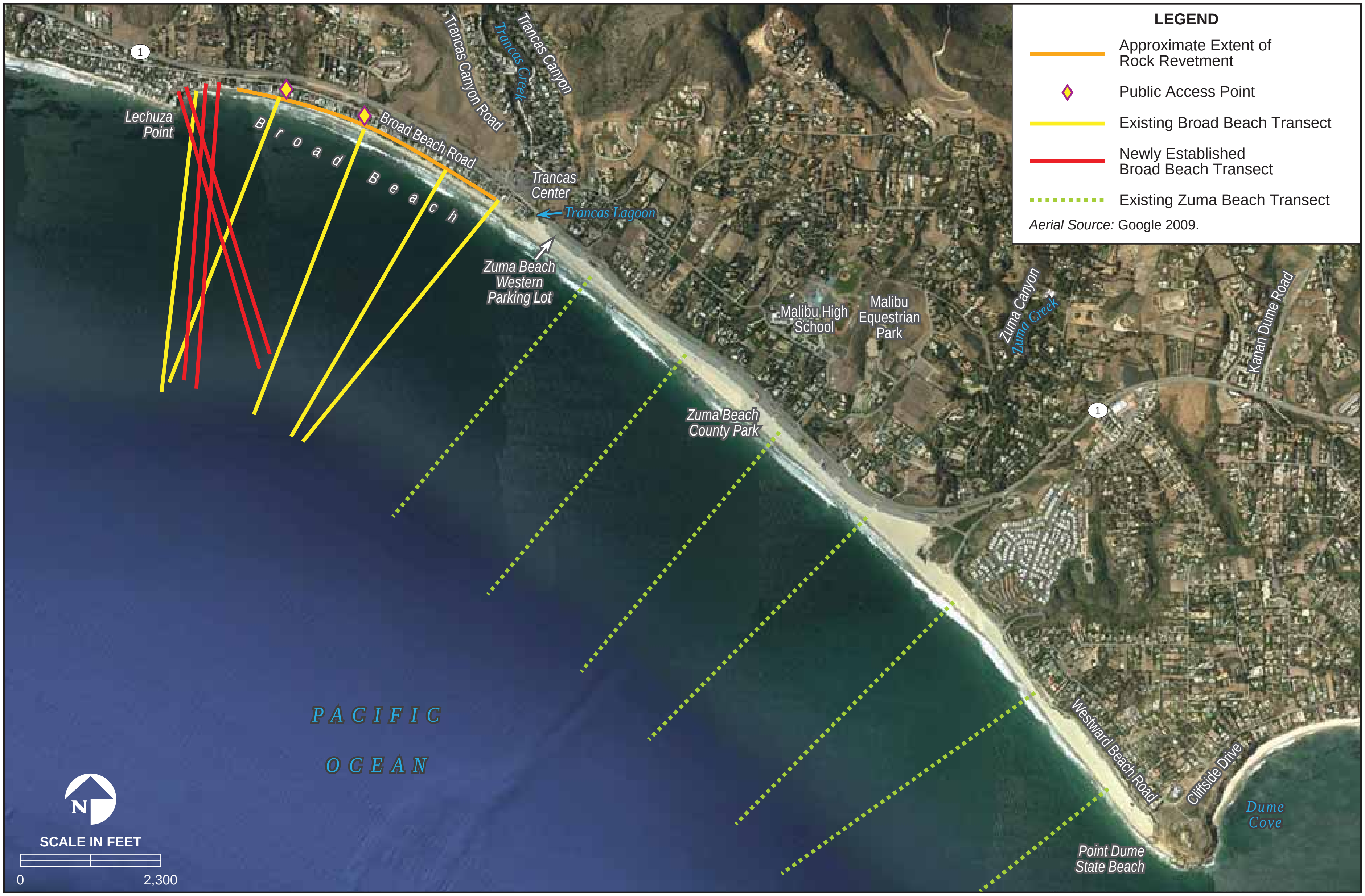
1. 408 (east end – 30756 Broad Beach Rd.) 2. 409 (east-central reach – 30916 Broad Beach Rd.) 3. 410 (central reach – 31108 Broad Beach Rd.) 4. 411 (west-central reach – 31324 Broad Beach Rd.) 5. 412 (west end – 31506/31504 Victoria Point Rd.)	*Existing monitoring locations with official markers embedded 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.

