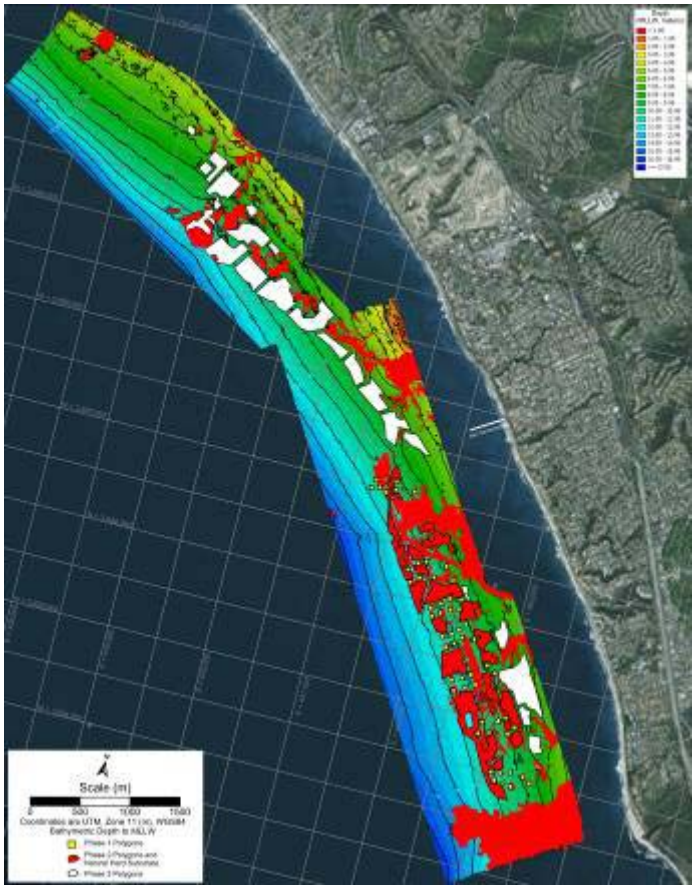
PROJECT DESCRIPTION

WHEELER NORTH REEF EXPANSION AT SAN CLEMENTE, CALIFORNIA
SONGS ARTIFICIAL REEF MITIGATION PROJECT

PHASE 3



for

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PROJECT DESCRIPTION

WHEELER NORTH REEF EXPANSION AT SAN CLEMENTE, CALIFORNIA SONGS ARTIFICIAL REEF MITIGATION PROJECT

PHASE 3

1.0 INTRODUCTION

Southern California Edison Company (SCE) proposes to expand Wheeler North Reef (WNR) by approximately 210 acres to satisfy California Coastal Commission (CCC) Permit No. 6-81-370-A. The WNR is located 0.6 miles offshore of the City of San Clemente (Figure 1-1) between the San Clemente City Pier to the north and San Mateo Point to the south, in approximately 11.5 m to 15 m water depth (38 to 49 ft).

In August 1999, the State Lands Commission (SLC) issued a General Lease (PRC 8097) to SCE for the construction of the Phase 1 (SCE's test modules), and ultimately the Phase 2 build out of the reef. The original lease was for 862 acres, and included a large enough area for SCE to develop the mitigation reef. The lease was a parcel of submerged land in the Pacific Ocean in the vicinity of the city of San Clemente, and San Mateo Point, Orange County, California, more particularly described as follows.

A four (4) sided parcel of submerged land in the Pacific Ocean having the following North American Datum 1983 geographic coordinates:

Latitude 33° 25' 01.7" North, Longitude 117° 37' 45.0" West
Latitude 33° 23' 15.2" North, Longitude 117° 36' 20.0" West
Latitude 33° 22' 57.6" North, Longitude 117° 36' 45.2" West
Latitude 33° 24' 47.3" North, Longitude 117° 38' 14.9" West

The lease agreement between SCE and the SLC was amended to a smaller area after completing the construction of the existing WNR in September 2008. SCE now seeks to expand the lease area for the expansion of WNR.

The existing WNR was built in two phases. The Phase 1 Experimental Artificial Kelp Reef was completed on September 29, 1999. It consisted of 56 modules (40 m x 40 m), totaled 22.4 acres (CE, 1999a,b), and served as a scientific platform for experimental study to determine the optimal materials and design specifications for subsequent reef construction (Reed, 2005). Phase 2, the final build-out of the reef, commenced on June 9, 2008, and concluded on September 11, 2008, a construction period that lasted 73 days. Phase 2 involved the placement of 152 acres of low-relief, low-coverage rock.

The Phase 2 WNR reef (CE, 2008a,b) was constructed of 17 polygons, varying spatially from 1.35 to 38.88 acres. Polygon siting relied primarily on the historical locations of kelp beds (maps) and multibeam and sub-bottom profiling sonar surveys. The acoustic surveys were

verified (ground-truthed) by SCUBA diver surveys. Additionally, the dive surveys evaluated the biological diversity and habitat value of the Phase 2 project area. The design also considered the historical, physical, and biological data collected during previous studies in the area and the results of experimental reef monitoring between 1999 and 2004 (Reed, 2005).

The Phase 2 reef construction achieved the following: 1) all polygons were built in close proximity to the San Mateo Kelp Bed; 2) all polygons avoided hard substrate areas; 3) the integrity of the Phase 1 Experimental Reef modules was maintained; 4) navigation channels were provided; and 5) all constructed reef polygons avoided areas of historical kelp growth, as well as areas of special interest to local fisheries. The Phase 2 reef construction material consisted exclusively of quarry rock cast upon the appropriate benthic substrate in a single-layer deposition at a density of approximately 760 to 850 tons per acre.

Figure 1-1 shows the general location of WNR at San Clemente with respect to SONGS, the San Mateo Kelp Bed, and Dana Point Harbor. Figure 1-2 shows the Experimental Reef modules (Phase 1) and Phase 2 polygons sequentially numbered from 1 to 17. Figure 1-3 shows the area surveyed for the proposed WNR expansion area in April 2017. The total proposed project area is about 380 acres.

The objective of this report is to outline the project background and proposed project objectives and to describe SCE's preferred project in Sections 2 to 5, as well as to identify project alternatives (Section 6) for the California Environmental Quality Act (CEQA) analysis and present a project schedule (Section 7). The preferred project alternative is denoted in this report as the "proposed project." The purpose of and need for the WNR expansion will be discussed in Section 2, as well as the project location, including site-specific studies that have been conducted in the project area and reef construction assumptions (Section 3). The potential environmental effects of the construction and management of this project will be addressed in an effort to determine the extent of environmental review required under the CEQA and National Environmental Policy Act (NEPA).

The proposed WNR Phase 3 layout is presented in Section 4. The reef expansion will be constructed of quarry rocks. The specifications of the reef materials are discussed in Section 5. Section 7 outlines the potential project schedule. The proposed project is expected to be 30-50% complete by 2018, but this depends on the CEQA completion by 31 May 2018. Construction activities will be completed by September 30, 2018 to avoid the lobster season. If the CEQA is not completed by the 31 may 2018, a second window of construction will be used between June 1, 2019 and September 30, 2019. Appendices A and B contain the California Department of Fish and Wildlife (CDFW) guidelines and the May 24th letter from CCC to SCE, respectively.

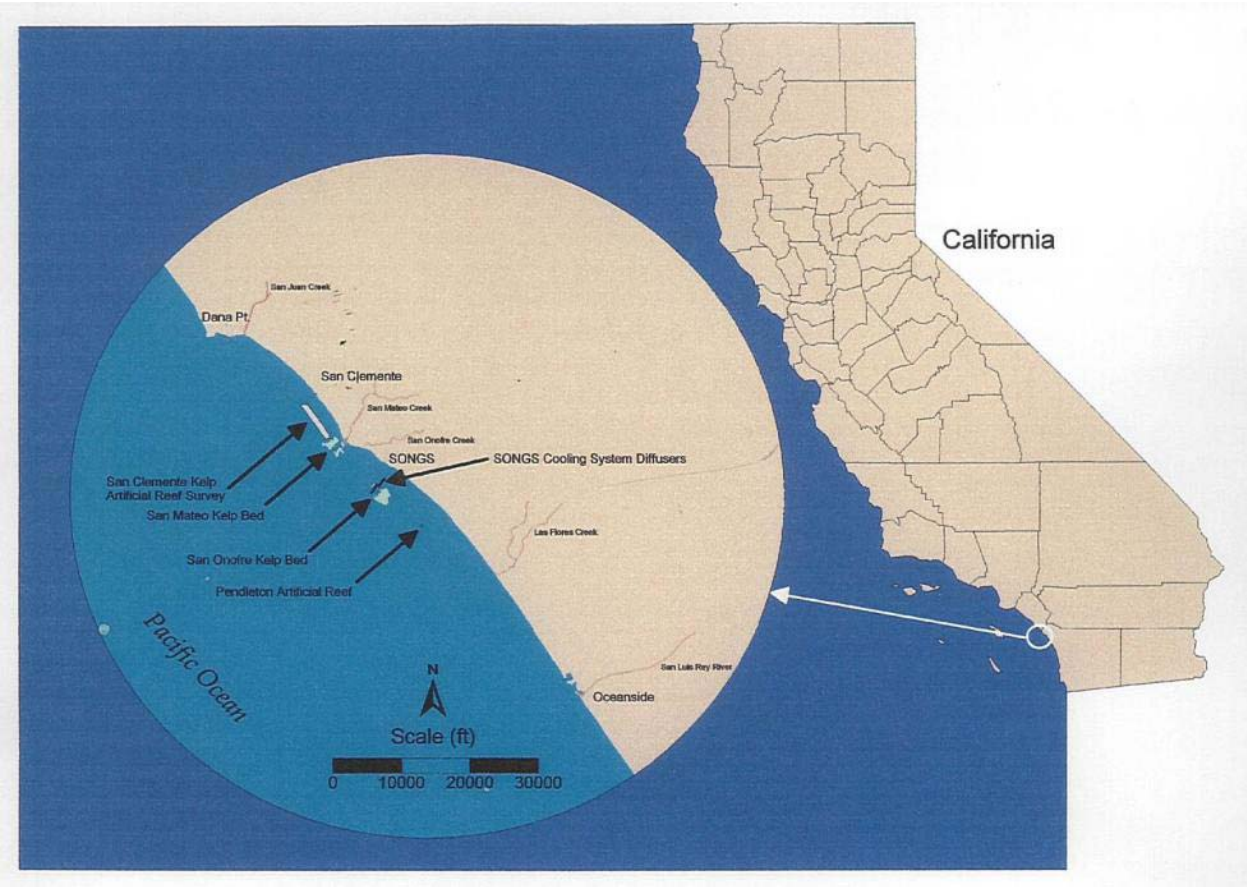

Figure 1-1. Location map of WNR site (project area).

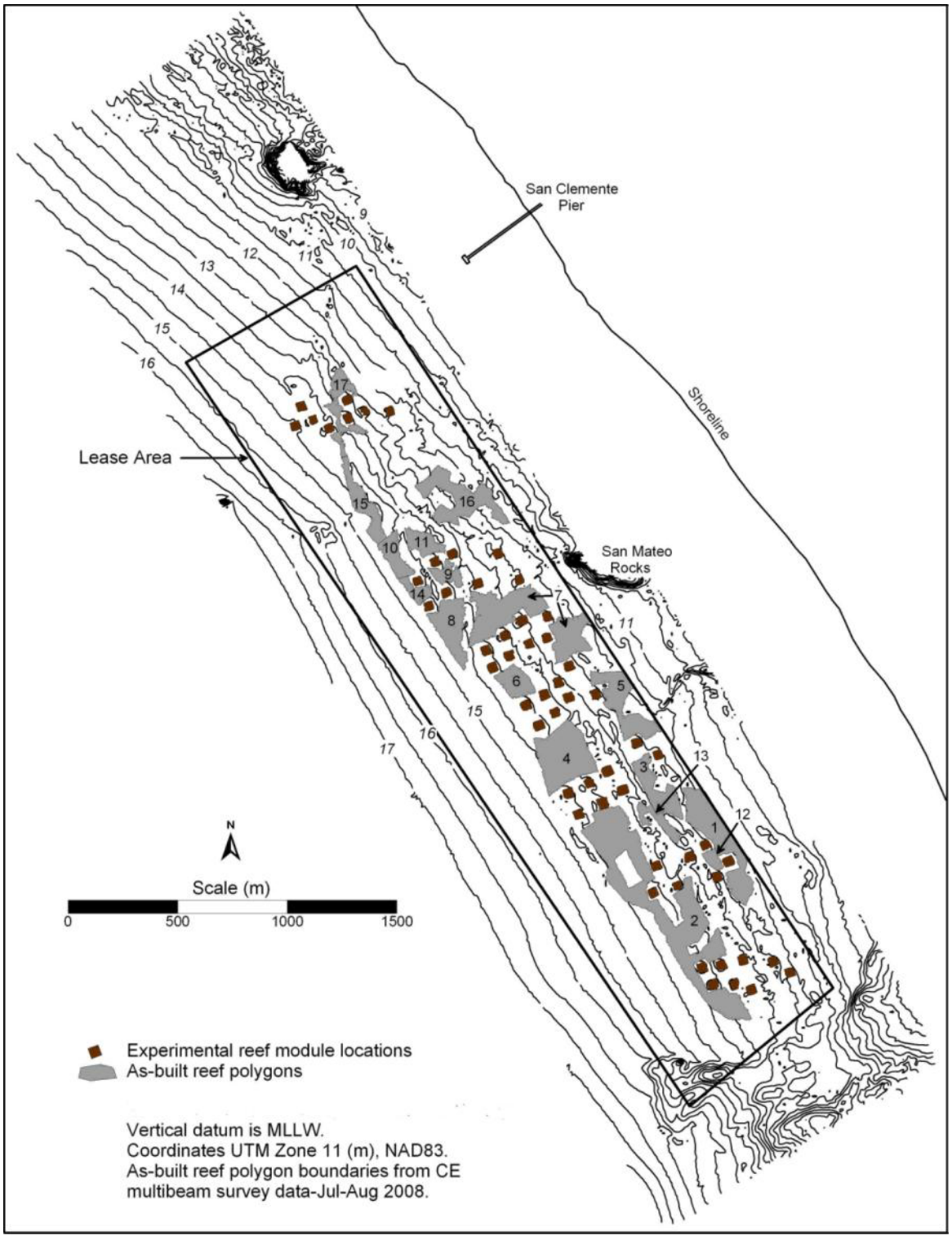

Figure 1-2. Current WNR, with Phase 1 modules represented by brown squares and Phase 2 polygons represented by gray areas.

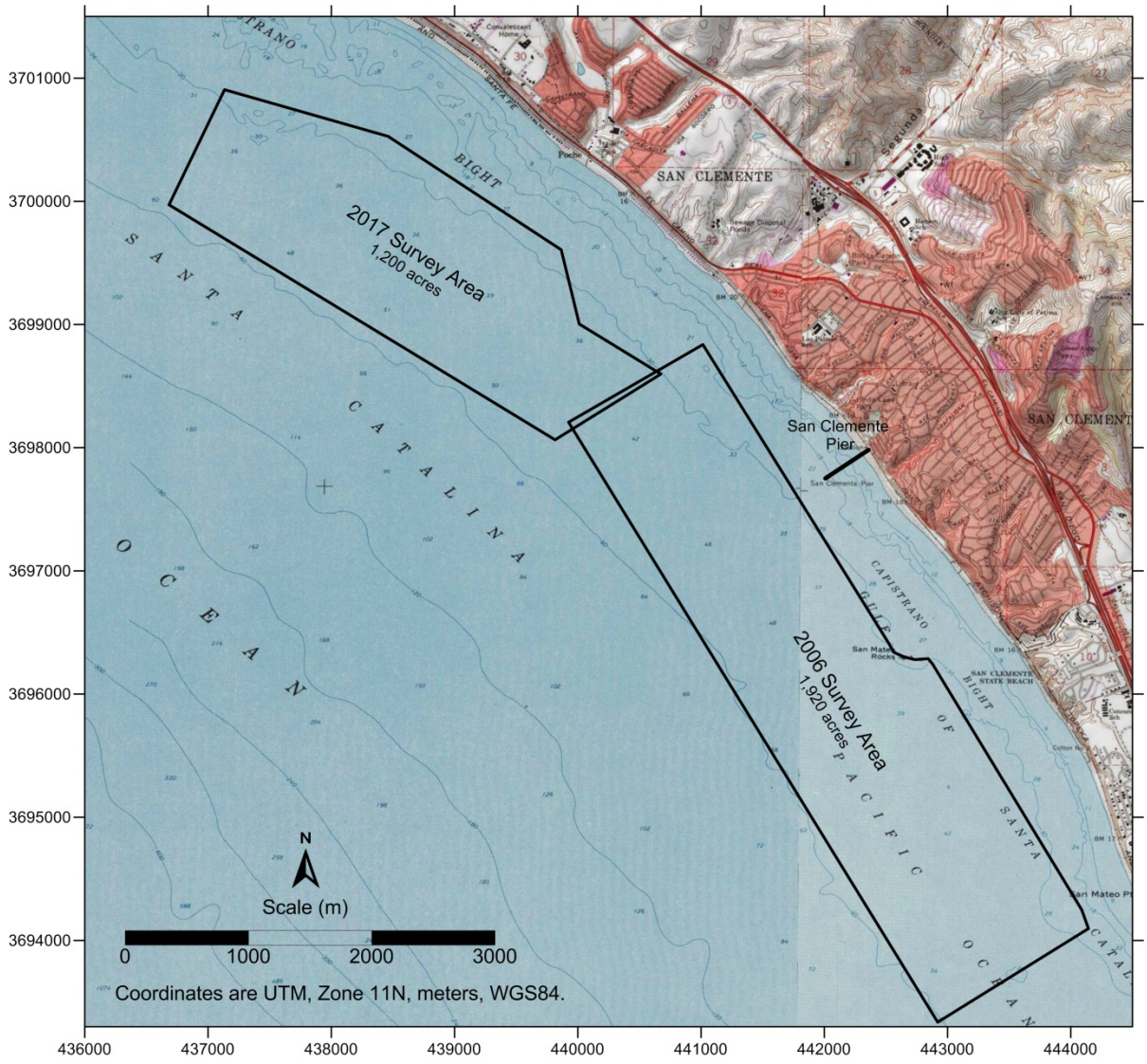

Figure 1-3. Sonar surveyed areas in 2006 and April 2017.

2.0 PROJECT BACKGROUND

2.1 PURPOSE, OBJECTIVES, AND NEED

The CCC issued a Coastal Development Permit (CDP) No. 6-81-370-A for the construction and operation of the San Onofre Nuclear Generating Station (SONGS), Units 2 & 3, in 1974. This permit required a Marine Review Committee (MRC) to monitor the impact of the operations of SONGS on the marine environment. After a 15-year study, the MRC concluded that the operation of SONGS had resulted in significant impacts to the San Onofre Kelp (SOK) community through the discharge of turbid water. The CCC adopted permit conditions in 1991 that required mitigation to compensate for these losses, which included the construction of a 300-acre artificial reef for kelp growth. Subsequent studies determined that resource losses at SOK were fewer than originally estimated, and the CCC amended the permit conditions in 1997 to require an artificial reef that would sustain 150 acres of medium-to-high-density kelp and the associated biota, along with a mariculture/fish hatchery program (CCC, 1997). The amended SONGS permit called for an experimental reef project (Phase 1) with a minimum of 16.8 acres and a five-year monitoring program to provide guidance on how to design the full reef. A second phase (Phase 2) of construction with a minimum of 133.2 acres was to be completed for the total mitigation reef. The actual acreages of Phase 1 and 2 were 22.4 and 152 acres, respectively.

The CDP contains performance standards that the WNR must meet. The WNR is monitored by independent scientists for these performance standards. The performance standards are divided into absolute standards that are measured against fixed values and relative standards that are measured at WNR and two reference reefs. To receive mitigation credit, the WNR must meet each absolute standard and must perform similar to a natural reef based on the relative standards. The four absolute standards are: 1) at least 90% of the exposed rock must remain available for the attachment of reef biota, 2) the artificial reef shall sustain 150 acres of medium-to-high density giant kelp, 3) the standing stock of fish must be at least 28 US tons, and 4) the important functions of the reef shall not be impaired by undesirable or invasive benthic species.

Results from CCC independent monitoring show that although SCE is meeting 3 of the absolute standards and is performing similar to the natural reefs, one absolute standard has not been met. In a letter dated May 24, 2016, the CCC stated that SCE is not meeting the absolute standard for fish standing stock (28 US tons) and would not likely meet the standard and for SCE "*to comply with the requirements of CDP 6-81-330-A, SCE must remediate WNR by building new reef acreage that at a minimum meets the size, relief, and cover requirements of one of the options described in Table 1*" [of the CCC letter] (See Appendix B).

The main purpose of the WNR expansion (Phase 3) at San Clemente is to increase the fish standing stock in order to comply with the fish standing stock absolute standard. The expansion of WNR will supplement the existing reef. Phases 1 and 2 of the WNR, with a 4-year running average of 18.8 tons, fall short in complying with the fish biomass condition that requires a standing fish stock of 28 tons. Figure 2-1 shows the one-year and four-year average values of fish standing stock at WNR between 2009 and 2015 (UCSB, 2016). A secondary objective is to make sure that in the future, existing permit conditions, which are currently in compliance, remain in compliance, even during years of adverse oceanographic conditions.

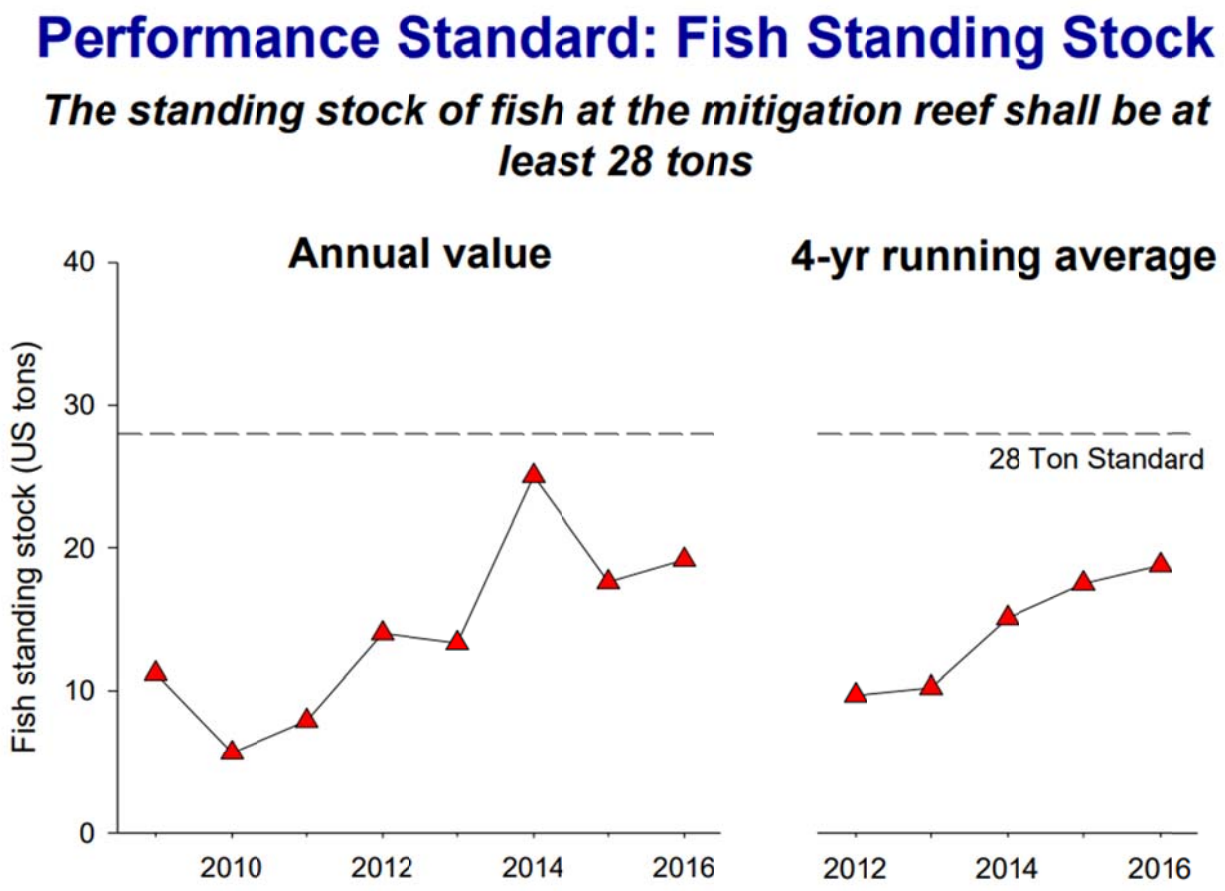

Figure 2-1. Results from the mitigation monitoring reveal that fish biomass at the SONGS artificial reef mitigation project falls short in complying with the standing fish stock requirement of 25.4 metric tons (28 US tons) per year (UCSB, 2017).

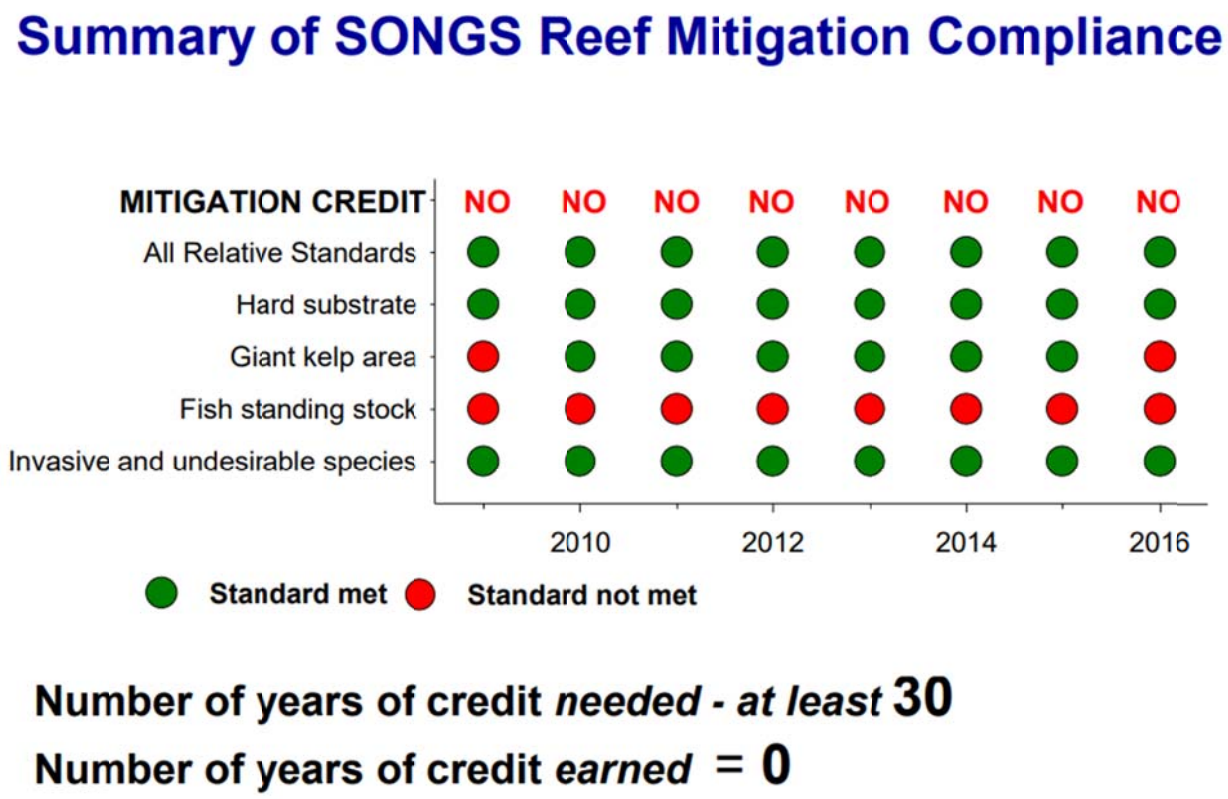

Figure 2-2. Summary of compliance for the SONGS artificial reef mitigation project reveals that the project has successfully met most of the mitigations requirements, however, it has failed to meet the performance standard for fish standing stock in every year and thus has not accrued any mitigation credit to date (UCSB, 2017).

2.2 PROJECT AREA USAGE PATTERNS

This is a marine project that is restricted to an offshore site. The area is open to recreational and commercial vessels. Fishing and diving is prevalent in the area. Kayaking and paddle boarding also occurs in the area. Other recreational activities such as surfing and swimming are located inshore in the surf area.

Onshore of the project area, it is predominantly urban, with the exception of several public and private open-space areas scattered along the San Clemente coastline, and to the southeast, much of the San Diego County coastline.

Directly onshore of the project area are San Clemente City Beach, San Clemente State Beach, and Calafia Beach Park. Doheny State Beach and Dana Point Harbor are just north of the project. Project area beaches support a variety of activities, such as sunbathing, swimming, and surfing, as well as organized community events, and attract over two million visitors annually (City of San Clemente, 1993). Above the beach, most of the coast is occupied with single-family residences, with the exception of the Pier Bowl area, which supports higher-density residential and commercial development (i.e., vacation-oriented facilities such as retail stores, restaurants, bars, offices, and lodging). There is also a group of four gated communities—the Cotton's Point, Breakers, Cypress Shores, and Cypress Cove neighborhoods—located at the southern end of the City. The San Clemente coastline boasts 14 public and four private improved coastal-access points, many of which incorporate developed recreational amenities.

Activities that occur in the offshore project vicinity include boating, commercial and sport fishing, SCUBA diving, surfing, whale-watching, and kayaking.

3.0 PROPOSED PROJECT

3.1 THE PROJECT

The proposed project would create approximately 210 acres of kelp reef on low-relief quarry rocks located on submerged lands located offshore of the City of San Clemente (Figure 3-1). The proposed action is referred to as WNR Expansion (Phase 3). The submerged lands to be used are owned by the State of California and administrated by the California State Lands Commission (CSLC).

Figure 3-1 shows the proposed WNR Expansion (Phase 3). It consists of 23 polygons covering an area of 210.6 acres. The reef would be created through the placement of 150,000 (± 10%) tons of quarried rock on top of the sandy ocean bottom, which has a sand thickness of less than 0.6 m. The estimated hard substrate coverage for the proposed reef is 42% based on the method recommended by the CCC consulting scientists (coverage from Reed et al., 2005). The quarry rock would be transported to the site via tugboat and barge. The source of rock is yet to be determined; however, Phase 2 was constructed with rock primarily from Catalina Island. During construction of Phase 2, the Catalina Island quarry could not produce enough rock so some of the rock was obtained from a quarry in Mexico.

3.2 SONAR AND DIVER SURVEYS (2017)

3.2.1 Sonar Surveys

Maps representing bathymetry, seafloor characterization, and sub-bottom sonar surveys of sediment thickness were generated for the area of the project surveyed in 2017 (CE, 2017). A multibeam system was used to obtain bathymetry data and locate sea bottom hard substrate. The bathymetry data were plotted in a 3D format to show bottom relief. The bathymetric relief, in conjunction with the backscatter data, allowed for the accurate delineation of areas of hard substrate coverage. The use of backscatter data produces images similar to those obtained using side-scan sonar ("pseudo-side-scan-sonar"). These data were used to prepare the seafloor characterization map presented in this study. The use of multibeam data was successful in characterizing the seafloor bottom, and the results were comparable to those of previous surveys that used side-scan sonar.