<u>Backpassing</u>

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).

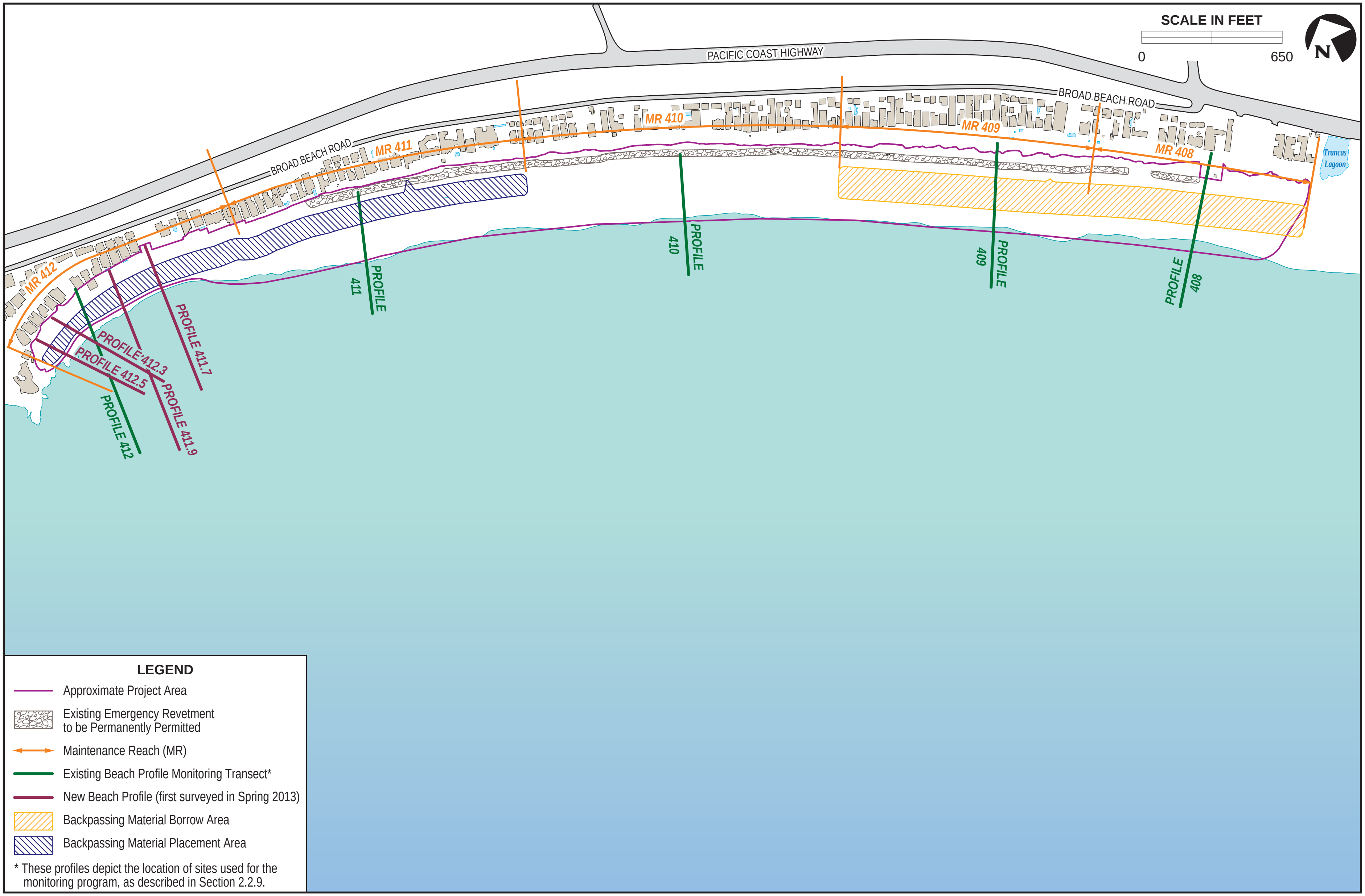
A western end reach of the nourished beach is considered to be in deficit when the reach width average is 50 feet or less for 6 consecutive months and the eastern reach average is at least 25 feet wider than the western average over the same period of time.[14] Since the net direction of sand movement (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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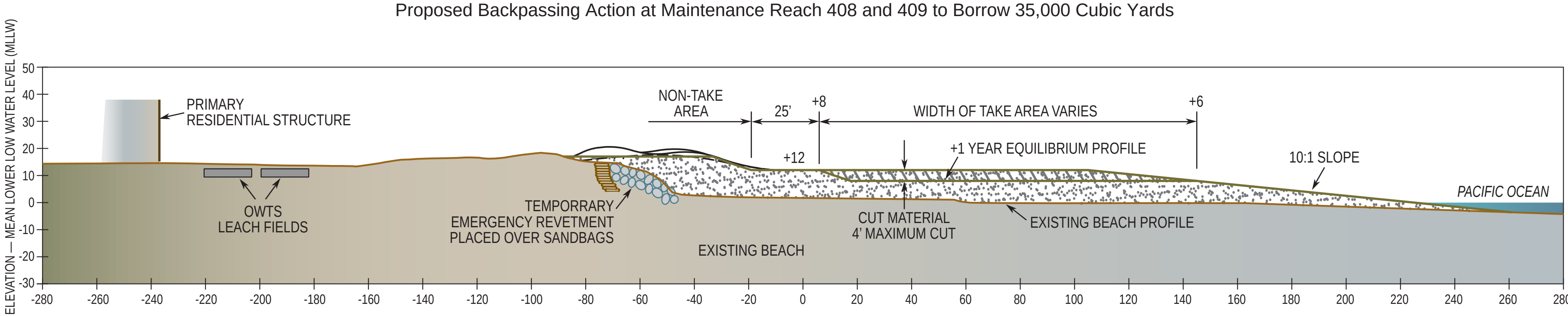
Maintenance Reaches and Backpassing Scenario 2