Sonar surveys carried out in 2017 provided useful information about the areas that would be suitable for the WNR Expansion Project. The bathymetry survey defined the seafloor topography within the survey area and allowed the delineation of areas suitable by depth for kelp growth (at this location, between 11-16 m). Maps of bathymetry and seafloor characterization and isopachs of sediment thickness are presented in Figures 3-2 and 3-3. Figures 3-2 provides bathymetry and substrate information for the seafloor off San Clemente. Figure 3-3 shows a 0.5-m sediment thickness isopach, which was verified by groundtruth probe in 2017 (Section 3.2.3). For the WNR Expansion, areas offshore and adjacent to the northern portion of Phases 1 and 2 were surveyed by multibeam, side-scan sonar, and sub-bottom profiler in 2006 (CE et al., 2006).

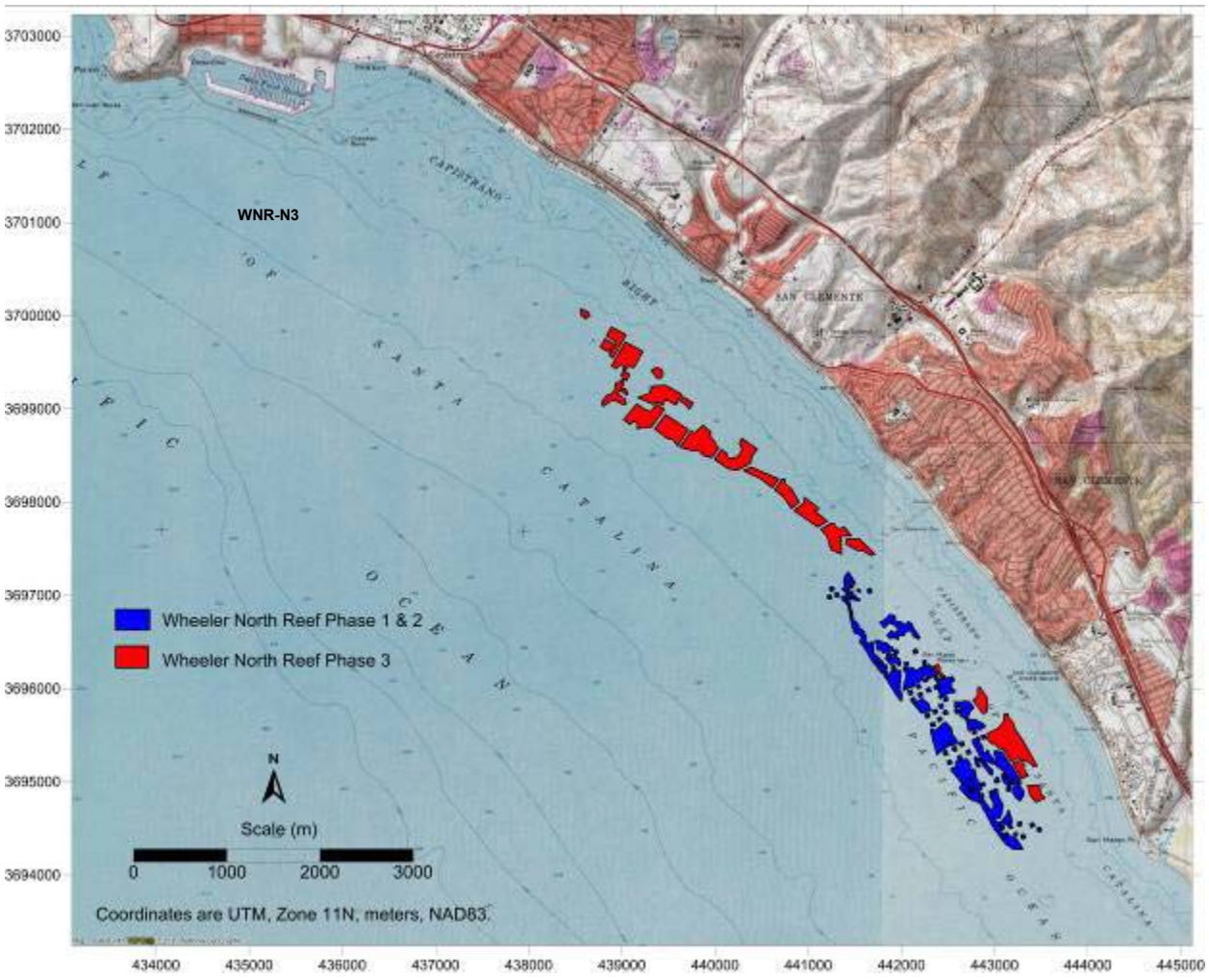

Figure 3-1. Proposed 210.6 acres Phase 3 WNR Expansion (red areas) and existing 176 acre WNR Phase 1&2 (blue areas).

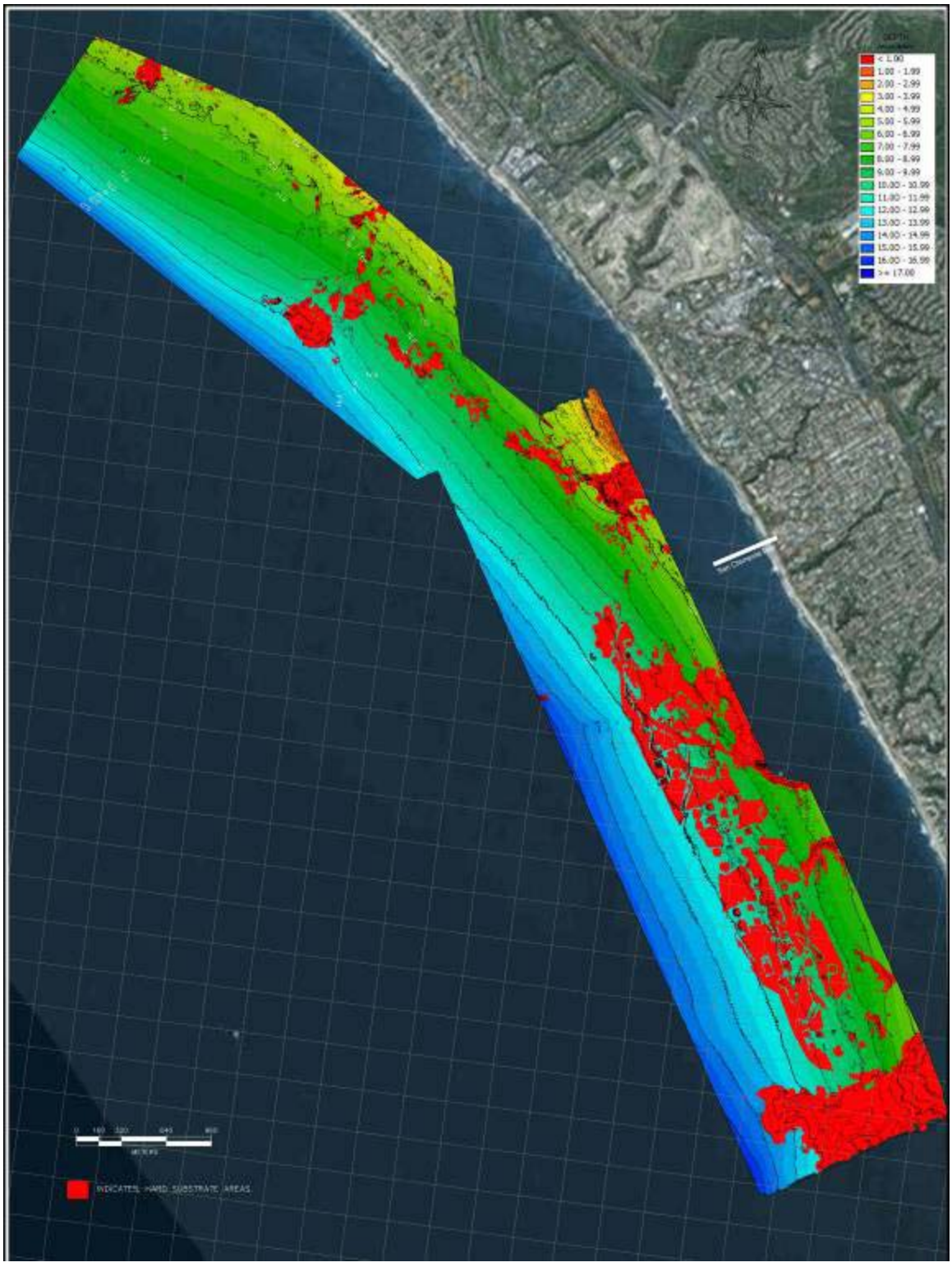

Figure 3-2. Bathymetric map for 2006 and 2017 sonar survey. Red areas represent hard substrate.

Figure 3-3. Sediment thickness map offshore of San Clemente from 2006 and 2017 surveys.

3.2.2 Jet Probing

Divers performed jet probes at 25 bottom locations in the project area to verify the accuracy of the sonar survey for sand thickness. The locations for jet probing were selected to calibrate and verify the sonar sand thickness results. The groundtruth probes were concentrated in areas that were of high probability for placement of the expansion reef. Consequently, the majority of the sites had sediment thicknesses less than 1.0 m.

Figure 3-4 shows the locations of these probes. Table 3-1 gives the coordinates of the jet probes. EcoSystems Management Associates' 26-foot Farrallon survey boat and divers were used to make these determinations. Divers were deployed off the boat at preselected locations, shown in Table 3-1. Location was determined using a differential global positioning system (DGPS) with an accuracy of 1 to 3 m.

Divers were equipped with a pneumatic probe that could be inserted into the seafloor sediments down to bedrock or other hard substrate. The probe consisted of metal tubing 1 cm in diameter and 2 meters in length. While inserting the probe into the seafloor, a valve was opened to admit pressurized air from an accompanying SCUBA tank, pushing the probe into the seafloor. The probe was marked along its length so that the diver could accurately determine the depth to hard bottom. At each location, the diver made three probes, one at the center and the others one meter apart in opposite directions from the center point. The measurements were recorded on data forms made for that purpose.

Table 3-1 also compares the results of the probing survey with the sediment thickness determined from the sub-bottom profiling survey. In general, there was good agreement between the probing and the sub-bottom profiling sediment thicknesses, with 19 of the 25 stations being $\leq$0.35 m different.

3.2.3 Biological Observations

The purpose of the diver-based biological survey was to provide insight into the biota present within selected areas with the highest potential for expansion of the WNR. Twenty transects were selected in order to spatially represent the proposed area of expansion (Figure 3-5) and were assessed by divers in June 2017.

Transect locations were selected for this sampling based on the results of the multibeam survey. The observations were made in a 1-m-wide swath on either side of each 60-m- long transect. The data were subdivided into 5-m increments along the transects, resulting in twelve 10-m^2 quadrants for each transect.

The biota observed during this survey were those commonly encountered in the nearshore area along the southern California coastline and did not include sensitive or rare biotic communities, such as sand dollar beds (*Dendraster excentricus*). There are multiple habitat types in this area, each supporting biota adapted to the particular bottom substrate and associated conditions.

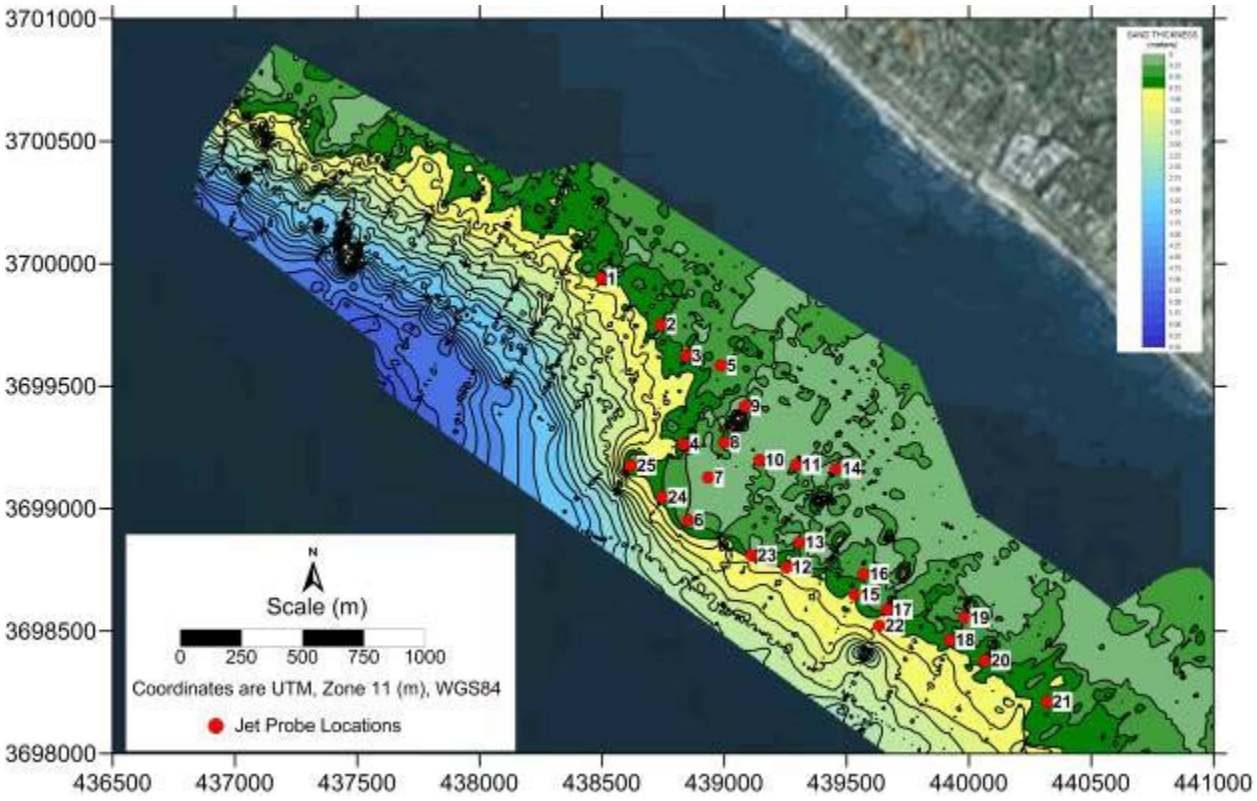

Figure 3-4. Locations of the 25 jet probes shown as red circles.

Table 3-1. Locations of underwater jet probe and comparison of sediment thickness from groundtruth probing and sub-bottom profiling survey.

Station ID	UTM, Zone 11, WGS84		Sediment Thickness Data (meters)						Sediment Type
	X Meters	Y Meters	Probe 1	Probe 2	Probe 3	Probe Average	Sub-Bottom Sonar	Difference btw Probing & Sub-Bottom	
1	438496.3	3699939	0.5	0.5	0.5	0.5	0.75	-0.25	Sand/Silt
2	438738.9	3699752	0.3	0.4	0.4	0.37	0.7	-0.33	Sand/Silt
3	438843.5	3699625	0.4	0.4	0.4	0.4	0.5	-0.1	Sand/Silt
4	438834.6	3699263	0.3	0.3	0.3	0.3	0.65	-0.35	Sand/Silt
5	438985.3	3699585	0.4	0.4	0.4	0.4	0.4	0	Sand/Silt
6	438852.5	3698953	0.3	0.6	0.5	0.47	0.2	0.27	Sand/Silt
7	438934.2	3699128	0.4	0.4	0.4	0.4	0.2	0.2	Sand/Silt
8	438999.3	3699271	0.3	0.4	0.3	0.33	0.5	-0.17	Rocky
9	439083.6	3699419	0.3	0.1	0.4	0.27	0.2	0.07	Sand
10	439142.3	3699198	0.3	0.3	0.4	0.33	0.2	0.13	Sand
11	439292.9	3699179	0.8	0.9	0.8	0.83	0.25	0.58	Sand
12	439253.4	3698762	>2	>2	>2	>2	0.7	>1.3	Sand
13	439307	3698862	>2	>2	>2	>2	0.7	>1.3	Sand
14	439456.4	3699164	0.2	0.4	0.5	0.37	0.3	0.07	Sand
15	439531.7	3698649	0.6	0.5	0.5	0.53	0.75	-0.22	Sand/Silt
16	439570	3698733	0.6	0.6	0.6	0.6	0.4	0.2	Sand
17	439665.7	3698588	0.5	0.5	0.5	0.5	0.5	0.3	Sand
18	439921.1	3698464	>2	>2	>2	>2	0.8	>1.2	Sand
19	439981.1	3698555	0.6	0.6	0.6	0.6	0.4	0.2	Sand
20	440065.4	3698380	0.5	0.6	0.6	0.57	0.5	0.07	Sand
21	440318	3698212	>2	>2	>2	>2	0.8	>1.2	Sand/Silt
22	439633	3698523	0.2	0.2	0.2	0.2	0.95	-0.45	Sand
23	439111	3698810	0.5	0.5	0.5	0.5	0.45	0.05	Sand
24	438745	3699047	0.6	0.5	0.5	0.53	0.5	0.03	Sand
25	438618	3699177	0.1	0.2	0.1	0.13	0.4	-0.27	Sand/Rock

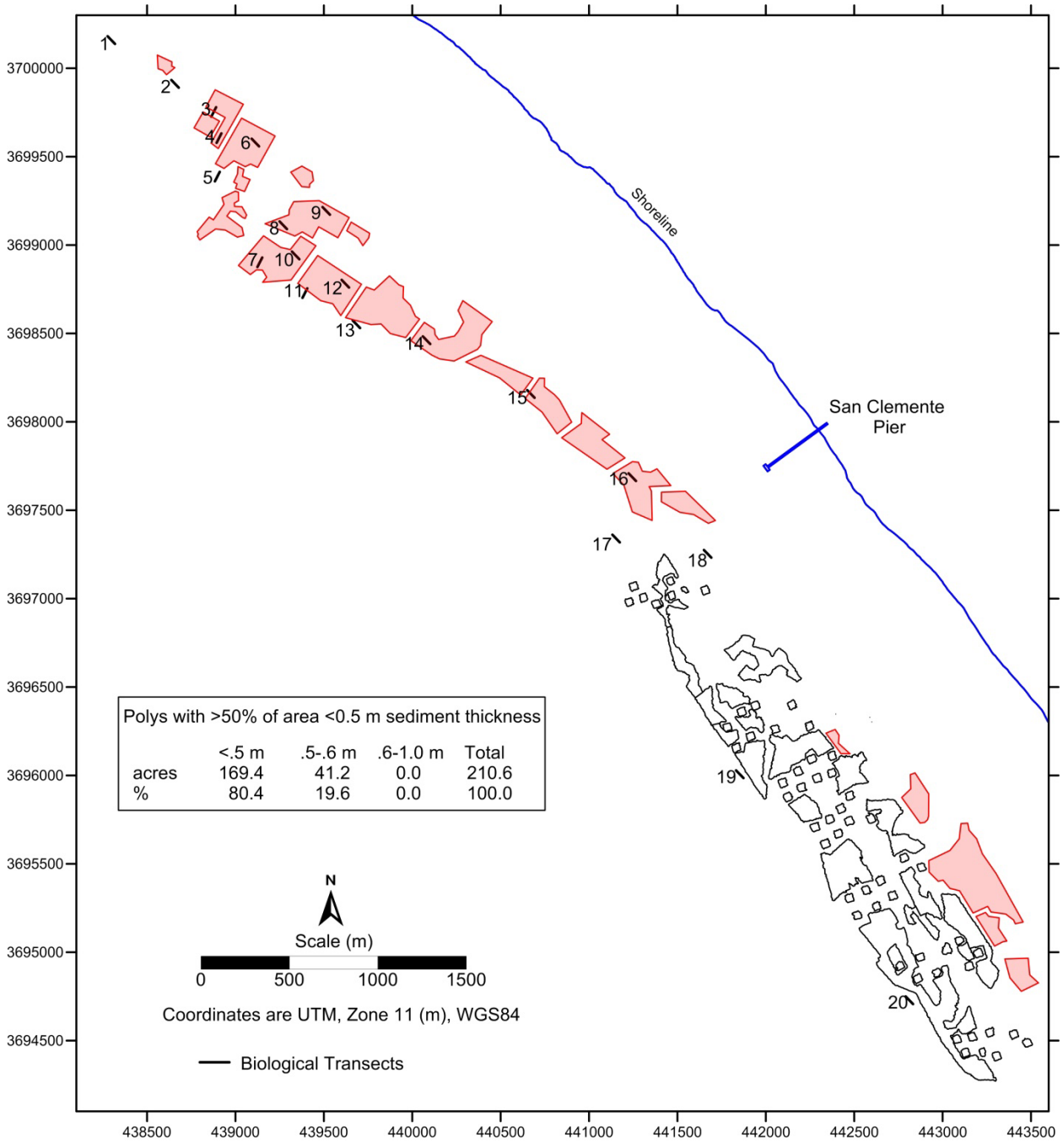

Figure 3-5. Transect locations for diver biological observations.

Biota associated with the sandy-bottom habitat would be buried by the reef materials, but past studies have determined the impact to be minimal. The Final Program Environmental Impact Report for the construction and Management of an Artificial reef in the Pacific Ocean, San Clemente, California (Resource Insights, 1999) concluded that "the loss of sand bottom community biota and habitat through burial by concrete and quarry rock is considered to be a 'less-than-significant impact'." Many of the species found in the sandy areas are mobile and are expected to move to avoid burial.

Areas with hard substrate coverage of 10–30 percent supported species common to sandy-bottom areas and had occasional areas of hard substrate. These hard substrate areas supported additional species such as red algae, sea urchins, and the sea fan *Muricea*. The limited quantity of hard substrate in these areas consisted of small isolated patches and would not be a major impediment to reef placement.

Transects representing areas with hard substrate coverage of 30 to 60 percent supported understory kelps, other perennial large brown algae, and sea fans. The presence of these biota shows that at least some of the hard substrate in these areas, although surrounded by and interspersed with sand, has remained uncovered for periods long enough to support biota over a period of several years. These areas will be avoided during rock placement.

Transects representing areas with hard substrate > 60 percent supported biota commonly associated with kelp, such as the understory kelps *Pterygophora* and *Laminaria* and the invertebrates *Pisaster*, *Strongylocentrotus*, and *Muricea*. As with other areas of hard substrate that support similar biota, these hard substrate areas will be avoided when the rock is placed. The results of the biota diver survey presented above are discussed in detail in Section 4.3 of CE (2006a).

The "Final Program Environmental Impact Report (PEIR) for the Construction and Management of an Artificial Reef in the Pacific Ocean near San Clemente, California" presents the results of the PEIR (Resource Insights, 1999). Section 2.4 of the PEIR addresses the biological resources that are potentially vulnerable to impacts, which include three types of ecological communities—the subtidal sandy-bottom community, the kelp-forest community, and the beach community—and species assemblages of marine mammals, birds, and turtles. The resources addressed in this section also include the habitats of the potentially vulnerable ecological communities and species.

Section 6 (Biology) of the "Summary of Environmental Impacts and Mitigation Measures for the Proposed Project" concluded that no mitigation measures were required (Resource Insights, 1999).

The biological survey confirms the above conclusions that the biota present in the WNR Expansion area are those commonly encountered in the nearshore area along the southern California coastline and did not include sensitive or rare biotic communities (CE, 2017). Additional data can be provided by the California Coastal Commission from the eight-year study of the Phase 1 and 2 reef areas.

Table 3-2. Scientific and common names of biota observed on the 2017 dive survey.

Scientific Name	Common Name
Algae	
Macrocystis pyrifera	Giant kelp
Macrocystis pyrifera	Giant kelp
Cystoseira osmundacea	Chain bladder kelp
Laminaria farlowii	Oar weed
Pterygophora californica	Understory stipitate kelp
Egregia menziesii	Feather-boa kelp
Invertebrates	
Astropectin armatus	Spiny sand star
Lovenia cordiformis	Sea porcupine or heart urchin
Portunus xantusii	Swimming Crab
Randallia ornate	Purple Globe Crab
Crassispira semiinflata	California Drillia
Kelletia kelletii	Kellet's Whelk (Gastropod Mollusc)
Muricea spp.	Sea Fans (Cnidarian)
Stylatula elongate	Sea Pen
Renilla kollikeri	Sea Pansy
Penaeus californicus	Brown Shrimp

3.3 HISTORICAL KELP ABUNDANCE

One of the primary criteria for the selection of sites for placement of new reef material was the avoidance of areas with significant biological resources. Historical records of kelp canopy that were collected by the CDFW and MBC for the period of 1989 to 2015 were analyzed. The kelp canopy maps in the WNR Expansion area were digitized and entered into a geographic information system (GIS) database.

The new canopy data were then combined to produce a composite canopy persistence database that showed the number of years that kelp canopy was present at any location within the expansion areas. Figure 3-6 shows the kelp canopy in the project area surveyed in 2006 and 2017 along with the proposed Phase 3 polygons. The presence of natural kelp beds near the Phase 3 polygons demonstrates that the proposed reef expansion project is within the area of suitable habitat for kelp growth and persistence.

3.4 ROCK SOURCES

Two commercial Catalina Island quarries, Pebbly Beach and Empire Quarry, are capable of supplying the quarried rock (Figure 3-7). The individual rocks used for the project would range from approximately 0.25 to 0.5 tons. The rocks would be clean and free of contaminants, per CDFW material specification guidelines (Wilson et al., 1990), which include being durable in seawater and having a specific gravity greater than 2.3 tons/m^3. Testing performed by an independent laboratory would assure the size, specific gravity, durability, purity, water absorption, and abrasion resistance of the quarry rock to be used for the project.

These two commercial quarries are located on Catalina Island with loading docks that have direct marine access for the loading of quarried rock. Cranes and front-end loaders would be used to load the quarry rock onto 2,000-ton-capacity, flat-deck supply barges. The supply barges would be towed by tugboat, two at a time, approximately 58 miles to the project site. Each trip would transport about 4,000 tons of quarry rock, and approximately 38 trips from Catalina Island to the project site would be required for 150,000 tons of rock. The trip from Catalina Island to the project site is estimated to take approximately 6 hours, using an assumed average speed of 9.3 miles per hour.

3.5 CONSTRUCTION METHOD

SCE has not requested bids from a construction contractor. Variations in the equipment and the methodology for placing rock may occur. Therefore, SCE is using the methodology from Phase 2 to describe the potential construction methodology. Figure 3-8 shows a schematic of the potential construction method and equipment, including the derrick barge, the flat-deck supply barge, GPS markers, anchoring points, rock placement lines, and front-end track loader. A “push off” construction method using a front-end track loader would be used for placing the quarry rock within the project area. The front-end track loader would be lowered via crane from the derrick barge to the flat-deck supply barge so that boulders could be pushed over the side. The winch operator would maneuver the edge of the flat-deck supply barge to the required position (e.g., at the first line) by winching “in” or “out” on six anchor cables connected to their

respective anchors. The derrick-barge winch operator would use a computer monitor displaying the triangulated data to assist in locating the edge of the supply barge at the exact line of deployment. Two differential GPS (DGPS) receivers would be mounted on the derrick barge to keep the barge accurately positioned as it moves along the lines. Positional accuracy of the DGPS system would be estimated at one to two feet, and the software acceptance limits would be set at six feet, meaning that the winch operator would hold position to within a tolerance of six feet.

The construction of Phase 2 was carried out by an eight-person crew that included a crane operator, foreman, crane oiler, deck engineer, barge-hand, loader operator, superintendent, and project manager.

The construction activities are proposed to take place between June 1, 2018 and 30 September 2018 to avoid the lobster-fishing season and to utilize the calm weather conditions that are typical of that time of year in southern California (although a second construction period may be proposed for 2019 if work is not completed by September 30, 2018). The construction time period is controlled by weather conditions, the time required to move from one site to another, and the tonnage of rock placement per day. It is expected that about 1,750 tons of rock per day would be placed. This calculates to a minimum of about 100 days of construction to place 150,000 tons of rock. Construction would be carried out during daylight hours six days a week (Monday through Saturday), except on holidays and during inclement weather (no construction would be performed if wave heights were larger than four feet). Onsite work would begin no earlier than 7:00 AM and be halted no later than 7:00 PM. The average work day placing quarry rock at the project site is expected to be about 10 hours.

The minimum average amount of rock coverage on a per-acre basis for Phases 1 and 2 is approximately 790 tons. These low-density modules were found to have bottom coverage of approximately 42% based on methods used in the CCC surveys (Reed et al., 2005).

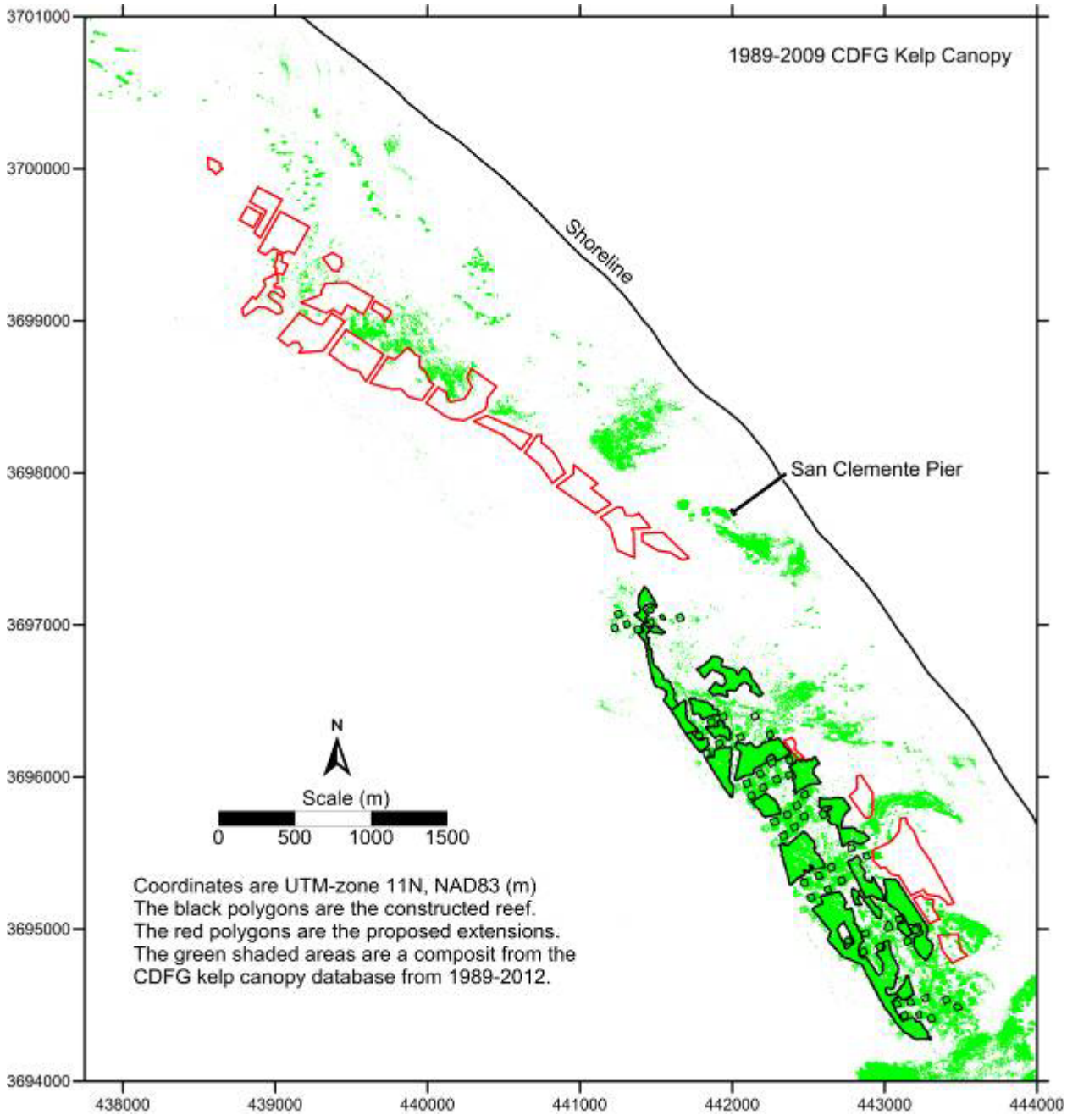

Figure 3-6. Kelp canopy 1989-2012 (California Department of Fish and Wildlife) is shown in the green shaded areas. The black polygons are the Phase 1 & 2 constructed reef. The red polygons are the Phase 3 proposed extension.