FIGURE 2-13

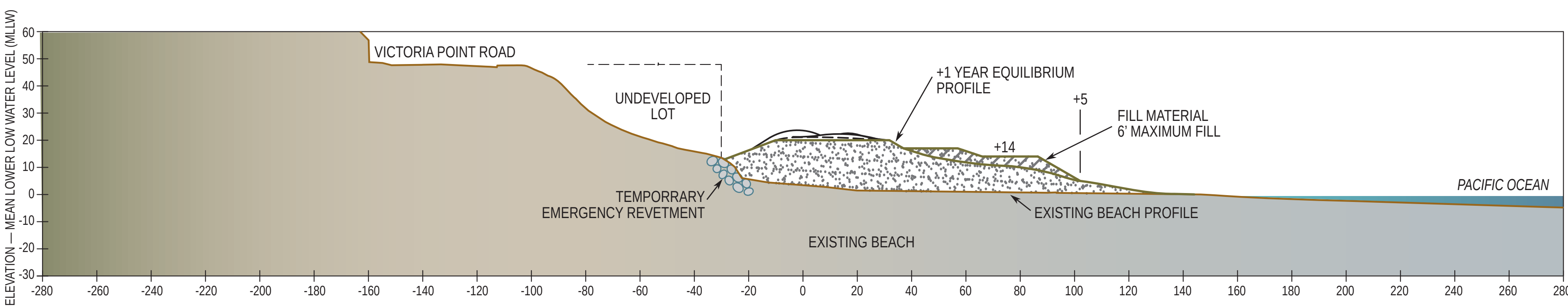
EAST BROAD BEACH

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).

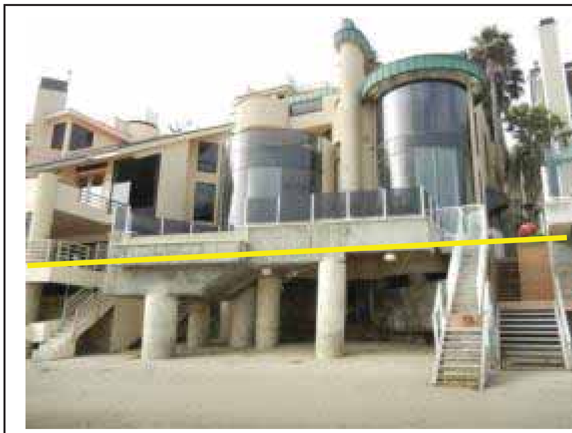

***Illustration 2-10**. The proposed new sand dunes of 17 to 20 feet above MLLW (up to 8 feet above the beach, represented generally by the yellow line) would partially cover existing pilings, seawalls, foundations and lower segments of stairways of homes at Broad Beach’s west end.*

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.