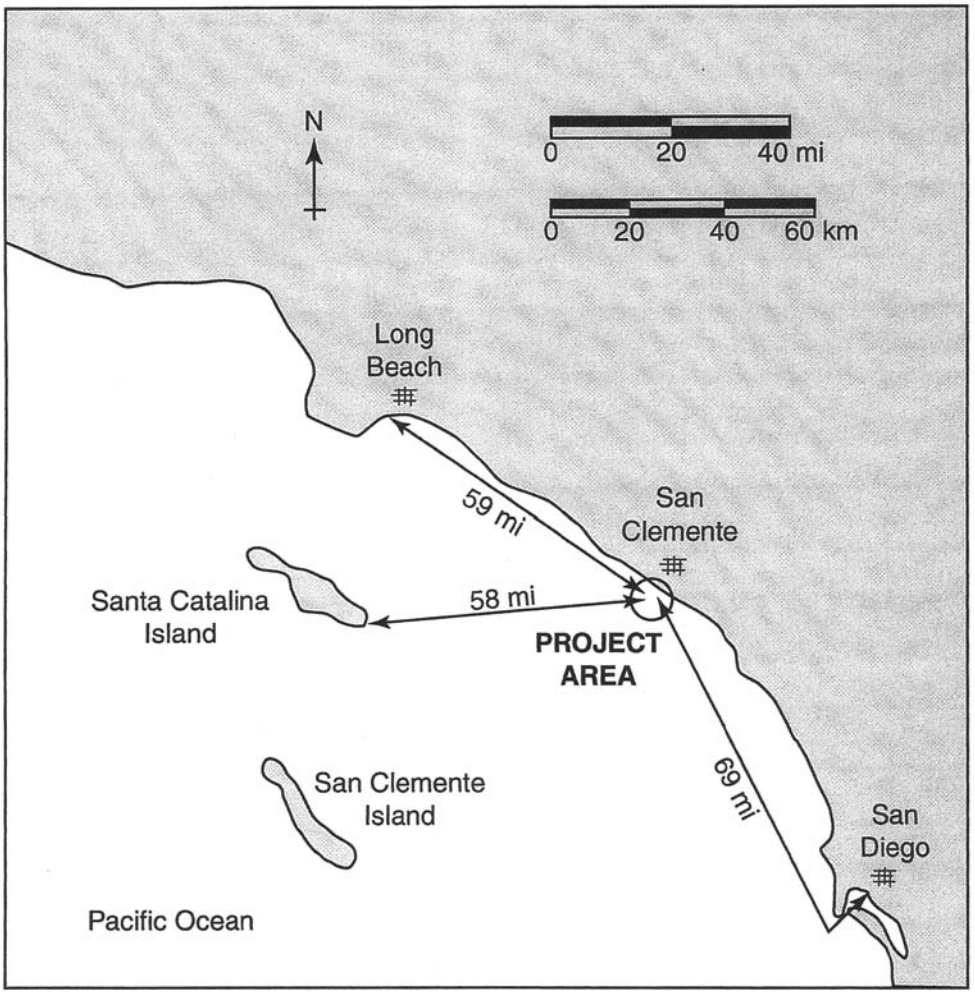

Figure 3-7. Distance from Santa Catalina Island to the project area.

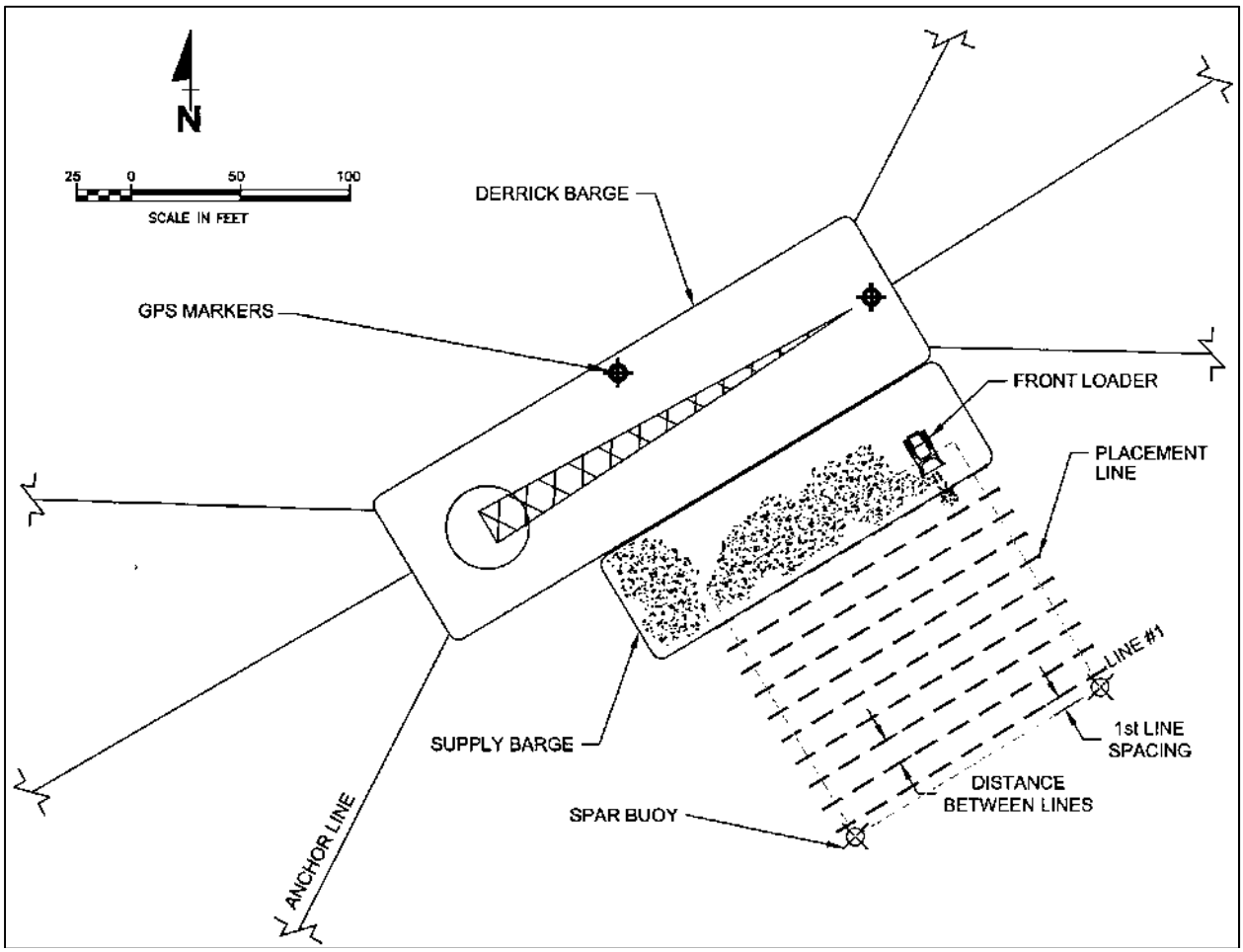

Figure 3-8. Construction method schematic showing derrick barge, supply barge, front-loader, rock placement lines, and six-anchor positioning.

4.0 PROPOSED ARTIFICIAL REEF DESIGN

The exclusive building material for the construction of the Phase 3 Expansion will be quarry boulders for all alternatives. The criteria used to determine and design the polygon areas for the WNR reef expansion are as follows:

- Sited within the expanded State Lands lease area.
- Water depth between 11.5 and 15 m.
- Sand thickness 0.75 m (± 20%).
- Polygon areas designated as having less than 30 percent exposed hard substrate.
- Constructed in areas with no kelp presence greater than one year in the historical database from 1967 to 2012 (CDFW).
- Quarry rock will not be deposited within 50 m of areas of special interest (e.g. fishing sites).
- Anchor sites will not be located in a way that would impact areas of special interest.
- Anchors will not be placed in areas that would impact hard substrate. The large areas of hard substrate at the northern edge of the San Mateo Kelp Bed will be of specific concern in anchor placement.
- Quarry rock will not be deposited within 7 m of the existing reef modules and polygons.
- Adequate navigation channels will be provided.
- Project site is in close proximity to an existing kelp bed.

For the preferred project, 23 polygons were selected to construct the 210.6 acres and comply with the above criteria. The boulders will be graded to assure a low projected profile (relief) distributed at a low-coverage density (42%, 790 tons per acre) upon the appropriate benthic substrate. The polygons have been overlaid onto a 3D GIS map of the seafloor bathymetry (Figure 4-1). In Figure 4-1, the yellow (40 x 40 m) modules are shown in seven blocks representing the Phase 1 Experimental Reef, the red polygons represent the 17 reef areas constructed during Phase 2, and the white polygons represent the Phase 3 WNR Expansion. Table 4-1 gives the areas of the Phase 3 polygons.

The design achieves the following:

- Proximity to persistent kelp bed,
- Avoids hard substrate areas of greater than 30 percent,
- Avoids areas of persistent historical kelp growth,
- Places substrate on sand with a depth of less than 0.75 m to minimize subsidence of the new substrate,
- Locates the reef in water depths suitable for kelp recruitment and growth,
- Isolates the experimental reef modules from the new reef,
- Provides a 7 (± 1) meter margin from existing hard substrate,
- Allows several navigation lanes between inshore and offshore areas,
- Avoids areas of special interest (e.g., local fisheries), and
- Is designed to increase the perimeter of the reef.

The 210.6 acres for the Phase 3 WNR Expansion encompasses approximately 10 acres of additional polygons that were designed as contingency areas of reef construction and potential future remediation areas. The contingency (remediation) polygons will be utilized at the discretion of the SCE Project Manager and will serve as an alternate reef-construction location if site-specific issues dictate termination of construction at any of the primary locations (polygons). Some of the ten acres may be utilized as areas of high-relief reef having heights between 2 to 3 m. Histograms are presented in Figure 4-2 for the Phase 3 Expansion (proposed project) and Phase 2 polygon areas.

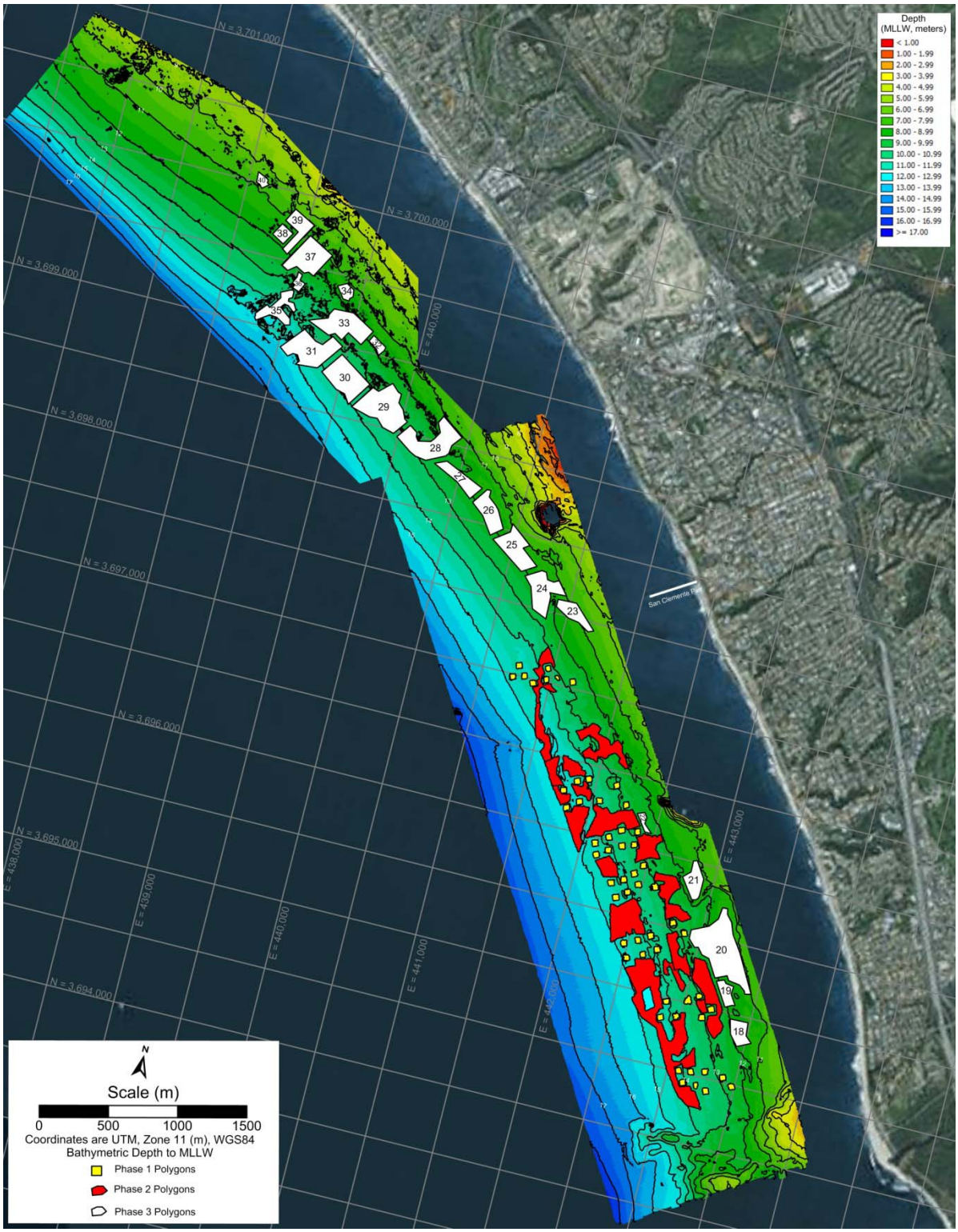

Figure 4-1. Phase 3 Expansion (210.6 acres), including 10 contingency acres, overlaid onto a seafloor bathymetric map.

Table 4-1. Areas of polygons 18 to 40 of the Phase 3 Expansion (including contingency).

Polygon #	Acres
18	5.10
19	3.74
20	29.79
21	6.15
22	1.47
23	6.09
24	12.09
25	11.58
26	8.60
27	7.01
28	16.81
29	18.96
30	14.58
31	16.05
32	1.89
33	14.56
34	2.34
35	7.69
36	1.64
37	13.18
38	2.70
39	7.10
40	1.48
Total	**210.6**

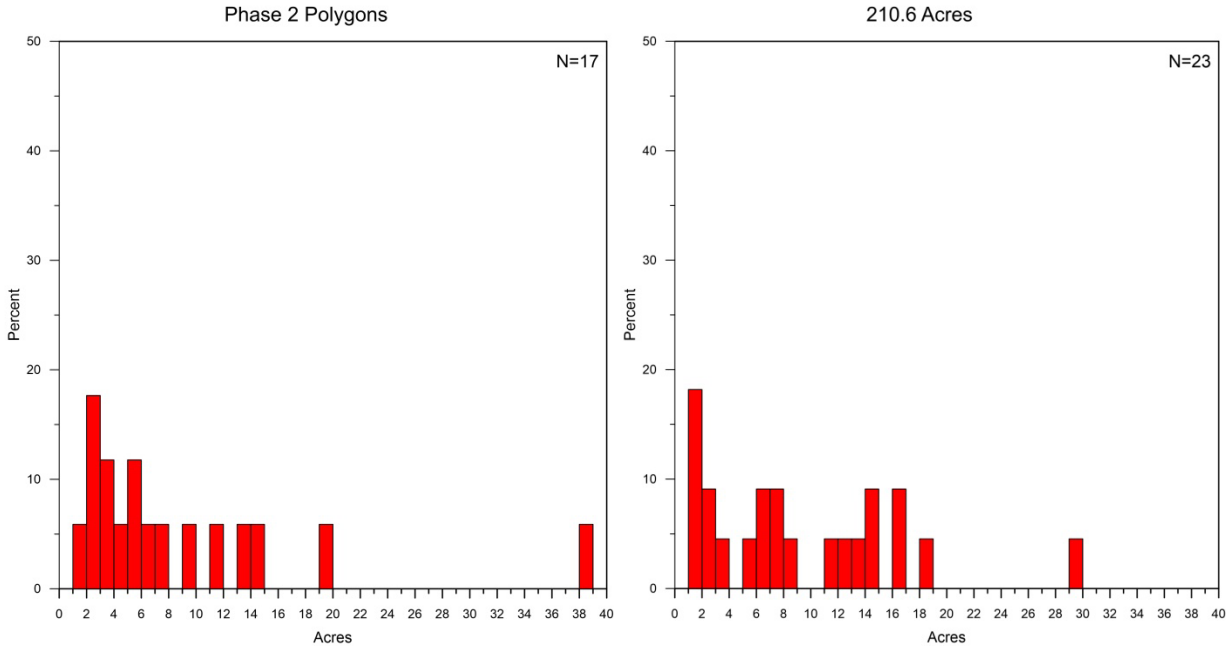

Figure 4-2. Histograms of polygon areas for Phase 2 (left) and Phase 3 (right).

5.0 SPECIFICATIONS FOR REEF MATERIALS

5.1 PHYSICAL PROPERTIES

Materials availability, source locations, and minimization of air quality impacts influenced SCE and CE to select quarry boulders as the exclusive building material for constructing the reef for the first two phases. Quarry boulders were acceptable to CCC staff for construction of the Phase 1 and 2 reef.

All rocks used for this project shall conform to the CDFW material specification guidelines for augmentation of artificial reefs with surplus materials (Appendix A; Bedford, 1997). Written approval will be obtained from CDFW prior to depositing any rock. Pertinent criteria include:

1. The materials shall be clean and free of any contaminants, especially those that could dissolve in seawater (e.g., asphalt, paint, oil, or oil stains).
2. All rocks used for this project must be accepted by state and federal agencies in the following respects:
    - Purity: The materials shall be free of contamination and foreign materials.
    - Specific gravity: Shall be greater than 2.3 tons/m^3.
    - Durability: Rocks used must remain unchanged after 30 years of submersion in seawater.

5.2 BOULDER DIMENSIONS AND WEIGHT

Table 5-1 shows the dimensions of the quarried boulders to be used. Boulders used in this project will have a specific gravity greater than 2.3 tons/m^3. Table 5-2 gives rock weight distribution per acre and estimated number of rocks per class.

Figure 5-1 shows the estimated rock distribution, and Figure 5-2 shows the weight distribution and estimated number of rocks per class.

Approximately 790 (± 10%) tons of graded quarry rock distributed over one (1) acre will achieve the desired density of artificial hard substrate (~ 42% density, as estimated by CCC contract scientists in Reed et al., 2005). An estimated 150,000 (± 10%) tons of quarry rock will be deposited on 210 acres to construct the Phase 3 Expansion reef.

5.3 MATERIAL TEST SPECIFICATIONS

Table 5-3 specifies the material tests required to ensure contractor compliance with the specific weight, absorption, and durability requirements of the rocks used for this project.

Table 5-1. Quarried rock dimensions for the Phase 3 Expansion.

Parameter	Nominal Dimensions (ft)	Tolerance (ft)	Percent of Quarried Rock At Nominal Dimensions
Length	2	± 1	85
Width	1.5	± 0.5	85
Height	1 – 2	+ 1	85

Note: Less than 5% of the boulders shall exceed 3 feet in length.

Table 5-2. Estimated rock weight distribution by range.

Distribution Range		Mean, Rock Weight		% of Rocks by Weight
kgs	lbs	kgs	lbs	
20 – 34	44 – 75	27	59	5
34 – 220	75 – 484	127	279	42.5
220 – 450	484 – 990	335	737	42.5
> 450	> 990	450	990	10
Total				100

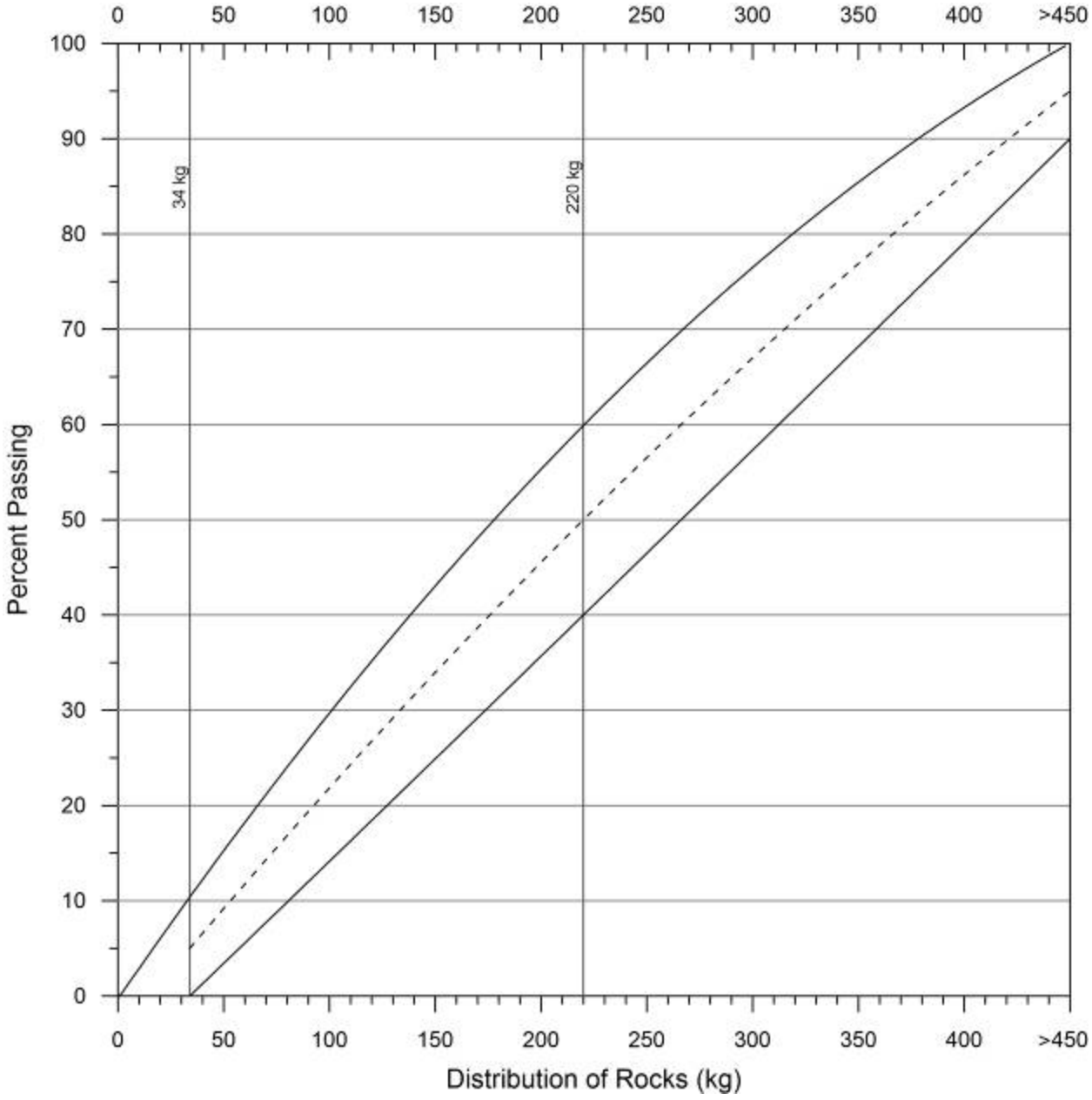

Figure 5-1. Upper and lower boundary for rock distribution (solid lines). The dotted line shows the mean estimate for rock distribution.

Table 5-3. Required material tests (revised on March 25, 2008).

Test	California / *ASTM Test	Requirement
Apparent Specific Gravity	206 / ASTM C127	2.3 minimum
Absorption	206 / ASTM C127	6.8% maximum
Durability Index	ASTM C535	38% maximum at 500 revolutions, 50% maximum at 1000 revolutions

* American Society of Testing and Materials

6.0 PROPOSED PROJECT ALTERNATIVES

6.1 INTRODUCTION

The proposed project (Figure 4-1) would have an area of 210.6 acres of low relief with 42% hard substrate coverage of quarry rock. The footprint of this alternative is stretched laterally along the coast, extending north of the Phase 1 and 2 modules by 4.2 kilometers to maximize the ocean edge of the project. Based on data from the CCC's independent monitoring program of the WNR, it is suggested that this edge is the most productive for fish. This design will utilize the ocean edge to increase the amount of fish biomass. The low-coverage/low-relief design mimics the existing reef's construction. Since the WNR has been shown to be successful for many of the performance standards, duplication of the design presents a high confidence level that the reef expansion will perform as well as the existing reef. This alternative uses the least amount of rock compared to other alternatives that would produce the necessary fish biomass, which has two positive effects: 1) reduced air emissions and 2) lower costs to SCE customers. Chapter 4 gives a full description of the preferred project alternative.

In this chapter, we present three additional alternatives. The range of reasonable alternatives considered in this study includes those with polygons of different sizes or those with different coverage from the proposed project. All of the alternatives are low relief (< 1 m) and are located near the existing WNR Phase 1 and 2. The project alternatives presented below are within the City of San Clemente. All the project alternatives satisfy the CCC's recommendations as presented in its letter to SCE dated May 24, 2016 (Appendix D).

Alternatives 2 and 3, presented below, have a higher percentage of hard substrate coverage than the proposed project (63% and 81%, respectively). These two coverage percentages are referred to in this report as medium and high coverages.

The screening criteria used to select the agency's preferred alternative are described in the following section.

6.2 SCREENING CRITERIA

The alternatives were evaluated individually and were screened by considering the purpose of and need for the proposed expansion and the relative environmental benefits and adverse effects of each alternative. The screening criteria focused on achieving the greatest environmental benefits in terms of extent, numbers, and diversity of restored organisms, while minimizing the potential adverse effects on other environmental resources.

The criteria used to select the additional module/polygon areas for the extended Phase 3 reef are as follows:

- Located within the State Lands lease area or near WNR Phase 1 and 2.
- Water depth between 11.0 and 16 m.
- Sand thickness of 95% of the reef area should be less than 1 m.

- Polygons constructed on areas designated as having less than 30% exposed hard substrate.
- Constructed in areas with no kelp presence greater than one year in the historical database from 1967 to 2015.
- No areas of special interest (e.g., fishing sites) within 50 m of proposed deposition area for quarry.
- No need for anchor sites located in a way that would impact areas of special interest.
- No need for anchor placement in areas that would impact hard substrate. The large areas of hard substrate at the northern edge of the San Mateo Kelp Bed would be of specific concern regarding anchor placement.
- No deposition of quarry rock within 7 m of the existing reef.
- Project site in close proximity to natural kelp bed.

6.3 DESIGN ALTERNATIVES

The design for the WNR Phase 3 Expansion requires polygons of optimal size and spacing in order to increase both the footprint and the perimeter-to-area ratio of the reef. The polygons should not be too small or too large in order to ensure kelp persistence and the project goal regarding fish biomass. Several design alternatives were considered (CE, 2016). Below we present three feasible alternatives.

6.3.1 Alternative 1: Compacted 200 Acres, Low-Coverage Reef

Figure 6-1 shows the footprint of the 200-acre low-coverage reef (42% hard substrate coverage). This alternative would place 150,000 (± 10%) tons of quarry rock within nine polygon areas (Table 6-1). In Figure 6-1 and Table 6-1, the total reef area is shown as 229 acres; however, only 200 acres would be constructed. The footprint of this alternative is adjacent to and north of the existing reef. Unlike the preferred project alternative, Alternative 1 compresses the northward design, extending only 3 kilometers northwest of the existing WNR. This compressed, northerly design reduces the ocean edge. The polygons are larger, and they extend into deeper water and deeper sand than the preferred alternative.

While this alternative may satisfy the project goal, the rocks are placed on a sand thickness of about 1 m, increasing the probability of reef burial, and the polygons are larger than the preferred alternative. Decreasing the perimeter-to-area ratio thus decreases the fish biomass per unit of placed rock (Wilson et al., 1990).

6.3.2 Alternative 2: 125 Acres, Medium-Coverage Reef

Figure 6-2 shows the layout of the 125-acre, medium-coverage reef (63% hard substrate coverage). This alternative would place 225,000 (± 10%) tons of quarry rock within 15 polygon areas (Table 6-2). The increased rock coverage would allow for a smaller footprint. This design uses nearly 50% more rock than either Alternative 1 or the proposed project. The increased quantity of rock would increase emissions, extend the amount of time required to place the rock, and increase costs for SCE's customers.

6.3.3 Alternative 3: 105 Acres, High-Coverage Reef

Figure 6-3 shows the layout for the 105-acre, high-coverage reef (81% hard substrate coverage). This alternative would place 288,750 (± 10%) tons of quarry rock within 37 polygon areas (Table 6-3). The increased rock coverage would allow for a smaller footprint. This design uses almost 93% more rock than either Alternative 1 or the proposed project. The increased quantity of rock would increase emissions, extend the amount of time required to place the rock, and increase costs for SCE's rate-payers.

6.4 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, SCE would not implement the WNR Expansion and would not be able to satisfy the CCC's permit requirements. As such, the No-Action Alternative would not address the purpose of and need for the proposed action. Design parameters for the proposed project and its alternatives are presented in Table 6-4.

Figure 6-4 presents all alternatives and the proposed project.

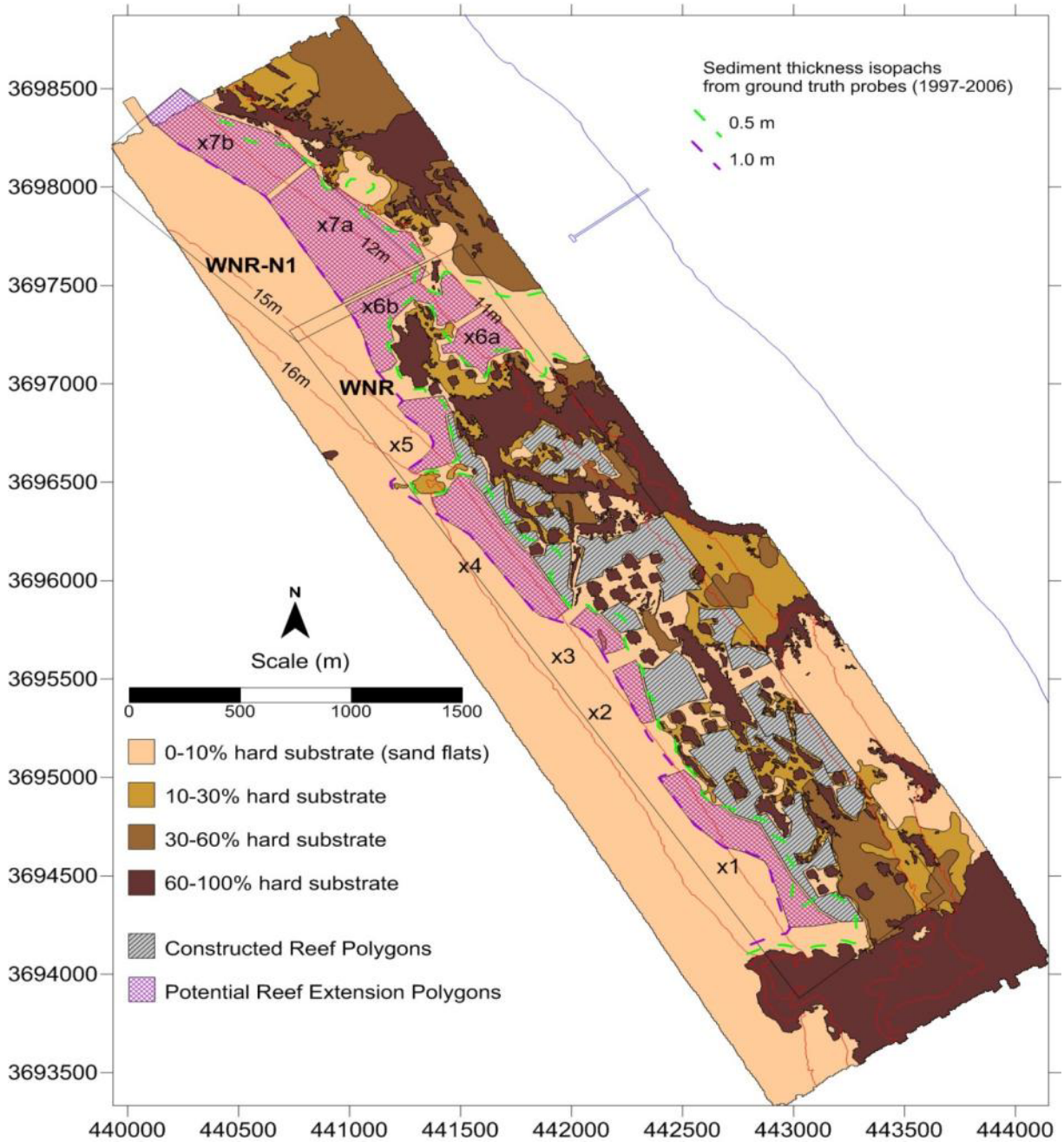

Figure 6-1. Alternative 1: Compacted 200 acres, low-relief reef, showing polygons.

Table 6-1. Alternative 1: Compacted 200 acres, low-relief reef, with polygon sizes.

Extension Area	Polygon ID	Acres
WNR	x1	31.0
	x2	6.6
	x3	6.8
	x4	32.2
	x5	13.0
	x6a	13.9
	x6b	28.6
WNR-N1	x7a	56.1
	x7b	41.3
	Total	**229.4**[a]

[a] Reef coverage (200 acres) , with approximately 29.4 acres of contingency

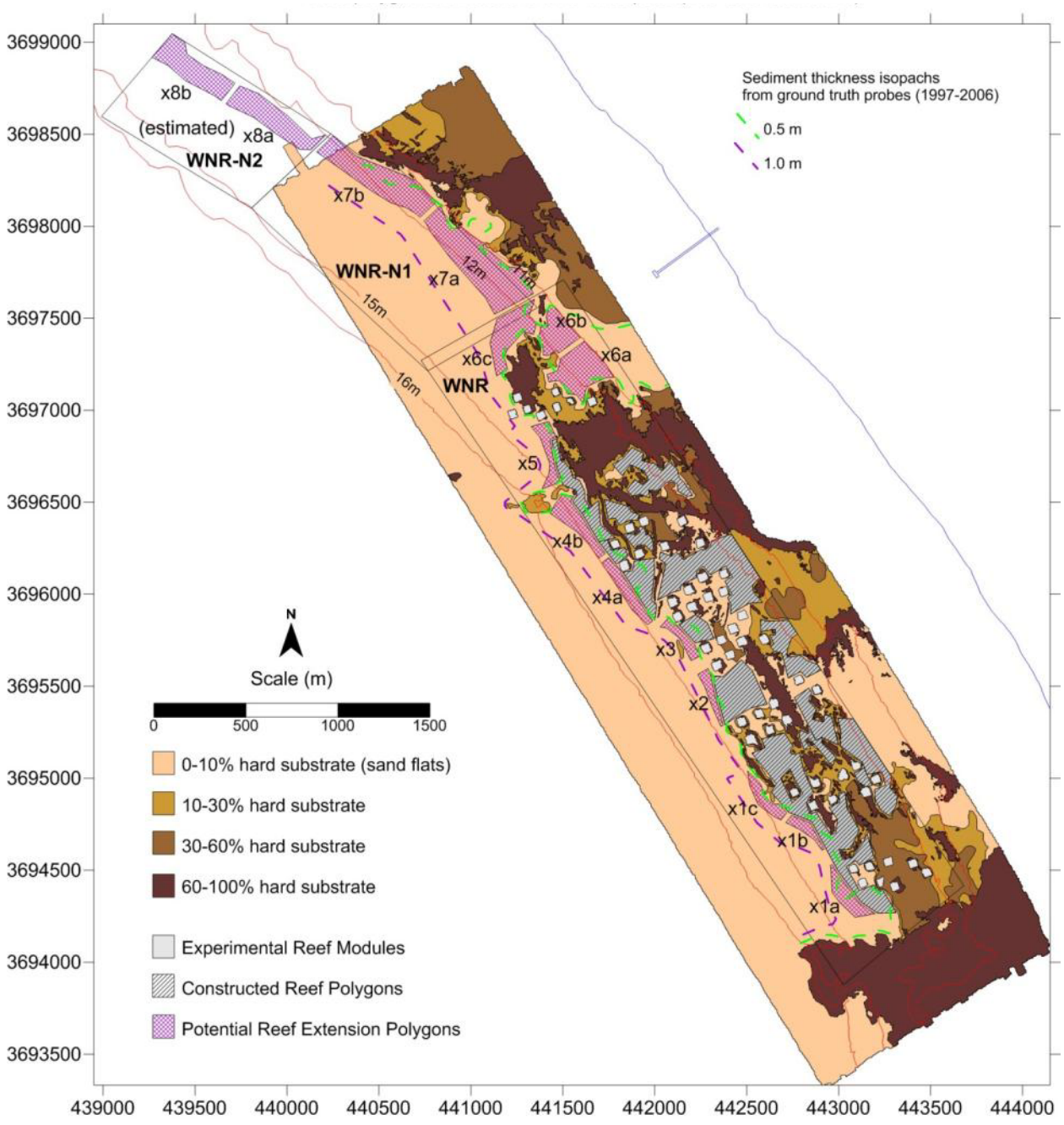

Figure 6-2. Alternative 2: Medium-coverage reef, showing polygons (125-acre alternative).

Table 6-2. Alternative 2: Medium-coverage reef, polygon sizes.

Extension Area	Polygon ID	Acres
WNR	x1a	5.5
	x1b	2.6
	x1c	4.0
	x2	2.9
	x3	3.2
	x4a	5.6
	x4b	7.3
	x5	4.7
	x6a	13.9
	x6b	8.3
	x6c	11.3
WNR-N1	x7a	29.7
	x7b	22.2
WNR-N2	x8a	14.6
	x8b	14.1
	Total	**149.9**[a]

[a] Medium coverage (125 acres) reef, with approximately 24.9 acres of contingency

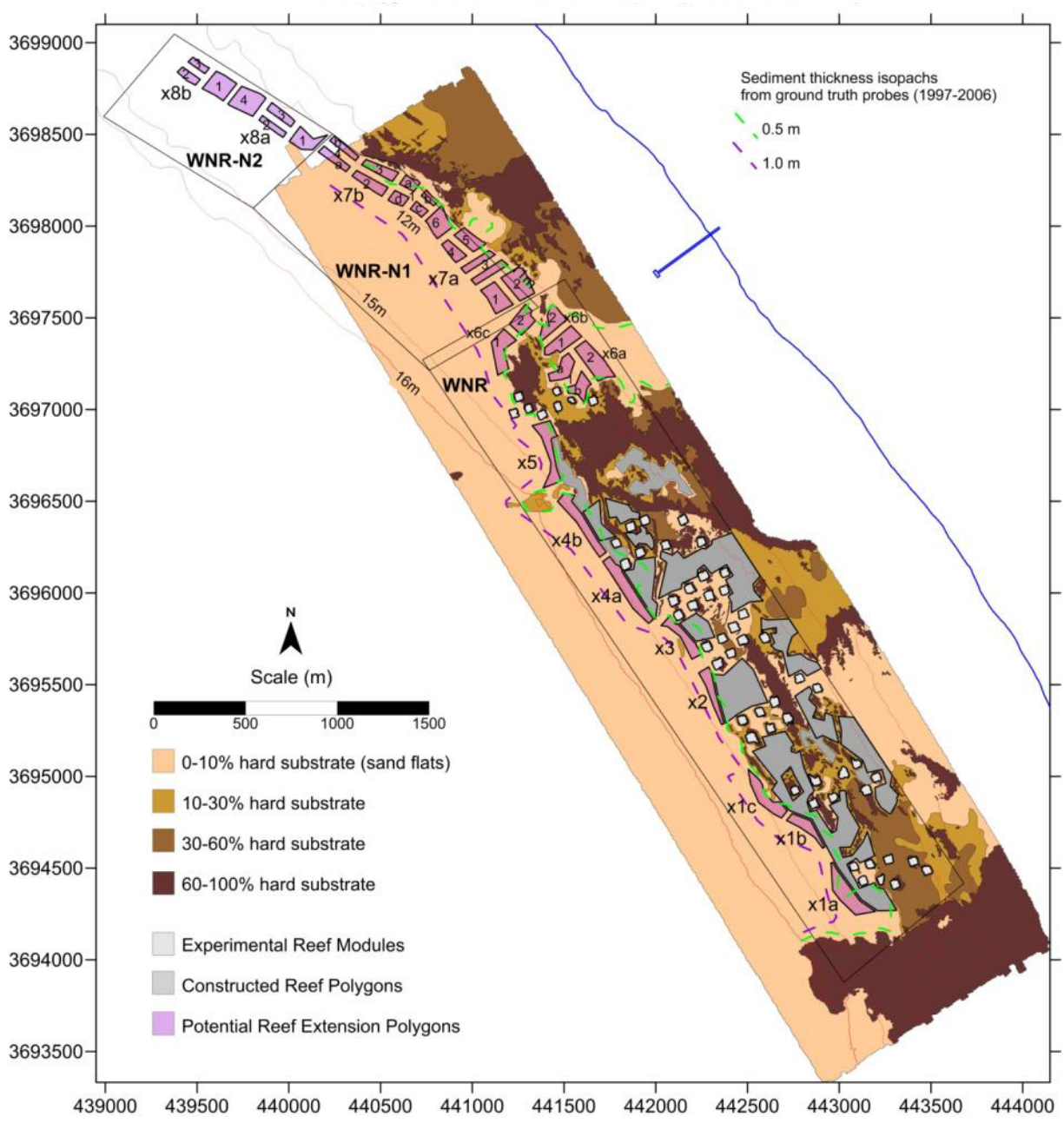

Figure 6-3. Alternative 3: High-coverage reef, showing polygons (105-acre alternative).

Table 6-3. Alternative 3: High-coverage reef, polygon sizes.

Extension Area	Polygon ID	Acres
WNR	x1a	5.5
	x1b	2.6
	x1c	4.0
	x2	2.9
	x3	3.2
	x4a	5.6
	x4b	5.0
	x5	4.7
	x6a-1a	2.7
	x6a-1b	2.3
	x6a-2	5.1
	x6b-1	3.5
	x6b-2	3.0
	x6c-1	4.1
	x6c-2	2.9
WNR-N1	x7a-1	3.6
	x7a-2	4.5
	x7a-3a	1.7
	x7a-3b	2.0
	x7a-4	1.8
	x7a-5	2.5
	x7a-6	3.3
	x7b-1a	1.3
	x7b-1b	0.8
	x7b-1c	1.0
	x7b-1d	1.3
	x7b-2	2.4
	x7b-3	2.3
	x7b-4a	1.8
	x7b-4b	1.4
WNR-N2	x8a-1	3.1
	x8a-2	1.3
	x8a-3	1.8
	x8a-4	4.6
	x8b-1	3.9
	x8b-2	1.3
	x8b-3	1.0
	Total	**105.9**

Table 6-4. Parameters of proposed project and alternatives.

Design	Phase 3 Acres	Sand Thickness (m)	Relief (m)	Percent Coverage	Tonnage of Rock (ton)
Proposed Project	210.6	< 0.75	< 1	Low[a]	150,000
Alternative1	200	< 1.0	< 1	Low[a]	150,000
Alternative 2	125	< 0.75	< 1	Medium[b]	225,000
Alternative 3	105	< 0.75	< 1	High[c]	288,750
No-Action Alternative	0	–	–	–	–

[a] 42% coverage
[b] 68% coverage
[c] 86% coverage

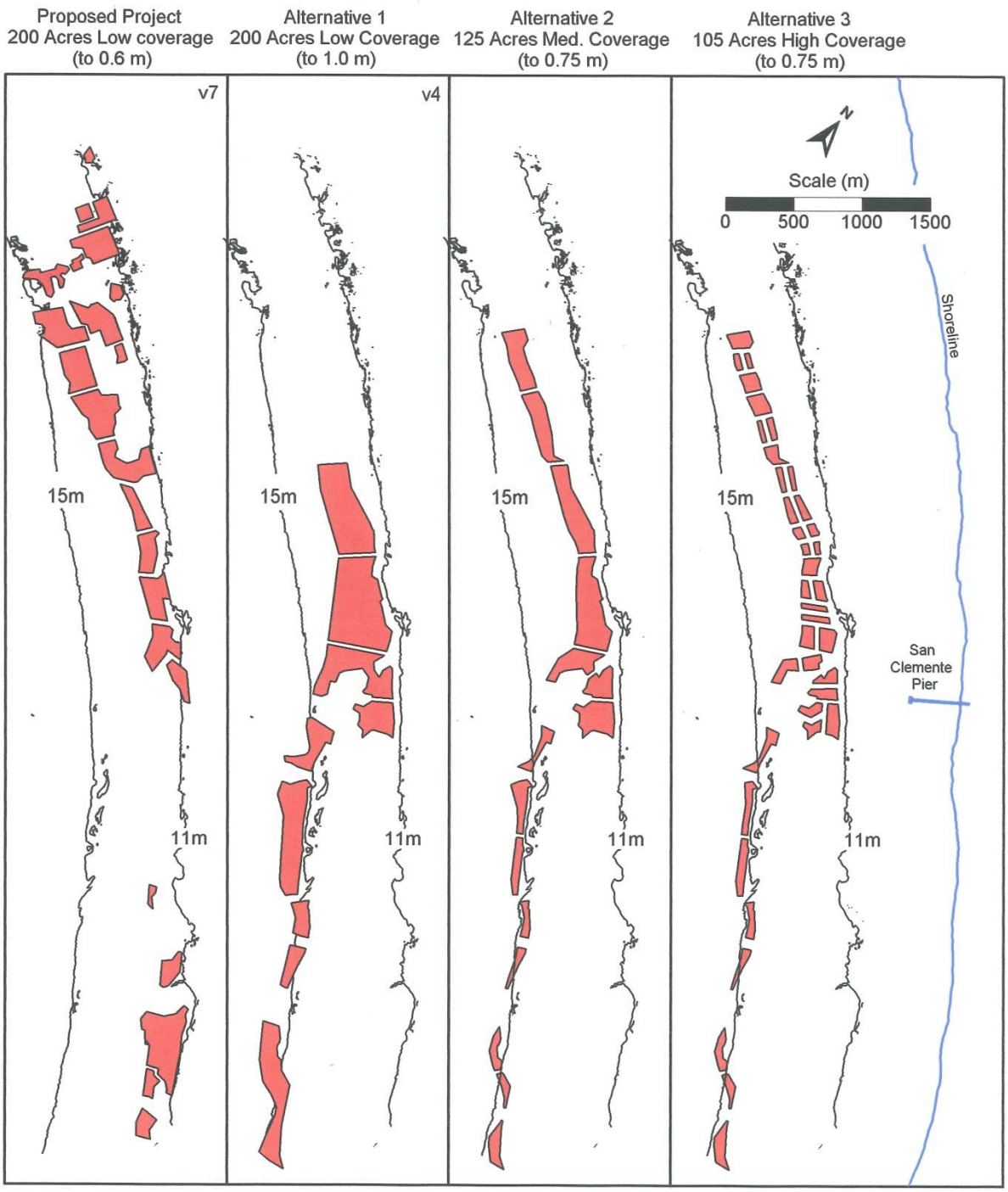

Figure 6-4. Proposed project and all alternatives.

7.0 PROJECT SCHEDULE

7.1 PROJECT SCHEDULE CONSIDERATIONS

The following issues have been considered in estimating the project's duration:

1. The construction company will need at least a four- to six-month lead-time to secure an adequate supply of quarry rocks of the appropriate dimensions.
2. Lobster season prevents construction activities between the beginning of October and mid-April.
3. Weather conditions may interfere with the construction schedule. Twenty-four hours before the development of weather conditions that would generate ground swells (waves) greater than 1.6 m, all construction vessels will be withdrawn to a safe location. The estimated schedule delay for each adverse weather event is 2-3 days.
4. Air quality and cumulative construction daily emissions of PM10 and NO_x.
5. Possible damage to existing kelp at the experimental reef modules by anchor lines or relocation of construction vessels.
6. Equipment failure and unforeseen circumstances.

7.2 SCHEDULE OUTLINE

Project schedule depends upon compilation of the CEQA analysis. We hope to construct 30-50% of the Phase 3 proposed reef expansion in 2018, but this depends on CEQA completion by 31 May 2018. The compressed schedule is dependent on the regulatory process moving quickly.

Work will stop completely if wave heights exceed 1.5 m (4-9 ft), and the derrick barge will be moved to a location where it can be anchored safely, to deep water, or to Long Beach Harbor. The anchoring plan has been designed so that minimal time will be spent moving the barge from one location to another.

8.0 REFERENCES

City of San Clemente, 1993. *Pier Bowl Revised Draft Specific Plan*. http://san-clemente.org/department-services/planning-services/specific-plans.

California Coastal Commission, 1997. Adopted Findings and Conditions: Permit Amendment and Condition Compliance, Permit No. 6-81-330-A (formerly 183-73), Southern California Edison Company (Edison) on behalf of Edison, San Diego Gas and Electric Company, and Cities of Anaheim and Riverside, as Owners of San Onofre Nuclear Generating Station (SONGS) Units 2 and 3. May 14, 1997.

Coastal Environments, 1999a. Construction of Southern California Edison Experimental Artificial Kelp Reef, San Clemente, California, Volume I. Report submitted to Southern California Edison, Rosemead, CA, 91770, on 24 November 1999, CE Ref. No. 99-1. 35 pp. and 4 appendices.

Coastal Environments, 1999b. Construction of Southern California Edison Experimental Artificial Kelp Reef, San Clemente, California, Volume II. Report submitted to Southern California Edison, Rosemead, CA 91770, on 24 November 1999, CE Ref. No. 99-15. 6 pp. and 4 appendices.

Coastal Environments, EcoSystems Management Associates, and Fugro Pelagos, 2006a. Seafloor Characterization for SONGS Artificial Reef Mitigation Project at San Clemente, California, Volume I. Submitted to Southern California Edison, 16 March 2006, CE Ref No. 06-01. 54 pp., 3 appendices.

Coastal Environments, EcoSystems Management Associates, and Fugro Pelagos, 2006b. Seafloor Characterization for SONGS Artificial Reef Mitigation Project at San Clemente, California, Volume II. Submitted to Southern California Edison, 16 March 2006, CE Ref. No. 06-02 . 7 Chapters and 3 appendices.

Coastal Environments, 2008a. Final Construction Report for Wheeler North Reef at San Clemente, California (formerly the SONGS Artificial Reef Mitigation Project, Phase 2 Mitigation Reef), Volume I: Technical Report. Prepared for Southern California Edison, 4 November 2008 (revised 12 December 2008) CE Ref No. 32. 42 pp., 4 appendices.

Coastal Environments, 2008b. Final Construction Report for Wheeler North Reef at San Clemente, California (formerly the SONGS Artificial Reef Mitigation Project, Phase 2 Mitigation Reef), Volume II: Data Report. Prepared for Southern California Edison, 5 November 2008 (revised 12 December 2008), CE Ref. No. 33. 8 pp., 7 appendices.

Coastal Environments, 2016. Reef Design Alternatives. Wheeler North Reef Extension at San Clemente (SONGS Artificial Reef Mitigation Project, Phase 3 Mitigation Reef). Draft Report. Technical Report. Report submitted to SCE on 27 October 2016, Rosemead, CA 91770. CE Ref. No. 16-22, 39 pp.

Coastal Environments, 2017. Seafloor Characterization at Wheeler North Reef Expansion Project San Clemente, California. Draft Report. Technical Report. Report submitted to SCE on 09 October 2017, Rosemead, CA 91770. CE Ref. No. 17-16, 112 pp.

Reed, D.C., S.C. Schroeter, and D. Huang, 2005. Final Report on the Findings and Recommendations of the Experimental Phase of the SONGS Artificial Reef Mitigation Project. Prepared for the California Coastal Commission, Marine Science Institute, University of California, Santa Barbara, 1 August 2005. 136 pp.

Resource Insights, 1999. Final Program Environmental Impact Report (PEIR) for the Construction and Management of an Artificial Reef in the Pacific Ocean near San Clemente, California. Prepared for the California State Lands Commission (CSLC). 8 Chapters and 8 Appendices.

University of California, Santa Barbara (UCSB), 2016. Performance Evaluation of Wheeler North Reef: 2015 Monitoring Results. PowerPoint Presentation, http://marinemitigation.msi.ucsb.edu/.

University of California, Santa Barbara (UCSB), 2017. Remediating Wheeler North Reef SONGS Mitigation Monitoring Project. Prepared by Kate Huckelbridge, at the California Coastal Commission, 10 May 2017. 13 slide ppt.

Wilson, K.C., Lewis, R.D., and H.A. Togstad, 1990. California Department of Fish and Game nearshore sport fish habitat enhancement program artificial reef plan for sportfish enhancement. Administrative Report no. 90-15. Prepared in cooperation with Southern California Company.

APPENDIX A

CALIFORNIA DEPARTMENT OF FISH AND GAME GUIDELINES

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CALIFORNIA DEPARTMENT OF FISH AND GAME GUIDELINES

MATERIAL SPECIFICATION GUIDELINES AND NOTIFICATION PROCEDURE FOR AUGMENTATION OF ARTIFICIAL REEFS WITH SURPLUS MATERIALS

The California Department of Fish and Game (CDFG) coordinates the state program for research and construction of artificial reefs off the coast of California. Department biologists have been involved in the planning and construction of over 35 artificial reefs off our coastline. Some of these reefs, in Orange and San Diego Counties, are permitted for future expansion through the use of surplus materials of opportunity. Cities, counties, public agencies and private organizations or businesses are invited to submit proposals to CDFG for disposal of certain categories of surplus materials for use in the construction of artificial reefs.

Acceptable Materials

Materials suitable for construction of artificial reefs must meet the following criteria:

(1) The material must be persistent. It must be hard, but may not be so brittle that collisions with other similar materials or boat anchors would tend to shatter it. It must remain unchanged after years of submersion in seawater.
(2) The material must have a specific gravity at least twice that of seawater. The material must be dense enough to remain in position during strong winter storms, even in water depths as shallow as 30 feet.
(3) The material must not contain potentially toxic substances. Petroleum products, including tires, are not acceptable reef material.
(4) Acceptable materials include, but may not be limited to, quarry rock and high density concrete. Other materials may be considered on a case-by-case basis.

Procedure for Placement of Materials

Placement of material at any reef site requires prior written approval from the California Department of Fish and Game. Specific off-loading sites and actual configuration of material placement will be determined by CDFG, in writing, and will be strictly adhered to.

Responsibilities of Principal Party to Agreement (City, Port District, etc.)

NOTIFICATION: The Principal party to the agreement must notify CDFG a minimum of one full month prior to moving any material to the specified reef site.

Responsibilities of Barge Contractor

NOTIFICATION: The barge contractor must notify the U.S. Coast Guard two weeks prior to moving any material to the reef site. The Coast Guard must be given a minimum of two weeks lead time to include this job in their Aids to Navigation and Notice to Mariners (Los Angeles area, 562-499-5410; San Diego area, 619-557-5877).

This notification must include:

(1) Location of work site.
(2) Size and type of equipment that will be performing the work.
(3) Name and radio call sign for working vessels, if applicable.
(4) Telephone numbers for on-site contact with project engineers.
(5) Schedule for completing the project.

PLACEMENT OF MATERIALS:

The contractor must arrange for inspection of loaded barge materials immediately prior to movement of any barge to the reef site.

CDFG shall place temporary buoys at the off-loading site. The barge loads of materials must not be allowed to drift off-site during material augmentation.

Prepared by:
Dennis W. Bedford
Marine Resources Region – Long Beach
October 30, 1997

APPENDIX B

MAY 24, 2016 LETTER FROM CCC TO SCE REGARDING REMEDIATION OF THE WHEELER NORTH REEF

CALIFORNIA COASTAL COMMISSION
45 FREMONT, SUITE 2000
SAN FRANCISCO, CA 94105- 2219
VOICE (415) 904- 5200
FAX (415) 904- 5400
TDD (415) 597-5885

May 24, 2016

Dr. David Kay
Southern California Edison Company
6040 North Irwindale Avenue
Irwindale, CA 91702

Re: Requirement to remediate Wheeler North Reef

Dear David:

On March 10, 2015, Coastal Commission staff sent you a letter documenting that the Wheeler North Reef (WNR) has not met the absolute performance standard for fish standing stock required by Coastal Development Permit (CDP) 6-81-330-A, issued to SCE for the construction and operation of the San Onofre Nuclear Generating Station (SONGS), and the conclusion by Commission staff, the Science Advisory Panel (SAP) and the University of California Santa Barbara (UCSB) independent monitoring team that the current size (174.42 acres) and configuration (low relief reef with an average of 47.6 % coverage of rock) of WNR is insufficient to consistently meet the permit requirement for a minimum fish standing stock of 28 US tons.

Attached to that letter was a paper entitled Report on the Causes of Low Fish Standing Stock at Wheeler North Reef and Possible Solutions for Remediation, written by the UCSB independent monitoring team in consultation with the Scientific Advisory Panel, that analyzed the reasons for WNR's inability to meet the fish standing stock requirement and provided estimates of additional reef needed to consistently meet the requirement. Since March 2015, our staff has met with your team several times to discuss the report and how to move forward to ensure compliance with CDP 6-81-330-A.

We appreciate the time that the Southern California Edison (SCE) team has spent with Commission staff, the SAP and the UCSB independent monitoring team discussing potential feasible remediation options. The purpose of this letter is to formally notify SCE of my determination as acting Executive Director that remediation of WNR is necessary to meet the requirements of CDP 6-81-330-A. CDP 6-81-330-A, Condition C, Section 2.4 includes the following condition:

> *Monitoring independent of the permittee shall be implemented in accordance with Condition D to: (1) determine whether the performance standards of this condition are met (i.e., whether the mitigation reef successfully replaces the lost and damaged resources in the San Onofre Kelp bed), (2) if necessary, determine the reasons why any performance standard has not been met, and (3) develop recommendations for appropriate remedial measures. The permittee shall be*

responsible for fully implementing any remedial measures deemed necessary by the Executive Director.

In accordance with Condition C of CDP 6-81-330-A, the UCSB independent monitoring team used monitoring data collected at the Phase I reef since 2000 to determine the area of different configurations of new reef needed for remediation. Results from these analyses, summarized in Table 1 below and further explained in the March 2015 report, indicate the area of additional reef needed for the WNR to meet the performance standard for fish standing stock. The acreage of additional reef varies for different configurations of relief and rock coverage and the level of statistical confidence that it will support an annual standing stock of at least 28 tons. Table 1 shows that for a given level of statistical confidence, the acreage of additional reef needed is highest for low relief and low cover and decreases as the relief and cover of the additional reef increases. The level of confidence in meeting the 28 ton standard also increases as the acreage of additional reef increases.

(a) Reef Configuration		(b) Level of Confidence	(c) Additional acres
Relief	Cover		
low	low	95%	200
low	medium	95%	125
low	high	95%	105
high	high	95%	30
low	low	99%	240
low	medium	99%	155
low	high	99%	140
high	high	99%	38

Table 1. Additional acreage required for WNR to consistently meet the 28 ton fish standing stock permit requirement as a function of reef design and level of confidence.

I have reviewed the analysis described above and concur that to comply with the requirements of CDP 6-81-330-A, SCE must remediate WNR by building new reef acreage that, at a minimum, meets the size, relief and cover requirements of one of the options described in Table 1. We hope SCE staff will work with us to move forward with the planning and implementation of remediation as quickly as possible.

Although WNR has provided substantial benefits to the marine ecosystem and has successfully met many of the permit requirements, WNR's inability to meet the fish standing stock requirement, a critical element of the mitigation plan, represents a significant loss to the marine biological community. SCE benefited from the operation of SONGS for over 30 years without fully mitigating its impacts, and thus it is critical that we move quickly to ensure that resources that have been damaged and lost are replaced and SCE is in full compliance with the SONGS permit.

To that end, please submit a Remediation Plan of Action to Commission staff within 45 days of the receipt of this letter. At a minimum, the Plan of Action should include a list of steps and a proposed timeline for implementation of remediation of WNR. My staff and I would be happy to meet with you and your team to discuss the Remediation Plan of Action or to address other questions or concerns you may have. We understand that SCE has engaged the CPUC on the issue of remediation, and we will also plan to coordinate with CPUC staff to ensure that they are informed of our process moving forward. Please let us know if you would like us to set up a joint meeting with the CPUC.

We look forward to working with you to bring WNR into compliance with Condition C of the SONGS permit. If you have questions or would like to discuss this determination, please call Susan Hansch, Chief Deputy Director, at (415) 904-5244 or Kate Huckelbridge at (415) 396-9708.

Sincerely,

John Ainsworth
Acting Executive Director

CC: Eric Greene, CPUC
Cy Oggins, SLC
Jennifer Lucchesi, SLC